UNHCR WASH Manual

Tools and Guidance for Refugee Settings

UNHCR
The UN Refugee Agency

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UNHCR WASH Manual: Tools and Guidance for Refugee Settings
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UNHCR WASH Manual

Tools and Guidance for Refugee Settings

Foreword

This manual is the first major revision of UNHCR's WASH guidelines since the release of the UNHCR Water Manual for Refugee Situations (UNHCR, 1992). It addresses the changing nature of humanitarian emergencies over the last 20 years and summarizes best practice and lessons learned for the provision of WASH services in a number of contexts including: rapid onset emergencies, long-term protracted emergencies, urban settings, collective centres, spontaneous (unplanned) camps, high-density or large camps, host communities, repatriation programs, local integration programs, and assistance for refugee persons living with host families, in rented accommodation, occupying buildings, or in dispersed locations.

This WASH manual aims to create a clear policy environment for refugee settings that defines WHO, WHAT, WHERE, WHEN, and HOW specific WASH interventions should be carried out. This manual does not aim to replace the multitude of excellent WASH technical resources that exist in the field. Instead, this manual aims to define commonly agreed standards and procedures that should be followed - along with which existing technical resources should be used to carry out the correct approaches which include...

- ☐ Handbook for Emergencies (UNHCR, 2008)
- ☐ Water Manual for Refugee Situations (UNHCR, 1992)
- ☐ Engineering in Emergencies (RedR, 2002)
- ☐ Water and Sanitation for Populations at Risk (ACF, 2005)
- ☐ Hygiene Promotion: A Practical Manual for Relief and Development (Ferron, Morgan, O'Reilly, 2007)
- ☐ Excreta Disposal in Emergencies (WEDC, 2007)
- ☐ Humanitarian Charter and Minimum Standards in Humanitarian Response (SPHERE, 2011)
- ☐ Public Health Engineering in Precarious Situations 2nd Ed (MSF, 2010)
- ☐ Public Health Guide for Emergencies (John Hopkins and IFRC, 2008)

The manual should be used as UNHCR's core policy and operational reference document for UNHCR staff and WASH actors around the world. This document contains UNHCR's criteria for design, operation, maintenance, management and monitoring of WASH service provision throughout all phases of the relief cycle. The manual should be used to understand the requirements that are expected in all refugee settings and in particular, UNHCR's role in coordinating, supporting, monitoring, capacity building and regulating the WASH response to ensure that refugee populations receive quality WASH services.

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Steven Corliss
UNHCR Director of Division of Programme Support and Management

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THIS LIST WILL BE UPDATED DURING THE PEER REVIEW PHASE.

Acronyms and abbreviations

The following acronyms and abbreviations have been used in the text.

AGDM	Age, Gender and Diversity Mainstreaming
AWD	Acute Watery Diarrhea
BCC	Behaviour Change Communication
CAT	Comprehensive Assessment Tool
CATS	Community Approaches to Total Sanitation
CBO	Community Based Organisation
CFU	Colony Forming Units
CHW	Community Health Worker
CLTS	Community Led Total Sanitation
CSP	Community Support Projects
DPD	Diethyl-p-phenylenediamine
FGD	Focus Group Discussion
FRC	Free Residual Chlorine
GI	Galvanized Iron (Pipe)
GBV	Gender Based Violence
GIS	Geographical Information System
GPS	Global Positioning System
HDPE	High Density Poly Ethylene (Pipe)
HP	Hygiene Promotion
HTH	High Test Hypochlorite
HRF	Horizontal Flow Roughing Filtration
HWTS	Household Water Treatment and Safe Storage
HWWS	Hand Washing With Soap
IDP	Internally Displaced Person
IEC	Information Education Communication
IM	Information Management
KAP/KABP	Knowledge, Attitudes, Beliefs, Practices
M&E	Monitoring and Evaluation
MF	Micro Filtration
MHM	Menstrual Hygiene Management
MPN	Most Probable Number
MSD	Minimum Safe Distance

Acronyms and abbreviations

The following acronyms and abbreviations have been used in the text.

NFI	Non-Food Item
NTU	Nephelometric Turbidity Units
O&M	Operations and Maintenance
PE	Polyethylene (Pipe)
PHAST	Participatory Hygiene and Sanitation Transformation
PLA	Participatory Learning and Action
PLWHA	People Living with HIV/AIDS
POUWT	Point of Use Water Treatment
PVC	Polyvinyl Chloride (Pipe)
QIP	Quick Impact Project
RAT	Rapid Assessment Tool
RCM	UNHCR Refugee Coordination Model
RF	Rapid Filtration
RO	Reverse Osmosis
RSF	Rapid Sand Filtration
SAR	Solids Accumulation Rate
SSF	Slow Sand Filtration
TDS	Total Dissolved Solids
UF	Ultra Filtration (Water Treatment)
UFW	Unaccounted For Water
UV	Ultraviolet (Water Treatment)
uPVC	Unplasticized Polyvinyl Chloride (Pipe)
VLOMM	Village Level of Management of Maintenance
VIP	Ventilated Improved Pit (Latrine)
WASH	Water, Sanitation, and Hygiene
WSP	Waste Stabilization Ponds
WSP	Water Safety Plan

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Summary of WASH Guidelines

The following pages provide a summary of the WASH guidelines that UNHCR and WASH actors should aim to follow in all refugee settings. More information for each guideline can be found by referring to the associated guidance notes.

WASH Principles

1.1 Saving lives

a) Ensure that resources, materials and implementation mechanisms are in place to provide a timely and adequate emergency WASH response to refugees. Aim to initially meet SPHERE standards moving rapidly onto adopt UNHCR standards. **[See sections 1.3 – 1.4]**

b) Ensure that the rate of change of core WASH indicators are closely monitored to clearly show that target values will be met on-time. If the scale-up rates show that the targets will not be met on-time, additional financial, material and human resources should be allocated immediately. **[See sections 1.5 - 1.6]**

1.2 Safety and protection of refugees

a) Ensure that the location and design of all WASH facilities (bathing, toilet, water collection, laundering and waste collection) is carried out with full participation of users, in particular women and girls. Potential daytime and night-time threats must be eliminated. **[See 1.10 – 1.13]**

b) Ensure that WASH programmes start or transition as quickly as possible into the construction of household or shared toilets and bathing facilities. **[See section 1.14 – 1.15]**

c) Ensure that a WASH feedback and follow-up system is established and operational. **[See section 1.16]**

d) Ensure that all water, sanitation and hygiene infrastructure ensures the physical safety of all users (in particular children and infants) and is free from trip, crush, pinch, pierce, cut, splinter, burn and drowning risks. **[See section 1.17]**

1.3 Working with WASH service providers and regulatory authorities

a) Ensure, where possible, that WASH programmes are developed and run in full collaboration with the local water, waste, hygiene and vector control service providers and regulatory authorities, extending existing services to refugees where possible. **[See sections 1.20 – 1.21]**

b) Ensure that national standards for water supply, water quality, sanitary codes, and environmental measures and monitoring are respected once SPHERE and UNHCR standards have been met. **[See section 1.22]**

1.4 Consultation, participation and cultural norms

a) Ensure that WASH programmes are developed and run in full participation with the refugee population taking into account preferences and cultural norms. Women and refugees with special needs in particular should be consulted with regards to the design of WASH facilities. **[See section 1.23 – 1.25]**

WASH Principles continued…..

b) Ensure that the refugee population is empowered to manage their own WASH services as soon as is possible. Programmes should aim to strengthen capacities and resilience over time to the point where the refugee population is fully able to manage their own WASH services with limited external assistance. **[See sections 1.26 – 1.27]**

c) Ensure that all WASH programmes have active gender-balanced and representative WASH committees. **[See section 1.26]**

1.5 Universal access

a) Ensure that all WASH infrastructure including toilets, water collection points, bathing, laundering and handwashing facilities, solid waste collection points, waste containers and recycling facilities can be accessed and used comfortably by all in particularly children, the elderly, pregnant women, the infirm, and persons with disability and mobility issues. **[See sections 1.34 – 1.45 and 1.50 – 1.54]**

1.6 Equability of WASH services

a) Ensure that all social, ethnic and religious groups have equitable access to water, sanitation and hygiene services. WASH monitoring mechanisms should not only track WASH service provision within geographic zones but also within each of the target socio-economic groups. **[See section 1.47]**

b) During the post emergency phase, ensure that WASH service levels not only meet the UNHCR minimum WASH guidelines, but also takes into consideration levels of access of the host population and the level of access the refugee population was accustomed to in their country of origin. **[See sections 1.48 – 1.49]**

1.7 Appropriate technology choice and cost effectiveness

a) Ensure clear strategies are developed from the start that include transfer to more efficient and sustainable technologies, and reduced dependence on imported equipment, fuel supplies or imported chemicals. **[See sections 1.55 – 1.56]**

b) Ensure that all post-emergency phase WASH hardware is appropriate for the local technical and financial conditions. Designs should respect the norms and traditional practices of the refugee and local population whilst respecting public health best practice. Technologies should be used that are simple enough to be operated, maintained and repaired by the refugee population with limited external assistance. **[See sections 1.57 – 1.62]**

c) Ensure that a clear strategy exists for the eventual transition, phase out or handover of WASH interventions. Technology should be selected as early as possible that can be sustainably managed by local service providers, local regulatory authorities, or the refugee population themselves. Any handover initiatives should be accompanied with adequate capacity building. **[See section 1.63 – 1.65]**

WASH Principles continued…..

d) Ensure that all WASH programmes track the per-beneficiary costs of supplying WASH services. Small changes in how WASH staff, vehicles and resources are managed can yield enormous cost-savings. **[See section 1.66 – 1.68]**

1.8 Capacity building of WASH stakeholders

a) Ensure that all post emergency phase WASH programmes are accompanied with adequate capacity building to facilitate eventual handover. **[See sections 1.73 – 1.75]**

b) Ensure that programmes prioritize the development of WASH related skills which can serve the refugee population during eventual return, integration, or resettlement. Coordinate with the UNHCR programme in the country of return so that refugees with WASH skills can be used to lead WASH return initiatives. **[See section 1.76]**

1.9 WASH infrastructure quality

a) Ensure that all water supply, excreta management and solid waste infrastructure meets UNHCR's minimum standards for design and construction workmanship. All design work should be conducted by qualified engineers. Construction should be supervised by experienced technicians. **[See section 1.77]**

1.10 A comprehensive approach to WASH service provision

a) Ensure that WASH activities are fully integrated into Education, Livelihoods, Community Services, Protection, Community Health, Nutrition and HIV/AIDS programmes in order to avoid overlaps and gaps. Ensure that all settings have clear documents describing modalities of sectoral support and integration. **[See section 1.78]**

b) Ensure that all post emergency WASH interventions are planned based on a comprehensive mix of hardware, software and enabling environment interventions. **[See sections 1.79 – 1.81]**

1.11 WASH interventions in urban settings

a) Ensure that assessments are immediately undertaken to fully understand WASH priority needs in addition to the impact of the refugee influx on existing urban WASH services. Ensure that resources, materials and mechanisms are in place to provide a timely and adequate urban WASH response. **[See sections 1.82 – 1.83]**

b) Ensure that there is a clear strategy to meet the WASH needs of: refugees in rental accommodation; refugees that have congregated on public land or in collective centres; refugees that are staying with host families; and host and refugee families in districts where the refugee influx heavily inundates WASH services. **[See section 1.84]**

c) Where necessary, work with municipal authorities to identify suitable buildings and public spaces that can be safely and adequately occupied by urban refugee families. Undertake WASH assessments to determine upgrades that are necessary so that buildings or land meets UNHCR minimum WASH requirements. **[See section 1.85]**

WASH Principles continued…..

1.12 WASH strategy documents and operational plans

a) Ensure that WASH strategy documents and operational plans at the national, sub-national and site levels provide a clear overview of the refugee WASH situation, the WASH needs and gaps, progress against WASH indicators, and a description of the agreed short, medium and long-term WASH strategies. **[See section 1.87 – 1.91]**

1.13 Monitoring and accountability

a) Ensure that the UNHCR core WASH indicators are reported on a monthly basis. Where the UNHCR WASH Monitoring System and TWINE have been rolled out (http://twine.unhcr.org/), data must be uploaded monthly to TWINE. **[See section 1.92 and chapter 10]**

b) Ensure that beneficiaries, local authorities and donors are informed and up-to-date with the progress of the WASH programme. Copies of the updated WASH plan/strategy from each refugee site should be made available to all stakeholders every six months. Selected information from this document should be available to the beneficiary population via camp information boards. **[See section 1.93 and chapter 10]**

1.14 Protection of the environment

a) Ensure that all WASH interventions are designed from the outset to minimise the impact on the environment in particular long-term pollution, degradation, or depletion of environmental resources. Failure to do so can have widespread ramifications and prove costly to address. **[See section 1.94 – 1.95]**

b) Ensure that in all settings local sanitary codes and environmental legislation concerning excreta, blackwater, greywater, sewage, and faecal sludges are respected once UNHCR guidelines are met. **[See section 1.96]**

c) Ensure that all permanent refugee sites are selected based on their ability to provide sustainable access to potable water without conflict with other users, or long-term depletion. Abstraction of non-renewable or fragile water resources (in particular fossil groundwater sources) should be avoided. **[See section 1.97]**

d) Ensure that all WASH programmes, regardless of context, monitor levels of unaccounted for water (UFW). **[See section 1.98]**

e) Ensure that any water treatment chemicals or by-products are stored, treated, transported, and disposed of in a manner that minimises any potentially negative impacts on the environment. **[See section 1.99 – 1.100]**

f) Where viable, ensure that WASH services in refugee settings prioritize renewable energy (solar, wind, or ram pumping) where grid-based electricity is not available. **[See section 1.101]**

g) Ensure that all excreta, blackwater (from septic tanks), greywater (from shower and laundering points), sewage, and faecal sludges from all household, public and communal sanitation systems are treated, conveyed, reused or disposed in a manner that minimises any potentially negative impacts on the environment. **[See section 1.04]**

WASH Principles continued…..

h) Ensure that all supplies of wood for household latrine slabs, latrine superstructures, privacy screens, and latrine brick production has been procured from sustainable sources outside of the refugee camp environment. **[See section 1.107]**

i) Ensure that all domestic and commercial wastes collected from the refugee environment are collected, stored, transported, treated, reused or disposed in a manner that minimises any potentially negative impacts on the environment. **[See section 1.111]**

j) Ensure that wastes of environmental and public health importance are dealt with immediately compared to those that require a longer-term approach. In many cases the correct management of toxic domestic wastes (e.g. used oils, electronic wastes, paints, varnishes, paint thinners, lead-acid batteries, and asbestos) may be of greater environmental and public health importance than management of general domestic wastes that are generally inert. **[See section 1.112]**

k) Ensure that all waste management programmes are designed around the principles of reduction, reuse and recycling. Ensure activities are in place to source separate organic matter, paper, plastics, metals, and glass from the landfill waste stream. Ensure that landfills are kept small and manageable by only allowing wastes that cannot be recycled, composted, or reused to enter the landfill. **[See section 1.113]**

l) Ensure that the selection of sites for sanitary landfills is carried out in full cooperation with the local authorities and refugee and host populations. Sites should be selected that completely seal leachates from the environment by either a natural or artificial impermeable barrier. **[See section 1.113 – 1.114]**

m) Ensure that all non-food items (NFI) items that are distributed to the refugee population are free from any unnecessary packaging. **[See section 1.116]**

n) Toxic dioxins formed during the low-temperature burning of certain plastics are carcinogenic. Burning of solid wastes must not take place in refugee settings under any circumstances. **[See section 1.117]**

o) Ensure that any vector control chemicals used in refugee settings are stored, applied, treated, and disposed in accordance with national and international guidelines and in a manner that minimises any potentially negative impacts on the environment in particularly aquatic wildlife. **[See section 1.118]**

p) Ensure that all refugee sites undertake a WASH related environmental impact assessment that includes **[See section 1.119]:**

   i) An assessment of WASH related environmental related risks along with an assessment of their likely probability and impact.
   ii) A matrix of mitigative activities to offset the impacts of high risk WASH interventions.
   iii) A matrix of environmental monitoring parameters.
   iv) A description of how WASH interventions are meeting UNHCR and national environmental guidelines.

WASH and Public Health

2.1 Public health based approach to disease prevention and control

a) Ensure that all WASH interventions are fully integrated into the public health strategy for the refugee setting. WASH and Medical focal points should aim to meet regularly to ensure the following. **[See sections 2.1 – 2.5]**

Emergency phase: ensure water, excreta management, solid waste management, hygiene promotion and disease vector control interventions block all common high-risk disease transmission routes.

Short term: ensure WASH interventions are targeted using weekly health clinic morbidity and mortality data in collaboration with the Health section's case management and follow up activities.

Medium and longer term: ensure that WASH interventions and WASH campaigns are planned based on an assessment of disease epidemic risks and analysis of seasonal disease morbidity and mortality data.

2.2 WASH related epidemic preparedness, response and evaluation

a) Ensure that every refugee setting has its own epidemic preparedness plan that includes detailed WASH preparedness and response activities. **[See section 2.17]**

b) Ensure that WASH actors fully participate in any disease specific coordinated epidemic response and task forces following declaration of a disease outbreak. **[See sections 2.20 – 2.24]**

c) Ensure that a full evaluation of the effectiveness of the WASH epidemic preparedness and response activities is carried out and that any weaknesses are addressed in future WASH preparedness and response activities. **[See section 2.25]**

Water Supply

3.1 Water quantity

a) Ensure that the refugee population is provided with at least 15 litres of water per person per day on arrival at the setting. **[See section 3.8]**

b) In planned settlements, ensure that the refugee population receives at least 20 l/pers/day or a higher level of supply similar to their place of origin or the host population. **[See sections 3.10 – 3.12]**

c) In planned settlements, ensure that daily water production takes into account water for public institutions including health clinics, schools, mosques, and administrative facilities. **[See section 3.10 – 3.13]**

d) Ensure that up to date details from water production logs and rapid household surveys are fully documented in the site WASH plan/strategy along with an analysis of any trends and discrepancies in service levels. **[See sections 3.12 and 3.111 – 3.112]**

3.2 Water quality

a) Ensure that all water supplies in the refugee setting, regardless of their intended use, are fit for human consumption at the point of storage, delivery and consumption. **[See 3.14 - 3.16, 3.98 – 3.101, and 3.102]**

Water Supply continued…..

b) Ensure that steps are taken to immediately protect all water sources from contamination. Sanitary surveys should be used to assess each step of the water chain and identify risks and corrective actions. **[See sections 3.20 and 3.85 – 3.90]**

c) Ensure that there are no faecal coliforms per 100ml of the point of water delivery and consumption. **[See sections 3.14 – 3.15 and 3.98 – 3.101]**

d) Ensure that all water supplies have a free chlorine residual of 0.5mg/l at all collection points at all times. [**See sections 3.15 and 3.91 – 3.95]**

e) Where chlorine-resistant protozoans exist, ensure that all water supplies are irradiated to at least 10mJ/cm2 before final residual chlorination. **[See sections 3.158 – 3.160]**

f) Ensure that the taste, colour and smell of water supplied is acceptable to the refugee population. **[See sections 3.107 and 3.157]**

g) Ensure that all refugee settings possess the minimum list of water quality testing equipment and at least three months of consumables. Ensure staff have sufficient capacity to use equipment. **[See 3.108]**

h) Ensure that every refugee setting has a water safety plan that includes a water quality monitoring framework and trend analysis. **[See sections 3.111 – 3.113]**

3.3 Household water storage

a) Ensure that the refugee population is provided with water storage containers with at least 10 litres of capacity per person on immediate arrival at the setting and consistently throughout the refugee emergency. **[See sections 3.17 – 3.19]**

3.4 Household water treatment

a) In planned settlements, ensure that bulk water treatment strategies are fully functional before considering additional household water treatment programming. **[See section 3.164]**

b) If household water treatment products are distributed, ensure they are accompanied with a full visual practical demonstration of how to use the products and any supporting equipment required to use the products. **[See section 3.167]**

c) Ensure that a full description of the household water treatment strategy, including tracking of distribution rates, usage rates, transcripts from focus group discussions concerning the approach and the monitoring plan are documented in the site WASH plan/strategy. **[See section 3.184]**

3.5 Water accessibility and the burden of water collection

a) Ensure that a functional water tap is available for every 100 persons (or every 200 persons in the case of a handpump or well) within 200m of every household. **[See sections 3.24 – 3.26]**

b) Ensure that water point coverage is monitored in the site WASH plan/strategy including maps showing 200m water collection buffer zones. **[See section 3.25]**

Water Supply continued…..

c) Ensure that there are no more than 10 persons queuing at water points at any time. Excessive queuing is an indicator of either insufficient numbers of water points, inadequate flows, or insufficient hours of operation. **[See sections 3.24 – 3.26]**

3.6 Site selection based on water availability and ease of treatment

a) Ensure that the selection of sites includes an analysis of water availability, quality, ease of abstraction, and ease of treatment. If there is any risk of insufficient supply or poor quality water, then an alternative location should be identified. **[See sections 3.21 – 3.23 and 3.46]**

b) Ensure that an analysis of the suitability of water supplies is fully documented in the site WASH plan/strategy. **[See sections 3.21 and 3.46]**

3.7 Reliability, backup supplies and reserve capacity

a) Ensure that every major piece of water abstraction, treatment and distribution equipment or machinery has at least one backup. **[See section 3.113]**

b) Ensure that all refugee settings have at least half a day of reserve water storage capacity to cover system breakdowns and fire fighting. **[See section 3.113]**

c) Ensure that all refugee settings have at least 3 months reserve of fuel supplies and water treatment chemicals at all times. **[See section 3.113]**

d) Ensure that the strategy to ensure water reliability is fully described in the site WASH plan/strategy. **[See section 3.113]**

3.8 Bathing and laundering facilities

a) Ensure that the refugee population have access to facilities where they can bathe and launder clothing and bedding in privacy and dignity. **[See section 1.30]**

3.9 Management and reuse of wastewater

a) Ensure that wastewater from water collection, bathing, or laundry facilities is managed in properly designed drainage systems or in conjunction with sub-surface irrigation systems designed to eliminate the risk of pathogen transmission or vector breeding. **[See section 3.206]**

b) Ensure that the strategy for waste water management and reuse is fully described in the site WASH plan/strategy. **[See section 3.206]**

3.10 Water for livestock, agricultural and livelihood activities

a) Ensure that there are appropriate interventions to provide water for livestock, agricultural and livelihood activities once the basic human needs have been met. **[See section 3.13]**

b) Ensure that water interventions for livestock, agricultural and livelihood activities are carefully planned with the refugee and host populations in a transparent manner so that all sections of the population are able to benefit equitably and responsibly. **[See 3.13]**

c) Ensure that a description of the medium and long term strategies for equitable and responsible water resource development is documented in the site WASH plan/strategy. **[See section 3.13]**

Excreta Management

4.1 Environment free from human faeces

a) Ensure that the environment inhabited by refugee populations is free from human faeces as rapidly as possible. [See section 4.5 – 4.8]

b) Ensure that steps are taken to immediately prevent contamination of existing water sources from human excreta. [See section 4.9 – 4.10]

c) Ensure that public health risks are evaluated at every step of the current excreta management chain including storage, treatment, transportation and final disposal/reuse. [See section 4.23]

d) Ensure that appropriate measures are taken in high water table or flooded environments to ensure that excreta systems continue to isolate excreta from the environment. [See section 4.29]

4.2 Transition to household or shared toilets as quickly as possible

a) Ensure that excreta management programmes start or transition as quickly as possible into the use of shared or household toilets, rather than communal facilities, if it is clear the emergency will last more than 6 months. [See section 4.11]

4.3 Toilet coverage guidance

a) Ensure that the excreta management programme meets the following toilet coverage targets. [See section 4.17 – 4.18]

Within first 8 weeks	One toilet per 50 persons (1:50)
Within first 6 months	One toilet per 20 persons (1:20)
Within first year	One toilet per 5 persons (1:5)

b) Ensure that the number of public toilets installed at reception areas, health clinics, markets, schools and other public institutions meet coverage targets. [See section 4.19]

4.4 Locating of communal toilets

a) Ensure that if any communal WASH facilities are constructed they are located in consultation with users, arranged for their **exclusive use**, and serve no more than one community (16 families) at a time. [See section 1.30]

4.5 Gender segregation

a) Ensure that if any communal WASH facilities are constructed there are at least three female toilets to every male toilet, factored to take into account disaggregated population data. [See section 4.20]

b) Ensure that toilet cubicles are segregated according to sex and clearly marked with culturally appropriate signage. [See section 4.20]

4.6 Water for flushing and anal cleansing

a) Where necessary, ensure that toilets are provided with sufficient quantities of water for flushing in addition to culturally appropriate anal cleaning materials in situations where they are unable to adequately provide their own. [See section 4.143]

Excreta Management continued…..

4.7 Handwashing facilities

a) Ensure that all public, communal, shared and household toilets are equipped with fully functioning handwashing facilities. **[See section 4.123]**

4.8 Arrangements for cleaning and maintenance

a) Ensure that all shared, communal and public toilet facilities have clear written arrangements with the users concerning responsibilities for cleaning and maintenance. **[See section 4.133]**

4.9 Monitoring of toilet coverage and condition

a) Ensure that the condition of any public or communal toilet facilities is closely monitored on a monthly basis and any public health risks are promptly dealt with. **[See section 4.142]**

4.10 Household toilet tools and equipment

c) Ensure that every refugee household has the means, tools, materials and appropriate technical guidance to construct, maintain and clean their own household toilet from the start of the emergency. **[See 4.15]**

4.11 Communal toilets exit strategy

d) Ensure that a clear strategy to phase out the use of communal toilets is in place if it is clear that the refugee emergency is likely to last more than 6 months. **[See section 4.146]**

Solid Waste Management

5.1 Environment free from waste

a) Ensure that the environment inhabited by refugees is immediately free from all wastes, in particularly those that are hazardous, or promote breeding of disease vectors. **[See section 5.1 and 5.8 – 5.9]**

b) Ensure that steps are taken to immediately prevent contamination of existing water sources from wastes. **[See section 5.10]**

c) Ensure that at every step of the waste management chain there are no risks to public health, or the environment. **[See section 5.40]**

5.2 Waste collection services

a) Ensure that the collection of hazardous domestic wastes, or those that provide breeding sites or food for disease vectors, are prioritized over the collection of wastes that are relatively inert. **[See section 5.9]**

b) Ensure there is immediate designation of one waste collection point for every 16 families. As soon as is possible, equip each point with durable waste containers of up to 200 litres volume. **[See section 5.11]**

c) Ensure that a system is in place to collect domestic and market wastes at least twice or week or more frequently if necessary. **[See section 5.21]**

d) Ensure that a full waste survey is conducted at least once a year and waste collection activities are re-evaluated and reorganised according to the findings. **[See section 5.24]**

Solid Waste Management continued…..

e) Ensure that all staff involved in waste collection, processing, or disposal activities have adequate personal protective equipment for the tasks they are performing. [See section 5.09, 5.28, 5.59, and 9.12 – 9.13]

f) Ensure that a street sweeping system is in place to keep public areas free from litter and other wastes. [See section 5.17]

5.3 Management of hazardous domestic wastes

a) Ensure that systems are in place to facilitate collection of hazardous wastes before they enter the domestic waste stream. [See section 5.36]

5.4 Medical wastes

a) Ensure that all medical wastes generated in the refugee setting are source-separated, collected, handled, treated and disposed of in strict compliance with WHO protocols and with minimum risk to health-care staff, waste management staff, the general public, or the environment. [See section 5.128]

5.5 Reduce, recycle, reuse

a) Ensure that all solid waste management programmes are designed around the principles (in priority order) of reduction, reuse and recycling. [See sections 5.41, 5.56, and 5.81]

5.6 Waste management in urban settings

a) Ensure that municipal waste management services are provided with additional support during refugee influxes. Aim to provide sufficient levels of support so that the host and refugee populations are able to receive the same level of access to services as prior to the influx. [See sections 5.15, 5.20, 5.67, 5.68, and 5.82]

5.7 Sanitary landfill

a) Ensure that sanitary landfill sites are selected and managed to minimize impacts on public health and the environment. [See 5.113]

b) Ensure that only wastes that cannot be recycled or reused enter the landfill waste stream. [See section 5.110]

c) Ensure that all hazardous wastes are managed and do not enter the landfill waste stream. [See section 5.111]

d) Ensure that the landfill is covered with daily soil cover to prevent access from disease vectors. [See section 5.110]

Disease Vector Control

6.1 An immediate response

a) Ensure that there is swift assessment and response of vector related public health risks within the first few days of any refugee emergency. [See section 6.1 and 6.6 – 6.12]

b) Ensure that any dumps of domestic waste, food waste, faeces, any standing water, or any other potential breeding sites for high risk disease vectors are immediately cleaned up. [See section 6.8]

c) Ensure bi-weekly collection of domestic, market, and commercial wastes is established immediately. [See section 6.8]

Disease Vector Control continued…..

d) Ensure that the refugee population has the knowledge to protect themselves from high-risk disease vectors on immediate arrival and consistently throughout the refugee emergency. [See section 6.9]

e) Ensure that all refugee families are provided with essential household vector control items on immediate arrival and consistently throughout the refugee emergency. [See section 6.10]

6.2 Site selection

a) Where possible, ensure that the selection of sites for the settlement of refugees includes an analysis of risk from disease vectors. [See 6.7]

6.3 Frequency of disease vector interventions

a) Vector borne diseases are likely to follow seasonal climatic conditions and insect breeding cycles therefore UNHCR and WASH actors may consider broadly basing disease vector interventions around a preventative seasonal calendar. [See section 6.11]

Hygiene Promotion

7.1 An immediate response

a) Ensure that all refugee families are provided with essential household hygiene related non-food items on immediate arrival and consistently throughout the refugee emergency. [See section 7.10 – 7.15]

b) Ensure there is immediate dissemination of key hygiene messages related to high-risk WASH related diseases on immediate arrival and consistently throughout the refugee emergency. [See section 7.17 – 7.20]

c) Ensure that there is swift assessment hygiene and behaviour related public health risks within the first few days of any refugee emergency. [See section 7.21]

7.2 Coordination

a) Ensure that any hygiene related mass media activities are fully coordinated between the Community Health, Nutrition, HIV/AIDS, Education and Community Services programmes to avoid overlaps and gaps. [See section 7.5 – 7.6]

WASH Programme Management

8.1 Human resources

a) Ensure that full use is made of locally available human resources from the refugee population, host population, and local WASH authorities and service providers. [See sections 8.4]

b) Ensure that all WASH staff, volunteers, or daily labour have received sufficient basic equipment and training for the tasks they are performing. [See sections 8.5]

8.2 Health and safety

a) Ensure that an assessment of health and safety risks has been carried out for all WASH activities and a plan is in place to mitigate and monitor priority risks. [See sections 8.9 – 8.11]

WASH Programme Management continued…..

b) Ensure that WASH staff, contractors, volunteers, or daily labourers have adequate personal protective equipment and health and safety training for the tasks they are performing. [See sections 8.12 - 8.13]

c) Ensure protocols and procedures are in place for the safe handling, storage, use, and disposal of water treatment and disease vector control chemicals. [See sections 8.14 – 8.15]

d) Ensure that there is a system in place for reporting and following-up of work related accidents and near-misses. [See sections 8.16]

e) Ensure short, medium and long-term WASH related worker health and safety strategies and monitoring are fully documented in the site WASH plan / strategy. [See sections 8.16 – 8.17]

8.3 Operation and maintenance

a) Ensure that where possible, on-going operation and maintenance of WASH services is planned and carried out in close collaboration with refugees and existing local WASH service providers extending existing services to refugees where possible. [See sections 8.18]

b) Ensure that a strategy to transition into household or shared facilities is in place if it is clear that the time-frame of the humanitarian situation is likely to last more than six months. [See sections 8.19]

c) Ensure that all communal WASH infrastructure has effective community-based cleaning and maintenance arrangements in place that ensures facilities are clean and functional at all times. [See 8.20]

d) Ensure that all public WASH infrastructure receives punctual and appropriate cleaning and maintenance interventions that are both preventative and responsive. [See sections 8.27 – 8.32]

e) Ensure sufficient budgeting for operation and maintenance activities (including ensuring sufficient back-up capacity for breakdowns and new influxes). [See sections 8.29]

f) Ensure short, medium and long-term strategies for operation, maintenance, and contingencies are fully documented in the site WASH plan / strategy. [See sections 8.36]

WASH Assessments

9.1 Rapid WASH needs assessments

a) Ensure that in all contexts a rapid WASH assessment is carried out within the first 72 hours of any refugee emergency to identify humanitarian priorities. [See sections 9.1 – 9.5 and 9.11]

9.2 Coordination

a) Ensure that all WASH assessments are undertaken in a coordinated manner and the same populations are not visited by multiple agencies. [See sections 9.1 – 9.5]

b) Ensure that all WASH assessments use common operational datasets (common population names, population sizes, administrative boundaries) and WASH indicators. [See sections 9.3]

WASH Assessments continued…..

c) Ensure where possible that WASH agencies use common data collection tools and methodologies. **[See sections 9.4]**

d) Ensure that harmonized assessment tools and methodologies are prepared as part of contingency planning activities. **[See section 11.28]**

9.3 General principles

a) Ensure that all WASH assessments are designed in a participatory and transparent manner taking local preferences and cultural norms into full consideration. **[See section 9.5]**

b) Whenever possible ensure WASH assessments are carried out in full collaboration with national refugee & WASH authorities. **[See section 9.6]**

c) Ensure that assessments do not overburden the population and do not collect any more information than is required. **[See section 9.7]**

d) Ensure that any surveys are carried out with a properly designed survey instrument, a sampling plan, and a sample size calculation. No more data should be collected than necessary. **[See section 9.7]**

WASH Monitoring and Reporting

10.1 Establishment of the routine monitoring of WASH indicators

a) Ensure that the UNHCR core WASH indicators are routinely monitored from the start of the emergency according to the collection frequencies and procedures outlined in the UNHCR WASH Manual, regardless of whether the context is camp-based, non-camp based, urban, or rural. **[See sections 10.1 and 10.4 – 10.5]**

b) Ensure that WASH actors undertake monitoring in a harmonized manner using common monitoring tools, methodologies, indicators and operational datasets (common refugee population sizes, population names, administrative boundaries). **[See section 10.2]**

c) Ensure that WASH programmes not only monitor core WASH indicators but extrapolate their rate of change to clearly show that the UNHCR target values will be met on-time. **[See sections 10.6]**

d) Ensure that where the UNHCR WASH Monitoring System has been rolled out that core WASH indicator data is uploaded monthly to TWINE. **[See sections 10.7 – 10.8]**

10.2 Establishment of the routine reporting of WASH indicators

a) Ensure that up to date progress against WASH indicators is routinely documented in the site's WASH plan/strategy. Charts, graphs, infographics and maps should be used to present WASH data in a manner that is clearly legible to WASH actors, local authorities and representatives of the refugee population. **[See section 10.25 – 10.26]**

b) Ensure that a summary of the latest monitoring data is publically visible to all WASH actors, local authorities and representatives of the refugee population, via a system of camp information boards. **[See section 10.27]**

WASH Monitoring and Reporting continued…..

10.3 Monitoring and reporting of WASH programme efficiency

a) Ensure the cost-effectiveness and efficiency of all post-emergency WASH interventions are closely monitored. This is not just to save the donors money but to move to a cost efficient model that may be handed over to the refugee population or local authorities. **[See sections 10.17 – 10.21]**

10.4 Monitoring of the effectiveness of WASH interventions through the use of annual KAP surveys

a) Ensure that all WASH programmes undertake an annual WASH KAP Survey (Knowledge, Attitude, Beliefs and Practices) and that analysis is used to inform changes in the WASH strategy. **[See 10.14 – 10.15]**

b) Ensure that KAP surveys do not overburden the population and do not collect any more information than is required. **[See 10.14 – 10.15]**

c) Ensure that KAP surveys are carried out with a properly designed survey instrument, a sampling plan and a sample size calculation. **[See sections 10.14 – 10.15]**

WASH Coordination

11.1 Immediate establishment of sector coordination arrangements

a) Ensure that WASH sector coordination arrangements for refugees are established at the national, sub-national and site level from the start of the refugee situation. If WASH coordination mechanisms for refugees already exist then ensure that coordination is supported, reinforced and functioning effectively - avoiding creating parallel coordination mechanisms. **[See sections 11.1 – 11.2 and 11.8]**

b) Ensure that, where possible, WASH coordination arrangements are co-chaired by the national government with strong support from UNHCR. **[See sections 11.4]**

c) Ensure that sector coordination arrangements include the establishment of an advisory group to facilitate transparent decision making based on consensus. **[See section 11.24]**

d) Ensure that there are regular national, sub-national and site level refugee focussed WASH coordination meetings with clear agendas, copies of minutes and documented action points. In emergencies, weekly meetings may be required. **[See section 11.14]**

e) Ensure that where necessary short term ad-hoc technical working groups are used for analysing problems, formalising principles and responsibilities, and preparing technical guidelines. **[See 11.15 – 11.16]**

11.2 Common analysis of WASH needs and gaps at the national, sub-national and site levels (baseline assessment)

a) Ensure where possible that agencies use harmonized WASH data collection tools and methodologies. **[See 9.1 – 9.5 and 11.11 – 11.13]**

b) Ensure that all WASH assessments use common operational datasets (common population names, population sizes, administrative boundaries) and WASH indicators. **[See 9.1 – 9.5 and 11.11 – 11.13]**

WASH Coordination continued…..

c) Ensure that all WASH assessments are undertaken in a coordinated manner and the same refugee populations are not visited by multiple agencies. [See 9.1 – 9.5 and 11.11 – 11.13]

d) Ensure that a common analysis of WASH needs and gaps is undertaken through sharing of assessment information and pooling of resources. [See 9.1 – 9.5 and 11.11 – 11.13]

11.3 Establishment of a common sector ToR and response plan/strategy at the national, sub-national and site levels

a) Ensure that there are ToRs and common WASH sector response plans/strategies at the national, sub-national and site levels that are based on a clear analysis of the refugee WASH needs, gaps and progress against WASH indicators. [See 11.10 and 11.21 – 11.22]

11.4 Establishment of common monitoring and reporting

a) Ensure that there are agreed common WASH indicators and standards for the refugee WASH response. At a minimum ensure that the UNHCR core WASH indicators are routinely monitored in all refugee settings following the collection frequencies and procedures outlined in the UNHCR WASH Manual. [See section 11.11]

b) Ensure that a common WASH monitoring and reporting system is established for the refugee response and that all WASH actors feed in their monitoring data on a regular basis regardless of whether they are funded by UNHCR or other sources. If the UNHCR WASH Monitoring System has been rolled out ensure that data is uploaded monthly to the TWINE website. [See section 11.11 – 11.13]

c) Ensure that progress of the WASH sector is regularly presented to WASH actors, local authorities and representatives of the refugee population through the use of WASH updates, sitreps, bulletins, public communication boards and updated WASH plans/strategies. Ensure that WASH sector progress and gaps are presented in a clear and legible manner through the use of charts, 4W matrices (WHO, WHAT, WHERE, WHEN), infographics and maps. [See section 11.20]

d) Ensure that a common internet platform is used for the sharing of documentation, contact information, meeting minutes and other WASH information. [See section 11.23]

11.5 Coordinated sector preparedness and contingency planning

a) Ensure that national, sub-national and site level refugee WASH contingency plans are prepared in conjunction with multi-sectorial contingency plans. Contingency plans should include an analysis of historical and probable WASH needs, probable scenarios, likely impacts, WASH stockpiling and stand-by arrangements, coordination arrangements and links to early warning systems. [See 11.27 – 11.28]

b) Ensure that common interagency WASH rapid and comprehensive assessment tools and approaches are widely agreed and supported by all agencies as part of contingency planning efforts. [See section 11.28]

WASH Coordination continued…..

c) Ensure that common hygiene messages, tools and approaches are widely agreed and supported by all agencies as part of contingency planning efforts. Messages should be in the refugees own native language and should target the most critical hygiene risks for the context. If these messages are broadcast using mass-media (e.g. radio) ensure adequate time for approval from host government ministries. [See chapter 7]

11.6 Provision of dedicated WASH sector coordination resources

a) Ensure that resources are immediately available to make coordination work from the start of the refugee emergency which may include a dedicated coordination website, computers, mapping facilities and dedicated refugee WASH sector coordination focal points and Information Managers. [See section 11.25]

11.7 Capture and application of lessons learned and best practice

a) Ensure that as early as possible efforts are made to evaluate the refugee WASH sector response in terms of speed, relevance, effectiveness, efficiency, impact and sustainability. Ensure that all lessons learned are used to inform policy change and sector best practice on a national and global level. [See section 11.29]

11.8 Monitoring the quality of sector coordination and performance

a) Ensure that a self-evaluation of the quality of the WASH sector performance, in particular WASH coordination, is undertaken every six months based feedback from WASH actors. UNHCR should change the WASH sector coordination structure if more than 50% of WASH actors find the performance to be below average. [See section 11.30]

Introduction

UNHCR has the primary responsibility for coordinating, drafting, updating and promoting guidance related to water, sanitation and hygiene (WASH) in refugee settings. This WASH Manual has been prepared through a process of open collaboration and discussion in participation with UNHCR's WASH Officers, UNHCR's sister agencies, and experts and practitioners from the WASH community.

Structure of the WASH Manual

This WASH Manual has been organised around a series of WASH guidelines that should be met in all refugee settings (see **pages viii to xxiv**). More information for each guideline can be found by referring to the associated guidance notes in the relevant sections that form the main body of the document. The overall structure of the WASH manual is as follows:

- **Section 1** provides an overview of the purpose, scope and rationale for the UNHCR WASH Manual in addition to a short introduction to UNHCR's protection mandate, and the legal framework for the rights to water and sanitation.
- **Section 2** discusses the philosophies and principles behind UNHCR's WASH interventions in particularly: safety and security; a timely and adequate response; participation of stakeholders; universal access; child friendly facilities; value for money and cost effectiveness; appropriate technology selection; durable solutions; reinforcing the capacity of stakeholders; monitoring the effectiveness of WASH interventions; accountability to donors, beneficiaries and local authorities; protection of the environment; and contingency planning.
- **Section 3** focuses on the role of WASH interventions in prevention and control of communicable diseases, in addition to the importance of having a comprehensive and coordinated approach with health programming during outbreak responses.
- **Section 4** provides an overview of UNHCR's guidelines for water supply interventions with a focus on: water sources; water prospection and evaluation; water abstraction; water source protection; water quality monitoring and testing; bulk water treatment; household point of use water treatment; water storage; water distribution; and water safety plans.
- **Section 5** looks at the importance of excreta management in particular: excreta management technical options; operation, maintenance and management of wash infrastructure; household

toilets; and guidelines for construction quality.

- **Section 6** concentrates on the importance of solid waste management in refugee settings including: waste classification and management options; waste reduction; waste recycling; reuse of domestic wastes; and technical options for waste collection, storage, transportation and disposal.
- **Section 7** contains an introduction to UNHCR's guidelines for disease vector control with a focus on: common disease vectors; and environmental, chemical, and behavioural related prevention and control measures.
- **Section 8** presents an overview of UNHCR's guidelines for hygiene promotion interventions with a focus on: key hygiene messages; key hygiene activities; hygiene related non-food items; hygiene related surveys; approaches to hygiene promotion; and behaviour change programming.
- **Section 9** provides a general overview of how WASH programmes should be managed including: management of human resources; operation, maintenance of WASH infrastructure; health and safety; and staff personal protective equipment.
- **Section 10** introduces guidance for rapid and comprehensive WASH needs assessments including guidance for: household surveys; focus groups; key informant interviews; sanitary surveys; and infrastructure assessments.
- **Section 11** focuses on the UNHCR guidelines for monitoring in refugee settings including a full description of core WASH indicators, their monitoring frequencies, and data collection methods.
- **Section 12** describes UNHCR's responsibilities to ensure timely and effective coordination of the WASH sector during refugee emergencies in collaboration with local authorities.
- **Section 13** provides a comprehensive set of references for refugee WASH interventions broken down by WASH thematic area.
- **Section 14** provides links to a comprehensive set of technical forms, drawings, checklists, and field tools for refugee WASH programmes.

Introduction

1. UNHCR, the United Nations refugee organization, is mandated by the 1951 convention of the United Nations to lead and coordinate international action for the world-wide protection of refugees and the resolution of refugee problems. UNHCR's primary purpose is to safeguard the rights and well-being of refugees and other persons of concern.
2. This manual outlines the WASH guidelines that should be met in all refugee settings to provide an adequate standard of basic WASH services for refugees. This Manual does not strive to replace the multitude of excellent WASH technical resources that exist in the field. Instead, it aims to create a clear operational guidance for refugee situations that defines



WHO, WHAT, WHERE, WHEN, WHY and HOW specific WASH interventions must be carried out - along with WHICH procedures must be used, and WHERE to find approved technical procedures, tools, methodologies and designs. Above all, it aims to set out a set of WASH guidelines that should be respected by all organisations in all refugee settings.

3. This manual focuses on practically all refugee situations, where UNHCR operates WASH programmes, in low-middle-income and high-income countries, emergencies, protracted situations, care and maintenance settings, and eventually repatriation or any other durable solution identified. The focus of the manual is on refugees, but in some contexts, may apply or be adapted to asylum-seekers, stateless persons, internally displaced and returnee settings.

4. These recommendations have been written for use by UNHCR staff, WASH actors, national governmental authorities, emergency response coordinating bodies, contingency planners, programme evaluators, and any individuals or organisations involved in providing WASH services in refugee settings. WASH field staff are welcome to dip into the sections that are relevant to their activities. WASH Coordinators should have a global and holistic overall appreciation of the WASH guidelines.

5. The manual aims to complement many of the existing excellent WASH technical resources that exist in the field, helping define which of the multitude of technical resources best describes the correct approaches to be followed. Some of the core documents that are referenced in this document include:

- Handbook for Emergencies (UNHCR, 2014)
- Water Manual for Refugee Situations (UNHCR, 1992)
- Engineering in Emergencies (RedR, 2002)
- Water and Sanitation for Populations at Risk (ACF, 2005)
- Hygiene Promotion: A Practical Manual for Relief and Development (Ferron, Morgan, O'Reilly, 2007)
- Excreta Disposal in Emergencies (WEDC, 2007)
- WEDC Technical Briefs (Various)
- Oxfam GB Technical Briefs (Various)
- Humanitarian Charter and Minimum Standards in Humanitarian Response (SPHERE, 2011)
- Guidelines for Drinking Water Quality 2nd Ed. Vol 3 (WHO, 1997)
- Public Health Engineering in Precarious Situations 2nd Ed (MSF, 2010)
- Public Health Guide for Emergencies (John Hopkins and IFRC, 2008)
- Global Strategy for Public Health (UNHCR, 2014)


UNHCR

Legal framework and the human rights to water and sanitation

6. In 2010 the UN General Assembly and the Human Rights Council explicitly recognized the human rights to water and sanitation. These rights are derived from the right to an adequate standard of living as stipulated in Article 11 of the International Covenant on Economic, Social and Cultural Rights and other international human rights treaties. Key aspects include..

- Water must be sufficient and continuous to cover personal and domestic uses, which comprise water for drinking, washing clothes, food preparation, and personal and household hygiene.
- Water for drinking and domestic uses must be safe and acceptable to users. It must be free from elements that constitute a threat to a person's health. Water must also be of an acceptable colour, odour, and taste to ensure that individuals will not resort to polluted alternatives.
- Water and sanitation facilities must be physically accessible and within safe reach for all sections of the population, taking into account the needs of particular groups, including persons with disabilities, women, children and the elderly.
- Water services must be affordable to all. No individual or group should be denied access to safe drinking water because they cannot afford to pay.

Description of phases used in this document

7. UNHCR recognises four main phases of assistance to refugees including an 'emergency' phase; a 'post emergency' phase; in some cases a 'protracted situations' phase; and finally a 'durable solutions' phase. This UNHCR WASH Manual aims to provide WASH guidance in all of these phases.

Emergency phase

8. The definition used by UNHCR for the emergency phase has been defined in the UNHCR Global Strategy for Public Health (2014 - 2018) as '*the period following a refugee emergency up to six months after population movement has stabilized'*. However, the document notes that this definition should only serve as general guidance and disease outbreaks may constitute a return to the emergency phase. Emergency WASH interventions are typically required at the locations where the refugee population crosses a border and also for establishing services at the sites where refugees are congregating or are being hosted.

Post emergency phase

9. For the purposes of this manual, the post emergency phase is described as '*the period six months after population movement has stabilized up to the period the situation is declared a protracted situation or a durable solution has been reached and the population is no longer displaced'*.



Protracted situation phase

10. The definition used by UNHCR for a protracted refugee situation is described in the UNHCR Global Trends (2013) as '*a refugee situation in which 25,000 or more refugees of the same nationality have been in exile for five years or longer in a given asylum country*'. Based on this definition, it is estimated that some 6.3 million refugees (54% of all refugees) were in a protracted situation by the end of 2013. These refugees are currently living in 27 host countries, constituting an overall total of 33 protracted situations. In some settings the protracted phase has been known to last fior more than 20 years.

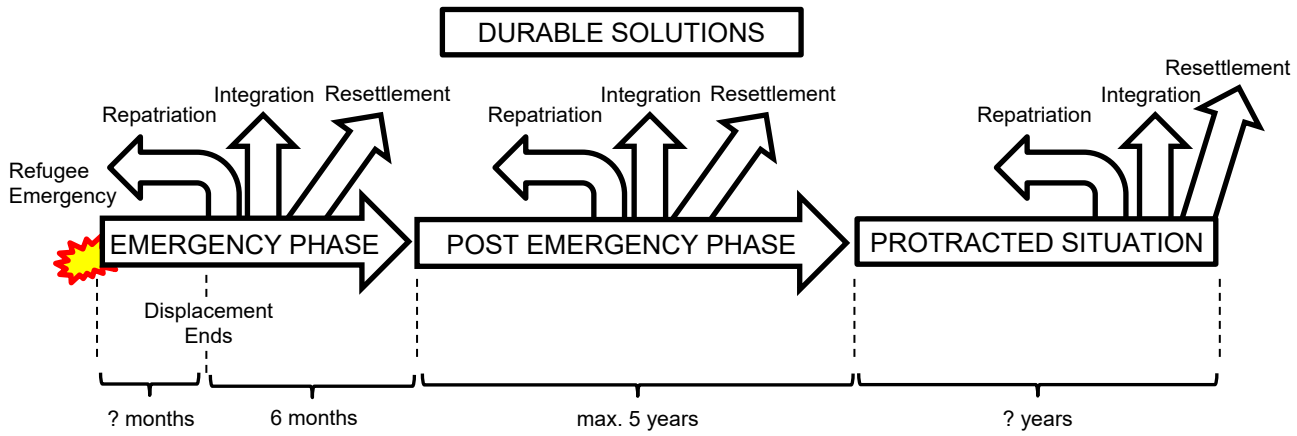
Durable solutions phase

11. The durable solutions phase can be described as the period when displacement has ended because sustainable and permanent living arrangement has been achieved for the refugee population. UNHCR defines three possible options for durable solutions for refugees which include repatriation to their country of origin (if conditions are suitable), integration in the country of asylum, and resettlement in a third country.

How to use this UNHCR WASH Manual

12. The UNHCR WASH Manual is intended for use in all refugee settings regardless of the type or size of the displacement emergency or context. The WASH guidelines cover all phases of the displacement cycle from the

Figure 1-1 Overview of WASH Priorities by Phase



WASH Priorities:
- Saving lives.
- Providing immediate access to basic WASH services.
- Reducing transmission of diseases of public health importance.
- Scaling up WASH service coverage.
- Close monitoring of WASH service provision and rates of scale up.
- Full refugee participation in the design and provision of WASH Services.
- Support to National WASH Authorities and WASH Service Providers.

WASH Priorities:
- Transition to cost-efficient WASH services with reduced reliance on fuel, energy, chemicals and expertise.
- Partial handover of responsibility for WASH service provision to refugee community based organisations, National WASH Authorities and National WASH service providers.
- Support to National WASH Authorities and WASH Service Providers.
- Capacity building of refugee community based organisations.
- Full transition to household toilets and bathing facilities within 6 months.
- Monitoring of WASH service provision via refugee community based organisations and National WASH Authorities.

WASH Priorities:
- Full handover of responsibility for WASH service provision to refugee community based organisations and National WASH Authorities and service providers. Service provision in accordance with National WASH Policies and Strategies.
- Revenue collection if refugee livelihood opportunities exist (fees collected to cover the costs of WAHS service provision).
- Monitoring of WASH service provision via refugee community based organisations and National WASH Authorities and WASH service providers.

emergency up to when a durable solution is found. The WASH Manual is relevant for all displacement contexts including:

Planned camps

13. Planned camps allow centralized assistance to be provided to the refugee population. Ideally WASH services can be planned and set up before the refugee population arrives. It should be noted that in all cases UNHCR considers the establishment of camps to be a last resort option with other out of camp solutions, in particular integration, being promoted first. However, if camps are established, the full range of water supply, excreta management, solid waste, hygiene promotion, and disease vector control interventions covered by these WASH guidelines must be provided.

Transit centres

14. Transit centres may provide basic rest, nourishment and basic Shelter, WASH and Health services en route to a permanent settlement or during repatriation. The period of stay may only be a couple of hours, or overnight. However, the full range of water supply, excreta management, solid waste, hygiene promotion, and disease vector control interventions covered by these WASH guidelines must be provided.

Reception and registration areas

15. Reception and registration is a time consuming process for all involved. It is essential that the reception and registration area is adequately covered by the full range of water supply, excreta management, solid waste, hygiene promotion, and disease vector control interventions covered by these WASH guidelines.

Informal settlements

16. Informal and unplanned settlements may occur in any refugee setting where groups of refugees settle in one or a number of locations. Informal unplanned camps pose a number of challenges for the provision of WASH services, especially if space is limited for communal WASH infrastructure or access is difficult for WASH service vehicles (e.g. water tankers, waste collection vehicles). Regardless of whether the settlement is planned or unplanned, a full assessment of the WASH needs must be undertaken and an adequate WASH response must be planned following water supply, excreta management, solid waste, hygiene promotion, and disease vector control interventions covered by these WASH guidelines must be provided.

Rural dispersed settings

17. In some settings the refugee population may be dispersed as small groups of families dispersed over a large area, either on the outskirts of villages, or in isolated locations. Despite the risk of disease transmission being lower than if the refugee population were all settled in a camp, it is essential that the full range of water supply, excreta management, solid waste, hygiene promotion, and disease vector control interventions covered by these WASH guidelines is provided.

Urban settings

18. In some settings the refugee population may migrate into towns and cities in large numbers either staying with host families, renting temporary accommodation, or congregating in public (or private) buildings or land. An influx of refugees into an urban environment can quickly overburden municipal WASH services leading to water shortages, increases in open defecation, waste dumping, contamination of water supplies and conflicts over WASH resources. It is therefore essential that the full range of water supply, excreta management, solid waste, hygiene promotion, and disease vector control interventions covered by these WASH guidelines is provided. In urban displacement settings, WASH interventions may be required for both the host and refugee populations to bring WASH service provision back to levels experienced before the displacement crisis.

Refugee families in urban settings living with host families.

19. In some settings a proportion of the refugee families may have the option to temporarily stay with extended family or friends. Despite these families being fortunate enough to receive independent support from their host families, efforts must still be undertaken to assess their needs for support with sufficient quantities of safe water, toilet facilities, bathing facilities, hygiene materials and messages, solid waste management services, and disease vector control services - in addition to their impact on the host family. Despite the generosity of the host family, supporting additional persons can quickly become a burden and UNHCR and WASH actors may consider developing a host family WASH assistance package of hygiene items, cash, and construction materials for household WASH improvements.

Refugee families in urban settings in rented accommodation.

20. In some displacement emergencies a proportion of the refugees may have sufficient resources to temporarily rent accommodation in towns or cities. Despite these families having limited means, efforts must still be undertaken to assess their needs for support with sufficient quantities of safe water, toilet facilities, bathing facilities, hygiene materials and messages, solid waste management services, and disease vector control services. Many refugee families may onlyhave sufficient resources to live in urban districts where WASH services are extremely poorly delivered. Throughout the displacement crisis, levels of access to basic WASH services to refugee families in rented accommodation must be closely monitored. Neighbourhood level WASH interventions may be required in addition to household level assistance with hygiene items, and construction materials for household WASH improvements.


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Refugee families in urban settings congregated in public (or private) buildings or land.

21. In some displacement emergencies a proportion of the refugees may be drawn to the livelihood opportunities available in urban settings but may have insufficient resources to rent accommodation or stay with extended family or relatives. Some refugee families make seek refuge in abandoned buildings or public spaces (schools, mosques, areas of land). These families are often particularly vulnerable and the full range of water supply, excreta management, solid waste, hygiene promotion, and disease vector control interventions covered by these WASH guidelines must be provided. UNHCR and WASH actors may also consider working with municipal authorities to identify suitable unused urban buildings and spaces that can be safely and adequately occupied by refugee families. WASH assessments should be used to determine the required WASH upgrades that are necessary so that the building or land is habitable and meets UNHCR minimum WASH requirements.

WASH assistance in urban districts where resources are under high stress due to the exceptional and unplanned influx of refugees

22. Overburdening of WASH services affects both the refugee and host population. UNHCR and WASH actors must be prepared to assess the impact of the influx on existing WASH services and reinforce the interventions carried out by existing WASH service provider. Interventions should directly target both the refugee and host populations in those urban districts that are most affected. The locations of the urban refugee population are generally tracked through registration and distribution activities.

1. UNHCR WASH Principles

All refugee WASH programmes should be designed around the principles of: saving lives; a timely and adequate response; protection and safety of beneficiaries; participation and consultation; universal and equitable access; capacity building; partnership and institutional strengthening; appropriate technology and cost effectiveness; contingency planning; and integrated programming with a focus on sustainable solutions and clear exit strategies.

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Introduction

UNHCR's principles for the provision of WASH services in refugee settings

1. This chapter describes the guiding principles that UNHCR and WASH actors should take into consideration when designing WASH programmes. The guiding principles include:
   - A focus on saving lives
   - Ensuring the safety and protection of beneficiaries
   - Working with service providers and regulatory authorities
   - Participation, consultation and respect of cultural norms
   - Universal access to all groups
   - Equitable access
   - Appropriate technology and cost effectiveness
   - Exit strategies, transitions and handovers
   - Capacity building and partnership
   - Institutional strengthening
   - A comprehensive approach
   - Monitoring and accountability
   - Contingency planning
   - Health and safety of staff
   - Protection of the environment
2. These principles are essential to create conditions where refugees can live with without risk of disease, in dignity, and to ensure that there are cost-effective and sustainable solutions in place in the long-term. This is regardless of the phase of the emergency or whether refugees are living in camps, collective centres, spontaneous unplanned camps, with host families, in rented accommodation, or they are occupying land or buildings.

Saving lives

The importance of immediate WASH interventions

3. In all acute emergencies or settings where lives of refugees are at risk, resources must be mobilised immediately to carry out the following WASH interventions (*in priority order*).
   - Ensure immediate access to survival quantities of safe drinking water during transit and on arrival at a refugee setting (15 litres/person/day).
   - Ensure immediate establishment of gender separated toilets in transit facilities and on arrival at a refugee setting (1 toilet for every 50 persons).
   - Ensure immediate clean-up of excreta and pathogenic or hazardous wastes within the refugee setting.
   - Ensure immediate dissemination of key hygiene messages and distribution of essential WASH non-food items (in particular soap, water containers, and menstrual management materials) during transit and on arrival at a refugee setting (all families have received kits and messages within 72 hours).
   - Ensure immediate identification and control of high-risk disease vector populations within the refugee setting.
   - Ensure that WASH needs are evaluated as part of a multisectoral assessment within 72 hours of an acute refugee emergency.

4. The general aim of WASH agencies should be to initially meet SPHERE emergency standards moving rapidly on to adopt UNHCR standards. More information regarding each of the above interventions (water supply, excreta management, hygiene promotion, disease vector control, and rapid multisectoral assessments) can be found in the relevant chapters of this Manual.

The provision of basic WASH services from the outset of the emergency is better than delayed provision of improved systems.

The problem with scaling up quickly

5. UNHCR has defined WASH coverage targets for both the 'emergency' and the 'post-emergency phases' (definitions of these phases can be found on **pages 6 and 8**). However, it is a common problem during refugee emergency responses that WASH programmes fail to scale-up quickly enough to meet the overwhelming WASH needs.
6. During acute refugee emergencies, WASH agencies should not only track core WASH indicators but also the rate of change of these core WASH indicators (for example the quantity of water distributed per day, the number of hygiene kits distributed per day, the number of toilets constructed per day) to clearly show that the UNHCR target values will be met on-time. If the rates show that the UNHCR target will not be met on-time, additional financial, material, and human resources must be allocated immediately. Changes in WASH implementation strategy may also be required for example: the use of mechanical excavators, imported skilled labour, or mass production of WASH infrastructure (e.g. bathing or toilet superstructures) in a dedicated production-line type facility. Programmes that fail to track implementation rates often fail to realize their WASH programmes are failing before it is too late. UNHCR and WASH agencies must ensure that tracking is given a priority in all emergency settings.

The importance of adequate contingency planning

7. The ability to provide a timely and appropriate response is often directly proportional to the amount of effort that has been set aside to WASH contingency planning. Every UNHCR mission should prepare a country level and site level WASH contingency plan that is based around historical and probable WASH needs. The plan should include: an analysis of the risks; probable scenarios; likely impacts; WASH stockpiling arrangements; personnel and equipment stand-by arrangements; coordination arrangements; links to early warning systems; and mitigative activities related to building preparedness resilience. The WASH contingency plan should be included in every refugee site's WASH plan/strategy document describing the detailed contingency arrangements for water supply, excreta management, solid waste management, hygiene promotion and disease vector control.


CAUTION
CAUTION
CAUTION

8. Contingency planning should also include preparedness activities. During an acute WASH emergency response, there is usually very little time available to compare WASH agency rapid assessment materials and ensure that there is a common tool and approach that is widely supported. The effectiveness of the WASH inter-agency rapid assessment can be dramatically improved by finalizing agreed tools and methodologies during the contingency planning process.
9. Similarly, during a WASH emergency response, there may be little time to coordinate the preparation and approval of agreed inter-agency WASH hygiene promotion key messages and approaches. The effectiveness of the emergency response can be dramatically improved by finalizing these messages and methodologies before an emergency takes place.

Safety and protection of refugees

10. UNHCR is mandated to protect and safeguard refugee populations and every necessary step must be taken to assure that water collection points, toilet facilities, bathing areas, laundering areas and waste collection points minimises the threats to users, especially women and girls, day and night. Lack of security, or dignity, when using facilities can lead to anxiety concerning their use. Inappropriately designed or located WASH facilities can lead to users putting themselves at risk of Gender Based Violence (GBV) for example facilities may not offer enough security or women and girls may put themselves at further risk by defecating outside of the camp environment.

The importance of refugee participation when locating WASH facilities

11. All WASH facilities should be designed and located in discussion with the refugee communities, in particularly women and girls. One practical way to involve men, women and children in the design is to build a sample facility and invite groups to come and critique it. Communal WASH facilities must be located in areas that are secure in discussion with the refugee population, in particular women and girls. Security should be the primary selection criteria when choosing a location.

WASH facilities should be located in areas that are secure in discussion with the refugee population, in particular women and girls. Security should be the primary selection criteria when choosing a location.

Guidelines for WASH facility privacy and security measures

12. Every communal WASH facility should include privacy and security measures designed in collaboration with the refugee population. These include: siting and design in collaboration with the community; a privacy screen around the facility; secure lockable doors; night time illumination to 100 lumens per square metre; and the possible use of night-time community patrols. Full technical specifications for privacy screens,

lockable doors and night time illumination can be found as part of the **UNHCR standard communal latrine** design.

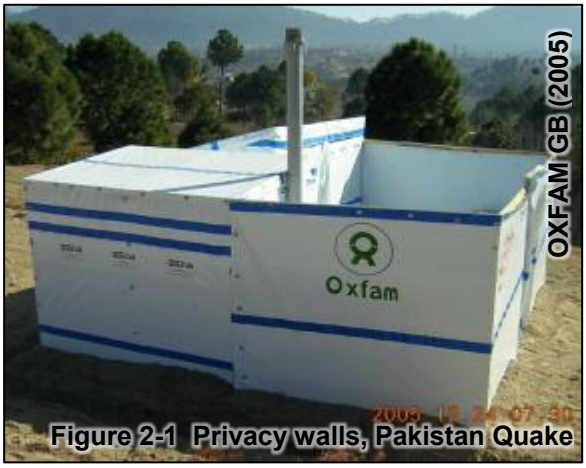


Figure 2-1 Privacy walls, Pakistan Quake



Figure 2-2 External toilet lighting, Zaatari

Use of night-time community patrols

13. In some cases it may be beneficial to engage community guards or patrols to ensure WASH facilities are safe during the night. The modality of this service should ideally be defined and organised by the community themselves.

The importance of rapid transition to household or shared WASH facilities

14. Due to the security risks associated with public toilet and bathing facilities, WASH programmes should start or transition as quickly as possible into the construction of household facilities shared between families. This approach is essential if it is clear that the timeframe of the humanitarian situation will be longer than six months, and especially if it is clearly the cultural preference. Transcripts from focus group discussions and key informant interviews related to the implementation of household toilet and bathing facilities, or willingness to share facilities, should be included in the site WASH strategy/plan. If a WASH programme has decided to build blocks of public or communal toilets and showers, rather than the preferred strategy of moving directly to shared or individual units, the reasons justifying this decision must be fully explained in the site WASH strategy/plan.

15. If a decision has been taken to build communal WASH facilities then WASH blocks must serve no more than 1 community (16 families) and facilities should be arranged with the users for their exclusive use. All communal toilet and bathing facilities should be fully phased out within one year. Within one year all families should have their own private facilities - with public toilet facilities remaining in public areas such as schools, clinics, and market places.

UNHCR modular camp planning

Module	Consisting of	No. persons
1 family	1 family	4-6 people
1 community	16 families	80 people
1 block	16 communities	1,250 people
1 sector	4 blocks	5,000 people
1 camp	4 sectors	20,000 people

Source: UNHCR (2007) *'Handbook for emergencies – third edition'*. UNHCR, Geneva.

Establishment of a functioning feedback mechanism

16. All refugee settings should have a functioning anonymous WASH feedback mechanism not only to report problems of poor WASH service provision but also to communicate safety and protection issues. All refugees should be aware that the complaints mechanism exists and how to access it. The senior WASH programme staff must take personal responsibility for reviewing feedback and ensuring active follow-up and rectification. A description of the feedback mechanism, statistics related to the number and type of feedback that have been received, and the rate at which they have been resolved, should be included in the site WASH plan/strategy.

Ensuring the physical safety of users

17. UNHCR and WASH actors must ensure that all WASH service protect the physical safety of users (in particular children, and infants, the elderly and refugees with disabilities) and are free from trip, crush, pinch, pierce, cut, splinter, burn and drowning risks. Great care must be taken to ensure that the all users (in particularly children and infants) are adequately protected from falling into wells, toilet pits or waste pits. Medical and hazardous waste management areas must be adequately secured to prevent risks to children or scavengers. If hot water is provided for bathing or laundering (in cold climates) there should be no risk of scolding from excessive water temperatures (hot water should not be greater than 50°C). Water boiling apparatus must be secure, safe and out of the reach of children. An up to date checklist assessing potential protection and safety risks (**see annex**) must be completed for each site and a copy should be included in the site WASH plan.

Documenting the protection and safety strategy and activities

18. A clear strategy of how the protection and safety of refugees is being addressed in the short, medium and long term should be included in the site WASH strategy/plan in addition to FGD notes concerning safety and an up to date WASH safety and security checklist (**see template in annex**).

Participation in planning and running WASH services

19. Refugee WASH programmes can involve a whole range of stakeholders including local public and private service providers, local municipal, regulatory, environment and public health authorities, host and refugee populations and community based organisations (e.g. recycling groups or waste scavengers). WASH programmes can quickly go wrong if these stakeholders are not involved in key decisions concerning how the services will function. All WASH programmes must include a strong element of community mobilisation and empowerment. As much as possible, recognized and legitimate refugee and local community leaders should have final decision concerning aspects of the WASH activities within their jurisdiction.



Working with national WASH service providers and regulatory authorities

20. UNHCR and WASH actors should ensure, where possible, that WASH programmes in refugee settings are developed and run in full collaboration with the local water, waste, hygiene, and vector control service providers and regulatory authorities, extending existing services to refugees where possible. As refugee settings can last for decades, with the average length of time around 17 years, it is essential that national WASH organisations are fully engaged. This is particularly important during urban displacement scenarios where the refugee population may present an additional burden on municipal WASH service providers.
21. National WASH service providers and regulatory authorities might be reluctant to support refugee WASH services in distant or isolated settings away from the general population. Technical support, capacity building, material support and funding may be required to ensure that national WASH organisations have the resources to support refugee WASH programming. Direct support and capacity building initiatives should be planned as early as possible.
22. UNHCR and WASH actors should ensure that refugee WASH standards for each response phase are set in agreement with national government authorities and WASH actors, taking into account SPHERE standards, UNHCR standards, and any national guidelines and standards related to water abstraction, water quality, excreta management, solid waste management, wastewater disposal, hygiene promotion, and disease vector control. During emergency responses it may be possible to seek temporary relaxation of national WASH standards. During the post-emergency phases, WASH service provision should adhere to national government approved designs, standards, sanitary codes, regulations and quality standards. If alternative designs or approaches are being promoted, then it is essential that the appropriate national government ministries and bodies have approved the technology and approach.

Consultation, participation and cultural norms.

23. UNHCR and WASH actors should ensure that all WASH programmes and infrastructure are designed, developed and run in full participation with the refugee population taking into account local preferences and cultural norms. One practical way to involve men, women and children in the design of WASH services is to build a sample facility and invite groups to come and critique it.
24. Users, in particularly women and refugees with special needs, should be involved in all aspects from the design and siting of WASH service areas to the frequency and quality of services. If users are not involved there is a risk of public opposition to the siting or type of WASH services that are proposed. In many contexts, WASH related activities, in particular excreta management,



menstrual hygiene management, and solid waste management, have many cultural nuances and it is essential to understand how best to work with the population when it comes to the more complex behavioural aspects. In all cases it is essential to understand how WASH activities were undertaken in the refugee population's place of origin and what they feel are the best solutions for the current context. If the refugee population is not involved in the planning of services there is nothing to stop them simply avoiding, stealing, or misusing WASH services and infrastructure.

25. Refugees should be encouraged to creatively personalize or customize the design of WASH facilities. Being able to add relatively inexpensive details such as paint, mirrors, clothes hooks or shelves in bathing cubicles, somewhere to put a bar of soap (instead of on the floor) can not only create a sense of ownership but can also provide a great deal of dignity to users. Notes from consultative sessions and an up to date plan showing how the needs and preferences of the refugee population are being met should be included in the site WASH plan.

26. Where possible, refugee WASH programmes should have active gender-balanced, representative, and democratically elected water, sanitation and hygiene committees. The size and composition of the committee should be adapted to the context but may include sectoral focal points (water, excreta, solid waste, hygiene promotion, disease vector control) in addition to positions related to gender and protection, universal access, WASH services in marketplaces, or WASH in schools. During the post-emergency phases, the WASH committee may be supported to establish their own WASH related Community Based Organisation (CBO) or to write their own legislation and sanitary codes for the refugee setting (see **section 1.80**). An update of the activities of the WASH committee, in addition to their current action plan, should be included in the site WASH plan.

27. The refugee population should be empowered to plan and manage their own WASH services as early as possible. Programmes should aim to strengthen capacities and resilience over time to the point where the refugee population is fully able to manage their own WASH services with limited external assistance.

Use of group meetings and focus group discussions

28. Group meetings can be effective in discussing aspects of the WASH programme with the refugee population, i.e. what is proposed, how the systems will operate, and why the interventions are important. Such meetings should give the refugee community an opportunity to question what is being proposed and steer decisions that are being made. It is important that every effort is made to include as many of their views as possible. Group meetings can be effective in discussion general information concerning the WASH programme, but it is typical that some sections of the community


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will not participate in these meetings and alternative means of discussing programme design should be sought.

29. Discussion concerning WASH related cultural norms, taboos and concerns related to safety and security, in addition to management of excreta, anal cleansing materials, or women's menstrual hygiene materials, is usually better achieved on a one-to-one basis or within a very small focus group (see **section 9.26** for general guidance for conducting focus groups).

Selecting the location of water points and communal WASH services

30. WASH services for camp based refugee populations should be planned using the community, block, and sector model (see **section 1.15**) where WASH service areas are organised and allocated on a per community basis (defined as 16 families or 80 persons under the UNHCR model). Keeping the number of families small creates an environment where users are known to each other and are more likely to take greater care of facilities.

Creating ownership through the use of restricted communal space

31. The UNHCR Handbook for Emergencies (see below) states that grid based layouts for WASH services must be avoided. Instead, UNHCR and WASH actors should locate water points and WASH service areas in such a way that they create communal ownership. This can be facilitated by working with site planners to establish layouts such as hollow square, staggered square, communal road, and loops and cul-de-sac models.

> ***"Every effort should be made to avoid a rigid grid design which does not account for community layout and interaction and presents difficulties in identifying proper community-based locations for services such as latrines, water points, showers etc. Grid design does not promote ownership of services, which is crucial for proper usage, cleaning and maintenance."***
>
> **UNHCR Handbook for Emergencies – 3rd Edition (2007).**

32. The use of restricted communal space has not only found to beneficial in enabling communal ownership of WASH facilities but has also been found to have strong social and psychological benefits, providing visual relief, opportunity for relaxation, a place for casual contacts, green zones, shading for water points, and a safe, secure and healthy environment for children.

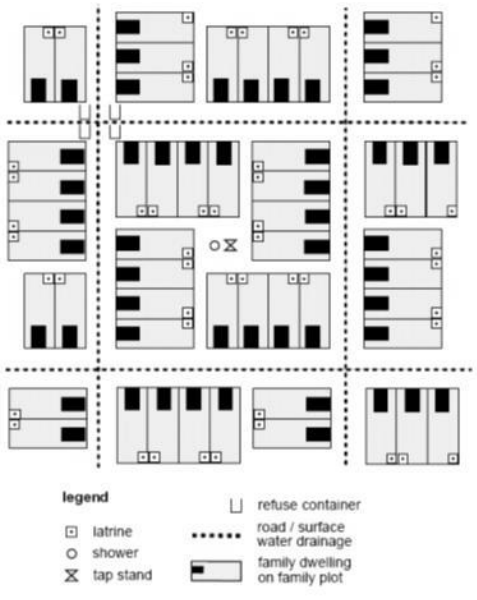


Figure 2-3 Hollow square site model



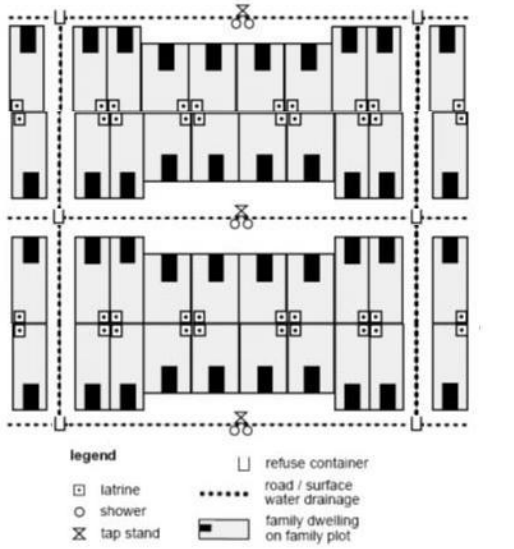


Figure 2-4 Community road site model

Empowering the refugee population from the start

33. The refugee population should clearly understand that they are not just passive recipients of humanitarian aid but they have the rights, capacity and means to manage and dictate the direction of their daily affairs, including managing their own WASH services. The degree to which the refugee population can be empowered to undertake their own WASH services depends upon the phase, the context and the capacity of local actors. In most settings where there are strong municipal waste services, or private sector waste management companies, community leaders should be empowered to work directly with these authorities. In some contexts where local service providers or local authorities are weak or non-existent, UNHCR may consider building capacity of WASH to a community based organisation (CBO) established from representatives of the refugee population to manage the daily running of WASH services.

Universal access

The importance of universal access to WASH facilities

34. UNHCR and WASH actors must ensure that all WASH infrastructure including toilets, water collection points, bathing, laundering and handwashing facilities, solid waste collection points, waste containers and recycling facilities can be accessed and used comfortably by all in particularly children, the elderly, pregnant women, the infirm, and persons with disability and mobility issues. In situations where water is rationed, distribution must be planned to ensure the needs of vulnerable groups. Hygiene promotion materials must ensure accessibility to all (in particular those who are blind, deaf, or have eyesight or hearing difficulties).

Collecting data on vulnerable users

35. The World Health Organisation estimates that between 4% and 10% of any population has some form of disability; however in refugee settings (particularly conflict settings) these figures are likely to be higher. In addition refugee settings generally have a significantly higher proportion of women of reproductive age, small children and elderly persons - who are all likely to benefit greatly from WASH universal access features. In all refugee settings, data should be collected so that facilities can be constructed as near to vulnerable users as possible. A summary of the types and rates of disability present in the setting, in addition to short, medium and long-term strategies and approaches for vulnerable groups



should be included in the site WASH plan/strategy.

Involving vulnerable users in the design of WASH services

36. UNHCR and WASH actors should ensure that vulnerable groups including pregnant women, the elderly and the disabled have an active voice in decisions concerning facilities designed for their use. Vulnerable users generally have a clear idea of their needs and are usually very willing to participate.

Helping users with reduced mobility get to WASH facilities

37. WASH facilities are of no use if users with limited mobility cannot easily access them. Paths may need landscaping to facilitate access by the elderly, pregnant women or users with physical handicaps.



Figure 2-5 Access ramp with curb

38. Once the user arrives at the WASH facility it may be necessary to install steps or a length of ramp for final access. The decision to install access ramps outside WASH facilities should be based on an assessment of the disabled users in the setting. In contexts where there are no wheelchairs it may be easier to install gentle steps with a firm handrail than ramps. If ramps are installed their slopes must meet global regulations with an inclination of no greater than 1:15 and length of no longer than 5 metres. In addition, access ramps must have a curbed edge of at least 3cm to prevent wheelchair wheels falling over the ramp edge. At the end of the ramp there should be a flat and level space of at least 1.5m diameter to allow a wheelchair to stop, turn and safely enter the WASH facilities without rolling back. Access ramps should also have a grab rail to aid users that are unsteady on their feet.

39. All floor surfaces inside and outside should be even and non-slip. The decision to install access ramps outside WASH facilities should be based on an assessment of the disabled users in the setting. In contexts where wheelchairs are completely impractical it is often better to install gentle steps with a firm handrail than waste time and resources on ramps that will never be used.

Helping users with reduced mobility get into WASH facilities

40. Once the user has reached the WASH facilities they need to be able to get safely inside. If inward opening doors are used extra space must be used to allow the door to fully open. If outward opening doors are used there must be sufficient space to avoid the risk hitting users waiting outside the facility. A handrail next to the outside of the door is useful for users who are unsteady on their feet opening the door. A rail or rope attached to the inside can be helpful to pull the door closed once inside.

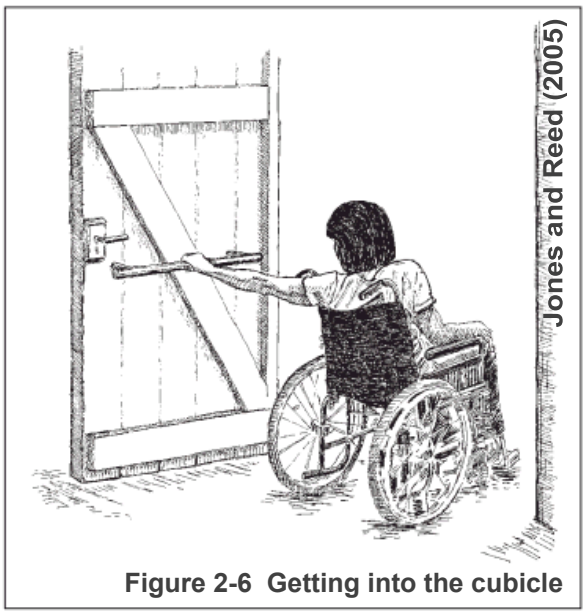


Figure 2-6 Getting into the cubicle

Helping users with reduced mobility move around inside WASH facilities

41. All WASH facility door widths should be at least 90cm wide to allow passage of a wheelchair. All toilet and shower cubicles should have a free space (not including door clearance or fixtures) of at least 1.5 metres by 1.5 metres to allow for full wheelchair rotation. This large space also allows for a mother assisting a child or a caretaker assisting an elderly person or pregnant woman.

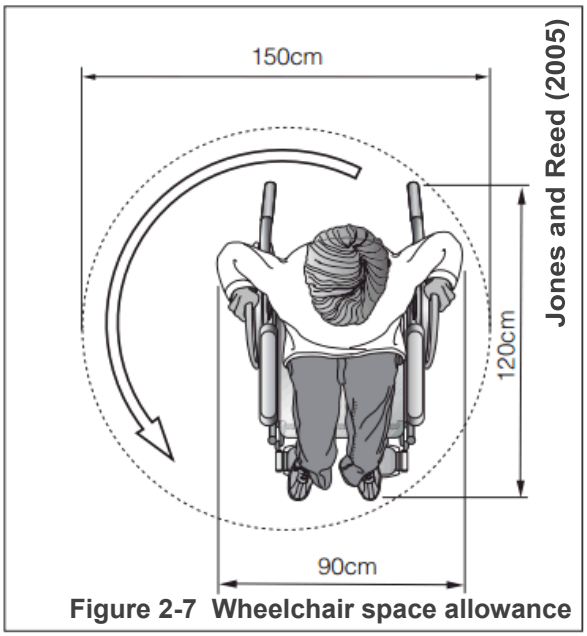


Figure 2-7 Wheelchair space allowance

42. All toilet and shower facilities should include grab rails to assist elderly, infirm, pregnant women and people with disabilities to use the facilities with security. Toilet should generally be placed in the corner of the cubicle to maximise space. Transition onto the toilet is best achieved in a sideways motion. Grab rails should be strong enough to support the full weight of an elderly or disabled user and should be positioned to facilitate transition onto the toilet.



Figure 2-8 Toilet adapted for disabled use



Figure 2-9 Toilet adapted for disabled

Provision of bed pans and commodes

43. Incontinence can be a problem affected the elderly, disabled people, postnatal women, people

who are sick, and some men, women and children who just have a problem with their urinary or faecal systems. If reaching the toilet is a problem, a bedpan or commode may be a more convenient option. The bed pan or commode will need to be regularly emptied into a toilet. Appropriate materials for incontinence paddings may be included with hygiene materials in discussion with community members.

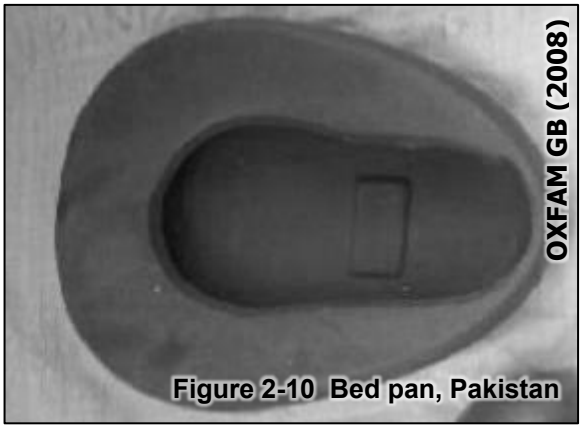


Figure 2-10 Bed pan, Pakistan



Figure 2-11 Commode, Pakistan

Universal access to water collection points and waste containers

44. Water collection points should be no higher than 0.8m from the ground so they are easily accessible to all users. Mechanisms used to abstract water (taps, handpump levers etc.) should not require excessive force and should be free from pinch, puncture, entrapment and drowning risks. Floor surfaces around the water point should be non-slip and free from standing water..

45. Waste containers should be no higher than 0.8m from the ground so they are easily accessible to all users. If lids are used to reduce vector populations, it may be necessary to install mechanisms to facilitate their opening. Floor surfaces around the waste containers should be non-slip, free from standing water and free from waste. Waste collection points should be clean, free from smells, disease vectors and with access in order to facilitate use by users with reduced mobility.

Monitoring of universal access

46. An up to date universal access assessment checklist should be completed for all refugee settings and should be included in the site WASH plan/strategy.

Equitable access

The importance of providing equitable access to WASH services to all groups

47. UNHCR and WASH actors should ensure that all social, ethnic and religious groups within the refugee setting have equitable access to water, sanitation and hygiene services. WASH monitoring mechanisms should track WASH service provision within each of the target socio-economic groups.

48. During the post-emergency phases, UNHCR and WASH actors should aim to provide a level of service in the refugee setting that meets the UNHCR minimum requirements in addition to the level of service available to the local host population and the level of service the refugee population is accustomed to in their place of origin. If the level of service in the host population is lower than the UNHCR minimum standards, then equitable WASH assistance to the host community should be considered through national WASH development agencies.

49. Short, medium and long-term target levels of service for the refugee and host settings must be clearly defined as part of consultation and coordination mechanisms between WASH stakeholders. A description of the current levels of service for each group should be routinely documented within the site WASH strategy/plan.

Child friendly facilities

Participation of children and parents in the design of WASH facilities

50. UNHCR and WASH actors should ensure that all WASH infrastructure including toilets, water collection points, bathing facilities and waste disposal facilities are designed so that they are safe to use and accessible to children. Design features to facilitate the use of children should be discussed in meetings with parents, children and representatives of the refugee community. Focus groups should be carried out with children to understand barriers to the use of WASH facilities for example fears of filth, smells, fear of the dark, or falling into the latrine pit, waste pit, or water source.

Adapting the design of WASH facilities for children

51. All WASH facilities should be adapted so they can be used comfortably and safely by children. Additional hand-washing basins, hand rails and door handles may need to be installed that can be reached by smaller children (see Box). Care should be taken so locks are at a height that children can use and they don't become locked in. The distances between toilet squat slab foot rests should be sufficient so children can use the facility comfortably and are not scared of falling inside. Urinals should be lowered so young boys can use them comfortably. Hand rails may help small children maintain their balance when squatting. Handpumps should have sufficient mechanical advantage so that excessive force is not required to obtain water.

WASH facility dimensional data for young children 3 – 5 years old

Hand-washing basin height	58cm
Toilet seat height	26cm
Maximum reach for handles	80cm

Source: Zomerplaag. J., Mooijman. A. (2004) '*Child Friendly Hygiene and Sanitation Facilities in Schools'.* IRC Netherlands.

Ensuring adequate lighting of WASH facilities for children

52. Natural light and light coloured wall paint inside WASH facilities should provide sufficient lighting

during daytime use so that children are not afraid to use them. Having sufficient natural lighting inside a toilet facility is often contradictory with the need to keep the toilet interior dark to reduce fly populations in certain types of toilets (in particular the ventilated improved pit VIP design). However, if the toilet cubicle door is lightly sprung loaded and the toilet has a well screened vent pipe, then fly infestation can still be reduced. An alternative is to use tightly fitting drop hole lids or to install a water seal system.



Figure 2-12 Colourful toilets, Haiti

Distribution of potties, buckets and trowels to parents of young children

53. Close attention should be given to the disposal of infant faeces. Practice and cultural norms concerning the collection and disposal of infant faeces should be discussed in focus groups. If appropriate, potties and trowels may be included in family hygiene kits. It may be necessary to provide parents with information about safe disposal of infant faeces and safe nappy (diaper) laundering or disposal practices.

Ensuring cleanliness

54. WASH facilities should be clean with light colours, natural light and good ventilation in order to encourage use by children. All surfaces in contact with faeces and urine and all floors should be durable and able to withstand repeated cleaning. Children may not have fully developed toilet skills and so steps should be taken by care takers to help them use facilities and toilet cleaning arrangements should be reinforced where they are used frequently by children.

Appropriate technology selection and value for money

Transitioning into efficient WASH operations as early as possible

55. Emergency phase WASH interventions, in particularly water tankering, toilet desluding, and operating and maintaining large public WASH blocks, can be very costly and inefficient. Clear strategies should be developed from the start that include transfer to more efficient and sustainable technologies. Solutions should be selected to reduce dependence on imported equipment, fuel supplies, imported chemicals, or large numbers of staff.

56. The costs involved in operating and maintaining public and communal WASH blocks in a refugee setting can be staggering (especially maintenance costs, incentives to WASH attendants, cleaning supplies, and maintenance crew costs). As the average lifetime of a refugee camp is 17 years it is essential to consider moving directly to shared toilets/bathing facilities or household facilities as early as possible, or better still from the start of the emergency.

Simple, basic, sanitary, clean, safe and functional WASH systems must be selected over complicated, high-tech solutions that are difficult and costly to operate and maintain. In almost every case, it is it simpler and more cost effective to use on-site solutions than systems that involve transportation of wastes, excreta or water.

Selecting WASH technology based on local technical and financial conditions

57. During the post-emergency phases, UNHCR and WASH actors should ensure that WASH hardware is appropriate for the local technical and financial conditions. Designs should respect the norms and traditional practices of the refugee and local population whilst respecting public health best practice. Technologies should be used that are simple enough to be operated, maintained and repaired by the refugee population with limited external assistance. In all cases, programmes should make use of locally available equipment, materials and spare parts. All consumables should be readily available in-country. Where they exist, national standards for WASH infrastructure should be respected.

58. Where required, water treatment processes should be as simple as possible (for example simple roughing or rapid sand filtration) rather than relying on imported machinery or expensive chemicals. Gravity should be used wherever possible for the movement of water or excreta over distance. If handpumps are used they should be based on models that meet national standards to ensure availability of spare parts and technicians.

59. Latrine designs should be simple, yet functional, appropriate, sanitary and safe. Simple systems must be selected over complicated, high-tech solutions that are difficult and costly to operate and maintain. In almost every case, it is it simpler and more cost effective to use on-site sanitation than systems that involve transportation of excreta. During the post-emergency phases it is better to have a simple latrine design of sufficient quality to last 10-15 years rather than a lower-cost latrine that needs replacing every two years. In many settings, alternating twin-pit urine diverting dry toilets (UDDTs) are an excellent and durable low-cost solution.

60. Careful studies should be undertaken when selecting waste collection vehicles and equipment to ensure that they are appropriate to the waste characteristics (in particular bulk density) and the geographic/roads/climatic conditions. Vector control programmes should concentrate on root causes (e.g. reduction of breeding sites or proper solid waste management) rather than the unsustainable use of imported chemicals.

61. In general, the selection of WASH hardware - for example handpumps, solid waste containers, vehicles, processing equipment, treatment and disposal technology and methods - depends

greatly upon the local context. Approaches that work well in one setting cannot necessarily be applied to another. In all cases, the approaches must build on the traditional practices and the expertise of local specialists. Justification for the selection of water supply, excreta management, solid waste management and disease vector control technology must be fully documented in the strategy part of the site WASH plan/strategy.

Evaluating WASH technologies based on total lifetime costs

62. In all cases, careful studies should be undertaken when evaluating WASH technologies and approaches to ensure total lifetime value for money for both capital and recurring costs. Technology should be selected taking into account total life-cycle costing over a period of 15-20 years (average lifespan of a refugee camp) and encouraging the use of technologies that may have higher up front capital costs, but lower long term operations and maintenance costs. The best facilities are those that are affordable, durable, easy to maintain, easy to clean, generate pride in a community, and encourage proper use. Look for options with the lowest life-cycle costs that have no compromise on quality. Despite a higher initial investment, money will be saved because the facilities will require less maintenance over time without the public health risks that are associated with poor-quality WASH infrastructure.

Selection of WASH technology with a view to eventual handover

63. All post-emergency and protracted phase water supply, excreta management and solid waste facilities should be selected with a view to eventual handover to local authorities, or refugee management. In order to be successfully handed over, technology must be selected as early as possible that can be sustainably managed by these organisations with sufficient capacity building and financial support.

Use of local materials and labour

64. Where possible, WASH infrastructure designs should take advantage of locally available construction materials to reduce costs in addition to avoiding the delays in importing materials. Locally available labour and expertise should be prioritised over imported labour and expertise.

Saving costs through the use of alternative energy

65. According to Oxfam GB (2013) it costs 10 times more to install and run a diesel powered water pumping system as opposed to an equivalent solar powered system over a period of 10 years. In addition, the cost of solar panels has dropped by over 80% during the last 10 years. Therefore, UNHCR and WASH actors should ensure that new pumping installations and rehabilitations in refugee settings prioritize lowest lifetime cost renewable energy options (solar, wind, or ram pumping) provided grid-based electricity is unavailable. This not only has the benefit of affordable


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operation and maintenance costs but additional environmental benefits.

Reducing costs through optimization of labour and vehicles

66. Small changes in how WASH staff, vehicles, and resources are managed can yield enormous cost-savings and WASH programmes must ensure that operations are optimized and efficient. Labour and vehicle costs make up a significant part of the expenditure associated with WASH service provision and small optimizations in efficiency of either the workforce, or the way vehicles are used can make big cost saving. For example, the way that hygiene promoters, street sweepers, waste collectors, WASH block cleaners, or maintenance crews are managed and monitored can significantly improve the productivity of the WASH programme. Waste collection programmes should use transfer stations to optimize vehicle operating radius. Waste collection vehicles should be operated at their rated tonnage. When selecting vehicles, the fuel consumption rating can be a more important factor than the initial purchase price.

67. UNHCR and WASH actors should ensure that the costs of each of the WASH interventions (water, excreta management, solid waste, hygiene promotion, disease vector control) are fully documented in the site WASH plan/strategy, including an analysis of trends over time. This should include at a minimum..

- The cost of water supply (cost per m3 for water abstraction, treatment and distribution up to the end user)
- The cost of excreta management (cost per person per year for excreta management services)
- The cost of solid waste management services (cost per tonne of managing each waste steam)
- The cost of hygiene promotion activities (cost per person per year for hygiene promotion interventions)
- The cost of disease vector control (cost per person per year for each disease vector control intervention)

68. These are important indicators that allow WASH actors to track trends in the cost of WASH service provision and compare the cost in one setting against another setting. In addition, they allow WASH actors to understand ways in which costs can be economised (i.e. by reducing initial capital costs or the annual costs of fuel, electricity, consumables, staffing, logistics, or administration).

Saving costs through waste reduction, recycling and reuse

69. The collection, transportation, processing, handling, reuse, treatment or final disposal of wastes is expensive and costs can add up along the whole length of the waste management chain. Typical capital costs include waste containers, waste collection vehicles, transfer station infrastructure, waste processing stations and landfill infrastructure. Typical recurring costs include vehicle parts and maintenance, transportation fuel, salaries for



collection and sorting personnel, salaries for sweepers responsible for communal areas, landfill fees and environmental monitoring costs. Every kg of waste that is diverted from the waste stream can result in a significant cost saving to the waste management operation. In all settings, make every effort to promote prevention, reduction, reuse and recycling of wastes.

70. In many settings there is commercial value in recycling of glass, metals and paper. Integrated waste management best practices should be followed which looks as waste holistically and uses the funding from waste streams that are profitable such as recycling of metal and glass, to fund waste streams that are not profitable e.g. the safe management of toxic domestic wastes.

Charging for WASH service provision in long term settings

71. In some long term refugee settings, if income generation and livelihoods are possible then UNHCR and WASH actors may consider developing equitable tariff structures for WASH services in line with national and local norms. For example in some long term refugee settings, refugee commercial enterprises that are generating significant quantities of waste above and beyond the typically domestic production rates should be charged a fee that reflects the actual cost to dispose the quantities and types of waste they produce including the difficulties experienced in handling it. These costs should be established in negation with . refugee leaders and businesses to ensure they are fair, transparent and equitably applied to all businesses. Reviews of tariffs may be undertaken on a yearly basis. Fees collected for WASH services should go back into paying the costs of service provision – ideally to the refugee CBO running the services. The main motivation for these payments should be to serve as an incentive to reduce waste and cover actual costs rather than to make a profit.

Documenting appropriate technology selection and cost reduction strategies

72. A detailed description justifying the selection of WASH technology, in addition to short, medium and long term strategies to ensure appropriate technology use and a cost effective approach, should be updated in the site WASH plan/strategy.

Capacity building of WASH stakeholders

The importance of building the capacity of WASH stakeholders

73. UNHCR has found that the average lifetime of a refugee emergency is 17 years. Therefore, as early as possible, UNHCR and WASH actors should take steps to identify suitable solutions for transferring responsibility for WASH service provision to a suitable service provider or organisation. Options to be considered depend greatly on the context but may include..

- Transition of WASH service provision to national water, sanitation and public health

authorities with/without financial support and resources.
- Transition of WASH service provision to private sector WASH service providers with financial support and resources.
- Transition of WASH service provision to a community based organisation (CBO) made up of members of the refugee community with financial support and resources.

Assessing the capacity of WASH stakeholders

74. An organisational capacity assessment tool (**see annex**) has been developed to help UNHCR and WASH actors understand what they can do to help support and build the capacity of WASH organisations that are potential candidates for running WASH operations. The tool has been designed to help obtain a snapshot of the capacity of the organisation and understand the type of interventions that can be carried out to build capacity. The tool should be used to guide a conversation (approximately an hour long) with the most senior representatives of the organisation and understand where the organisation can most benefit from additional support and strengthening.

Interventions to build the capacity of WASH stakeholders

75. Interventions to build the capacity of WASH stakeholders depends greatly on context but include..
    - Reinforcing technical skills (e.g. for design, operation, or maintenance activities).
    - Technical advisory support (e.g. for water treatment processes, management of sanitary landfills, hazardous wastes, recycling and reuse operations, maintenance and logistics operations).
    - Secondment (either secondment of experts to the organisation, or short-term secondment of staff from the organisation to centres of expertise).
    - Technical training of staff (e.g. sectoral capacity building in water, excreta management, solid waste, hygiene promotion, or disease vector control).
    - Managerial training of staff (reinforcement of managerial, administrative, logistic, or financial procedures).
    - Logistics or fleet management support.
    - Provision of additional operational resources (e.g. vehicles, tools, or WASH infrastructure such as sanitary landfills, or recycling facilities).
    - Provision of managerial resources (e.g. computers, expanded office facilities, or office equipment)
    - Provision of funds to support budget shortfalls or expansion of WASH services.

Before any WASH services are handed over, UNHCR and WASH actors should ensure that any WASH infrastructure has been upgraded so that it is cost-efficient, affordable, easily operated, maintained and repaired using locally available resources and expertise. In addition, UNHCR and WASH actors should ensure that

the technical, managerial, financial and logistical capacity of the potential organisation is sufficient to take on responsibility for running the WASH services. Any interventions to transfer WASH service provision should be carried out slowly and carefully with constant monitoring and support. Once WASH services are handed over, work with national regulatory authorities to ensure that the quality of services continues to be carried out to defined standards.

Building refugee WASH capacity to facilitate return / integration / resettlement

76. In all settings, UNHCR and WASH actors should prioritize the development of refugee WASH related skills which can serve the population during eventual return, integration, or resettlement. During return or resettlement, UNHCR and WASH actors should coordinate with the UNHCR programme in the country of return so that refugees with WASH skills can be used to lead WASH related return initiatives. In Pakistan for example, UNHCR's partners have trained teams of Afghan refugee well drillers and has supported them with drilling rigs and drilling contracts.

WASH infrastructure quality

References to UNHCR standards for WASH infrastructure quality

77. UNHCR and WASH actors should ensure that all WASH infrastructure has been designed and constructed according to the technical specifications and standards found on the **wash.unhcr.org** website.

A comprehensive approach to WASH service provision

Ensuring WASH interventions are fully integrated with other sectors

78. UNHCR and WASH actors should ensure that WASH activities are fully integrated with Education, Livelihoods, Community Services, Protection, Community Health, Nutrition and HIV/AIDS programmes. In order to avoid confusion, including overlaps and gaps, WASH programmes should ensure there is clear documentation describing the modalities of sectoral support and integration. In refugee schools and health-care facilities for example, it is essential there is clarification with the Education and Health sectors concerning the limits of responsibility for daily cleaning of WASH infrastructure, maintenance of WASH infrastructure, water quality testing, hygiene promotion, waste management, medical waste management and disease vector control. In livelihoods programming, it is essential to come to an agreement concerning water provision for economic activities and livestock, in addition to support to WASH related small businesses.

Ensuring a comprehensive mix of hardware, software and the enabling environment

79. UNHCR and WASH actors should ensure that all post-emergency phase water supply, excreta management, solid waste management, hygiene promotion and disease vector control programmes are planned based on a comprehensive mix of hardware,


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software, and enabling environment interventions. Equal amounts of energy and time, that are invested into hardware should also be invested into community mobilization, policy development, stakeholder capacity development, and resilience building. In all settings, UNHCR and WASH actors should prioritize investments in the capacity of the refugee population to manage their own WASH programming and to facilitate independence which can serve the eventual return process. Enabling environment interventions that are suitable in the post-emergency phases include...

- Demand creation activities (e.g. marketing for improved sanitation)
- Establishing and supporting the local WASH private sector (e.g. supporting handpump spare parts markets, local sanitary artisans, local drillers, local producers/distributors of sanitary wares including toilets, toilet slabs, showers, plumbing accessories etc.)
- Institutional strengthening (e.g. capacity building of local WASH service providers or regulatory authorities).
- Policy and legislation improvements (e.g. writing of sanitary codes at the refugee site level, or higher)

80. In some cases the refugee population may be supported in writing and enforcing their own WASH related legislation for the refugee setting. When elaborating sanitary codes it should be kept in mind that rules and regulations should not be stricter than is necessary and consultation must always precede regulation. It is also worth remembering that regulation and associated disciplinary measures cannot generally be enforced without majority acceptance by the population. Suggestions for sanitary code include...

- People defecating in public places should be fined once toilet facilities have been made available to the refugee population.
- No permanent housing should be constructed by the refugee population without adequate sanitation provision.
- During urban emergencies, the letting of any house, part of a house, or plot of land for residential purposes must include basic toilet and bathing facilities.
- Tenants should be able to construct basic facilities and deduct the expense from the rent payable to the landlord if a landlord fails to provide adequate sanitation within a specified time.

81. The site WASH plan/strategy should clearly describe the short, medium and long-term strategies for ensuring holistic and comprehensive WASH interventions that address hardware, software and the enabling environment, and the arrangements for WASH integration with other sectors.

Approaches to WASH service provision for urban refugees

The importance of reinforcing WASH

services for urban refugees

82. An influx of refugees can quickly overburden urban municipal WASH services leading to water shortages, increases in open defecation, unmanaged solid waste, contamination of water supplies, and conflicts over WASH resources - in particular water resources. In urban settings, UNHCR and WASH actors should ensure the following. *In priority order:*

- Ensure that urban refugees are living in conditions where they have adequate access to sufficient quantities of safe drinking water.
- Ensure that urban refugees are living in conditions where they have adequate access to toilet facilities.
- Ensure that urban refugees are living in conditions free from excreta or other hazardous wastes.
- Ensure that urban refugees have received key hygiene messages and essential WASH non-food items in particular soap, water containers and menstrual management materials.
- Ensure that urban refugees are living in conditions free from high-risk disease vector populations.

During urban emergencies, the host government may prefer to directly absorb the refugee population into the urban setting, rather than create camps, in order to reduce tensions with the host community, reduce concentrations of refugee populations and reduce security risks. Housing options depend greatly on the context but are likely to include renting, staying in short-term collective centres, or with host families (if the refugee family has family ties). Temporary accommodation will usually be provided to vulnerable families identified as part of the registration process.

83. Provision of WASH services for refugees in urban settings can be significantly harder than in camp-based settings as it can be harder to provide structured WASH assistance. In addition, many problems with poor WASH service delivery in the urban setting may be chronic and entirely unrelated to the refugee crisis. In some cases, WASH services and conditions for the resident urban poor may be worse than for the newly arrived refugee population. Overburdening of WASH services by a refugee influx affects both the refugee and host population and the WASH needs of both groups may need to be reinforced.

The importance of evaluating the separate WASH needs of refugee families in rented accommodation, refugee families staying with host families and refugee families congregating in public buildings, land or collective centres.

84. UNHCR and WASH actors should ensure that efforts are made to differentiate the different WASH needs of refugee families in rental accommodation, refugee families that have congregated on public land, or in collective centres, refugee families that are staying with hosts, and blanket WASH interventions for both the refugee and host populations in areas that

are generally heavily inundated. At a minimum UNHCR core WASH indicators including per capita water consumption, water quality, toilet access, household water storage capacity and access to soap must be fully evaluated for all groups. Following the evaluation phase UNHCR and WASH actors should draft clear short, medium and long term WASH strategies for each of these groups. Typical interventions can be found in the table below.

Working with local municipal authorities

85. Where necessary, UNHCR and WASH actors should work with municipal authorities to identify suitable unused urban buildings and public spaces that can be safely and adequately occupied by urban refugee families. This may include unused/abandoned areas of land or buildings, public sports facilities, community centres, factories, warehouses, public parks, religious buildings, military barracks, or private hostels. WASH assessments should be undertaken to determine the required WASH upgrades that are necessary so that the building or land is habitable and meets UNHCR minimum WASH requirements in addition to any local urban building or sanitary codes. Before undertaking any works there must be a clear agreement describing rights, duties, ownership and responsibilities in place with the landowner.

WASH assistance for refugee families in urban settings congregated in public (or private) buildings, land, or collective centres	**WASH assistance for refugee families in urban settings in rented accommodation**	**WASH assistance for refugee families in urban settings living with host families**	**WASH assistance to both the refugee and host population in urban districts where the refugee influx heavily inundates the local population**
• Establishment of supplementary public water points • Clean up campaigns (open defecation, waste dumps, ditches) • Reinforcing solid waste collection services • Distribution of WASH hygiene kits, water filters and water vouchers • Construction of temporary toilet and bathing facilities • Identification of suitable unused urban buildings and spaces that can be safely and adequately occupied by refugee families, in close collaboration with municipal authorities. WASH assessments should be undertaken to determine the required WASH upgrades that are necessary so that the building or land is habitable and meets UNHCR minimum WASH requirements.	• Distribution of WASH hygiene kits, water filters and water vouchers • Distributions of a sanitation improvement package or cash grant if the refugee family is expected to remain for longer than six months.	• Distribution of WASH hygiene kits, water filters and water vouchers • Distributions of a sanitation improvement package or cash grant if the refugee family is expected to remain for longer than six months.	• Establishment of supplementary public water collection points • Rehabilitation of existing public WASH infrastructure • Clean up campaigns (open defecation, waste dumps, ditches) • Reinforcing solid waste collection services • Distribution of WASH hygiene kits, water filters and water vouchers • WASH related community driven Quick Impact Projects (QIPs) Activities must be carried out as much as possible through existing national WASH service providers!
Note: Provision of WASH assistance for families that are renting or staying with hosting families (i.e. WASH NFIs, water vouchers, and construction materials for sanitation upgrades) must be prioritized according to UNHCR vulnerability criteria.			


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Coordination with the shelter sector

86. In urban settings, the WASH response is closely dependent on the Shelter sector to identify the types of accommodation that are being planned and exactly where and when the refugee persons of concern will be accommodated. In addition, the Shelter programme will typically establish a refugee financial and material support package to match each of the settlement options which should include WASH items including: hygiene kits; water vouchers; and possibly a household upgrade packages that may be used for improving household sanitation, water supply, or water storage. If the refugees are to be located in collective centres, generally, the Shelter sector will take responsibility for ensuring humanitarian shelter standards are met in terms of building conditions (structural stability, safety, earthquake resistance, sealing, water protection, roofing, windows, partition walls, ventilation, winterization, electrical wiring, access, damp, noise) and WASH will ensure that there are adequate water supply, excreta management, bathing, laundering, solid waste, wastewater, hygiene and disease vector control services. UNHCR and WASH actors should ensure that close coordination is also carried out during the assessment and shelter identification stages to ensure that refugee sites are selected based on the feasibility of providing WASH services.

WASH strategy documents and operational plans

Country level WASH strategies/plans

87. At the national level, the UNHCR Country Programme should ensure that all WASH stakeholders working with refugees are able to contribute towards a country level WASH strategy document that briefly describes the refugee context, the baseline WASH situation, WASH coverage, WASH gaps, short, medium and long-term strategies for water supply, excreta management, solid waste management, hygiene promotion and disease vector control, in addition to each of the fourteen (14) core UNHCR WASH philosophies and principles. The WASH country strategy should be used as the basis for developing ad-hoc country operational plans and should be linked to the approaches and principles in the UNHCR Global WASH Strategy. Individual refugee site WASH plans/strategies should be included in annex. The UNHCR template for a country level WASH strategy and operational plan – including an example from Ethiopia can be found on **wash.unhcr.org.**

Site level WASH strategies/plans

88. UNHCR and WASH actors should ensure that every refugee setting has a site WASH strategy document that contains up to date and relevant data and information concerning the WASH situation in the site. The document should describe the short, medium and long-term strategies for water supply, excreta management, solid waste management, hygiene



promotion and disease vector control, in addition to the fourteen (14) core UNHCR WASH philosophies and principles. In addition to the general strategies, an operational plan should be included that clearly describes the ongoing WASH activities in terms of WHO, WHAT, WHERE, WHEN and HOW.

89. The site WASH strategy/plan for each site should be seen as a living document that should be kept up to date with the latest information concerning the conditions within the refugee setting. All of the results from water quality testing, sanitary surveys, waste surveys, baseline surveys, focus group discussions, rapid household surveys and KAP surveys should be included in the site WASH plan annex. The WASH sectoral strategies developed for the site should be based on a solid interpretation of the WASH data that is collected.

90. The initial draft of the site WASH plan/strategy should be prepared within the first three months of the refugee emergency and should be revised every six months based on analysis of the latest data from monitoring mechanisms. Overall responsibility for coordinating production of the site WASH plan/strategy lies with the UNHCR WASH Officer(s) present in country, with responsibility for the content resting with the WASH implementing agencies and the WASH sector lead. Preparation and dissemination of the latest incarnation of the site WASH plan/strategy should be carried out in full collaboration with all the active WASH stakeholders. A follow-up meeting of all WASH stakeholders should be called with each updated related to reflect on the latest findings and refine the individual short, medium and long term strategies and WASH workplan (WHO, WHAT, WHERE, WHEN, HOW). Copies of the updated site WASH plan/strategy should be widely circulated with the following...

- Representatives of the refugee population.
- Representatives from the donor community.
- Representatives of national government departments related to water supply, excreta management, hygiene promotion, solid waste management and disease vector control.
- Representative of WASH agencies.
- The UNHCR WASH Officers present in country (if any).
- The UNHCR Regional WASH Officer.
- The UNHCR Senior WASH Officer, UNHCR Geneva.

91. The UNHCR template for a site level WASH strategy and operational plan can be **found in annex**.

Accountability to donors, beneficiaries and local authorities

92. UNHCR and WASH actors should ensure that core WASH indicators are reported on a monthly basis. Where the UNHCR WASH Monitoring System and TWINE have been rolled out (**http://twine.unhcr.org/**), data should be uploaded monthly to


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TWINE. More detailed information can be found in **chapter 10**.

93. UNHCR and WASH actors should ensure that there is functional system in place to report back to donors, beneficiaries and local authorities the progress of the WASH programme. Different communication strategies (for example camp information boards for beneficiaries) should be used to meet the information needs of different groups. Copies of the updated site WASH plan/strategy should be made available to all stakeholders every six months. More detailed information can be found in **chapter 10**.

Protection of the Environment

94. Poorly managed WASH activities in refugee settings can potentially have an extremely negative impact on the environment. The major environmental risks from WASH programmes are related to pollution and degradation of the environment from poorly managed excreta, greywater, solid waste, and disease vector control related activities. In addition over-exploitation of fragile water resources may lead to rapid depletion with irreversible impacts on water reserves or fragile ecosystems. Finally, unsustainable procurement of wood or burned bricks for latrine construction may present a large environmental risk particularly in locations where sustainable supplies of wood are in limited supply.

95. In all cases short, medium and long-term environmental impacts from WASH interventions must be considered from the outset of a refugee emergency. Failure to do so can have widespread ramifications and prove costly to address. Preventative and mitigation measures are far more cost-effective than remedial actions. Environmental measures must be budgeted from the start.

Respect of local sanitary codes and national environmental legislation

96. In all settings, local sanitary codes and environmental legislation related to water, wastewater, excreta, blackwater, sewage, solid waste, vector control must be respected. During short term emergency responses it may be possible to negotiate with national authorities for relaxation of sanitary codes and environmental standards. In cases where national sanitary codes and environmental legislation do not exist then the minimum guidance provided in this UNHCR document must be met. WASH programmes should be designed and monitored in close collaboration with local regulatory authorities. All environment related rules, regulations and norms should be clearly communicated to the refugee population.

Environmental guidelines for water supply

97. All refugee programmes should ensure that refugee sites are selected where there are sustainable water resources that are able to meet the needs of the refugee population without conflict with other users or long-term depletion. All WASH programmes should clearly understand the nature of water resource recharge mechanisms that are in place and



ensure that recharge rates are greater than abstraction rates. Abstraction of non-renewable or fragile water resources (in particular fossil groundwater sources) should be avoided. Rainwater harvesting should be considered as a low-tech and cost-effective method of supplementing water availability in all viable refugee settings.

98. Levels of unaccounted for water (UFW) should be monitored in all refugee settings regardless of phase or context. All WASH programmes should clearly document the steps they are taking to reduce leakage, wastage, or inappropriate water use. This is not just to avoid over exploitation of water resources but also to ensure efficient and cost-effective water supply operations.

99. Water treatment by-products or sludges should be stored, treated, transported, and disposed of in a manner that minimises any potentially negative impacts on the environment. Any sludges produced as a result of treatment with chemical coagulants (e.g. aluminium sulphate or ferric chloride) should be dried and the resulting cake disposed of in a properly designed and sealed sanitary landfill. All programmes should transition as soon as possible to sustainable water treatment technologies with reduced reliance on the procurement and use of treatment chemicals (e.g. use of infiltration galleries, rapid filtration, or roughing filtration).

100. Water treatment chemicals should be stored in a cool, ventilated and shaded location in sealed containers out of direct contact with the ground and in a manner that minimises any potentially leakage or contamination of the environment.

101. Where viable, programmes should ensure that WASH services prioritize renewable energy (solar, wind, or ram pumping) where grid-based electricity is not available. The use of renewable energies not only reduces the environmental impact of the WASH programme but often leads to more reliable and sustainable WASH services with lower operational costs. Long-term use of fossil fuels should be avoided not only to reduce the overall carbon footprint of the WASH programme but to reduce the burden of operation and maintenance on handover to local authorities or the refugee population.

102. The use of boiling as a drinking water treatment method must not be promoted in any refugee setting – especially in locations where sustainable supplies of wood are in limited supply.

103. Bottled water has been shown to be an effective acute emergency response mechanism however it should not be used beyond the first week of any refugee emergency. It is far more effective, cost-efficient, and environmentally friendly to move as quickly as possible to establish fixed water distribution points (e.g. through the use of bladders and tapstands).


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Environmental guidelines for excreta management

104. Refugee programmes should ensure that all excreta, blackwater (from septic tanks), sewage, and faecal sludges from all household, public and communal sanitation systems are treated, conveyed, reused, or disposed in a manner that minimises any potentially negative impacts on the environment. In all settings, excreta, blackwater, sewage, and faecal sludges must not be allowed to enter the environment without treatment.

105. On-site treatment, reuse and disposal of excreta may be permissible in low-density settings (>45m^2 per person) provided minimum safe distances are respected between pit infrastructure and the groundwater table and an engineer's report has verified that ground types are suitable for the type of sanitation system that has been selected (i.e. travel times of pathogens through the unsaturated zone should be greater than 25 days - refer to **Guidelines for Assessing the Risk to Groundwater from On-Site Sanitation, BGS 2001**).

106. In medium density settings (<45m^2 per person) off-site treatment, reuse and disposal of excreta may be required due to restrictions on aquifer contamination (particularly due to sustained nitrate loading from urine). Centralized treatment should be budgeted for excreta management in all high density refugee settings (<15m^2 per person) or settings with multi-story accommodation.

107. Ensure that the environmental impact of sourcing large quantities of wood for household latrine slab, superstructures, or privacy screens, in addition to the burning of large quantities of wood in brick production, is mitigated in refugee locations where sustainable supplies of wood are in limited supply. In some cases it may be better to procure wood supplies from sustainable sources outside of the refugee camp environment. Alternative construction techniques for latrine superstructure construction such as the use of sun dried mud brick; rammed earth; stabilized soil bricks; or earth-filled sand bag and barbed wire techniques; may have a significantly lower overall environmental impact.

Environmental guidelines for greywater disposal

108. All greywater from showers, handwashing stations, and laundry points, should be treated, reused or disposed in a manner that minimises any potentially negative impacts on the environment. In all settings, greywater should not be allowed to flow directly into water courses without treatment.

109. In low-density settings (>45m^2 per person), on-site disposal of greywater or wastewater into properly designed soak pits may be permissible provided an engineer's report has verified that soils have sufficient capacity to absorb the daily loading rates (see **soil infiltration test procedure on wash.unhcr.org**). Soakage pits and drain fields should be correctly sized based on daily loading rates. The base of all soakage pits and



drain fields should be at least 2m above the groundwater table. Greywater and wastewater may be diverted into small communal or household garden areas provided the system is designed to eliminate the risk of pathogen transmission or vector breeding (i.e. using sub-surface infiltration). Grease traps should be installed where cooking and eating utensils are washed in order to prolong the life of infiltration systems.

110. In medium density settings (<45m^2 per person) local sanitary codes and environmental legislation concerning greywater and wastewater management are likely to be more restrictive in order to prevent groundwater pollution and degradation. Some urban environmental guidelines may require that greywater and wastewater are combined with blackwater or sewage for off-site centralized treatment. Centralized treatment should be budgeted in all high density refugee settings (<15m^2 per person) or settings with multi-story accommodation.

Environmental guidelines for solid waste management

111. All solid wastes in the refugee setting should be collected, stored, transported, treated, reused or disposed in a manner that minimises any potentially negative impacts on the environment. Any indiscriminate waste piles should be dealt with before they have a chance to fester and clean-up becomes more difficult.

112. In all settings, domestic wastes should be triaged according to the principles enshrined in the universal waste hierarchy i.e. those that are an environmental and public health risk should be dealt with immediately compared to those that require a longer-term approach. In many cases the management of toxic domestic wastes (e.g. used oils, electronic wastes, paints, varnishes, paint thinners, lead-acid batteries, and asbestos) may be of more importance than management of general domestic wastes that are generally inert.

113. All refugee programmes should have a properly designed sanitary landfill that is constructed in a location that minimise any potentially negative impacts on the environment in particularly ground and surfacewater resources. Site selection for landfills should be carried out in full cooperation with the local authorities and refugee and host populations. Sites should be selected that completely seal leachates from the environment by either a natural or artificial impermeable barrier. In order to minimise the impact on the environment, only wastes that cannot be composted, recycled, or reused should be allowed to enter the landfill. All waste management programmes should have activities in place to source separate organic matter, paper, plastics, metals, and glass from the landfill waste stream.

114. Leachate production within sanitary landfills should be kept to a minimum by preventing rainwater, stormwater, or surfacewater entering the site. Active waste cells should be kept sealed through the application of 30cm of daily soil cover.



Completed waste cells should be capped with 50cm of compacted and landscaped soil to reduce water entry. Grasses should be planted on top of closed cells to encourage leachate reduction via transpiration.

115. All refugee settings should prioritise source management of domestic hazardous wastes (e.g. paints, varnishes, paint thinners, lead-acid batteries, used oils, electronic wastes, and asbestos). Waste management operations should ensure these items are collected separately and are not allowed to enter the domestic waste stream. If local host-government hazardous waste treatment facilities do not exist then hazardous wastes should be encapsulated in a dedicated section of the sanitary landfill facility.

116. Refugee programmes should ensure that all non-food items (NFI) items that are distributed to the refugee population are free from any unnecessary packaging.

117. Low-temperature burning of plastic wastes should not take place in any refugee settings. Toxic dioxins formed during the low-temperature burning of certain plastics are carcinogenic. Burning of solid wastes must not take place in refugee settings under any circumstances.

Environmental guidelines for disease vector control activities

118. All vector control chemicals used in refugee settings should be stored, applied, treated, and disposed in accordance with national and international guidelines and in a manner that minimises any potentially negative impacts on the environment in particularly aquatic wildlife. In all settings, the use of vector control chemicals should be used as a final control measure if a comprehensive approach to vector management including breeding site eradication, solid waste management, trapping, and barrier methods are failing to control vectors of public health importance.

Environmental impact assessments

119. All refugee sites should have completed a WASH related environmental impact assessment that includes at a minimum:

- An assessment of environmental related risks at each stage of water supply, excreta management, greywater disposal, solid waste management, and disease vector control. The risks should be ranked according to an assessment of their likely probability and impact.
- A matrix of short, medium and long-term mitigative activities to address the WASH related risks identified as having both “high impact” and “high probability”.
- A matrix of environmental monitoring parameters (along with their means of verification, monitoring frequencies, and target thresholds) to measure WASH related risks identified as having both “high impact” and “high probability”.
- A checklist of emergency corrective actions to be carried out if the environmental monitoring programme identifies


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parameters that exceed their target thresholds.

- An overview of national environmental legislation related to water supply, excreta management, greywater disposal, solid waste management, and disease vector control; along with how they are being addressed.

120. Overall preparation and monitoring of the WASH environmental impact assessment and action plan is the responsibility of the WASH programme however the activities should be undertaken in close collaboration with UNHCR's environmental stability and management specialists and national environmental monitoring authorities.

2. WASH and Public Health

Disease outbreaks can spread very rapidly in refugee settings leading to high morbidity and mortality rates. The susceptibility of the refugee population to disease is greatly increased by a number of factors including overcrowding, fatigue, poor nutritional status, insanitary conditions and a lack of access to basic needs. WASH interventions are essential for preventing and controlling disease transmission.

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Introduction

The importance of WASH interventions in disease prevention and control

1. Disease outbreaks are defined as the occurrence of cases of a disease with a frequency that is clearly in excess of what is normally expected in a given population, therefore, demanding emergency control measures. Diseases with rapid transmission and high mortality rates are of concern in particularly diarrhoeal diseases, enteric fevers, respiratory infections and malaria.
2. The susceptibility of the refugee population to disease is greatly increased by a number of factors including overcrowding, fatigue, poor nutrition, insanitary conditions and a lack of access to basic needs such as food, shelter, safe water, sanitation and disease vector control measures. The most at risk from disease are typically infants, the elderly and the chronically ill.
3. Experience has shown that the risk of WASH related diseases can be greatly minimised through the immediate provision of basic WASH interventions including: the provision of adequate quantity of sufficient quality; the safe containment of excreta; the provision of hygiene related non-food items in particular clean water storage containers and soap; the promotion of basic hygienic practices in particular handwashing with soap at critical times; and the efficient control of disease vectors in particular the reduction of vector breeding sites, clean up campaigns and the safe management of domestic wastes. Summaries of each of the most important WASH related diseases that are relevant to refugee settings, along with their prevention and control strategies, can be **found in the annex**.

WASH interventions as part of a comprehensive public health approach

4. UNHCR and WASH actors should ensure that all WASH interventions are fully integrated into the larger public health strategy with the overall aim of improving the health status of the refugee population. The WASH and Medical focal points should aim to meet regularly (at least once every two weeks) to share health incidence rates and conduct joint planning. Short-term water, excreta management, solid waste management, hygiene promotion and disease vector control interventions should be geographically targeted based on current health clinic morbidity and mortality data in collaboration with the Health section's case management activities.
5. Many WASH diseases exhibit seasonal peaks at certain times of the year that correspond to seasonal conditions e.g. peaks of diarrhoea or malaria during the time of year when fly and mosquito populations peak. Medium and longer term WASH interventions should be planned based on a comprehensive analysis of seasonal morbidity and mortality data if it is available.

   A description of how WASH interventions are addressing public health prevention, control and

preparedness - including an analysis of the up to date disease morbidity and mortality rates and historical analysis, should be updated in the site WASH plan/strategy. The site WASH plan/strategy should also clearly describe the current WASH coordination arrangements with the Health service providers including any updates from bi-monthly WASH and Health planning meetings.

Common WASH related diseases in refugee settings

Water-borne diseases in refugee settings

6. Waterborne diseases are caused by the ingestion of water contaminated by human or animal faeces or urine containing pathogenic bacteria, viruses, protozoans and spirochaete. Important water borne diseases in refugee settings include Watery Diarrhea, Cholera, Shigellosis, Typhoid and Hepatitis A and E. Transmission of water borne diseases follows the faecal-oral route and occurs when the pathogen is consumed in contaminated water or food. Diarrhoeal diseases have been responsible for up to 40% of deaths in refugee populations in the emergency phase. Diarrhoeal diseases are spread via the faecal oral route, depicted in the F-Diagram (see right).
7. The F-Diagram shows how pathogens in faeces from a person infected with the disease reach a new host. These pathogens are ingested either through contaminated water, poorly cooked or raw foods or directly from the hands. Human faeces from carriers of the disease are the principal source of pathogens for all of the diarrhoeal diseases with epidemic potential, making human faeces the greatest potential environmental hazard confronting refugees. While faeces from infected humans represent the greatest risk of epidemic diseases in emergencies it should be borne in mind that animal faeces contains pathogenic organisms that can cause disease in humans. To the extent possible animal and human water points should be separated.

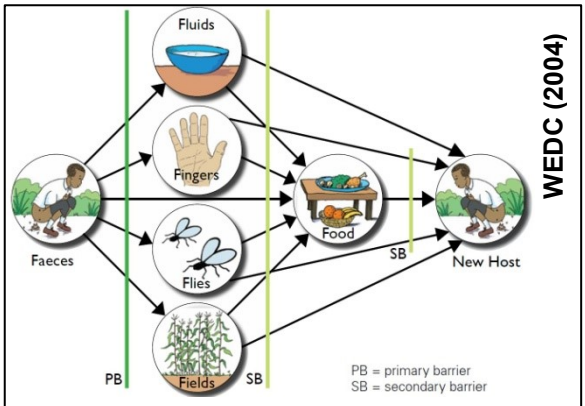


Figure 3-1 The F-Diagram

8. Strategies for reducing the transmission of diarrhoeal diseases are based on interrupting the pathways in the F-Diagram, which include..
   - Preventing faecal contamination at the water source through prevention of open defecation, increasing latrine coverage, enforcing of minimum safe distances and undertaking sanitary upgrades to water sources. Prevention of open defecation and clean-up campaigns are an essential

requirement to prevention of disease transmission by flies.

- Preventing contamination of water during transport and storage. It is thus critical that refugee populations have sufficient water containers to safely collect and store water and that water supplies are treated have residual chlorine levels that allow water to be continuously protected up to the point of consumption. Water must be irradiated to at least 10mJ/cm2 if there is evidence of chlorine-resistant protozoans in particular Cryptosporidium, Giardia lambia, or Entamoeba histolytica cysts.
- Educating the public on modes of transmission and protection in particular handwashing with soap (or with any rubbing agent such as ash) at critical times has been shown to be extremely effective in reducing the incidence of diarrhoea. Most of the studies available have been carried out in non-emergency settings and reductions in incidence of up to 40% have been achieved by this simple change in behaviour.
- Educating the public on the importance of proper food hygiene practices including thoroughly cooking food just before eating, washing fruits or vegetables that are eaten raw thoroughly with safe water, protecting food sources and utensils from flies, safe storage and reheating of cooked foods.
- Improved solid waste management can have the potential of reducing the numbers of fly breeding sites and should result in a lower density of vectors. All latrines should be clean and fly-proof and their use should be encouraged.
- Community participation is a prerequisite in prevention and control activities. The community is essential in sharing knowledge about the disease, risk factors, mode of transmission, signs and symptoms of the infection, and basic measures to prevent transmission.

9. The effectiveness of WASH interventions in reducing diarrhoeal diseases can be seen in the figure below.

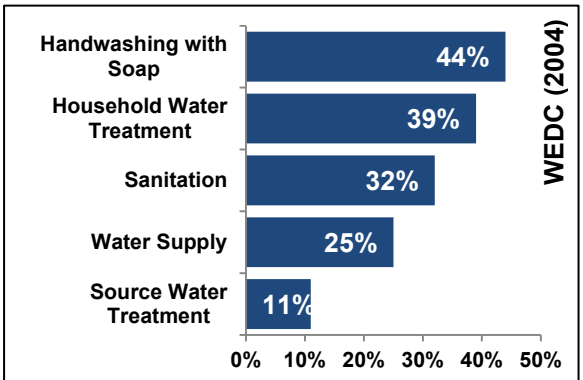


Figure 3-2 Impacts on Diarrhoeal Morbidity

The diagram shows that the simple action of encouraging the population to wash their hands with soap at critical times is a very effective intervention and has the potential of reducing diarrhoeal disease morbidity by an average of 44%. On the other hand, providing treated water alone (without supporting hygiene promotion activities), or increasing the quantity of available water, has a much lower impact on diarrhoeal disease morbidity.



Water-washed diseases in refugee settings

10. Water-washed diseases of the skin and eyes are generally caused by poor personal and domestic hygiene. Transmission is reduced by increasing the availability and volume of water and providing soap in addition to facilities for bathing and laundering of bedding and clothes. Quality of water is relatively unimportant. Water-washed diseases in refugee settings include Conjunctivitus, Scabies, Trachoma and occasionally louse-borne Typhus and Relapsing Fever. Encouraging frequent handwashing with soap has also been shown to impact respiratory infections.

Water-based diseases in refugee settings

11. Water-based diseases caused by parasitic worms (helminths), which depend on aquatic intermediate hosts to complete their life cycles, are common in many parts of the developing world where refugees reside. Types include both penetrating skin: e.g. Schistosomiasis and ingested: e.g. Guinea Worm. While water-based diseases tend to cause chronic health problems, refugee sites should be rejected if there is a risk of long term exposure to water-based diseases. In long-term refugee settings, control of water based diseases may be considered through breeding site management, treatment of surface waters with molluscides, drinking water treatment and public education concerning the risks of consuming or bathing in contaminated waters.

Diseases spread by mosquitoes

12. Diseases spread from person-to-person via biting mosquitoes are of significant importance in many refugee settings e.g. Malaria Falciparum, Malaria Vivax, Malaria Malariae, Yellow Fever, Dengue / Dengue HF, Japanese Encephalitis, Filariasis. Refugee sites must be rejected if they are in areas close to water bodies, marshy areas or large mosquito breeding sites. Control is generally achieved through a combination of the elimination of breeding sites in particular standing water, the use of barriers and screens, residual spraying with insecticide, fogging with insecticide and the use of insecticide treated bednets.

Diseases spread by flies

13. Domestic flies are an important transmission route for diarrhoeal diseases and infectious eye diseases including Trachoma and Conjunctivitis. Control is typically through domestic waste clean-up campaigns, reduction of open defecation, improved toilet infrastructure and cleanliness, and improved domestic waste management.

Diseases spread by lice

14. Typhus, Relapsing Fever and Trench Fever transmission are carried out by lice in typically crowded and unhygienic conditions. Control is achieved through improved laundering and drying of clothing and bedding, delousing, residual spraying and use of insecticide treated bednets.

Diseases spread by biting flies

15. Biting flies (e.g. tsetse flies, sand flies and blackflies) are the main

Box: Relationships between communicable diseases and WASH interventions

	Water quality	Excreta manage-ment	Personal hygiene	Domestic hygiene	Food hygiene	Waste manage-ment	Disease vector control
DIARRHOEAS AND DYSENTERIES: Transmission via faecal-oral routes. Diseases include Cholera, Shigellosis and Salmonellosis.	X	X	X	X	X	X	X
ENTERIC FEVERS: Transmission via faecal-oral routes. Diseases include Typhoid, Poliomyelitis and Hepatitis A.	X	X	X	X	X	X	X
WATER-WASHED: Infections of the skin which may be significantly reduced by improvements in domestic and personal hygiene. Quality of water is relatively unimportant. Diseases include infectious skin diseases, infectious eye diseases and louse-borne typhus and relapsing fever.		X	X	X		X	X
WATER-BASED: Transmission in which a pathogen spends a part of its life cycle in an aquatic animal (e.g. snail). Diseases due to infection by parasitic worms (helminthes) which depend on aquatic hosts to complete their life cycles. Examples include both a) PENETRATING SKIN: e.g. Schistosomiasis and b) INGESTED: e.g. Guinea worm.	X	X			X		X
MOSQUITOES Transmission by mosquitoes which typically breed in water. Control is typically through elimination of standing water, residual spraying with insecticides and use of treated bednets. Diseases include Malaria (Malariae, Falciparum and Vivax), Yellow Fever, Dengue / Dengue HF and Japanese Encephalitis.							X
LICE Transmission is by lice which are typically problematic in crowded and unhygienic conditions. Control is typically through improved laundering and drying of clothing and bedding, delousing, residual spraying and use of treated bednets. Diseases include Typhus, Relapsing Fever and Trench Fever			X				X
FLIES Domestic flies are an important transmission route for diarrhoeal diseases and infectious eye diseases including Trachoma and Conjunctivitus. Control is typically through a combination of vector control interventions including domestic waste clean-up campaigns, reduction of open defecation, improved toilet infrastructure and cleanliness and improved waste management.		X	X	X	X	X	X
BITING FLIES Biting flies (e.g. tsetse flies, sand flies and blackflies) are the main transmission factor in epidemics of Gambian Sleeping Sickness, Sandfly Fever, Cutaneous Leishmaniasis, Visceral Leishmaniasis, River Blindness.							X
TICKS, MITES AND FLEAS Ticks, mites, triatomine bugs and fleas are often responsible for localized outbreaks of diseases including Crimean-Congo HF, Typhus, Chagas Disease, Murine Typhus and Plague. Control is typically through improved domestic hygiene, residual spraying and use of treated bednets.			X	X			X

For more information, refer to Environmental Health Engineering in the Tropics (Cairncross and Feacham, 1993) and Disease Prevention through Vector Control: Guidelines for Relief Organisations (Thomson, 1995)

transmission factor in epidemics of Gambian Sleeping Sickness, Sandfly Fever, Cutaneous Leishmaniasis, Visceral Leishmaniasis and Onchocerciasis (River Blindness). Control interventions should be based on local protocols and practices.

Diseases spread by ticks, mites, triatomine bugs and fleas

16. Ticks, mites, triatomine bugs and fleas are often responsible for localized outbreaks of diseases including Crimean-Congo HF, Typhus, Chagas Disease, Murine Typhus and Plague. Control is typically through improved domestic hygiene, residual spraying and use of insecticide treated bednets.

More information concerning disease vector control interventions in refugee settings can be found in **Chapter 6**.

Epidemic preparedness and response in refugee settings

WASH related epidemic preparedness

17. Every refugee setting should have its own epidemic preparedness plan to respond to potential outbreak risks. The plan should be adapted to respective national plans and the UNHCR global Epidemic preparedness and response guidelines. The UNHCR Country Public Health Officer in coordination with health actors is responsible for developing the country specific plans for refugee camps/settlements. Disease-specific management plans should include only the most common/probable diseases according to disease prevalence and history of epidemics in the area. It is recommended that to keep plans practical they should be limited to maximum of the most likely diseases of epidemic importance. The plans should be updated on a yearly basis and must clearly describe the key outbreak preparedness, prevention and response activities including..

- WHO (e.g. Health Team, Hygiene Promoters, WASH Operation and Maintenance Team, Camp Management, Education, other sectors, camp committees and local government authorities) will do WHAT (e.g. outbreak investigation, outbreak information campaigns, distribution of WASH NFIs, increase chlorine residuals), WHERE, WHEN and HOW?
- HOW will daily and weekly outbreak response coordination be carried out? WHO will lead? WHO will attend? WHERE will coordination take place?
- HOW will the outbreak investigation phase take place? WHO will be involved? HOW will information be shared?
- WHAT is the communication strategy for delivering health/hygiene messages to the refugee population?
- WHAT is the communication strategy to retain the confidence and trust of the refugee population?
- WHAT are the key approved health/hygiene outbreak related messages? Are these messages translated and ready for communicating to the refugee population? HOW will



- these messages be passed to the refugee population? Are standby arrangements in place?
- WHAT are the main health/hygiene outbreak related communication activities in addition to disseminated messages? Have the activities been field piloted and are they ready for implementation.
- WHERE will any isolation facilities be established if required? WHAT will be the role of the WASH team?
- WHAT are the WASH and Health stockpiling, personnel and equipment stand-by arrangements?

Copies of the outbreak response plans for each major disease must be included in the site WASH plan/strategy.

The importance of epidemic surveillance and early detection

18. Early detection, reporting and response are vital to limit the spread of outbreaks and epidemics. Routine surveillance and reporting of bloody diarrhoea, watery diarrhoea, suspected cholera, lower respiratory tract infection, measles and meningitis must be carried out in all refugee settings. The reduction of disease incidence rates should be routinely reviewed to ensure that the WASH or disease vector control interventions are having an impact.

WASH prioritised disease outbreak response activities

19. Disease outbreaks remain a high risk in refugee populations not only in the emergency phase but also in the post-emergency and protracted phases. Outbreaks can spread very rapidly and can lead to high morbidity and mortality rates so the WASH Coordinator and the UNHCR Public Health Officer must ensure that there is an agreed plan in place for responding to each of the major diseases with epidemic potential in emergency situations. These plans should be agreed with all sectors and actors and communicated with the camp population.

Outbreak response coordination arrangements

20. A disease specific task force should be established in all cases of suspected or confirmed disease outbreak. The task force is ideally led by the Ministry of Health, or alternatively by the UNHCR Public Health Officer and should include representatives of local authorities, UNHCR, WASH and Health actors, health educators and community leaders. The Task Force (or Outbreak Control Team) will start the investigation of an outbreak alert and make quick a decision as to whether assistance from external experts should be requested. National outbreak investigation teams exist and are on standby in certain countries. Depending on the suspected disease, a wide range of specialists may be required including epidemiologists, microbiologists, clinicians, veterinarians, vector control and water and sanitation engineers. Those experts are primarily found in MoH, WHO and sometimes in research institutes. In all cases, it is mandatory that disease outbreak reports in all refugee camp settings are reported on the UNHCR Twine website (**http://twine.unhcr.org/**).



WASH participation in the Outbreak Control Team (OCT)

21. The full participation and presence of representatives from the WASH programme is essential in any outbreak response. It is likely that the WASH programme will play a very large and active role in controlling and reducing the transmission of the outbreak within the refugee setting. All WASH activities must be closely coordinated and planned with Health actors.

Confirming the outbreak

22. The lead health organisation should confirm the outbreak situation. Specimens for confirmation of diagnosis should be sent for testing.

Outbreak investigation

23. The Health section will typically lead the outbreak investigation stage. The WASH Coordinator may be required to assist in the process of helping formulate a hypothesis for the source of the disease pathogens or likely routes of transmission. The WASH Coordinator may also be required to take part in any epidemiological studies to clarify modes of transmission and identify risk factors or at risk-groups within the refugee population.

Responding to the outbreak

24. A dedicated and targeted WASH response to the outbreak should begin immediately even if the Health section has not completed an analysis to confirm sources of the pathogen, modes of transmission, and identification of risk factors and at risk-groups. Control measures should be relevant for the specific disease outbreak and are likely to include:

- Immediate dissemination of key relevant hygiene messages and re-distribution of essential WASH non-food items (in particular soap and clean water containers).
- Increasing chlorine residual levels of all water sources.
- Addition of additional water treatment steps (multi-barrier approach).
- Increasing the quantity of available water.
- Increasing the number and condition of toilet facilities including improving cleaning and sterilisation arrangements.
- Immediate clean-up of any excreta and pathogenic or hazardous wastes within the refugee setting.
- Immediate identification and control of high-risk disease vector populations.
- Support to WASH interventions in treatment facilities (e.g. Cholera Treatment Centres), health facilities and schools.

After the outbreak

25. A WASH evaluation report should be prepared following every outbreak in a refugee setting. The reports should include an evaluation of the cause of the outbreak, the effectiveness of the preparedness arrangements, the effectiveness of the coordination, and the appropriateness, timeliness, and effectiveness of the WASH response. If required, WASH preparedness activities and protocols should be revised to ensure any weaknesses identified are rectified for the future.

3. Water Supply

Safe water is essential for life, health and human dignity, and is a critical determinant for survival of a displaced population. In refugee emergencies consumption of contaminated water and insufficient water for personal and domestic hygiene can put the population at extreme risk. Water is among the primary criteria in the selection of a site for refugees.

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Introduction

The importance of safe water supplies in refugee settings

1. Safe water is essential for life, health and human dignity. People cannot survive longer than a few days without water and therefore the provision of adequate quantities of safe water demands immediate attention from the start of any refugee emergency. Consumption of water contaminated with faecal pathogens can quickly put the population at extreme risk of water-borne diseases such as diarrhoeal diseases and enteric fevers. Consumption of water contaminated with harmful chemicals present in the aquifer geology, or from domestic, agricultural, or commercial activity can put the population at risk from lethal, acute, or chronic toxic effects.

All water supplies in the refugee setting must be fit for human consumption, free from faecal pathogens and harmful chemicals that may be present as a result of the aquifer geology, or contamination from industrial, agricultural and human activity.

2. Water is an essential element to ensure the refugee population is able to carry out basic personal and domestic hygiene including: washing hands with soap; bathing; laundering clothes, bedding and menstrual management materials; cleaning the domestic environment; cleaning eating and cooking utensils; cooking; and practising safe food hygiene. Insufficient quantities of water for personal and domestic hygiene can put the population at risk from both water-borne and water-washed diseases including scabies, ringworm, trachoma, conjunctivitis, louse-borne typhus and relapsing fever. After the emergency phase, water will be essential for watering animals, and basic agricultural and livelihood activities. In some places, water-based sanitation may be the preferred method of conveying and treating excreta, or may be the culturally preferred method of anal cleansing. A safe and sustainable supply of water is among the primary prerequisites in the selection of a temporary or permanent site for refugees.
3. Providing sufficient access to water is an important factor in reducing the risks of violence and conflict between hosts / refugees, neighbours, and adults and children. Queues at water points around collection times can often lead to frustration and violence. Women and children may be subject to domestic violence if they are perceived to be taking too long to collect water.

Safe water supply as part of a comprehensive public health approach

4. The provision of adequate quantities of safe water must be seen as an essential element of the larger preventative health strategy with the overall aim of improving the health status of the population. The link between contaminated water, insufficient quantities of water and disease must be clearly understood by all.

Messages concerning the importance of safe water abstraction, handling, storage and consumption must be fully incorporated into the community health and hygiene education programmes. Water availability and water quality parameters should be investigated as part of the Health section's case management and follow up activities.

The importance of seeking expert professional advice

5. The implementation of water supply programmes in refugee settings can be complicated by additional constraints that include:
   i). Sites that are arid with water supplies that are difficult to locate and extract; at extreme depths, or of small quantities.
   ii). Sites that are marshy, have high water tables, or where water supplies are heavily contaminated.
   iii). Sites where surface water sources are contested or need to be shared with local host populations without over-exploitation or conflict.
   iv). Sites where water is of poor quality due to high mineral content, saline intrusion, or contamination from industrial, agricultural, or human activity.
   v). Sites that are geographically remote and challenging to access with water prospecting, water trucking, or water development equipment.
   vi). Sites with high density urban populations with water infrastructure that requires retrofitting or upgrading.
   vii). Sites where the population is unfamiliar or unwilling to use improved water supplies, resorting to traditional unprotected sources.
   viii). Contexts with lack of qualified and experienced personnel.
6. Due to these challenges it is essential to seek expert advice from professional water engineers who are familiar with the context. Assistance can be sought from sources such as government departments, NGOs, Universities, consultants or contractors. UNHCR Headquarters and Regional assistance should be requested if required.

The importance of respecting UNHCR's WASH philosophy and principles

7. In addition to the guidance in this chapter, all water supply programmes must be designed and carried out in full accordance with UNHCR's general WASH principles including (refer to **Chapter 1** for more information).
   - Safety and protection
   - A timely and adequate response
   - Participation of stakeholders
   - Universal access
   - Child friendly facilities
   - Designs and construction that meet minimum standards
   - Value for money and cost effectiveness
   - Appropriate technology
   - Sustainable solutions
   - Reinforcing the capacity of stakeholders
   - Monitoring the effectiveness of WASH interventions
   - Protecting the environment
   - Planning for contingencies


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Priority actions

An immediate response

8. The human body's basic survival drinking water requirement lies in the range of 3-7 litres / person / day, depending upon the climate, workload and other environmental factors. Taking into account the need for additional water for cooking and basic personal hygiene, it is essential that UNHCR and WASH actors ensure that the refugee population has access to a minimum of at least 15 litres / person / day on immediate arrival at the refugee setting. Basic water interventions (for example distributing water directly off the back of a water tanker) are better than delayed provision of improved systems. As the emergency response progresses, it is typical to employ a staged approach whereby water accessibility (in terms of distances and numbers of water points) and water quantity are both steadily increased as more water infrastructure is installed and brought online.

People cannot survive more than a few days without water and the speed at which water supply systems are established must be given absolute priority. Since water is a basic survival need, the priority in any response must be to provide water of sufficient quantity as quickly as possible whilst respecting quality.

9. Due to the health risks associated with drinking contaminated water, it is essential that UNHCR and WASH actors either select water supplies that are fit for human consumption, or can be easily treated so that they are fit for human consumption. Basic water treatment interventions, for example disinfecting with chlorine in a water tanker en-route to the setting, allowing suspended matter to settle overnight in storage tanks, or distributing water treatment tablets, are better than delayed provision of improved treatment systems. Some NGOs that are specialized in emergency response have developed compact water treatment units that are able to rapidly treat large volumes of water and are very useful in certain contexts during the initial emergency response phase.

Provision of water of sufficient quantity

10. Optimum standards in most refugee settings call for a minimum per capita allocation of 20 litres/person/day for human consumption, cooking, laundry and personal hygiene. In reality the total daily water production needs to provide more water than this to not only meet the per capita water demand, but also take into account spare capacity for communal needs (allow 10%), and an allowance for wastage and leaks (allow 15%). Some general basic water consumption planning figures can be found in the box on the following page.

11. In urban settings the influx of the refugee population may place a huge burden on existing municipal water services. UNHCR and WASH actors should plan water interventions to restore levels of service to meet conditions prior to the influx. This typically requires rehabilitation of existing



infrastructure and construction of new water supplies in areas with high numbers of refugee families.

Box: UNHCR water consumption planning figures

Water need	Water quantity
Basic needs	20 litres/pers/day
Transit centres	20 litres/pers/day
Anal cleansing	1-2 litres/pers/day
Conventional toilet	30 litres/flush
Pour flush toilets	5 litres/flush
Handwashing	1-2 litres/pers/day
Cubicle cleaning	5 litres/cubicle/day
Schools	5 litres/pupil/day
Mosques	5 litres/pers/day
Health centres and hospitals	5 litres/visitor/day 60 litres/bed/day
Cholera centres	60 litres/bed/day 15 litres/carer/day
Therapeutic feeding centres	30 litres/bed/day 15 litres/carer/day
Cattle / donkey / horse / mule	40 litres/beast/day
Sheep / goat / pig	5 litres/beast/day
Crop irrigation	5 litres/m^2/day

Note: Quantities are minimum values and figures should be adapted to context.

Adapted from UNHCR Handbook for Emergencies 3rd Ed (2007).

12. Water production and consumption rates (from rapid household surveys) should be closely monitored during all phases. Up to date daily water availability figures from tanker or pumping logs should be closely tracked and fully documented in the site WASH plan/strategy along with an analysis of any trends and discrepancies in service levels.

13. Once the basic human needs have been met, UNHCR and WASH actors may consider increasing the availability of water for livestock, agricultural and livelihood activities. Provision of additional water should be carefully planned with the refugee and host populations in a transparent manner so that all sections of the population are able to benefit equitably and responsibly. Water for livestock, agricultural and livelihood activities should be closely monitored and documented in the medium and long term strategies for equitable and responsible water resource management in the site WASH plan/strategy. Any historical records of community meetings related to water for livestock, agricultural and livelihood activities should be included as an annex to the site WASH plan/strategy.

The 20 litres/person/day target figure is a minimum planning value. In every context efforts should be made to match water availability to ensure the refugee population is able to experience a similar standard of access to their place of origin or the same level of access as the host community before the crisis.

Provision of water of sufficient quality

14. UNHCR and WASH actors must ensure that all water supplies in the refugee setting, regardless of their intended use, are fit for human consumption. All water supplies must be free from faecal coliforms at the point of storage, delivery and consumption. All water supplies must be tested for common chemical contaminants based on an analysis of hydrogeological conditions, and



local industrial, agricultural and human activity (see **section 3.91**).

15. The greatest threat to refugees during an emergency is from diarrhoeal disease outbreaks. Therefore at a minimum, UNHCR and WASH actors must ensure that all water supplies, regardless of use, are properly treated with chlorine so that a free residual of at least 0.5 mg/l is present at the point of water distribution. A surveillance system must be in place to ensure that all water supplies are free from faecal coliforms at the point of storage, delivery and consumption. Even if water supplies have been chlorinated they must also be checked for faecal contamination resulting from insufficient contact times, inadequate chlorination procedures, water network leaks and post delivery contamination.

16. UNHCR and WASH actors must also ensure all water supplies are free from chemical contaminants that are harmful to health either in the short or long term. In all cases, UNHCR and WASH actors must ensure that the quality of water supplied complies with national water quality guidelines. In the absence of recognised national standards, UNHCR potable water supply programmes should refer to the recommendations and guideline values contained in the WHO Water Quality Guidelines (2011).

An immediate distribution of water containers

17. UNHCR and WASH actors must ensure that the refugee population has immediate access to sufficient quantities of water containers to facilitate collection, treatment and storage of water for drinking, cooking, cleaning, bathing and laundering purposes. The minimum quantity of water storage per person should be no less than 10 litres per person in all settings. Often, the refugee population will arrive in a camp or community with virtually no possessions. One of the first activities they will need to carry out is the collection of water; therefore, the rapid distribution of water containers is an essential activity.

18. Water containers should be durable, stackable, and easy to use by older persons, pregnant women, children, people living with HIV and AIDS, and disabled people. If flexible water containers are used, new water containers may need to be distributed every six months. If more durable rigid water containers are used, then the period of replacement may be longer. All water containers should be closed with a narrow neck and screw cap to prevent secondary contamination.

19. Water container condition should be closely monitored and cleaning or replacement activities should be initiated if needed. Small quantities of soap or bleach should be made available through the hygiene promotion programme for container cleaning purposes. Household surveys should be used to monitor that availability and condition of household water containers.

Immediate protection of water sources

20. In order to reduce the burden of treatment, UNHCR and WASH



actors must ensure that steps are taken to immediately protect all water supplies from sources of contamination including pollution from excreta management, solid wastes, and domestic, agricultural, or commercial activities. Water sources may need to be upgraded to ensure they have functional sanitary seals and surface water diversion channels. Fencing and the use of guards can be used to stop animals and people defecating near water sources.

Selection of sites based on water quality and ease of treatment

21. UNHCR and WASH actors must ensure that the selection of sites for refugees is based upon a thorough investigation of the quality of water available and the required treatment to make them potable. Sites with groundwater should be prioritized as they are generally less susceptible to contamination from domestic, agricultural, or commercial activity and they generally require less treatment.

22. When selecting a site for the refugee population, the assessment of each water source should include..

    - Discussion with local public health and water authorities to identify known aquifer or water source water contaminants and treatment requirements; taboos and seasonal variations.
    - A sanitary survey to identify contamination risks in the immediate vicinity of the water source along with any corrective and mitigative actions.
    - Catchment risk mapping, identification of zones of domestic, agricultural and industrial activity within the vicinity of the water source along with an assessment of the types and risks of contamination to aquifers or surface water bodies.
    - An analysis of water quality parameters (based on the risks identified in the stakeholder interviews, catchment mapping and sanitary surveying exercise).
    - An analysis of any secondary data sources to determine spatial and temporal water quality characteristics.
    - An analysis of the type and level of treatment required to make the water source fit for human consumption.

23. In addition to carrying out an assessment at the water source, sanitary surveys should also be undertaken in and around the refugee setting to identify risks from solid waste, medical waste, and faecal waste to water aquifers in particular the risk of leachates from collection, storage and final disposal activities.

Water accessibility and reducing the burden of water collection.

24. UNHCR and WASH actors must ensure that the refugee population is not unnecessarily burdened with the task of collecting water. The most effective way to achieve this is to ensure that sufficient numbers of water points are located close to dwellings. Long round trip times in excess of 30 minutes are likely to reduce the amount of water used in the home, negatively impacting


SEWING MACHINE
SEWING MACHINE HEAD
MADE IN THE PEOPLE'S REPUBLIC OF CHINA
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on domestic and personal hygiene. In some situations long queues and / or distances may result in the refugee population resorting to unprotected sources. Queues can also contribute to frustration and violence, or domestic violence for having taken so long to collect water. Reducing distances and the numbers of users per water points may also increase a sense of ownership of the water collection point.

25. In all planned settlements, a functional water tap must be available for every 100 persons (or every 200 persons in the case of a handpump or well) and water points must be available within 200m of every household. Examples of maps showing water collection buffer zones can be found in **Chapter 10**. Water point coverage should be routinely reported in the site WASH plan/strategy (and mapped where possible).

26. Excessive queuing of more than 10 persons at water points is an indicator of either insufficient numbers of water points, inadequate flows, or insufficient hours of operation. In settings where the refugee population is integrated with the host population, it is essential to re-establish the same standards of water access as the host population prior to the emergency. In locations with high numbers of refugee families this may require the provision of additional water infrastructure, or repairs to existing infrastructure.

27. Water points must be located so as to ensure the physical safety users. The location of water points must take into account protection issues of all users. In many contexts the burden of collecting water for domestic use falls to women and children. Protection issues can include the potential of water source locations to expose populations to the risk of Gender Based Violence (GBV) during water collection.

Working in collaboration with local service providers and local authorities

28. It is highly critical that UNHCR and WASH actors do not undermine or replace the local authorities or service providers responsible for water supply services. In all scenarios, water supply programmes should be carried out in close collaboration with national actors and in full compliance with national legislation. In many cases, local authorities or service providers responsible for supply may be overwhelmed by the additional burden created by the refugee population. Programmes should aim to strengthen capacities and build resilience from the start. Where possible, WASH programmes should aim to handover service operation and maintenance to the local authorities.

Water sources

Surface water sources

29. Surface water includes water abstracted from ponds, streams, lakes, marshes, irrigation ditches and dams. The advantages of using surface water sources in an emergency response is that they can be rapidly exploited to provide

large quantities of water in a short period of time.

30. Surface waters are prone to contamination and must be immediately protected. Unless surface water is abstracted high in the mountains, or in areas with low population density, surface water quality is often poor in terms of high quantities of suspended particles and high levels of microbiological contamination. Surface water invariably requires significant levels of treatment before it can be used a potable supply.



Figure 3-1 Multiple use surface water

UNHCR and WASH actors must ensure that people are immediately prevented from defecating, bathing, washing clothes, or watering animals upstream of any settlements or surface water intakes.

31. Surface waters tend to exhibit high temporal variability in terms of water quality and availability. This variability can be diurnal or seasonal and may reflect long-term trends that are difficult to assess in an emergency. Surface water sources may even dry up completely for parts of the year. Surface waters are often subject to high sediment loads (turbidity spikes) following periods of heavy rainfall, which can affect the treatment processes.

32. Before a surface water source is chosen for a long term refugee settlement, hydrological data (in particular average monthly precipitation and flow rates) and catchment data (size, evaporation and run-off data) must be sought. The seasonal variation of the source should be determined from local sources of information. The catchment area for the surface water source should also be mapped and all potential sources of agricultural, domestic and commercial contamination should be identified. The water must be analysed for harmful contaminants based on an assessment of likely contaminants originating within the catchment.

33. In the long-term, reliance on pumping water from surface water sources, and the use of water treatment equipment and chemicals, can make the use of surface water unsustainable. In many scenarios, it is unlikely that the refugee population, host population, or local authorities will have the capacity to procure the necessary fuel, spare parts and water treatment chemicals when the emergency period is over.



Figure 3-2 Floating surface water intake

34. As a general rule surface water sources should not be considered suitable long term solutions for refugee settlements if feasible groundwater alternatives exist. The capital investment costs associated with detailed feasibility studies, environmental impact assessments, and civil engineering, are likely to be prohibitive. In addition, the need for treatment and maintenance is likely to entail continuous financial and technical support. These overhead costs are likely to be prohibitive and difficult to fund over the average lifespan of a camp. In addition, present demands on surface water source may cause conflicts, especially in areas where water is scarce. In all cases, the upstream and downstream effects should be investigated and mitigated.

Groundwater sources

35. Groundwater is water flowing through and residing in rock voids, pores and fissures in the ground. An aquifer is a geological formation or layer, made up of permeable material, which transmits or yields water in appreciable quantities. Aquifers are either recharged by rainwater percolating through the soil and through rock fractures or by infiltrating surface water bodies.

36. Significant recharge can even take place in arid climates, if the recharge zone has a large areal extent, or if wadis or occasional flooding takes place above the aquifer. In large aquifer systems, the recharge zones may be a long distance from the point of abstraction. Aquifers act as buffers to the effects of seasonal and climatic variations, e.g. low rainfall and droughts. The longer the residence times are in the aquifer, the better the natural filtration will be and the better the water quality is. Groundwater, if available in sufficient quantities is therefore normally preferred to surface water, due to smaller seasonal variations and generally better quality.

37. Groundwater is found in most places in the world and may be rapidly exploited in an emergency by increasing the demand on existing infrastructure (for example motorizing a hand dug well) or less rapidly by drilling new wells or boreholes. Groundwater sources include springs, hand dug wells, boreholes, qanats or karezes, and subsurface dams.

38. If groundwater sources are correctly protected from pollution and contamination, the cost and complexity of water supply, treatment and quality monitoring activities may be significantly reduced. Many groundwater sources exploit shallow aquifers which are prone to surface contamination. The quality of groundwater can often be significantly increased by ensuring the source is well sealed off from any surface contamination, fitting a self-priming pump, ensuring the water collection area is kept clean and free from stagnant water and animals, and carrying out a parallel programme explaining the fundamentals of household water management and hygiene.

39. Occasionally, groundwater in certain aquifers contains dissolved chemicals from the rocks and soils

that may give it a bad taste (in particularly iron and manganese), colour, or even be a health hazard (e.g. fluoride, arsenic). Aeration, followed by filtration is sometimes required to allow dissolved gases and minerals to come out of solution before consumption. Therefore, it is crucial to rapidly proceed with a complete water analyses for new water sources in order to understand what is required to make the water potable.

40. The main disadvantages of groundwater are the high complexity and exploitation costs. Specialist equipment and personnel are required in locating and constructing groundwater sources. The costs of abstracting groundwater can easily be far more than necessary unless well siting, construction and development is optimised and measures are in place to ensure the highest possible quality.



Figure 3-3 Drilling rig

Rainwater sources

41. Rainwater collected from the roofs of houses, local institutions, collection structures, or from specially prepared areas of ground, can make an important contribution to drinking water supplies. In some locations where groundwater is not potable, or difficult to extract, rainwater may be the only viable method of water supply. Options for collection of rainwater include:

- ☐ Plastic sheeting
- ☐ Corrugated roofing panels
- ☐ Clay / concrete tiles
- ☐ Wooden panels or planks
- ☐ Any hard, clean, surfaces including areas of ground.

Options for storage of rainwater include:

- ☐ Plastic, clay or metallic drums
- ☐ Cement jars
- ☐ Masonry, concrete or ferro-cement reservoirs
- ☐ Lined ponds

42. Rainwater is reasonably pure and can be considered safe for human consumption provided it has been collected from surfaces that have been kept clean and off the ground away from contamination, and rainwater is not collected in high density urban settings. The first major rainfall event after the dry season is typically diverted from the storage system and is used to flush the collection surfaces from dust, bird droppings and other contamination. Storage tanks should be kept covered to prevent mosquito breeding and to reduce evaporation losses, contamination and algal growth. In no circumstances whatsoever should

rainwater harvesting take place where asbestos roofing panels are present. Rainwater harvesting systems require regular maintenance and cleaning to keep the system hygienic and in good working order. A great deal of responsibility lies with the user and it is important to carry out a parallel programme of operation and maintenance training.



Figure 3-4 School rainwater harvesting

43. Rainwater systems are simple to construct from inexpensive local materials, and can be used in almost all locations around the world. The size of the rainwater storage structure must be sufficient to hold enough drinking water to meet the daily water demand throughout the year up until the following rainy season. The size of the water catchment area must be large enough to capture sufficient water to completely fill the rainwater storage structure before the start of the dry season. The quantity of water that can be collected is dependent on the plan area of the system, its collection efficiency, and the quantity of rainfall (in mm) that falls during the rainy season. Roof gutters should have sufficient incline to avoid standing water. They must be strong enough and large enough to carry peak flows.

44. Rainwater collection can provide a useful supplement to other sources of water, especially at health centres, schools and at structures that have large roofs for collecting rainwater and where storage can be provided and maintained. Rainwater from surface run-off can be collected in ground catchments and used for non-domestic uses and livelihoods activities such as animal watering and brick making.

Rainwater harvesting is generally not suited to the emergency phase as it takes a complete rainfall cycle for sufficient water to be stored for the coming dry season. Rainfalls can also be unpredictable and it is essential to ensure that backup arrangements are available if this approach is to be used.

45. Ground catchments should be considered only in areas where rainwater is very scarce and other sources of water are not available. They are more suited to small communities than individual families and often some form of treatment is necessary if the source is to be used for human consumption. If properly designed, ground catchments can collect large quantities of rainwater.

Water propspection and evaluation

The importance of refugee site selection based on water availability and quality

46. The selection of all settlements for refugees should be based on a comprehensive evaluation of the

availability, quality and seasonality of water supplies. However in reality many refugee sites are designated by local authorities often based on other factors than water availability.

47. Specialist expertise is essential to identify and evaluate potential water sources for refugee settings. Water prospection and evaluation is an inherently challenging process due to the complexity of nature. It requires experienced professionals to allow a step-by-step reduction of uncertainty, making use of a rational that always follows the fundamental physics underlying groundwater flow. If existing groundwater sources are available the possibility of extending or upgrading these existing sources to supply the refugee population should be given priority, but this has to be combined with groundwater monitoring in order to evaluate the impact of increased exploitation.

48. In all refugee drilling programmes, regardless of context, UNHCR and WASH actors must ensure that an experienced hydrogeologist is recruited to supervise the programme. A budget line for a project hydrogeologist that covers the duration of the project must therefore be included in project proposals, along with funding for hydrogeological investigations, such as geophysics, or pumping tests etc. The hydrogeologist has to come up with a site-specific and convincing investigation strategy before the drilling campaign starts, clearly stating the rationale behind any proposed investigation technique. Considering that the life span of a well-designed water source can be up to 20-50 years, a lot of effort should be put into maximising the quality of the water prospection phase, which will save money in the long run.

Key steps for water prospection and evaluation

49. The flow chart below describes the typical sequence of activities to be undertaken during the water prospection and evaluation phase. It represents an idealised situation that will need to be adapted for emergency situations.

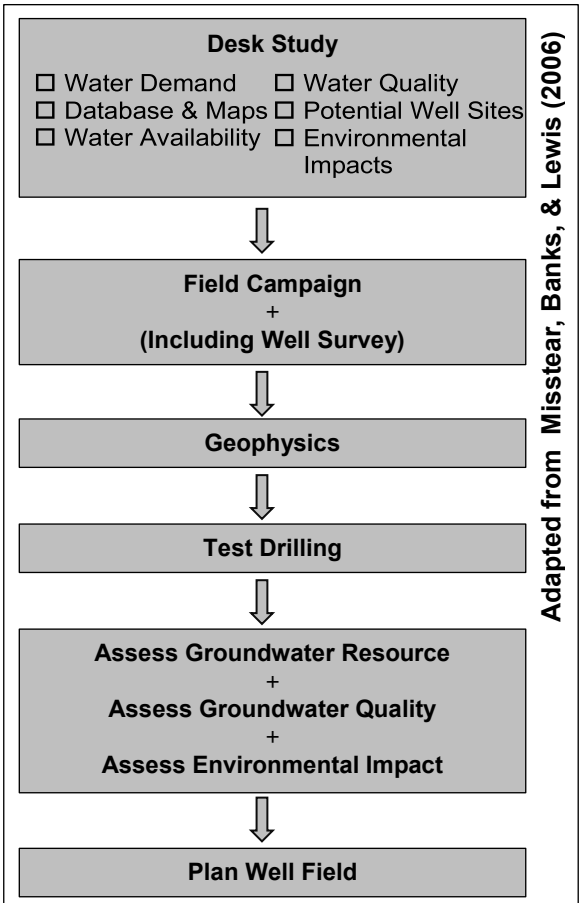


Figure 3-5 Groundwater investigation

Desk studies

50. The first stage of any water evaluation is a desk study of readily available information. A desk study should be undertaken regardless of whether the investigation is in response to an

emergency situation or longer-term supply, however in emergency situations the depth of the study is likely to be significantly reduced. The starting point for any desk study is to understand how much water is likely to be available as opposed to how much will be required for the refugee setting, taking into account potential population size, livestock, future economic and livelihood activities, and population growth.

51. Topographic maps and remote sensing data (aerial photos and satellite imagery) may be extremely useful in areas where there is very limited data available. Detailed images are able to provide information such as vegetation cover, drainage patterns and surface water courses. It is important that as much local knowledge and expertise as possible is included in the desk study. Likely additional sources of expertise include technicians from the relevant ministries, water boards and local drilling contractors.

52. The desk study should result in a desk report that includes:

- ☐ A literature review of hydrological (in particular stream flow and rainfall patterns), geological and hydrogeological data for the region and the proposed site.
- ☐ Compilation of hydrogeological data from water points in the regions of the proposed site (e.g. water level data, water quality, pumping tests and borehole logs).
- ☐ Elaboration of a conceptual model of the aquifer system, identifying (1) potential exploitable aquifers, (2) recharge processes, (3) potential pollution sources, in order to estimate the following:
  a. Groundwater flow directions and estimated velocities.
  b. Estimates of likely depths to exploitable groundwater and aquifer material (lithology).
  c. Estimates of likely yields and of the costs of pumping.
  d. Description of interactions between surface water and groundwater.
  e. Assessment of the likely quality of groundwater.
  f. Elaboration of a water balance.
- ☐ A description of available applicable water abstraction technologies.
- ☐ A description of any regulatory requirements.
- ☐ An analysis of data gaps in addition to a clear investigation strategy to close these gaps.

53. Sources of secondary data for the desk study include:

- ☐ International organisations (international geological and hydrogeological societies, environmental bodies, mapping agencies).
- ☐ National government ministries (water and energy, water resources, environment, geological, land survey, mines and energy, public works, meteorological).
- ☐ National universities (water resources, geography, geology, environmental science, mining)



- ☐ National drilling companies and hydrogeological consultants.
- ☐ Vendors of maps, aerial photos, high definition satellite imagery.
- ☐ Literature searches (i.e. scholarly articles via internet).

54. The duration of the desk study will vary depending on how much information is already available, the complexity of the hydrogeological setting, the time available and the scale of the water demand. Generally the amount of information available on water conditions at the location will depend on the extent to which water has been exploited locally.

Field campaign

55. Following the desk study a field campaign is required to fill the data gaps identified during the desk study and to carefully plan any exploratory investigations (e.g. geophysics). The activities involved in the preliminary field campaign should always include a survey of all water points (wells, springs and boreholes, rivers, lakes and marshes) in the region of the study area, measuring the following basic parameters:

- ☐ Water source and aquifer type.
- ☐ GPS location, elevation, diameter, depth, well equipment, pump type and capacity, operational hours.
- ☐ Static and dynamic water levels, flow measurement , water quality
- ☐ An assessment of the feasibility of meeting the demand from existing sources through rehabilitation or upgrading.
- ☐ Identification of locally appropriate technologies for water abstraction.
- ☐ Carrying out pumping tests in existing boreholes in the region in order to get the hydraulic properties of the aquifer.

56. The area for the field campaign will be defined during the desk study and its size and extent depend on the geology and hydrology of the area, more than on the amount of the planned abstraction. It is highly recommended that the field reconnaissance and well survey phase is carried out jointly with local water authorities and representatives from local communities who know the potential locations for water sources in addition to any potential causes of dispute.

Geophysical methods

57. Following the desk study and field campaign it is usually necessary to undertake local geophysical investigations for exact positioning of well locations. Geophysical methods should always target promising locations which were identified as a result of the desk study and field campaign.

    If carefully planned, surface based geophysics may reduce uncertainty in favourable geological settings. Under the most favourable conditions, such investigations may allow inferring the depth of the water table, the location of faults, the depth to the basement rocks, or the location of freshwater/saline water interface. Their main use in an area with limited geological information is likely to be as an aid in identifying potential sites for drilling.



58. The most frequently used surface based geophysical methods in hydrogeological investigations are based on electrical resistivity measurements. These geophysical methods seek to relate electrical properties of the earth to hydraulic properties. The relationship between the two properties is by far not linear, rendering interpretation of such investigations very delicate. In order to be meaningful, some of the measurements within a campaign have to be calibrated with borehole logs and other data (e.g. water level), i.e. have to be carried out next to boreholes where the subsurface conditions are known. As a rule of thumb, dry materials have a higher resistivity than wet ones and gravels have a higher resistivity than silts or gravels. Saline water has a low resistivity.

59. In any drilling campaign, within a refugee setting programme, a specialized hydrogeologist should be hired to oversee the geophysics and drilling activities for the whole duration of the drilling campaign. Since interpretation of geophysical measurements is delicate, it is of high importance for the clients (usually non-specialists) to insist on the following elements as integral parts of the investigation report:
    - ☐ All raw data have to be included in the report.
    - ☐ The interpretation of the results, based on mathematical inversion has to be plotted against the measured raw data.
    - ☐ The interpretation of the results has to include a list in which the local transformation of electrical properties to hydraulic properties is shown and based on calibrated data (compared with borehole logs or other available information).

Test drilling and pumping tests

60. Following the desk study, field reconnaissance, well survey and geophysical study, the most favourable sites may be selected for test drilling. Test drilling and pumping tests should be carried out to fully document the characteristics and yield of the aquifer. However in many cases it may make economic sense to go ahead a drill a production well as the costs are likely to be similar. UNHC guidelines for test drilling and pumping tests can be found on the **wash.unhcr.org** website.

Final water source selection

61. At the end of the prospection and evaluation phase the Hydrogeologist should have established a list of potential water supply options for the refugee setting ranked from ‘most favourable’ to ‘least favourable’ according to the following selection factors:
    - ☐ Predicted yield and seasonal variations.
    - ☐ Ease and cost of abstraction and transmission (taking into account distance from the refugee setting).
    - ☐ Existing water quality and ease and cost of treatment.
    - ☐ Ownership, security and legal considerations.
    - ☐ Ease and costs of operation and maintenance and human resources needs.

- ☐ Impact of abstraction on aquifers, local population and the environment.

Water abstraction

Surface water abstraction

62. Water can be abstracted from surface water bodies by direct pumping, pumping via an infiltration gallery or stilling well, or diverting part of the flow into an off-take channel or pipe. Intake pipes should be at least 1m above the floor of the riverbed to avoid drawing in silt, stones, or suspended matter, and at least 0.5m below the water surface to reduce problems with air vortices being drawn into the pumped water flow. Surface water intake structures should be designed to abstract the better quality water which is usually found as far as possible from the surface water body's edge.

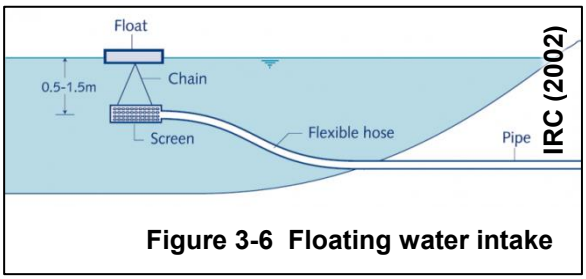


Figure 3-6 Floating water intake

63. Stilling wells and infiltration galleries take advantage of alluvial material in the bank or bed of the river or lake to partially treat the water as it is abstracted. Stilling well can be made by installing a lined well within the bank or next to the river or lake. Infiltration galleries are constructed by installing slotted pipes into a gravel filled trench in the river or lake bed and abstracting water through the river or lake bed.

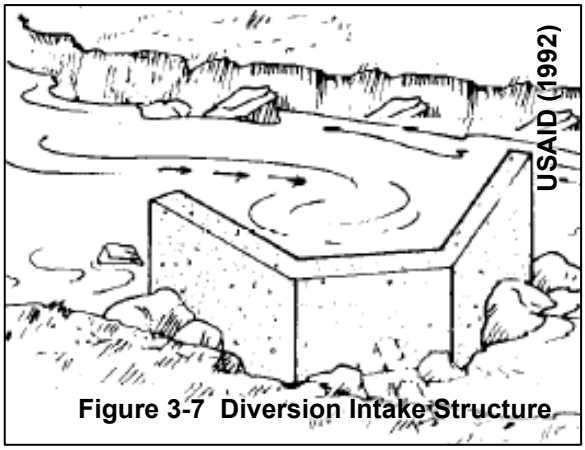


Figure 3-7 Diversion Intake Structure

64. Diversion structures channel part of the river flow into an off-take trench or pipe. They should be constructed of durable enough materials (e.g. concrete, stone masonry, or heavy gauge iron) to withstand the river flow forces exerted on them, in addition to risks of flooding, erosion and silting. They should be optimized to collect the best quality water, at the design flow, all year round.

65. The design of surface water intake structures for long term refugee settlements requires specialist engineering knowledge and experience and should ideally be based on the analysis long term historical flow records, carried out by a hydrologist with local knowledge.

Spring protection and abstraction

66. Springs form wherever the groundwater table intersects the earth's surface either as a spring 'eye' or generally as seepage. Springs can also be formed where high permeability layers are found on top of layers of lower permeability. These kinds of springs often occur as a line of springs, reflecting the topographical level of the impermeable layer. The source of water in springs may be either as a

result of the main water table or a perched water table. Springs can also be formed where fracture zones intersect the ground surface. The discharge and quality of these springs is often reasonably constant as their flow is due to the head in the underlying aquifer. The major advantages of exploiting springs in refugee settings are..

- ☐ They usually yield high quality water requiring no treatment other than chlorination.
- ☐ They can be relatively cheap to construct and are a low tech option, which can easily be transferred.
- ☐ They have very low operation and maintenance costs.
- ☐ In many cases, a gravity network can be used to deliver water directly to the users with no pumping requirements.

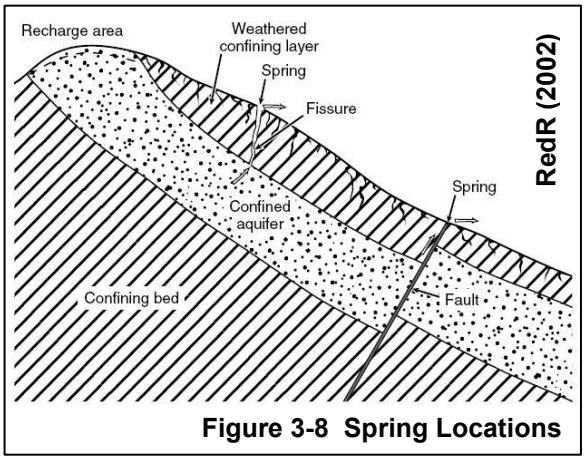


Figure 3-8 Spring Locations

67. When evaluating a spring it is critical to assess the seasonality of water discharge rates and water quality. Springs that have a constant discharge are the ideal source of water for refugee emergency situations, particularly where their point of emergence is elevated to allow distribution of the water to the refugee setting by gravity.

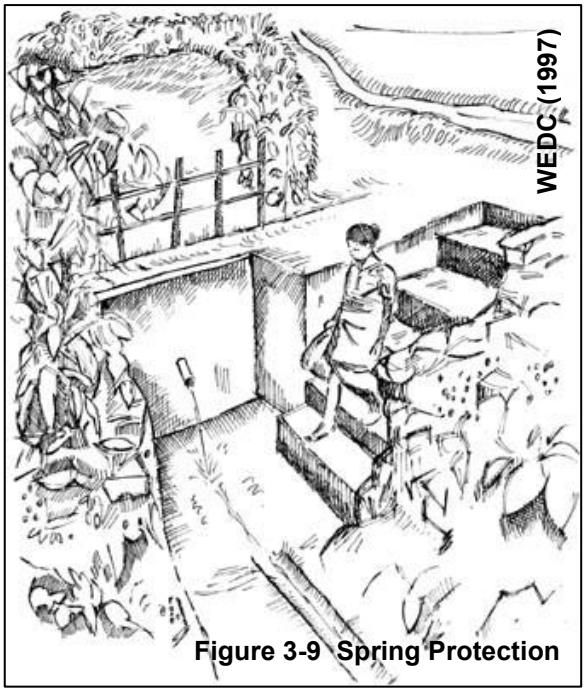


Figure 3-9 Spring Protection

68. Geological maps (if available) may help locate springs between outcropping lines of impermeable and permeable layers. Local people often know the locations of springs in their vicinity. Ownership of the spring must be identified to avoid potential conflict.

69. The quality of water from springs is dependent on the underlying spring geology but is usually of high quality. However, springs that are seasonal and rely mainly on shallow groundwater and rainfall recharge may require a higher degree of treatment. Regular monitoring of the spring discharge and water quality parameters should be made over time.

70. Discharge rates from springs can be calculated by measuring the time taken to fill a container of known volume. The average from three runs is usually enough to obtain a fairly accurate figure. If the spring is unprotected, the potential yield from the spring can be found by excavating down to the spring eye, constructing a temporary dam

using available earth, installing a discharge pipe of sufficient diameter, and measuring the time to fill a known volume when the water levels have reached a steady state.

71. Normally discharge will be highest at the end of the rainy season and lowest at the end of the dry season. If possible, it is preferable to measure the highest and lowest discharges in the spring's cycle in order to determine its suitability for development as a long term source of water. Observing the spring's resilience to impulses such as rainfall events is important if the opportunity arises.

72. Protecting the spring from surface contamination is an urgent priority. In the initial stages of a refugee emergency feasible protection measures include:

- ☐ Fencing
- ☐ Working with the community to ensure that water is abstracted and animals watered downstream of the spring eye;
- ☐ Construction of a surface water runoff diversion canal upstream of the spring eye;
- ☐ In consultation with the community establishing a protection zone around the spring catchment

73. Every spring capture is unique, however there are several principles that should be adhered to while working on springs. Firstly, the eye of the spring must be located. This can be a difficult process and will often entail careful and extensive excavation. Once excavation of the spring eye has been completed is should be permanently protected using a spring box or a small sealed gravel filled dam.

74. Back pressure on the spring eye can disrupt the flow paths and may cause the spring to be lost. It is imperative that the levels in the collection dam or spring box are maintained below the level of the spring eye. If there is uncertainty in the flow rate a large diameter overflow pipe should be used.

75. A spring box is recommended for springs that have low or variable discharges or a moderate suspended solids load. The spring box provides a settlement chamber that allows periodic access for cleaning and maintenance. Spring boxes often require extensive and expensive construction. A decision on the layout and final design of the spring catchment should seek to balance the cost of development against the potential yield of the spring. Excavation of the spring box foundations must extend to the impervious layer to prevent loss of water under the spring box. The bottom of the spring box is often left as a permeable layer. In an emergency, rapid spring captures can be constructed by excavating a simple earth barrage covered in plastic sheeting and backfilled with gravel.

Hand dug wells

76. Hand dug wells can provide a low-tech solution to accessing groundwater in low density settlements where contamination of the shallow groundwater is limited. In many cases, hand dug wells are similar to traditional abstraction methods and are readily accepted by the refugee

community. Hand dug well diameters can range from less than one metre to tens of meters and wells can be successfully excavated to depths of up to 60m and beyond. Hand dug wells have relatively low operation and maintenance requirements which are generally more related to maintaining the water abstraction device. Even if the hand pump breaks down, water can still be abstracted by the community by access through the head works.



Figure 3-10 Concrete Well Rings

77. The disadvantages of hand dug wells are that they are often not suited to hard ground formations and take time to dig and line. In addition, construction of hand dug wells can be dangerous due to collapsing soils, falling objects and asphyxiation from dewatering equipment. Hand dug well construction generally requires the use of a trained well construction team. Finally, construction of hand dug wells can require large capital costs for equipment such as concrete ring moulds, heavy lifting equipment, well shaft formwork, motorized de-watering pumps and fuel.

78. Hand dug wells are generally constructed by digging and lining a pit down to the water table and then by telescoping the lining further down into the aquifer. Yields are generally dependent upon how deep the construction crew is able to penetrate into the aquifer and if construction is taking place during the dry season when groundwater table levels are at their lowest. Yields may be significantly increased if the well is deepened up to the maximum limit of the dewatering pump and may even be improved by introducing vertical tunnels or perforated pipes. Hand dug wells that have low yields can be easily deepened by telescoping the lining further down into the aquifer.

All hand dug wells in refugee settings should be excavated using dewatering pumps rather than rope and buckets. This is critical to be able to meet the water demand all year round in particularly in the dry season.

79. Since most hand dug wells exploit shallow aquifers, the well may be susceptible to yield fluctuations and possible surface contamination. The quality of the well water can be significantly increased by lining the well, sealing the well head, fitting a self-priming hand pump, constructing an apron, ensuring the area is kept



clean and free from stagnant water and animals, moving sources of contamination (latrines, garbage pits) and carrying out hygiene education. The well should be cleaned with 1% chlorine solution after construction and a sanitary survey should be carried out as the situation demands. Bacteriological testing of water from a sample of hand dug wells should be carried out on a monthly basis (see **section 3.112**).



Figure 3-11 Hand Dug Well - Chad

80. Before excavation is planned, information about the geology, water table depth, seasonal fluctuations, recharge area and rate must be found. Wells should be sited in locations that are known to be favourable for example in low lying areas close to alluvial river plains. The use of reinforced concrete instead of plain concrete results in pre-cast well rings that are thinner, lighter and easier to install. Safety during hand dug well construction is of paramount importance.

Drilled wells and boreholes

81. Drilling is often the only water solution for deep consolidated aquifers. Machine drilled boreholes are always costly to construct, and often risky in case of failure. Before drilling begins, information about the geology, water table depth, seasonal fluctuations, recharge area and rate must be found. Sources of information include local expertise, existing records, aerial imagery, geological maps and geophysical investigations (see section on water prospection and evaluation). The drilling of production wells is expensive and it is makes economic sense to mitigate the cost of a dry hole by conducting a geophysical investigation (usually electrical resistivity). Groundwater yields are likely to be higher in aquifers of alluvium, unconsolidated sediments and weathered zones of bedrock. Ground water in hard rock fracture systems can be difficult to hit. Drilling a deep borehole is time consuming, expensive and risky in that there is no guarantee that there will be water. Large truck mounted drilling rigs may not be able to access difficult or remote locations. Water from deep boreholes may have high levels of arsenic, fluorides or dissolved salts, requiring sophisticated treatment.



Figure 3-12 Rotary Drilling Rig – S. Sudan



Drilling options

82. Drilling systems can be broadly divided into percussion, rotary, and rotary with down the hole hammer. Percussion rigs consist of a drill bit and weighted drill pipe which is attached to a strong cable that is raised and dropped repeatedly. Material is drilled then removed with a bailer. Rotary rigs achieve drilling through the use of weighted rotating cutting tool. Drilled material is flushed to the surface by recirculating drilling fluid. Compressed air driven down the hole hammers are used to drill through hard rock. Their faces have tungsten carbide 'buttons' which strike the drilling face at high frequency. Drilling rigs have capacities based on the maximum depth (pullback) they can extract the drill string. Drilling contractors and drilling rigs should be selected based on their ability to meet the required depths.

Manual drilling

83. In soft formations, with a shallow water table, and high permeability, it may be possible to use low-cost manual drilling technologies for small handpump installations in refugee settings during the post-emergency phases. Hand drilling rigs are relatively cheap, and simple to operate and maintain. Equipment can be fabricated locally. Data shows that hand drilled boreholes can be constructed in 1/5 of the time, for lower capital costs, than hand dug wells. Rapid penetration rates are possible however hand drilling is not suited to hard ground formations and even in soft formations boulders can stop further drilling completely. Hand drilling methods can encounter problems in unstable formations. Some hand drilling methods (jetting, sludging) require a source of water, which in dry regions may have to be transported to the site. Options for manual drilling include:

Driven wells. Constructing driven wells involve driving a specially designed, but inexpensive, well point and screen of hard steel into the ground connected to sections of casing. Borehole construction is straightforward, requiring little specialist equipment (sledge hammer and drill pipe).

Jetted wells. Constructing jetted wells involves using a motorized pump to drive water down a drill pipe equipped with a jetting drill bit. As the drill pipe is driven into the ground material is flushed to the surface. The technique is very effective in unconsolidated material but equipment costs are comparatively high.

Hand percussion. This technique drilling is identical to standard percussion drilling but uses lighter equipment and manual labour. At a minimum it requires a tripod, a pulley lifting mechanism, heavy drill bits and a bailer. Hand percussion drilling can achieve impressive depths in both unconsolidated and (time permitting) consolidated formations.

Hand auger drilling. This technique requires auger equipment, a raised platform and drill pipe. Augured wells are relatively easy to construct,

however their practical depth is limited to 15m – 20m.

Hand sludging. This technique requires a raised platform, drill pipe, a steel cutting shoe and a source of water. The drill hole is kept filled with water and as the pipe is raised the water column inside the pipe is released, slowly evacuating the cuttings.



Figure 3-13 Vonder Rig Manual Auger

Borehole design, development, pump testing and equipping

84. Guidance for the design of boreholes fin crystalline, consolidated, and unconsolidated aquifers along with guidance for conductor casing, pump casing, well screens, natural and artificial gravel packs, well development, pump testing, and borehole equipping can be found in additional more detailed guidance notes on the **wash.unhcr.org** website.

Water source protection

85. UNHCR and WASH actors should ensure that in refugee settings steps are taken to immediately protect all water sources from contamination. The most effective way to achieve this is to undertake a series of sanitary surveys at each step of the water chain to assess public health risks, and identify a list of corrective actions. The list of corrective actions should be prioritized into those that need to be carried out immediately and those that require a longer term approach.

Evaluation of existing water sources using sanitary surveys

86. A sanitary survey is a systematic assessment of the different factors that create a risk of faecal contamination of a water source. A WHO sanitary survey form consisting of a drawing and set of questions should be used for each type of water source and installation that is monitored. The full range of sanitary survey forms can be found in Annex 2 (page 150) of Guidelines for Drinking Water Quality, Volume 3 – Surveillance and Control of Community Supplies (WHO, 2011).

87. The sanitary survey forms take the same layout and are completed in an identical manner. On one side is a numbered list of sanitary risk questions which are phrased in such a way that a 'yes' answer indicates a sanitary risk factor. On the other side of the form there is a simple representation of the water infrastructure that is being assessed (e.g. a water source,

abstraction point, treatment process, or distribution system).

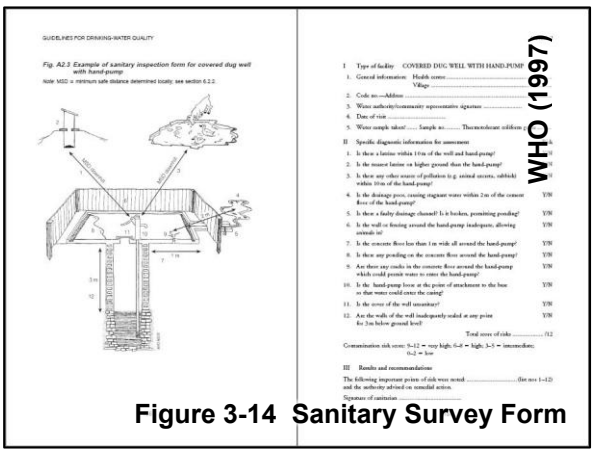


Figure 3-14 Sanitary Survey Form

88. Each of the numbered sanitary risk questions is also marked on the illustration using the same number. To complete the sanitary survey, each of the questions is answered in turn. At the end of the sanitary survey, the contamination risk score is calculated by adding together the sanitary risks. A score of 1-3 indicates an intermediate risk, 4-6 intermediate to high, and 7-10 very high.

Box: Sanitary Inspection Risk Scores

7-10	High risk
4-6	Intermediate to high risk
1-3	Low risk
0	No observed risk

Source: Guidelines for Drinking Water Quality, Volume 3 – Surveillance and Control of Community Supplies (WHO, 1997)

89. The sanitary survey form requires no specialist equipment or qualifications to carry out, and provides instant information that allows the risk of contamination to be estimated and corrective measures to be identified. The people carrying out the sanitary survey should be trained and supervised so that the information they produce is reliable and allows comparisons to be made between different water sources and monitor change over time. In all refugee settings, the risk scores from a sanitary inspections should be combined with the results from faecal coliform tests to create a framework for prioritising any remedial action (see table below).

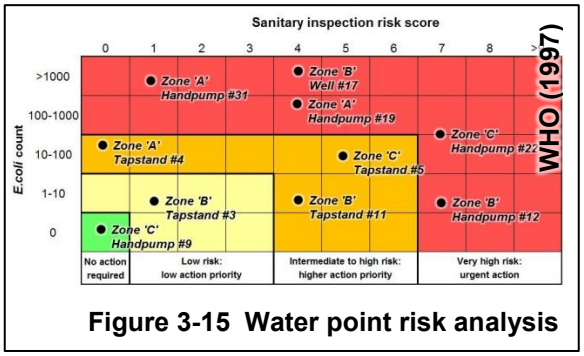


Figure 3-15 Water point risk analysis

90. Examples of corrective actions that are likely to come out of sanitary surveys include

Springs

- ☐ Ensuring minimum safe distances to latrines or sources of contamination
- ☐ Installing a surface water diversion trench
- ☐ Fencing the spring capture area to prevent entry by animals and people

Hand dug wells and boreholes

- ☐ Ensuring minimum safe distances to latrines or sources of contamination
- ☐ Installing or upgrading the sanitary seal
- ☐ Ensuring the apron is at least 3m in diameter
- ☐ Fencing the well apron to prevent entry by animals

Water quality monitoring and testing

The importance of water quality monitoring in refugee settings

91. UNHCR and WASH actors must ensure that all water supplies in the refugee setting, regardless of their intended use, are fit for human consumption. Due to the risks from diarrhoeal diseases, steps must be taken to ensure all water supplies have a free chlorine residual of at least 0.5mg/l at water collection locations (to be raised up to 0.8-1 mg/l in case of outbreaks depending on the acceptability of the users). Free chlorine residual levels must be constantly monitored and the results must be updated in the water quality monitoring section of the site WASH plan/strategy. Steps must be taken to immediately protect all water sources from contamination. Sanitary surveys should be conducted at each step of the water chain to assess risks, and identify corrective actions. A water safety plan that includes a water quality surveillance framework must be in place for every refugee setting.

92. UNHCR and WASH actors should not only ensure that water supplies are safe to drink but also that the taste, colour and smell of water supplied is acceptable. If water supplies are unacceptable there is a high risk that the population may seek out unprotected sources. Water supplies that are treated with chlorine should not have excessive levels of chloramines.



Figure 3-16 Water quality testing

93. All refugee settings should have an fully documented and active water quality surveillance system in place that is able to provide up to date water quality data, in addition to an analysis of historical water quality trends

Measurement of chlorine residuals

94. In all settings, UNHCR and WASH actors must ensure that total and free chlorine residual levels are being measured using N,N-diethyl-p-phenylenediamine based DPD1 and DPD3 tablets and a simple 'pool tester'. The UNHCR approved procedure for measuring chlorine residual using a 'pool tester' can be found in Annex 9 (page 226) of Guidelines for Drinking Water Quality, Volume 3 – Surveillance and Control of Community Supplies (WHO, 1997). Decay of free chlorine levels increases in warm temperatures or if the water is left in the sun therefore free chlorine levels should not only be tested at the point of collection but also the household level.

95. The UNHCR approved procedures for selecting the location of sampling points and sampling frequency for refugee settings can be found in Chapter 4 (page 51) of Guidelines for Drinking Water Quality, Volume 3 –

Surveillance and Control of Community Supplies (WHO, 1997). However, UNHCR and WASH actors must ensure that chlorine residuals are monitored on a daily basis for the first eight weeks, before moving to the monthly monitoring schedule suggested by WHO. UNHCR and WASH actors must ensure that all water quality testing results are updated in the site Water Safety Plan.

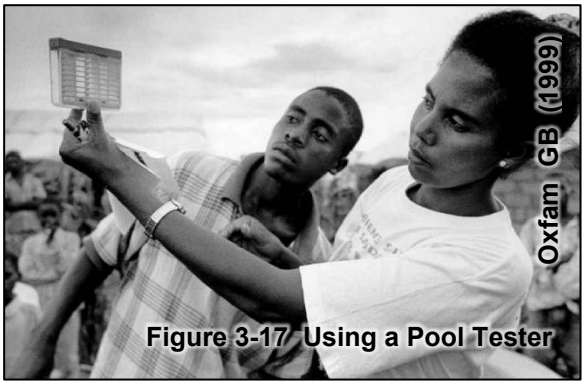


Figure 3-17 Using a Pool Tester

Measurement of turbidity

96. Turbidity is caused by the scattering of light due to the presence of colloids and fine suspended particles. Microbiological contaminants adhere to these particles, which can reduce the efficiency of disinfection in waters with turbidity in excess of 5 NTU. A precondition for effective chlorination is that the turbidity of the water is less than 5 NTU. This generally means that water supplies will requires some form of pre-treatment (such as sedimentation or filtration) to lower turbidity values to effective levels. The turbidity of the water can be verified using a colour comparator or a Jackson Tube. The UNHCR approved procedure for measuring turbidity can be found in Annex 10 (page 231) of Guidelines for Drinking Water Quality, Volume 3 – Surveillance and Control of Community Supplies (WHO, 1997).

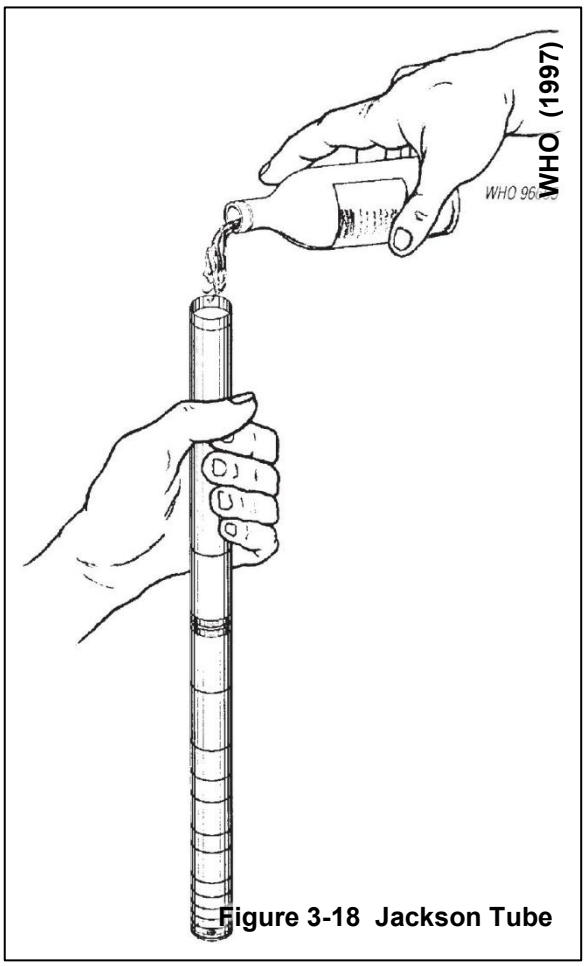


Figure 3-18 Jackson Tube

Measurement of pH

97. The pH of natural waters ranges between 5.7 (rainwater) to 8.5 (some groundwaters). For effective chlorination the pH of the water supplies being treated must be less than 8.0. If the pH is greater than 8.0 then the contact time must be significantly increased (refer to increased contact times in the section of water treatment with chlorine). Chlorine has very little disinfecting power above pH 9.0. The pH of the water can be determined using a 'pool tester' and phenol red. The UNHCR approved procedure for measuring pH can be found in Annex 10 (page 231) of Guidelines for Drinking Water Quality, Volume 3 – Surveillance and Control of

Community Supplies (WHO, 1997). Alternatively the pH may be measured using a recently calibrated handheld, digital meter that measures the potential difference between two electrodes immersed in the water.

Measurement of faecal contamination

98. Faecal contamination of drinking-water is a transmission route for many diarrhoeal diseases, including cholera and shigellosis, and other diseases such as hepatitis A and E, and typhoid. Even if water supplies have been chlorinated there is a risk that faecal pathogens may still be present resulting from insufficient contact times, inadequate chlorination procedures, water network leaks, and post-delivery contamination.

99. Faecally derived pathogenic microorganisms represent the greatest acute risk to human health associated with water quality. These microorganisms include bacteria, viruses and protozoa. It is not feasible to analyse water for the presence of specific pathogens therefore the approach adopted by WHO is to test the water for the presence of indicator organisms that are easily identifiable as bacteria that are present in human faeces. The detection of indicator organisms in a sample of water is taken as an indication of faecal contamination. E. Coli. and the Thermo-tolerant coliforms species, are the most commonly used indicator organisms.

100. The Membrane Filtration test has become the accepted standard for testing for indicator organisms. Standard test kits such as the Oxfam Delagua and the Wagtech Potatest are commercially available for field use. The results are normally expressed as Colony Forming Units per 100 ml. The UNHCR approved methodology can be found in the OXFAM Delagua (1993) Portable Water Testing Kit, User's Manual and Annex 7 (page 219) of Guidelines for Drinking Water Quality, Volume 3 – Surveillance and Control of Community Supplies (WHO, 1997).

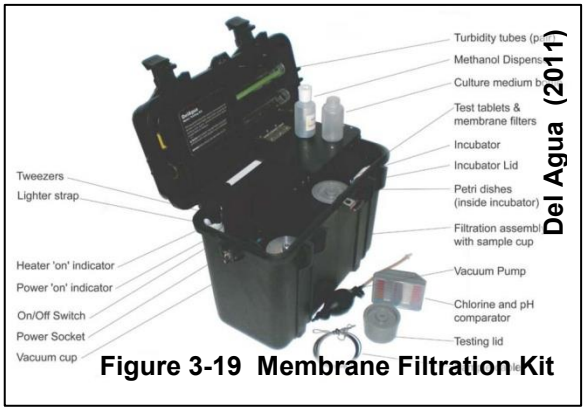


Figure 3-19 Membrane Filtration Kit

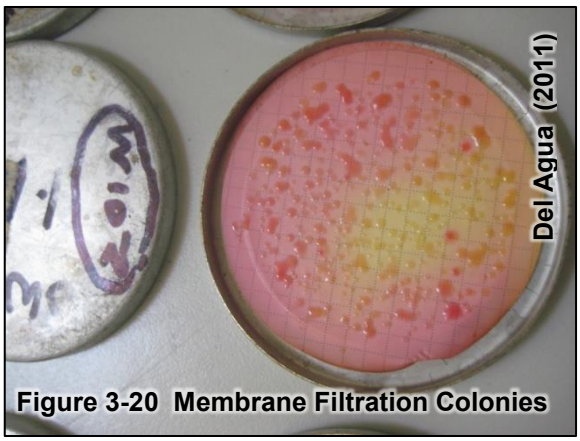


Figure 3-20 Membrane Filtration Colonies

101. The detection of faecal contamination must always be met by a response. Typically this will entail a rapid sanitary inspection of water point or source from which the sample was taken to identify the possible source of the contamination, cleaning, and possibly shock dosing with a strong chlorine solution.


DelAgua

Measurement of chemical water quality parameters

102. Water supplies in refugee settings must be free from chemical contaminants that are harmful to health either in the short or long term. Consumption of water contaminated with harmful chemicals present in the aquifer geology, or from domestic, agricultural, or commercial activity can put the population at risk from lethal, acute, or chronic toxic effects including:

Bone fluorosis: from Fluoride (F) naturally present in some geological formations or as a result of industrial activity such aluminium manufacture.

Cancers: from Arsenic (As), Uranium (U), or Radon (Rn) naturally present in some geological formations.

Neurological and nervous system toxicity: from Lead (Pb), Mercury (Hg), Cadmium (Cd), Aluminium (Al), or Manganese (Mn) present in some geological formations and domestic and industrial wastes (for example dumping of used batteries or electronic waste). Also from saline water with high levels of Total Dissolved Solids (TDS).

Methaemoglobinaemia: also known as blue baby syndrome caused by feeding infants with water containing high levels of Nitrates (NO3) and Nitrite (NO2) originating from fertilizers, livestock wastes, or leachates from unlined septic tanks or latrines.

103. It is important to seek agreement among the actors working in the refugee setting concerning the standards used to determine the quality of drinking-water. National standards, which are commonly derived from the WHO drinking-water quality guidelines, should be the primary reference. However, most national standards are determined for stable contexts, on the basis of consumption of the water over a lifetime and may be slightly relaxed in life threating situations for short period of time only.

Box: Common WHO water quality parameters

Parameter	Standard
Arsenic	0.05 mg/l
Fluoride	1 – 1.5 mg/l
Iron	0.3 mg/l
Manganese	0.1 mg/l
TDS	1000 mg/l
Turbidity	< 5 NTU
Nitrates	10 mg/l
pH	6.5 – 8.5
Thermotolerant Faecal Coliforms	0 FCU /100ml

Source: 'Guidelines for drinking-water quality, fourth edition', WHO (2011)

104. As soon as possible, UNHCR and WASH actors should ensure that the quality of water supplied complies with national water quality guidelines and the recommendations and guideline values contained in the WHO Water Quality Guidelines (2011). A summary of some of the more common guideline values can be found in the box above.

105. In addition to monitoring for natural contaminants, UNHCR and WASH actors should also ensure


DelAqua

that drinking water supplies are free from man-made chemical contaminants such as pesticides and herbicides. In urban areas industrial pollution and petroleum products may be of particular concern although the majority of pollutants associated with petroleum based products can be detected through tastes and smells at concentrations that are well below those required to cause illness (World Health Organisation, 2011).

106. Identification of pollution hazards due to man-made chemicals must begin with a catchment land-use mapping exercise. The exercise should identify chemicals that are likely to be present, their major sources and the potential pathways by which they could enter the water chain. This information is required to design a strategy for water testing. The most comprehensive reference for identifying the risks to human health associated with a given chemical is the Guidelines for Drinking water quality Chemical Fact Sheets. (World Health Organisation, 2011).

Measurement of physical water quality parameters

107. UNHCR and WASH actors should ensure that the taste, colour and smell of water supplied is acceptable to the refugee population. If water supplies are unacceptable there is a high risk that the population may seek out unprotected sources. Problems with taste may be caused by dissolved minerals (salinity), dissolved chemicals including iron and manganese, water treatment chemicals (in particular chloramines from incorrect chlorination), and occasionally dissolved gases. Water supplies that are high in suspended solids, iron, or manganese, may be rejected on the basis of colour - especially for drinking or the laundering of clothes. Water supplies with a Total Dissolved Solids (TDS) mineral concentration of up to about 500 ppm are generally considered to have a good taste (World Health Organisation, 2011). However, as the TDS concentration rises the water becomes increasingly saline and may be rejected on the grounds of taste and health as TDS concentrations approach 1000 ppm.

Minimum water quality testing equipment for refugee settings

108. All refugee settings should be in possession of UNHCR's minimum equipment for water quality testing that includes:

- A turbidity tube
- Portable ‘pool testers’ capable of measuring pH and free and total chlorine
- Portable TDS meter
- H2S presence/absence tests
- Portable membrane filtration field kits with incubators.

All refugee settings must be able to demonstrate that the equipment is functional, there are adequate consumables for the next three months, and there are trained staff that have sufficient technical capacity to use the equipment. An analysis of any recent water quality data, in addition to any historical trends must be included as part of the site WASH plan/strategy.

Water quality surveillance

109. To maintain a supply of safe water, a systematic approach to water safety surveillance is required. Sanitary surveys and microbiological testing provide a means of determining how safe a water source is at a single moment in time only, and systematic surveillance, linked to a response plan is required to maintain water safety. It is the responsibility of the UNHCR WASH Officer to ensure that these plans are documented and agreed with WASH actors.

110. Recommended frequencies for water safety surveillance are provided in the table below. In addition, detailed information on microbiological sampling and testing, sanitary inspections, including detailed reporting formats can be found in Guidelines for Drinking Water Quality Volume 3 - Surveillance and Control of Community Supplies (WHO, 1997), which also presents a detailed description of the elements of a water quality surveillance plan.

Water safety plans

111. A Water Safety Plan (WSP) is a concept for risk assessment and risk management throughout the water cycle from catchment to consumer. It includes the identification of hazards and introduction of control points that serve to minimize these potential hazards, providing more effective control of drinking-water quality. The approach was unveiled in the third edition of the World Health Organization's "Guidelines for Drinking Water Quality" (WHO, 2004) and the approach marks a fundamental shift away from just water testing. Further details were outlined in the 2009 WHO "Water Safety Plan Manual", the 2012 WHO "WSP Training Package", and the 2012 WHO "Water Safety Planning for Small Community Water Supplies" book. The approach draws on many of the principles and concepts from other risk management approaches in particular the multiple-barrier approach and Hazard Analysis and

Table: Recommended frequencies for water quality testing.

Population	Interval between sanitary inspections	Interval between catchment risk mapping and broad spectrum contaminant testing	Interval between free residual chlorine and turbidity testing	Interval between bacteriological testing and number of samples
Piped network >100,000	1 year	1 x rainy season 1 x dry season	1 sample per 10,000 per day	1 sample per 10,000 per week
Piped network 5,000-100,000	1 year	1 x rainy season 1 x dry season	1 sample per 5,000 per day	1 sample per 5,000 per week
Piped network <5,000	3-5 years	3-5 years	1 sample per day	4 samples per month
Wells, springs, & handpumps	Initial, then as situation demands			1 per structure per month

Notes: All water sources to be tested for chemical and biological contamination at time of development. Source: Adapted from Surveillance of Drinking Water Quality in Rural Areas (Lloyd, 1991), table 5.2, pg. 66

Critical Control Points (HACCP) which has been used for decades in the food industry.

112. All refugee sites should have an up to date water safety plan that includes:
- ☐ A clear 'water supply chain' flow diagram describing water provision from catchment-to-consumer.
- ☐ Results from sanitary surveys at each stage in the water chain with current public health risks and an analysis of potential public health risks and their impacts.
- ☐ A plan of short, medium and long term mitigating activities for each stage in the 'water supply chain'.
- ☐ A description of the water quality monitoring framework (which parameters, critical control points, when, how, how often)
- ☐ Results from the water quality monitoring framework along with an analysis of any trends and discrepancies.
- ☐ A list of emergency preparedness actions for each stage in the 'water supply chain'.
- ☐ A catchment risk assessment map describing local industrial, agricultural and human activity water contamination risks.

Example water safety plans from refugee settings can be found in the **references** section.

Ensure reliability, backup and reserve capacity

113. Interruptions to either the quality or quantity of water supplies in refugee settings for any period of time can be potentially disastrous. Therefore UNHCR and WASH actors should ensure that every major piece of water abstraction, treatment and distribution equipment or machinery has at least one backup. All refugee sites should ensure they have at least three months reserve in fuel supplies and water treatment chemicals. In addition, all refugee sites should ensure they have at least half a day of reserve water storage capacity to cover system breakdowns and fire fighting. The strategy to ensure water reliability should be fully described in the site WASH plan/strategy.

Technical options for water treatment

The importance of water treatment in refugee settings

114. UNHCR and WASH actors must ensure that all water supplies used by the refugee population are free from faecal pathogens, suspended solids and harmful chemicals. Water supplies should be selected that require the least amount of treatment. In most cases, a minimal amount of water treatment will be required to ensure that supplies are fit for human consumption.

115. Treatment of water supplies generally involves two steps:

i) Removal of suspended material and contaminants.
ii) Removal of pathogens and system protection through some form of terminal disinfection.

116. A number of treatment processes can be used depending upon the nature of the raw water

and the type and concentrations of the contaminants. Treatment processes can be used on their own or in combination as a series of steps. Treatment processes can be scaled up or down in size to treat water supplies at the community or household levels. The main processes include:

- ☐ Screening (**see 3.118**)
- ☐ Sedimentation (**see 3.0**)
- ☐ Coagulation and flocculation (**see 3.123**)
- ☐ Roughing filtration (**see 3.129**)
- ☐ Slow sand filtration (**see 3.136**)
- ☐ Microfiltration, ultrafiltration and nanofiltration (**see 3.140**)
- ☐ Chemical disinfection (**see 3.141**)
- ☐ Aeration (**see 3.157**)
- ☐ UV disinfection (**see 3.158**)

Water treatment costs are prohibitively expensive over the lifetime of a refugee settlement and in general, water sources should be selected that require the least amount of treatment.

117. Treatment may be required to improve the taste, colour and smell of water supplies. UNHCR and WASH actors must ensure that the aesthetic parameters of water supplies are acceptable to the refugee population. If water supplies are unacceptable there is a high risk that the population may seek out unprotected sources. A simple flow-chart for helping determine the optimum treatment type can be found in the box on the following page

Pre-treatment and screening

118. Pre-treatment is an essential step to remove coarse material before the main treatment stage. A large degree of pre-treatment can be achieved by selecting a location for the raw water intake that minimises the ingress of suspended materials, careful design of the structure, and the use of coarse screening.

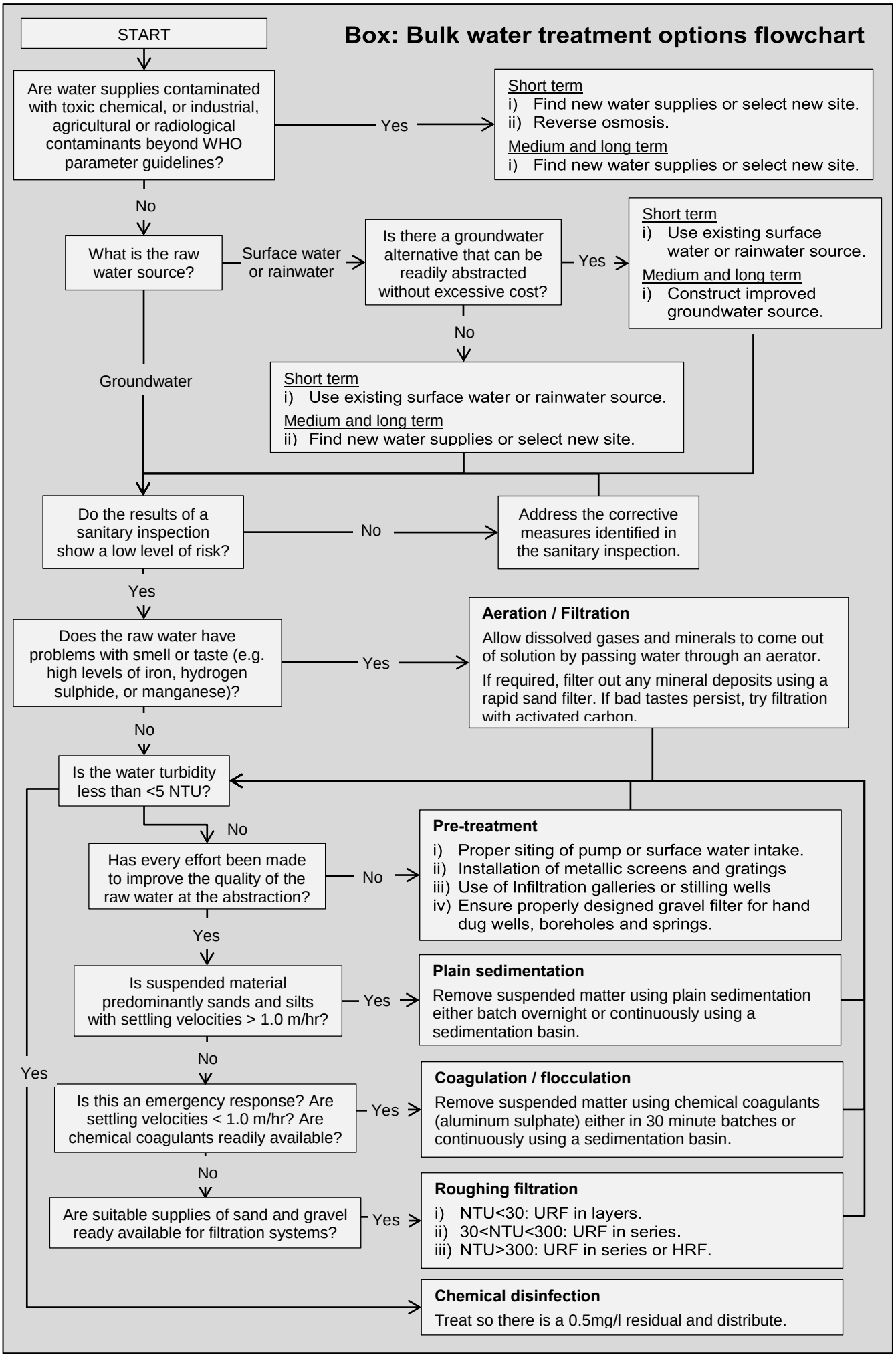
In order to reduce the burden and costs involved in water treatment, UNHCR and WASH actors should ensure that every effort has been made to incorporate properly designed pre-treatment measures for all bulk water systems.

119. In the case hand dug wells, boreholes, or spring boxes, a correctly designed gravel filter or geotextile mesh can significantly reduce the ingress of fines. In the case of a surface water source, careful positioning of intakes, the use of screens, or construction of infiltration galleries or stilling wells, can significantly reduce the levels of suspended materials before the main treatment.

Plain sedimentation

120. Plain sedimentation removes suspended particles in water by creating adequate conditions for removal by gravity. Removal of suspended particles is important as they can block pipes, clog filters and damage pumps. Removal has the advantage of not only reducing turbidity but also improving the biological and chemical quality of the water as many contaminants are in suspension or attached to particles. Plain sedimentation does not render water completely free

Box: Bulk water treatment options flowchart



from faecal pathogens and must always be followed by chlorination.

Box: Typical settling velocities of suspended particles

The following values represent the settling velocities of various suspended particles.

Material	Particle Diameter	Settling velocity
Sand	1.0 mm 0.5 mm	364 m/hr 194 m/hr
Fine sand	0.25 mm 0.10 mm	97.5 m/hr 29.0 m/hr
Silt	0.5 mm 0.005 mm	10.6 m/hr 0.14 m/hr
Fine clay	0.001 mm 0.0001 mm	5 mm/hr 0.005 mm/hr

Source: USAID (1984) *'Designing a small community sedimentation basin'*. Water for the world technical note, USAID, Washington.

121. Plain sedimentation can be carried out on a batch basis (for example simply storing water overnight) or on a continuous basis in a sedimentation basin. Sedimentation basins feature a large area diffuser inlet that minimizes re-suspension of settled particles. A perfectly level weir outlet at the opposite end skims off the top few millimetres of clarified water from the basin. The floor is gently inclined so that settled particles collect in a drain.

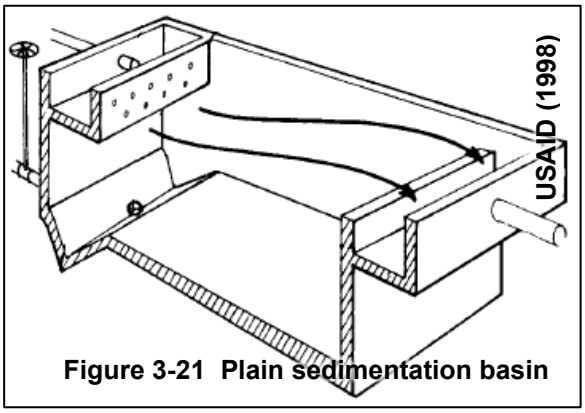


Figure 3-21 Plain sedimentation basin

122. The dimensions of a plain sedimentation basin are calculated according to the characteristics of the water to be treated in particular by the settling velocity of particles in the water source. The settling velocity can be measured by a laboratory or with a clear graduated measuring cylinder. The plan area of the basin is calculated by dividing the flow rate by the settling velocity. Sedimentation is not appropriate if the water contains very fine particles with settling velocities of less than 1.0 m/hr as the size and cost of the basin would not be justifiable and there is a risk that particles could easily become re-suspended. The process may not work at all if there are colloidal particles.

Coagulation and flocculation

123. If the raw waters contain fine particles in suspension then plain sedimentation alone will not be effective. Addition of a chemical coagulant helps to remove the electrostatic charges repelling colloidal particles and facilitates the formation of groups of particles called flocs. The most common coagulants are aluminium sulphate (alum) and ferric sulphate. Alum is generally more common and cheaper, however it has a much smaller effective pH operating range of pH 6.0 to 8.0 compared to pH 4.5 to 9.0 for ferric sulphate. In some cases it may be necessary to adjust the raw water pH so that it falls within the operating range of the chemical coagulant.

Box: Sedimentation basin design calculation example

A settlement with capacity for 20,000 refugees is to be established on the banks of the Blue Nile. It is not possible to pre-treat water via an infiltration gallery or stilling well because of rocky ground so a decision has been taken to build a sedimentation basin. Raw water is diverted upstream and conveyed a short distance by an open concrete channel to a single sedimentation basin. As the water passes along the length of the sedimentation basin, suspended particles will settle out to form sludge on the basin floor which will be evacuated back into the river. As raw water enters the sedimentation basin an equivalent volume of clarified water will be displaced and conveyed by gravity to two horizontal flow roughing filters for further treatment. River water tests give Total Suspended Solids (TSS) of 5.2 mg/litre and shows 90% of particles having a settling velocity of greater than 1.0 m/hr. What are the dimensions of the sedimentation basins?

Flow rate (Q) = N x V x F_1 x F_2 / 24 hours
Flow rate (Q) = 20000 x 20 x 1.1 x 1.1 / 24
Flow rate (Q) = 20,167 litres / hour
where

Q = the design flow rate
N = the design population
V = water demand (20 litres/per/day)
F_1 = 10% factor for leaks and wastage
F_2 = 10% factor for communal services

It follows that for the sedimentation basin..

Surface Area (A) = Q / Vs
Surface Area (A) = 20.1 m^3/hr / 1.0 m/hr
Surface Area (A) = 20.1 m^2

where

A = plan surface are of the basin
Q = design flow rate (20.1 m^3/hr)
Vs = design settling velocity (1.0 m/hr)

The ideal ratio of length to width should be around 3, therefore..

Basin length (L) = (20.1 m^2 x 3)$^{0.5}$
Basin length (L) = 7.7 m

Basin width (W) = 20.1 m^2 / 7.7 m
Basin width (W) = 2.6 m

The ideal depth of the basin should be 2.0m to avoid turbulence and scour.

124. Coagulant solutions of 1% strength should be dispersed uniformly throughout the raw water at a location where the flow is turbulent; either on the suction side of a raw water pump (before the water enters the impellor blades), or at the inlet to the mixing tank. Coagulant solution addition can be carried out manually or better still using a dosing pump. In some cases, alum will only be available as chips, rather than powder form, and dosing will need to be carried out by running the water through a correctly sized dosing cage.



Figure 3-22 Alum dosing cage

125. Flocculation involves a period of slow gently mixing to encourage floc formation. It can be facilitated by directing the flow parallel to the tank to encourage a gentle circular motion. Care must be taken to ensure that the water is not moving faster than 0.3 m/s which can cause flocs to break apart.



Figure 3-23 Rapid coagulant mixing

126. The optimum amount of coagulant will depend upon the nature of the particles suspended in the water, the type of coagulant and pH of the raw water. The lowest effective dose can be determined by the use of a jar test (see Box). In all cases, UNHCR field staff and their partners must ensure that a jar test is performed at least every 3 months or more often if there are large fluctuations in the levels of suspended particles (for example during the rainy season).

UNHCR field staff and their partners must ensure that all water supplies that are treated using chemicals are tested for treatment chemical carry over. WHO guidelines recommend that alum carry over should be no greater than 2mg/l. Levels can be easily monitored using a colour comparator and the correct reagents.

127. In emergency situations, assisted sedimentation using coagulation and flocculation can be used very quickly to treat turbid waters. Demountable steel tanks or PVC onion tanks can be rapidly erected and large volumes of heavily turbid surface waters can be treated on a batch basis in a matter of hours. However, if the emergency is likely to continue into the long term then it is much better to use a water source that does not require treatment (e.g. groundwater) or a water treatment method that does not rely on chemicals (for example roughing filters). It should be noted that coagulation and flocculation does not render water completely free from faecal pathogens and must always be followed by chlorination.

Box: Jar test procedure to determine the correct alum dose

1. Check the raw water pH is within the effective pH range of the coagulant using a pool tester.
2. Prepare a 1% solution of alum by mixing 10g of alum in 1 litre of water.
3. Prepare and label six (6) (preferably white) buckets each containing 10 litres of raw water.
4. The optimum alum dose will lie between 20mg/l and 120mg/l. Using a syringe, add a dose of 20ml, 40ml, 60ml, 80ml, 100ml and 120ml of 1% stock solution to each of the 10 litre samples to obtain doses of 20mg/l, 40mg/l, 60mg/l, 80mg/l, 100mg/l and 120mg/l.
5. Rapidly stir each bucket for 30 seconds with a wooden spoon. Continue very gently stirring for 5 minutes.
6. After 30 minutes extract a sample of water from each bucket and compare with a turbidity tube or electronic colorimeter.
7. Pick the lowest dose that produces a sample with less than 5 NTU.

Source: ACF (1996) '*Water, sanitation and hygiene for populations at risk – second ed*'. ACF, Paris, France.

128. Sludge accumulated from chemical coagulants has a high aluminium content. In all contexts, UNHCR field staff and their partners must ensure that all water treatment sludges are dewatered



in shallow basins, dried into cake, and disposed of safely in a landfill where the impact on the environment can be controlled, minimized and monitored.



Figure 3-24 Coagulant jar test

Roughing filtration

129. Roughing filters are used to remove suspended solids, by passing water through compartments containing progressively finer media typically graded between 25-15 mm, 15-10 mm and 10-5 mm. Their main advantages are their ability to reduce turbidity in a low tech and simple manner without the use of chemicals. Any durable, non-toxic media can be used including gravel, broken bricks and broken plastic. The different compartments containing the media can be arranged either horizontally (HRF) or vertically. In the vertical configuration, the flow can be arranged either upflow (URF) or downflow (DRF).

The upflow roughing filtration configuration uses gravity for backwashing and therefore is the simplest solution, often having the greatest performance over time. UNHCR field staff and their partners should take this into consideration when planning any surface water treatment facilities.

130. During HRF the length of each section is normally 3-4 m, 2-3 m and 1-2 m. Water depth is usually 1.2 m. The cross sectional area of a horizontal flow roughing filter can be calculated by dividing the demand flow rate by the design filtration rate (usually 0.5–1.0 m/h).



Figure 3-25 Horizontal flow roughing filter

131. Vertical roughing filters are either made up of individual units each containing different media, or a single unit containing several layers of media. The depth of the media in a single unit is usually 60cm – 1m and in a multi-layered filter it is usually 60cm (coarse), 30cm (med) and 30cm (fine).

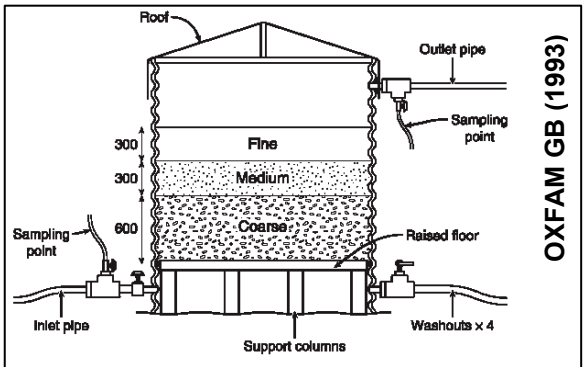


Figure 3-26 Layered upflow roughing filter

132. Roughing filters are cleaned by backwashing at high velocities (60-90 m/hr) to re-distribute filtered particles and flush them out. In upflow and horizontal roughing filters this is achieved by opening several large diameter outlet valves simultaneously. Backwash velocities can be increased by

installing drive pipes on the outlets or by adding additional driving head using a pump. Backwash velocities should be monitored by timing how long it takes the roughing filter water level to drop by one metre.

133. The frequency of roughing filter backwash depends upon the sediment loading and can range from daily to every three weeks. The quality of the water and resistance head should be closely monitored at the entrance and exit to each filter stage.

Where possible, all water treatment infrastructure should take advantage of natural gradients to provide flow through each stage of treatment without the additional costs and complexity of pumping.

134. In all cases it is highly recommended that roughing filtration is preceded with pre-treatment to remove any large particles before treatment begins. For example, if the raw water contains suspended matter with settling velocities of greater than 1m/hr, it is highly advantages to precede roughing filtration with a sedimentation basin. Selection of the roughing filter type depends upon the levels of suspended solids in the raw water. Single multi-layered URF units are recommended for raw waters with less than 30 NTU. URF units in series are recommended for raw waters of with 30 - 300 NTU. URF in series or HRF units are recommended for raw waters with more than 300 NTU. Calculations should use the highest annual turbidity levels that are typically experienced during the rainy season. In waters of high turbidity, multiple URF or HRF treatment units are often required in series to reduce turbidity to levels where the water can be directly chlorinated.

Box: Typical removal efficiencies of roughing filtration

	% Removal NTU	
Filtration Type	**0.3 m/hr**	**0.6 m/hr**
URF in layers	85%	75%
URF in series	92%	87%
DRF in series	88%	86%
HRF	92%	91%

Source: Weglin M. (1996) *'Surface water treatment by roughing filters*. EAWAG, SANDEC and SKAT, Switzerland.

135. The major disadvantage of roughing filters is that they can take considerable time to locate, grade and install filter media. Manual grading of filter media (sieving) can take a large amount of manpower.

Box: Upflow roughing filter design calculation example

A settlement with capacity for 20,000 refugees is to be established close to a large river. Water is partially treated using an infiltration gallery. It is estimated that during the rainy season, raw water will not fluctuate beyond 320 NTU. The water needs to be treated to a sufficient level for chlorination. How many URF units are required? What are their dimensions?

Daily Demand (D) = N x C x F_1 x F_2
Daily Demand (D) = 20000 x 20 x 1.1 x 1.1
Daily Demand (D) = 484,000 litres

where

N = the design population (20,000 pers)
C = per capita cons. (20 litres/per/day)
F_1 = 10% factor for leaks and wastage
F_2 = 10% factor for communal services

Assuming continuous water treatment..

Flow rate (Q) = 484,000 litres / 24 hours
Flow rate (Q) = 20,167 litres / hour

The raw water turbidity is greater than 300 NTU so use either URF with media in series or HRF units. The number of URF units required …

URF units = log [T_W / T_R] / log [1-R]
URF units = log [5 / 320] / log [1-0.87]
URF units = 2.04 units

Where..

Treated water turbidity (T_W) = 5 NTU
Raw water turbidity (T_R) = 320 NTU
URF removal efficiency (R) = 87%

i.e. at least 2 URF in series are required to reduce the turbidity from 320 to 5 NTU. Calculate the area of the URF units..

URF area (A) = Q / V_F
URF area (A) = 20.2 / 0.6 = 34.3 m^2

Where ..

Q = the design flow rate (20.2 m^3/hr)
V_F = filtration rate (0.6 m/hr)

A T45 demountable steel tank has a diameter of 6.4m, an area of 32.2m^2 and a height of 1.5m. Therefore a single URF with media in series can be constructed using 3 x T45 reservoirs filled with gravel of 12-18mm, 8-12mm and 4-8mm. Two URF units (6 x T45 reservoirs) are needed to reduce the turbidity of 484,000 litres of water from 320 NTU to 5 NTU.

Slow sand filtration

136. Slow sand filters produce high quality water drinking water 99.9% free from pathogens without the use of chemicals. They consist of a bed of specially graded sand that water is passed through at a very slow rate. Pathogens are removed by a combination of filtration, adsorption and the action of predatory organisms that are present in a biologically active layer (schmutzdecker).



Figure 3-27 Urban slow sand filter

137. Continuous filtration slowly blocks the pores of the top layer of sand increasing the driving head. When the driving head has reached a maximum the filter needs cleaning. Cleaning is carried out by scraping off the top 2cm of sand. Dirty sand can be washed in a large fluidizing drum or by high pressure hosing, flushing out the dirt. Cleaned sand can be returned to the filter. After scraping, the filter needs several days to re-establish the biological layer.



Figure 3-28 Slow sand filter cleaning

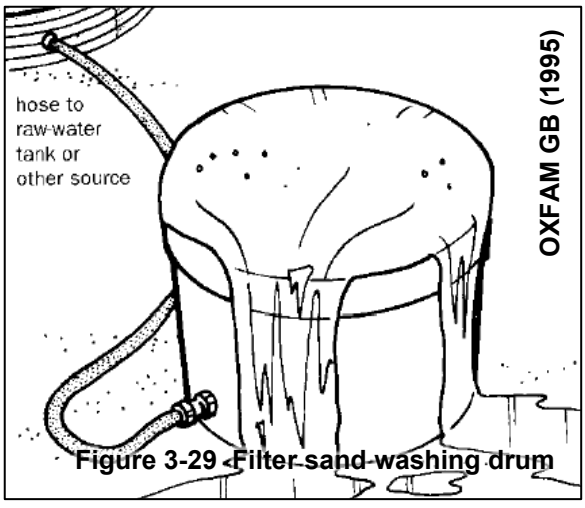


Figure 3-29 Filter sand-washing drum

138. The size of the slow sand filter unit can be calculated by dividing the demand flow rate by the design filtration rate (usually 0.1 – 0.3 m/h). The depth is typically around 1.2m allowing a minimum of 0.6m for effective filtration plus an additional 0.3m – 0.5m for cleaning. Slow sand filtration usually requires specially graded sand with a uniformity coefficient (D60/D10) of less than three and effective size (D10) between 0.15 - 0.35mm. A filter under drain is installed of either supported perforated slabs or a network of perforated pipes inside a graded gravel bed. When the filter is commissioned, the sand bed can take two to four weeks to ripen and chlorination must be carried out.

UNHCR and WASH actors should not consider installing slow sand filtration infrastructure in most refugee setting. They are not suitable for emergency responses and in most refugee settings are superfluous to water treatment due the UNHCR mandatory requirement that all water supplies need to be chlorinated.

139. Despite producing drinking water of very high quality without the use of chemicals, slow sand filters are not appropriate in emergencies as locating suitable sand for the filter and the filter ripening period takes a significant amount of time. Slow sand filters also yield small amounts of water for the relative size and cost of the treatment installation. In addition, they cannot tolerate water over 20 NTU and often need extensive pre-treatment. Finally, they require careful attention and constant monitoring from skilled staff.

Membrane filtration

140. Membrane filtration processes are used for large scale water treatment in developed settings. Depending on the pore-sizes that are deployed, membrane filters are able to remove virtually all contaminants from water supplies including viruses, endotoxins and organic contaminants. They are also useful in some settings where specific pathogens have developed resistance to chlorine (such as cryptosporidium and Giardia lambila).

Microfiltration (MF) membranes have pore sizes from 0.1 µm to 10 µm and are used to filter out microorganisms and suspended particles. MF is commonly used as a pre-treatment for ultrafiltration (UF) and reverse osmosis (RO).

Ultrafiltration (UF) membranes have pore sizes ranging from 0.1 µm to 0.01 µm and are able to filter out proteins, endotoxins and viruses.

Nanofiltration (NF) membranes have pores sized from 0.001 µm to 0.01 µm allowing monovalent ions such as sodium or potassium to pass but divalent ions such as calcium and magnesium and some higher molecular weight organic contaminants to be rejected.

Reverse Osmosis (RO) is the finest separation membrane process available, where the pore sizes range from 0.0001 µm to 0.001 µm. RO is able to filter out almost all molecules except for water. Reverse osmosis is fundamentally different to

nanofiltration since the flow goes against the concentration gradient using pressure as a means of forcing water to go from low to high concentration. Reverse osmosis requires extremely high pressures in the range 15 – 50 bar. The most common application for reverse osmosis is desalination of brackish water and seawater.

Membrane filtration equipment and approaches is generally not recommended for refugee settings as the high operating costs and dependency on expensive imported materials and expertise renders the approach prohibitive. In all settings, membrane filtration should be considered as a last option and if water supplies require this level of treatment it is often better to move the refugee population to a site with water supplies that have less of a treatment burden.

Chlorination

141. Chlorine is the most readily available and widely used chemical disinfectant for water supplies in the world and is the only treatment method that leaves a residual that continues to protect supplies from further contamination. UNHCR and WASH actors must ensure that all water supplies in refugee settings are immediately chlorinated, regardless of use.

UNHCR and WASH actors must ensure that at all times there are sufficient stocks of chlorine to cover the water treatment needs for the following three months.

142. The aim of chlorination is to supply a sufficiently high dose of chlorine to oxidise any pathogens and organic matter present in the water and leave a residual that will continue to protect the water supply network and water itself up to the point of consumption. UNHCR and WASH actors must ensure that a dose is selected to meet the 'chlorine demand' and leave a free chlorine residual of 0.5 mg/litre at the point of collection following a contact time of 30 minutes (or longer if the pH is greater than 8.0 – see box below). Care should be undertaken to ensure that the required free chlorine residual is available at the furthest water network branches.

Box: Minimum contact time requirements for water supplies with pH greater than 8.0

pH	Chlorine residual (mg/l)	Minimum contact time
8.0	0.2 0.5	30 mins
8.5	0.2 0.5	206 mins 82.5 mins
9.0	0.2 0.5	412 mins 165 mins

Note: Contact times must be increased for water supplies less than 20C.

Source: Oxfam (2001) *'Instruction Manual for Coagulation and Disinfection Equipment'*.

143. In all refugee settings, a multiple barrier water treatment approach should be adopted. During diarrhoeal disease outbreaks or times of risk of disease outbreaks, the free chlorine residual must be increased to 0.8 – 1.0 mg/litre. Where there are decentralized systems (i.e. hand dug wells, springs, handpumps, surface water

collection) a strategy of managed chlorination must be adopted; either through the use of chlorination posts or household water treatment (e.g. aquatabs).

144. Chlorine is available in many forms with varying strengths of available chlorine. The most common source of chlorine for treating water supplies is calcium high test hypochlorite (HTH - 70% available chlorine). Other common sources of chlorine include…

- ☐ High Test Hypochlorite - 70%
- ☐ Bleaching Powder - 34%
- ☐ Household Disinfectant - 10%
- ☐ Liquid Laundry Bleach - 5%
- ☐ Antiseptic Solution - 1%



Figure 3-30 Stockpiles of HTH

145. In all settings, UNHCR and WASH actors must ensure that total and free chlorine residual levels are being measured using DPD1 and DPD3 tablets and a simple 'pool tester'. The UNHCR approved procedure for measuring chlorine residual using a 'pool tester' can be found in Annex 9 (page 226) of Guidelines for Drinking Water Quality, Volume 3 – Surveillance and Control of Community Supplies (WHO, 1997). Decay of free chlorine levels increases in warm temperatures or if the water is left in the sun therefore free chlorine levels should not only be tested at the point of collection but also the household level.

146. The UNHCR approved procedures for selecting the location of sampling points and sampling frequency for refugee settings can be found in Chapter 4 (page 51) of Guidelines for Drinking Water Quality, Volume 3 – Surveillance and Control of Community Supplies (WHO, 1997). However, UNHCR and WASH actors must ensure that chlorine residuals are monitored on a daily basis in all settings. In addition, UNHCR and WASH actors must ensure that all water quality testing results are updated in the site Water Safety Plan.

147. A precondition for effective chlorination is that the turbidity of the water is less than 5 NTU. This generally means that water supplies will require some form of pre-treatment (such as sedimentation or filtration). The turbidity of the water can be verified using a colour comparator or a Jackson Tube. The UNHCR approved procedure for measuring turbidity can be found in Annex 10 (page 231) of Guidelines for Drinking Water Quality, Volume 3 – Surveillance and Control of Community Supplies (WHO, 1997).

148. For effective chlorination the pH of the water supplies being treated

must be less than 8.0. If the pH is greater than 8.0 then the contact time must be significantly increased following the guidance in the box on the previous page. Chlorine has very little disinfecting power above pH 9.0. The pH of the water can be determined using a 'pool tester' and phenol red. The UNHCR approved procedure for measuring pH can be found in Annex 10 (page 231) of Guidelines for Drinking Water Quality, Volume 3 – Surveillance and Control of Community Supplies (WHO, 1997).

149. The actual chlorine dose will depend on the raw water quality but can be expected to be in the range of 1 – 5 mg/l. The dose can be determined by carrying out a 'Jar Test' using plastic buckets. The UNHCR approved procedure for a 'Jar Test' can be found on page 448 of Water and Sanitation for Populations at Risk (ACF, 2005). The water quality of surface water and some groundwater is temporal and so the 'Jar Test' procedure should be repeated at different times of the year to ensure the optimum dose is being used.

150. Care must be taken to ensure that the water is not over-chlorinated as this may leave an unpleasant taste and users may return to traditional unprotected sources. Combined chlorine should be monitored using DPD3 tablets and a pool tester. Most individuals are able to taste or smell chloramine generated from the reaction of chlorine with ammonia in drinking water supplies at concentrations as low as 0.3mg/l.

Box: Calculation of chlorine stocks required for three months of water treatment

A large camp is providing water to 40,000 refugees. An jar test has indicated the chlorine demand of the water to be 4 mg/l to provide a free chlorine residual of 0.5 mg/l. How much HTH (70% available chlorine) should be procured to ensure a 3 month contingency supply is always on hand?

Daily Demand (D) = N x C x F_1 x F_2
Daily Demand (D) = 40000 x 20 x 1.1 x 1.1
Daily Demand (D) = 968,000 litres

where

N = the design population (40,000 pers)
C = per capita cons. (20 litres/per/day)
F_1 = 10% factor for leaks and wastage
F_2 = 10% factor for communal services

The daily amount of chlorine (X_{DAY}) required for water treatment is given by.

$X_{DAY} = D \times Y \times (100 / C_{ACTIVE})$

Where..

D = Daily Demand (968,000 litres)
Y = Chlorine Demand (4 mg/l)
C_{ACTIVE} = percent active chlorine (70%)

It follows that

$X_{DAY} = D \times Y \times (100 / C_{ACTIVE})$
X_{DAY} = 986,000 x 4 mg/l x (100/70)
X_{DAY} = 5.5 kg / day

Therefore the amount of HTH required for 90 days is…

Chlorine Amount (X_{90}) = X_D x 90 days
Chlorine Amount (X_{90}) = 5.5 kg x 90 days
Chlorine Amount (X_{90}) = 495 kg

In conclusion, 495 kgs of HTH chlorine (70% active chlorine) would be required to treat 20 litres of water a day for 40,000 people at a rate of 20 litres per person per day for 3 months.

151. UNHCR and WASH actors must ensure that there is always at least three months of chlorine stock on hand to ensure sufficient supplies for new influxes or disease outbreaks. An approximate calculation of the amount of chlorine stock required for three



months use in a refugee setting with 40,000 people can be found in the box on the previous page.

Box: Calculation of chlorine required to batch dose a 15,000 litre water tanker

An influx of refugees is putting additional stress on a local city public water supply network. It has been decided to assist the municipal water authorities by establishing additional temporary water distribution points supplied with tankers in districts with high numbers of refugee families. Water will be collected from the town's groundwater production facility which has a low turbidity of 4 NTU. The water has a small chlorine demand of 1mg/litre to ensure a free chlorine residual of 0.5mg/l. How much HTH powder should be added to each 15,000 litre water tanker before it takes the water to the distribution point?

Dose (X) = Q x Y x (100 / C_{ACTIVE})

where

Q = water quantity (15,000 litres)
Y = chlorine demand (1 mg/l)
C_{ACTIVE} = percent active chlorine (70%)

It follows that

Dose (X) = Q x Y x (100 / C_{ACTIVE})
Dose (X) = 15,000 x 1 x (100 / 70)
Dose (X) = 21,428 mg = 21.4 g

In conclusion, 21.4 g of HTH chlorine (70% active chlorine) should be added to each 15,000 litre tanker.

Note: The chlorine residual should be routinely measured and the dose slightly increased or decreased to ensure a residual of 0.5mg/l at the point of distribution

152. Water supplies can be chlorinated either on a batch or a continuous basis. During batch chlorination the required amount of chlorine is prepared in a bucket as a liquid paste and is applied directly to the water tanker or water reservoir, agitated and allowed to react for the minimum contact time. An example of batch dosing can be found in the box below.

Box: Preparation of a 200 litre drum of 1% chlorine solution

Water supplies are to be continuously dosed with 1% chlorine solution from a 200 litre drum. How much HTH should be added to the drum to create the 1% solution? If 180,000 litres of water are treated every day and the water has a chlorine demand of 3mg/l, how long will the drum of 1% solution last?

A 1% chlorine solution contains 10g of active chlorine for every 1 litre, therefore…

Dose (X) = Q x Y x (100 / C_{ACTIVE})

where

Q = water quantity (200 litres)
Y = chlorine concentration (10 g/l)
C_{ACTIVE} = percent active chlorine (70%)

It follows that

Dose (X) = 200 x 10g x (100 / 70)
Dose (X) = 2,857 g = 2.85 kg

In conclusion, 2.85 kg of HTH chlorine (70% active chlorine) should be added to 200 litres of water to make a 1% solution.

Part 2: How long will the drum of 1% solution last? A 1% chlorine solution contains 10g of active chlorine for every 1 litre, therefore for 200 litres of water..

Active chlorine = 200 litres x 10 g
Active chlorine = 2,000 g = 2,000,000 mg

If each litre of water requires 3mg of active chlorine we can treat (2,000,000 mg / 3 mg) = 666,667 litres of water in total. If 180,000 litres of water are treated every day, the 200 litre drum will last approximately (666,667 litres / 180,000 litres) = 3.7 days.

153. During continuous chlorination, a 1% chlorine solution is slowly added to the water supply typically before final storage. A 1% solution is prepared by mixing 10g of active chlorine for every litre of water. It is comparatively stable and can readily be used to dose water for short periods. An example calculation for preparing a 200 litre

drum of 1% solution can be found in the box on the previous page.

154. Chlorine is dangerous and only trained personnel should be allowed near stocks of chlorine or chlorinating equipment. Chlorine can cause burning and must not come into contact with skin or clothing. UNHCR and WASH actors must ensure that all staff working with chlorine use protective clothing when working with chlorine (gloves, goggles, apron, boots). Chlorine must be stored under dry, cool dark and ventilated conditions. Chlorine gas is heavier than air and corrosive.

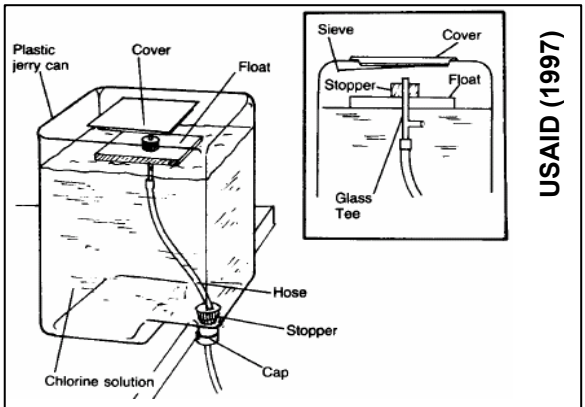
155. Automatic chlorinating units allow water supplies to be continuously chlorinated. They are available in a wide variety of sizes and types for small and large scale water systems including..

- ☐ Drip feed gravity fed
- ☐ Constant head gravity fed
- ☐ Suction doser
- ☐ Venturi doser
- ☐ Proportional doser
- ☐ Floating chlorinator
- ☐ Pot chlorinator

156. Recent technological advances have led to the development of solar powered units capable of manufacturing sodium hypochlorite through the electrolysis of a saturated solution of common household salt. These electrolytic chlorine units solve many of the sustainability issues related to the challenges and costs of procuring supplies of chlorine in refugee settings and it is highly recommended that all water systems use these systems.


ACF (1997)

Figure 3-31 Emergency chlorine doser



USAID (1997)

Figure 3-32 Constant head chlorinator


OXFAM GB (1997)

Figure 3-33 Floating pot chlorinator


Ben Harvey (2005)

Figure 3-34 Electrolytic chlorine generator

Aeration

157. Bad tastes and smells in water supplies can be reduced by creating an environment in which gases can escape and any dissolved minerals can come out of solution. An aerator allows this exchange to occur in a controlled manner before the water reaches the consumer. Simple systems typically maximize water/air contact time and contact area by cascading water supplies through a stack of aerating trays. As the water is aerated, minerals dissolved in the water are allowed to come out of solution and typically need to be filtered out of the water supplies using a rapid sand filter arrangement. Gravity aerator designs can be made that are simple enough to be maintained locally using no specialist knowledge or tools.

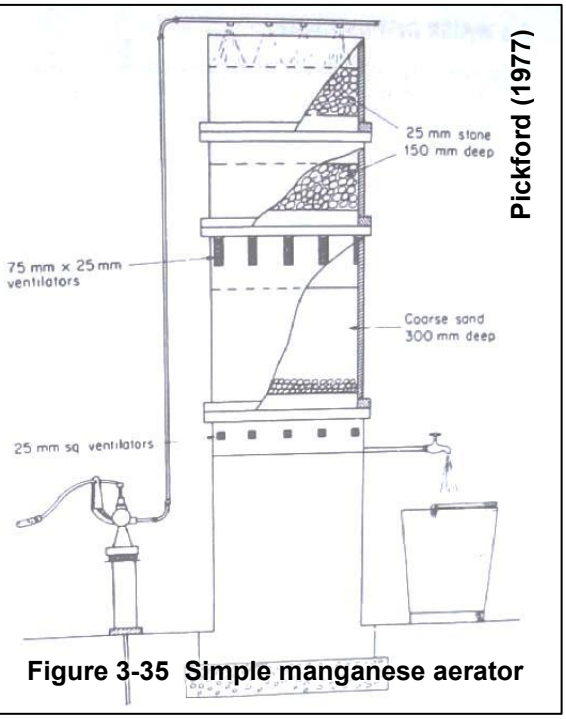


Figure 3-35 Simple manganese aerator

Ultraviolet irradiation

158. UV irradiation provides a quick and effective way of deactivating harmful pathogens in water supplies without the use of chemicals. UV light of the correct dosage has demonstrated efficacy at deactivating pathogenic bacteria, virus, protozoa and helminths. It is particularly effective at deactivating organisms that are resistant to chlorination such as cryptosporidium and giardia. It is usually used as a final step in water treatment before residual chlorination and distribution.

If there is a risk of chlorine-resistant protozoans, in particular Cryptosporidium and Giardia lambia cysts. Then UNHCR and WASH actors must ensure that water supplies are irradiated to at least 10mJ/cm^2 before final residual chlorination.

159. UV disinfection is achieved by allowing a thin layer of water to enter into contact with either submerged or air mounted low-pressure mercury vapour lamps that produce UV radiation at the optimal wavelength for pathogen destruction. Water can be treated on a batch or continuous basis by placing the lamp in a container of water for several minutes or longer, or on a flow-through basis in a housing or channel, with the water flowing parallel or perpendicular to the lamp(s).

160. UV irradiation does not create taste, odors or chemical by-products; however, the lamps require stable electrical energy supplies and need to be cleaned and replaced periodically. UV irradiation can be successfully scaled to treat water supplies at the bulk or household treatment levels.

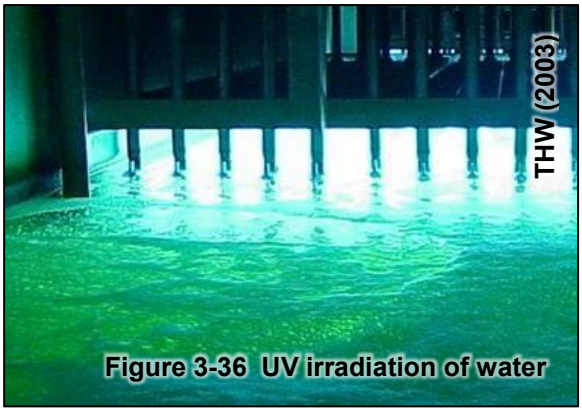


Figure 3-36 UV irradiation of water

Use of compact packages water treatment systems

161. A number of emergency response NGOs and commercial organisations have developed pre-packaged water treatment kits that allow water sources to be quickly treated and distributed in a matter of hours during a refugee emergency. These units are typically small, self-contained and portable (often trailer or skid mounted) that can be rapidly set up to produce large amounts of treated water.



Figure 3-37 Compact water treatment unit

162. The disadvantage of these units is that they are often highly complex, highly mechanized, expensive and heavily reliant on spare parts, chemicals, energy, and imported specialist expertise for operation, maintenance and repair. Most compact water treatment units are sensitive to turbid waters and may need pre-treatment to reduce turbidity to acceptable levels.

163. While these water treatment units are useful during the emergency phases of a refugee scenario, they are not appropriate for the post-emergency phases. Where treatment is required, UNHCR and WASH actors should aim to use simple techniques such as screening, plain sedimentation, infiltration galleries, stilling wells, and multiple stage filtration using correctly designed gravel and sand filters (roughing filtration and rapid sand filtration). Slow sand filtration should generally redundant due to the mandatory requirement of chlorinating all water supplies. Where possible water treatment systems should avoid or minimize dependence on fuel or electric pumping, using gravity to move water between all treatment stages. All water treatment systems should be capable of being operated and maintained by local water authorities or the refugees themselves at minimum on no cost by staff with low levels of formal education.



Figure 3-38 Compact water treatment unit

Household water treatment and safe storage

When and when not to consider household water treatment

164. In some refugee settings, centralized water treatment is not practical or feasible and simple, inexpensive household treatment products can ensure that refugees instantly have access to safe drinking water. Scenarios when household water treatment products may be used include:

- ☐ Acute emergency situations where bulk water supply and treatment has not yet been established.
- ☐ Rural dispersed settings where it is infeasible to establish bulk water supply and treatment.
- ☐ Unplanned camp settings where UNHCR or WASH actors are unable to establish bulk water supply and treatment and water tankering is infeasible.
- ☐ Urban non-camp settings where the population is staying in rented accommodation, with host families, or congregated in public (or private) buildings or land.

In camp based settings, UNHCR and WASH actors should ensure that bulk water treatment methods are prioritised over household water treatment methods to ensure that all refugees have access to safe water supplies.

Emergency phase household water treatment options

165. All water supplies during epidemics, or during times of risk of epidemics, should be treated with chlorine so there is a free chlorine residual. Therefore in emergency settings, UNHCR and WASH actors should only consider the following household water treatment options:

- ☐ Chlorination with tablets (e.g. aquatabs), chlorine solutions, or equivalent.
- ☐ Treatment with a coagulant /flocculant/disinfectant (e.g. PUR, Watermaker).

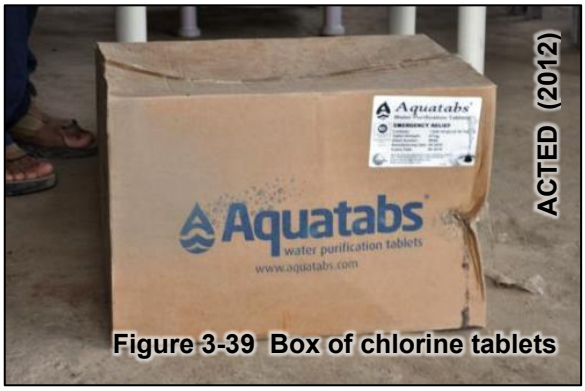


Figure 3-39 Box of chlorine tablets



Figure 3-40 Coagulant/ flocculant sachet

166. POU interventions in emergencies are most likely to succeed when the products that are being distributed are familiar or known to the affected population. There is a risk that distribution of POU water treatment products that are unknown may lead to low adoption rates (Lantagne, 2011).

Practical demonstrations of household water treatment products

167. If household water treatment products are distributed (such as chlorine tablets, flocculant/ disinfectant sachets, or water filters) then UNHCR and WASH actors must ensure that the first distribution of the product is accompanied with a visual demonstration in small groups. If use of the water treatment products requires additional household items (such as cutting, measuring, stirring, filtering, decanting, or storage items) then these additional items should be supplied as a kit. Alternatively UNHCR and WASH actors should verify that these products are available at the household level. In addition, a visual flyer illustrating the key steps should be distributed with the kit.

Flocculant/disinfectant sachets

168. PUR is a household water treatment product produced by Procter and Gamble. The product contains a combination of powdered ferric sulphate that acts as a flocculant removing dirt particles and calcium hypochlorite that acts as a disinfectant. PUR comes in a 4 gram sachet that treats 10 liters of water as a batch. The sachets arrive from the manufacturing facility in cartons containing 20 strips of 12 sachets each, for a total of 240 sachets per carton. Each carton is 25 cm x 11 cm x 15.5 cm.

169. Flocculant/disinfectant sachets should only be distributed as a HWT option where the main drinking water sources are turbid (i.e. river water, marsh water, or



Figure 3-41 PUR treatment steps

water from traditional open wells). Flocculant/disinfectants are not recommended for non-turbid drinking water sources (i.e. piped water networks, or water from handpumps). It is recommended that aquatabs or chlorine solutions (eau de javel) are distributed where the main drinking water sources are non-turbid.

Box: Recommended supplies to be distributed with flocculant/ disinfectant sachets

If communities have never used PUR before then UNHCR field staff and their partners must ensure the first distribution of the product is accompanied with the following equipment:

ITEM	PURPOSE
1 x Scissors (or a Knife)	PUR sachets are made from rip-proof material to prevent accidentally ingestion. The sachets can only be opened with scissors or a knife.
1 x 10 litre Plastic Bucket	Used during the treatment process.
1 x Wooden Stick (50cm)	Used to gently stir the flocs during treatment.
1 x Straining Cloth ($1m^2$)	Used to separate the flocs from the treated water.
1 x 10 litre Plastic Bucket (with cover)	Used to store the treated water safely.

170. It is recommended that a one month's supply of flocculant/ disinfectant sachets are distributed to each family at-risk at a time to ensure sufficient coverage. It is recommended that during the emergencies the flocculant/ disinfectant is only used to treat the drinking water component (estimated at 5 liters/person/day) of the daily water requirement. Therefore the following estimate shows that 90 PUR sachets are sufficient for a family of 6 people for one month of emergency household water treatment…

= 1 months x 30 days x 6 people x 5 liters/per/day
= 900 liters / 10 liters
= 90 sachets / month

Post-emergency phase household water treatment options

171. During the post-emergency and protracted phases, and provided there is no risk of disease outbreaks, UNHCR and WASH actors may consider the following household water treatment options in dispersed refugee settings provided that they are followed by chlorination:

- ☐ Plain / Assisted Sedimentation
- ☐ UV Disinfection by Sunlight
- ☐ Ceramic Filters
- ☐ Slow Sand Filtration (e.g. Biosand Filters)

172. In all cases, the decision to promote a household water treatment solution should be based on the raw water quality, the availability of household water treatment products, and the level of acceptance of the refugee population. Only water that is for drinking and food preparation may need treatment. Water for bathing, laundering and cleaning may be left untreated.

173. Household water treatment programmes need significant input in terms of social education in order to be a success. The success of a household water treatment is fully dependent on the motivation of the refugee population to adopt, operate, and if necessary, ensure the cleanliness of the system.

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Plain sedimentation

174. Plain sedimentation can be carried out by storing four or five days water supply. Storage for 24 hours can reduce the microbiological contamination levels by 50%. Storage for 48 hours can block the transmission of schistosomiasis. Assisted sedimentation can be carried out if natural or chemical coagulants are available locally. Chlorination or some other form of disinfection, is still needed after treatment to effectively kill all pathogens.

Household biosand filters

175. Household biosand filters can be effective at removing pathogens provided sand of the correct specifications and depth, and constant flow rates of 0.1 – 0.3 m/h are respected. The water must be <20 NTU, and the filter should be allowed several weeks to mature. Cleaning can be carried out by scraping off the top 5 mm of sand.



Figure 4-42 Household biosand filter

176. Oil drums, plastic drums, clay pots, or ferrocement jars can all be used for household treatment systems. Containers should be cleaned thoroughly as they may have held pesticides or chemicals. Final water storage containers should be covered and fitted with a tap to prevent contamination from utensils being dipped inside.

Household rapid sand filters

177. Household rapid filtration can be effective at reducing turbidity provided sand of the correct specification is used. Chlorination or some other form of disinfection, is still needed after treatment to effectively kill all pathogens.

Chlorine water treatment solutions

178. Chlorination is a very successful household treatment provided chlorine compounds are available, the water has <5 NTU, and the chlorine is applied in sufficient dose with enough contact time.



Figure 3-43 Household chlorine solutions

Household ceramic filters

179. Ceramic filters can be effective at filtering out suspended solids and killing pathogens (if treated with colloidal silver). Ceramic filters often become clogged with suspended particles after frequent use and need scrubbing. Use of household filters is generally not the preferred method for household water treatment in


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180. refugee settings unless it is followed by chlorination.



Figure 3-44 Household ceramic filter

SODIS

181. Plastic bottles half painted black and filled 3⁄4 full with low turbidity water <30NTU can be treated by the dual processes of UV irradiation and pasteurization if left in the sun for a full day. Vigorously shaking for several minutes helps dissolve oxygen in the water which reportedly aids the process disinfection process. SODIS is generally not the preferred method for household water treatment in refugee settings unless it is followed by chlorination.

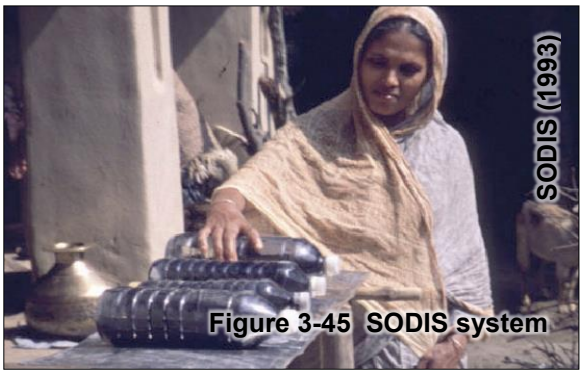


Figure 3-45 SODIS system

Boiling (Pasteurisation)

182. Boiling is one of the oldest and most common methods for treating water supplies. A rolling boil of at least one minute is recommended in order to deactivate all bacteria, viruses, protozoa (including cysts) and helminths that cause diarrheal disease. In mountainous regions water boils at much lower temperatures than 100°C and must be boiled for 1 minute plus an additional 1 minute per 1000 metres of elevation. Boiling of water supplies is easy to carry out in almost all settings as almost all households will have the required equipment and knowledge to carry out the practice. In addition, many populations have a strong culture surrounding tea or coffee preparation.



Figure 3-46 Boiling Water

183. Despite the simplicity and effectiveness of boiling water it should not be considered as the main drinking water treatment strategy in refugee settings as it has many disadvantages including the following.

- ☐ Boiling of water requires a considerable amount of wood, charcoal, biomass, or kerosene. It is very inefficient in terms of cost per litre of treated water when compared to other treatment techniques. Boiling of water may contribute to deforestation of refugee settings.
- ☐ Boiling of water has an opportunity cost in terms of collection of fuel and water preparation. Boiled water needs to be cooled and stored and cannot be consumed immediately.


UNHCR

- Collection of firewood is time consuming and may put women and girls at risk.
- Boiled water lacks residual protection and is often re-contaminated if poorly handled or stored. Boiled water should generally be stored in the same container in which it was boiled, handled carefully and consumed within 24 hours.
- Boiled water often tastes 'flat' when cooled and stored for drinking purposes due to dissolved oxygen escaping as part of the boiling process. Most cultures have objections to the taste of plain boiled water.
- Boiling water carries a high risk of domestic burn injuries putting children in particular at risk.
- Boiling of water does not remove suspended or dissolved chemical contaminants.
- Smoke pollution from indoor stoves present an increased risk to respiratory infections.

UNHCR and WASH actors should not promote boiling as the main drinking water treatment strategy in a refugee setting due to the associated environmental, protection, recontamination domestic burn injury risks, and respiratory disease risks. In addition, boiling of water is generally highly inefficient, costly and labour intensive compared to other methods.

Documenting the household water treatment strategy

184. A full description of the household water treatment strategy, including tracking of distribution rates, usage rates, transcripts from focus group discussions concerning the approach, and exit strategies should be included as part of the site WASH plan/strategy.

Technical options for water storage

The importance of bulk water storage in refugee settings

185. Water storage is an essential requirement in all refugee settings to buffer peaks in water demand and supply and also ensure there is at least half a day of reserve water storage and more if possible for emergencies and contingencies. Water reservoirs should be located at the highest point in the refugee setting to facilitate distribution by gravity. Alternatively if the site is flat reservoirs may be decentralized to provide localized storage for smaller WASH facilities.

186. During the emergency phase, emergency water storage kits may be deployed that include demountable tanks, bladder tanks, onion tanks, and large polyethylene (rototanks). However, all emergency water storage reservoirs should be replaced with permanent water reservoirs within 6 months if it is clear that the refugee emergency is going to last more than six months. Options for permanent water reservoirs include stone masonry, ferro-cement,



rototanks, or reinforced concrete. The emergency kits should be disassembled, serviced and put back into contingency stocks.

Demountable water tanks

187. Demountable tanks are used extensively in emergency refugee settings and consist of a kit of curved corrugated steel panels that are bolted together and lined with an inner rubber liner. The tanks come in various sizes including 11m3, 45m3, 70m3 and 95m3. Assembly can take anything from several hours to half a day depending upon the size of the tank and size of the assembly crew.

Polyethylene tanks (rototanks)

188. Polyethylene tanks (rototanks) are locally manufactured in almost every country in the world and are used extensively in emergency refugee settings. The tanks come in various sizes typically up to 20m3. The advantages of polyethylene tanks are that they are cheap, lights, durable, require no assembly, and can be used as both an emergency and post-emergency water storage solution.

Bladder tanks

189. Bladder tanks are very easy to transport and install and come in various sizes including 2.5m3, 5m3, 10m3 and 20m3. To ensure sufficient head for distribution the bladders should be placed at least 80cm higher that the tapstand on higher ground or a raised platform. The raised platform can be made of various materials but should be strong enough to support the weight (up to 20 tonnes). Options include:

- ☐ Backfilled earth platforms
- ☐ Sandbag platforms
- ☐ Masonry platforms
- ☐ Wooden platforms
- ☐ Oil drum platforms

190. Care must be taken on any ground that is sloped to ensure the space allocated is perfectly flat (or ideally surrounded by an earth bank) and the bladder is secured. Bladder tanks have been known to roll and cause extensive damage and loss of life. The site for the bladder should be free of sharp objects that could puncture the material. Smaller bladders can be installed on the back of flatbed or pickup trucks and used as temporary water tankers. The main disadvantage of bladders is their need for a raised platform, which takes time and resources. In addition, they are very difficult to clean effectively.

Onion tanks

191. Onion tanks are made from the same material as bladder tanks (high tensile PVC coated polyester fabric) and are equipped with a floating collar that allows them to contain water without the need for an external support structure. The advantage of onion tanks over bladder tanks is that they can easily be used for water treatment processes for example batch coagulation/flocculation.



Figure 3-47 Onion Tank, Dadaab


IRC



Figure 3-48 Bladder Platform Options

Post-emergency phase water storage

192. If it is clear that the refugee emergency is going to last for more than six months then plans should be made to upgrade all emergency water reservoirs with permanent structures made from reinforced concrete, ferro-cement, polyethylene, or stone masonry. Post-emergency phase water storage solutions generally requires the use of specialized construction expertise and experienced local contractors.

Technical options for water distribution

Water tankering

193. Water tankering can be a very quick method of getting water to the refugee population during an emergency response, providing suitable resources exist. In order to carry out water tankering, suitable tankers must be available locally of suitable quality for transporting drinking water. Make sure that the tanker is cleaned and chlorinated before use. Other options for tankering water include:

- ☐ Rigid tanker trucks.
- ☐ Flat-bed trucks fitted with reservoirs.
- ☐ Tractor pulled trailers.
- ☐ Animal pulled trailers.

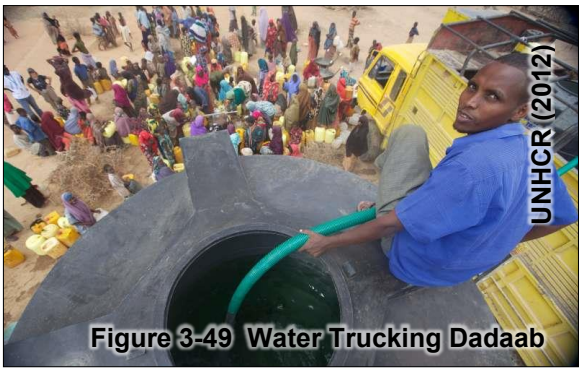


Figure 3-49 Water Trucking Dadaab

194. Tankering of water requires adequate access and road infrastructure for tankers to bring water to the affected population. In addition, a local water resource must be identified with sufficient quantity and quality to support the local and beneficiary populations. The water should be regularly tested for feacal and chemical contamination. The source water should be non-turbid, (NTU < 5) and properly chlorinated.



Figure 3-50 Water Trucking Bangladesh

195. The water tankers must be scheduled to deliver water regularly. The population must be reassured that water will arrive regularly. A back-up plan must be developed in case of tanker breakdown. Time must be allocated for maintenance and repairs of the tanker.



Figure 3-51 Water Trucking Zaatri

196. Water storage and distribution points should be installed as soon as possible. Tanker hire is expensive and the tanker should be used to transport water, not as a static distribution point. In emergency situations the water distribution points may require supervision and roped queues to control crowds.

197. The main advantage of water tankering is that the approach can be mobilized in a very short period of time getting water to refugees in need in the initial stages of an emergency, or when the refugee population is on the move. The main disadvantages of water tankering is its cost (up to 20 - 40 USD$ per m3 depending on distances). In addition it can be logistically difficult to organize and it is not economically feasible to tanker water over great distances. Water tankering can also be unsafe depending on road conditions, tanker loading and the driver's capabilities.



Figure 3-52 Flatbed Truck Tanker

Piped water distribution

198. A piped water network uses gravity or a pump to move water from the point of storage to point(s) of distribution. Materials for piped distribution networks commonly used in refugee settings include:

- ☐ High Density Polyethylene (HDPE)

- ☐ UnPlasticized Polyvinyl Chloride (U-PVC)
- ☐ Galvanized Iron (GI)
- ☐ Lay-Flat Hose

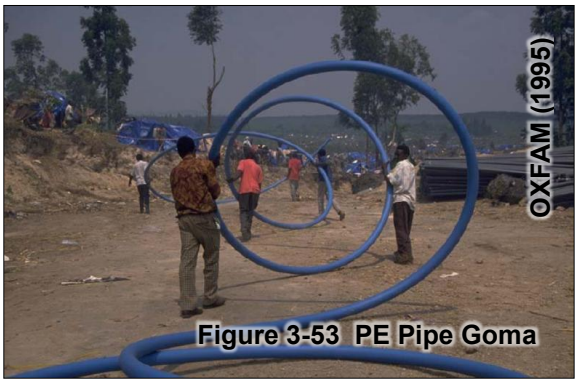


Figure 3-53 PE Pipe Goma

199. The advantages of piped water distribution networks is that despite higher capital costs, they are significantly more cost effective and simpler solution to providing water to a refugee setting in the short, medium and long terms than water tankering. Gravity flow systems do not rely on external power sources and can convey water over great distances for very little cost. The main disadvantage of piped water networks is they can take time to construct, especially if pipe materials need to be imported and pipe trenches need to be excavated.

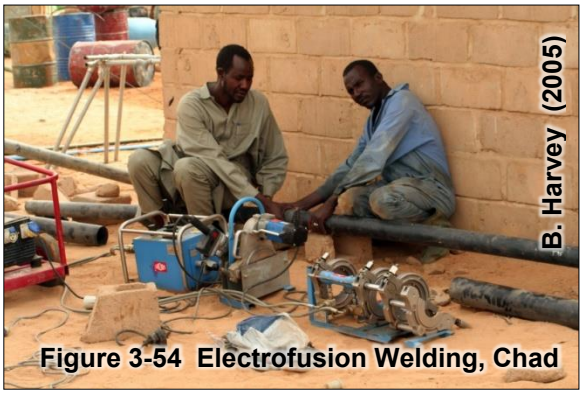


Figure 3-54 Electrofusion Welding, Chad

200. All water systems installed in refugee settings should be designed by a qualified engineer to meet UNHCR's design guidelines for piped water networks (see **wash.unhcr.org**). A package of detailed design calculations, material specifications, technical drawings, and bills of quantity should be submitted to UNHCR for verification before any medium or long-term project is initiated.

Motorized water pumping

201. Motorized (pumped) water system uses energy to move water around a distribution network or against gravity to a water storage reservoir. Water pumping options for refugee settings include:

- ☐ Surface mounted centrifugal pumps
- ☐ Electrical submersible centrifugal pumps
- ☐ Hydraulic ram pumps
- ☐ Helical rotor
- ☐ Reciprocating pump
- ☐ Solar powered pumps

202. Surface mounted centrifugal pumps and reciprocating (piston) pumps are typically used for pumping from surface water sources (e.g. lakes or rivers) or pumping water from reservoirs around a water distribution network. Electrical submersible centrifugal and helical rotor pumps are typically used to abstract water out of boreholes or wells. Hydraulic ram pumps use the energy of falling water, and the water hammer effect, to lift water to a higher elevation than the source.



Figure 3-55 Pump Installation,



203. Pump selection and pump system designs should be designed by a qualified engineer to meet UNHCR's design guidelines (see **wash.unhcr.org**). A package of detailed design calculations, material specifications, technical drawings, and bills of quantity should be submitted to UNHCR for verification before any medium or long-term project is initiated.

204. Pumped water systems need significant cash inputs for fuel, electricity, maintenance, skilled staff and spare parts. Wherever possible, motorized water pumps should always be selected that can be repaired and maintained locally. Spares should be available in country.



Figure 3-56 Pump Installation, Chad

Guidance for water collection points

205. Water collection points (also known as tapstands) typically come as a kit made from 2" GI Pipe supplying four to six taps and can be quickly erected during an emergency response. The water collection point should be free from standing water and should have a non-slip surface to facilitate use by all users. During the post-emergency phase, these may be improved by encasing the exposed pipes in a concrete pillar, constructing a concrete apron (at least 3m) and installing fencing.

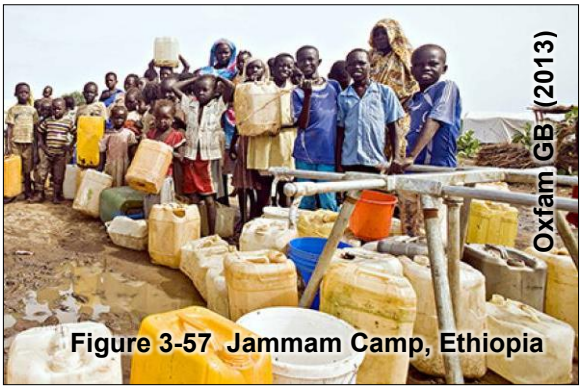


Figure 3-57 Jammam Camp, Ethiopia



Figure 3-58 IFO Camp, Dadaab, Kenya

Management of wastewater and drainage

206. Proper drainage at water collection points, bathing and laundering areas is essential to ensure that tapstands don't rapidly become dangerous or unhygienic places to collect water, or breeding sites for mosquitoes. All wastewater should be disposed of in properly designed drainage systems designed to eliminate the risk of pathogen transmission or vector breeding.

207. Wastewater may be diverted into small communal garden areas provided the system is designed to eliminate the risk of pathogen transmission using sub-surface infiltration. Wastewater should not be used to supply animal drinking troughs as it is undesirable to encourage animals to enter the habitable part of the camp. Another reason to avoid this practice is that in some settings refugees have been observed collecting drinking


WATER POINT NO 17
ZONE C BLOCK 1

water directly from the animal watering point. Blackwater (water from septic tank overflows) should not be used in any wastewater reuse projects in any circumstances. The strategy for waste water management and reuse is fully described in the site WASH plan/strategy.

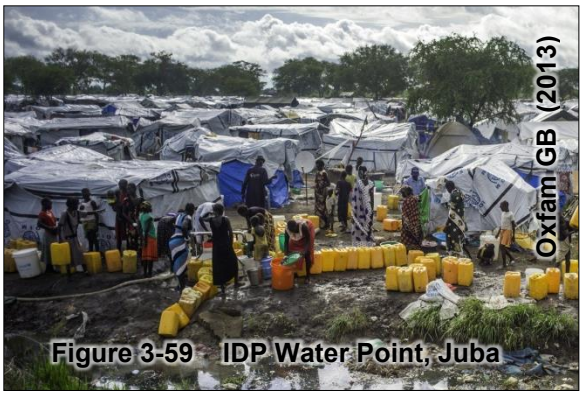


Figure 3-59 IDP Water Point, Juba

4. Excreta Management

An environment free from human excreta is essential to life, health and dignity. Safe excreta management is among the primary interventions for refugees.

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Introduction

The importance of excreta management in refugee settings

1. Safe disposal of human excreta is the primary barrier to excreta-related disease transmission and is essential for life with dignity. This is regardless of whether the refugee population are living in camps, collective centres, spontaneous unplanned camps, with host families, in rented accommodation, or they are occupying land or buildings. In every refugee setting, excreta management must be addressed with the same speed and effort as the provision of safe water supply.

UNHCR and WASH actors must ensure that during all stages in the emergency the environment inhabited by refugee populations is free from human faeces.

Excreta management as part of a comprehensive public health approach

2. The excreta management programme should be planned as part of the larger preventative public health strategy. Health and WASH interventions must be closely coordinated especially during times of risk of epidemic. The link between excreta contamination and disease must be clearly understood by all. Messages concerning the importance of toilet use and hand-washing after toilet use should be incorporated into the community health and education programmes.

The importance of seeking expert professional advice

3. The implementation of excreta management programmes in refugee settings can be complicated by additional constraints that include:
   i). Sites that are easily flooded, have high water tables, hard ground, and/or are barren or inaccessible;
   ii). Land ownership issues restricting the construction of infrastructure including toilets, (for example refugee populations temporarily occupying school or other private buildings);
   iii). Lack of physical space for toilets (for example in urban settings / high density camps);
   iv). Limited availability of local materials for toilet construction due to either geography or environmental protection;
   v). Existing urban buildings that require retrofitting or upgrading of existing infrastructure (for example refugee populations occupying collective centres);
   vi). Unfamiliarity or unwillingness of the population to use toilet infrastructure or change toilet use behaviour.
   vii). Lack of qualified personnel.
4. Due to these challenges it is essential to seek expert advice from professionals who are familiar with the context. Assistance can be sought from sources such as government departments, NGOs, Universities, consultants or contractors. UNHCR Headquarters and Regional assistance should be requested if required.

Priority actions

An immediate response

5. UNHCR and WASH actors must ensure that the environment inhabited by refugee populations is free from human faeces as rapidly as possible. In order to achieve this, UNHCR and WASH actors must ensure that there is swift provision of toilet facilities within the first few days of any emergency. The provision of a basic excreta containment intervention (for example pit latrines with reasonable privacy) is better than delayed provision of improved systems. Several decision trees can be found later in this chapter to help with the selection process of a suitable excreta management system.

The speed at which emergency excreta management systems are established must be given the same emphasis as provision of safe water supply.

6. It is a common problem during emergency responses that toilet construction programmes fail to scale-up quickly. In large refugee emergencies there are considerable time-saving advantages to engaging mechanical excavators for latrine trench construction. In addition, time can be saved by using prefabricated slabs and by mass producing toilet privacy structures in a dedicated mass production facility and transporting and assembling them on site (see designs on **wash.unhcr.org**). Even more time can be saved if these structures have been kept in contingency stock.

Clean up campaigns

7. UNHCR and WASH actors must ensure that the environment inhabited by refugee populations is free from human faeces. Observation walks (see **observation walk section** in Chapter 9) are a very effective way of identifying and mapping areas with a high defecation load. Copies of recent observation walks along with copies of focus groups related to the problems of open defecation should be included as an annex in the site WASH plan/strategy.

Box: Recommended tools for a sanitation brigade of 20 persons

Item	Qty
Shovels	10
Hoes	5
Rakes	5
Wheel-barrows	5
Gloves (pairs)	20
Boots (pairs)	20
Overalls	20
Backpack sprayers	5
Bleach (5% - 7%)	20 litres

Quantities for approximate guidance only. Figures should be adapted to context.

8. In some contexts sanitation brigades may be required at the start of the emergency to clean-up excreta. UNHCR and WASH actors should ensure that sanitation brigades are provided with appropriate tools (see box above) and personal protective equipment (refer to the staff **health and safety section** in Chapter 8). Any excreta that is collected must



be disposed of safely within a properly designed pit, tank, lagoon or sewer. Small patches of ground in contact with stools that have been cleaned should be lightly sprayed with 2% chlorine solution. All tools and personal protective equipment used in the clean-up of excreta should be cleaned with detergent and 2% chlorine solution after use.

Protection of existing water supplies

9. It is of particular importance that immediate steps are taken to prevent contamination of existing water sources from human excreta. During the initial stages of an emergency response this may require the use of guards to prevent the refugee population defecating close water sources or along river banks. Open defecation should also be discouraged along public highways, in the vicinity of hospitals, feeding centres, reception centres, food storage areas, food preparation areas, and in fields containing crops for human consumption. When it is impossible to establish toilet facilities, open defecation should be limited to specific, well-defined areas, in consultation with the community leaders, downstream of the refugee setting. These should be closed and covered over as soon as possible (see **section 4.44**)

10. All excreta management systems must respect the minimum safe distances (MSD) between all excreta management infrastructure and water sources. MSDs are highly dependent upon ground types and conditions but it is generally recommended that all toilet pits are located at least 30 metres away from any groundwater sources. In addition, the bottom of any pit or soak-away must be at least 1.5 metres above the groundwater table. These distances should be increased for fissured rocks, limestone, and coarse alluvial sands and gravels. In some special situations, groundwater pollution may not be of immediate concern if it is not used for drinking, for example in coastal areas where shallow groundwater is saline beyond drinking water health limits i.e. at least 1,500µS/cm[2].

Transition to household toilets as quickly as possible

11. The quickest way to rapidly scale up access to toilets is to build communal facilities. However, even if these are well designed, intensively supervised and spotlessly clean, other factors such as walking distances, insecurity, queuing, or a lack of anonymity may prevent their use. If it is clear that the time-frame of the humanitarian situation will be longer than six months, the best guarantee that people will safely defecate in a toilet and that toilets are kept clean and functional is to encourage the construction of shared or individual household toilets as quickly as possible.

12. In all settings, UNHCR and WASH actors should quickly conduct focus group discussions and key informant interviews to assess if there is a willingness to move to direct implementation of household toilets. If a WASH programme has decided to carry out a programme of public or communal toilets rather



13. than the preferred UNHCR WASH strategy of moving directly to shared or individual toilets, the reasons justifying this decision should be fully explained in the site WASH plan/strategy.

14. The immediate construction of one toilet shared between four families avoids the complications and costs that typically arise with communal facilities as families take responsibility for cleaning and maintenance themselves. If shared toilets are not constructed directly inside one of the family's plots then UNHCR and WASH actors should ensure that padlocks and keys are provided to ensure exclusive use with each household provided with at least two sets of keys.

The best guarantee that people will safely defecate in a toilet and that toilets are kept clean is to encourage the construction of shared or household toilets as quickly as possible.

Provision of tools and incentives to facilitate toilet construction

15. UNHCR and WASH actors should ensure that the refugee population have access to tools and technical support to construct, maintain and clean their own toilets from the outset of the refugee emergency. UNHCR and WASH actors should plan to provide one household toilet digging kit that is shared between every 8 families. The suggested contents of the kit can be found on **wash.unhcr.org**. In the cases where refugee families cannot provide their own, UNHCR and WASH actors may provide incentives such as toilet slabs and superstructure material to facilitate construction of household toilets. Dedicated staff for the household toilet programme should be recruited and mobilized as soon as is possible.

UNHCR and WASH actors should ensure that every household that wishes to construct their own toilet is able to access tools and technical support from the outset of the refugee emergency.

16. A report on the availability and uptake of household toilet construction materials and tools, household toilet progress rates, focus group discussion related to household toilets, in addition to strategies to increase uptake should be included in the site WASH plan/strategy.

Box: UNHCR toilet definitions

Household toilets are toilets used by a single household (including extended family) up to a maximum of 12 persons.

Shared toilets are single toilets that are shared between a maximum of 4 households. Shared toilets are often used as an emergency response intervention instead of constructing communal toilets. Shared toilets require that households are willing to share in the short-term.

Communal toilets are blocks of toilets shared by a group of households (typically 16 households under the UNHCR block and sector camp model).

Public toilets are toilets in public places such as markets, mosques or along main thoroughfares. There is generally less sense of 'ownership' with public toilets compared to communal toilets.



Toilet coverage targets

17. During the first eight (8) weeks of the emergency response, UNHCR and WASH actors should aim to provide either one toilet for every 50 persons, or better still, one toilet shared between eight (8) families. During the emergency phase (defined as "*the period up to six months after population movement has stabilised*" – see **page 6**) UNHCR and WASH actors should aim to provide at least one toilet for every 20 persons, or better still, one toilet shared between four families. Within one year, UNHCR and WASH actors should aim to ensure that every family have their own household toilet/bathing area. If it is clear that the refugee population will be displaced for at least six months it is often more productive to move directly to the provision of shared toilets and then household toilets.

18. Providing the large numbers of toilets required in refugee settings is challenging and often requires the use of extensive labour, mechanical plant and mass production of toilet slabs and superstructures. Progress towards toilet coverage targets should be tracked on a monthly basis and interventions should be scaled up if they fall behind target.

19. UNHCR and WASH actors should also ensure adequate coverage of gender segregated toilets in all public institutions including transit areas, reception areas, markets, clinics, schools and other public institutions. The box on the right describes toilet planning figures for public institutions.

Box: UNHCR toilet coverage targets for public institutions

	Short Term	Long Term
Feeding Centres	1:50 persons	1:20 persons
Transit Centres	1:50 persons	1:50 persons
Schools	1:30 girls 1:60 boys	1:30 girls 1:60 boys
Health facilities	1:20 beds 1:50 outpatient	1:10 beds 1:20 outpatient
Market Areas	1:50 stalls	1:20 stalls
Offices	1:20 staff	1:20 staff

Source: Adapted from SPHERE (2011)

Toilet planning based on disaggregated population data

20. It is UNHCR's experience that in many refugee contexts there are typically more women and children than men. This situation is particularly evident in conflict related settings where men may have remained behind to guard property or participate in the conflict. UNHCR and WASH actors should ensure that the planning of toilet facilities is based on disaggregated population data (see the box on the following page for a worked example). In addition, since many young children use the female toilet facilities with their mothers, and women generally visit the toilet more often and take longer, UNHCR and WASH actors should factor an additional ratio of three female toilets for every male toilet.,

21. Male urinals can be used to help reduce waiting times. Urinals have the advantage of lower costs and more efficient use of space compared to toilets. When


Oxfam

providing urinals, steps should be taken to discuss with beneficiaries the level of privacy that is acceptable for their use. Urinals should not be included when calculating toilet coverage figures.

Box: Toilet planning calculations based on disaggregated population data

As of 10th December 2013 there were 117,334 Syrian refugees in Za'atri Refugee Camp as follows:

Age	Male		Female	
0-4	11,499	9.8%	13,024	11.1%
5-11	11,851	10.1%	11,733	10.0%
12-17	9,035	7.7%	8,800	7.5%
18-59	20,533	17.5%	27,339	23.3%
60+	1,291	1.1%	2,229	1.9%
Totals	54,208	46.2%	63,126	53.8%

Calculate toilet coverage targets based on disaggregated data:

$$\#\text{ male cubicles} = \frac{N}{T} * \left[\frac{1}{\left(\left(\frac{F}{M}\right)*R\right)+1}\right]$$

$$\#\text{ female cubicles} = \frac{N}{T} * \left[1 - \left[\frac{1}{\left(\left(\frac{F}{M}\right)*R\right)+1}\right]\right]$$

Where…
N = total population
F = female population
M = male population
T = toilet coverage target (e.g. 1:20)
R = ratio male:female toilets (e.g. 1:3)
Therefore for Za'atri Refugee Camp…

$$\#\text{ male cubicles} = \frac{117{,}334}{20} * \left[\frac{1}{\left(\left(\frac{63{,}126}{54{,}208}\right)*3\right)+1}\right]$$

male cubicles = 1,306 toilet cubicles

$$\#\text{ female} = \frac{117{,}334}{20} * \left[1 - \left[\frac{1}{\left(\left(\frac{63{,}126}{54{,}208}\right)*3\right)+1}\right]\right]$$

female cubicles = 4,561 toilet cubicles

22. UNHCR and WASH actors should ensure that where communal toilet blocks are constructed they are always segregated according to sex and are clearly marked with culturally appropriate gender symbols and signage that are visible from 50m.



Figure 4-1 Signage, Oure Cassoni Camp

Evaluation of public health risks along the excreta management chain

23. UNHCR and WASH actors must ensure that excreta is stored, transported, treated, reused or disposed in a way that does not expose people to harmful pathogens, minimizes offensive odours in populated areas and minimizes the impact on the environment. Sanitary surveys (see **references**) should be carried out to assess public health risks to both the general public and sanitary workers (for example cleaners, technicians, maintenance staff, workers involved in desludging toilets, or excreta transportation) and formulate a plan of action. Copies of recent sanitary surveys should be included in the site WASH plan/strategy. Each step of the sanitation chain should be separately evaluated.

Excreta technology selection

Emergency phase technical options

24. UNHCR and WASH actors must ensure that there is swift provision of toilet facilities within the first few days of any refugee emergency.



25. Guidance for excreta technology selection can be found in the table and flowchart on the following page. These tools have been developed to provide options for refugee populations in camps, collective centres, abandoned buildings, occupying unused land, staying with host families or renting accommodation. They should be used as a starting point however the final decision should also take into account:

- Cultural considerations
  - Practices in the refugee population's location of origin.
  - Beneficiary preference.
  - Anal cleansing practice.
  - Willingness to share toilets.
  - Cultural taboos.
- Availability of water for flushing.
- Environmental conditions.
  - Hardness/rockiness of the soils.
  - Soil infiltration rates.
  - Ground water table distance.
  - Whether ground water is potable or non-potable (saline >1,500µScm^2)
  - Population density (rural / urban / peri-urban setting).
  - Available space for toilet construction.
- Permission from the land owner to build toilets.
- Availability of toilet construction materials.
- The presence of existing sanitation infrastructure such as sewer lines or treatment plants.
- Complicating factors such as hard ground, high water tables or flooding.
- National legislation concerning standards for sanitation and / or environmental pollution.

26. In general, the best emergency phase technical option if there are no complicating factors and no existing sanitation infrastructure is the construction of simple on-site systems such as trench latrines (see section 4.47) or simple VIP latrines (see section 4.64) organised either as communal blocks or better still, as individual units shared initially between four families. If there is a strong cultural preference for water based sanitation and there is sufficient water available (3-5 litres per person per day), and soil infiltration rates are favourable, then pour-flush toilets with septic tanks and drain fields should be considered (see section 4.74). In exceptional emergency situations, where there is no other option possible, it may be necessary to limit defecation to controlled locations away from water sources and below populated areas for a short period until improved facilities are constructed (see section 4.44).

The provision of basic excreta containment systems (for example pit latrines with reasonable privacy) is better than delayed provision of improved systems.

Upgrading emergency phase technical interventions

27. After the first few weeks of an emergency, the best excreta management strategy is often to upgrade and improve the infrastructure that was installed during the acute emergency, in addition to increasing coverage. Any temporary emergency

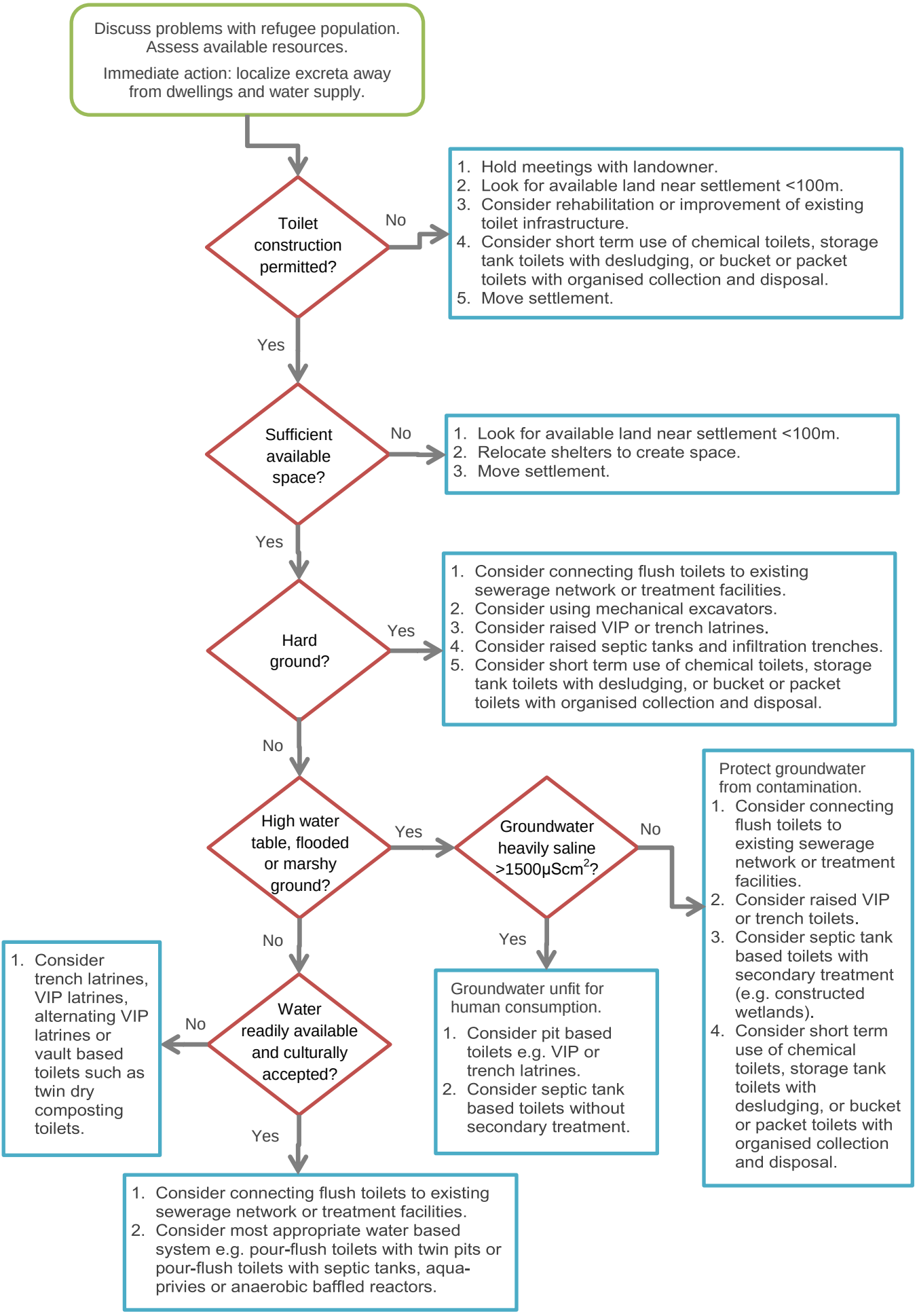
Box: Excreta management options for refugee population in camps, collective centres, abandoned buildings, occupying unused land, staying with host families or renting accommodation

	Excreta management technical option	Emergency 0-3 Months		Post-Emergency 3-6 Months		Maintenance 6 Months +	
		Urban	Rural	Urban	Rural	Urban	Rural
No additional complicating factors for toilet provision	1. Communal VIP or trench latrines	☆☆☆	☆☆☆	☆☆☆	☆☆☆		
	2. Communal alternating VIP latrines	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆	
	3. Communal flush toilets with on-site treatment (septic tanks and drain field / trench)		☆☆		☆☆		
	4. Communal flush toilets with on-site treatment (anaerobic baffled reactor)	☆☆		☆☆		☆☆	
	5. Communal flush toilets with off-site treatment (existing sewage works or stabilization ponds)	☆☆☆☆	☆☆☆	☆☆☆☆	☆☆☆	☆☆	
	6. Communal augured latrines	☆	☆				
	7. Communal chemical toilets with desludging	☆		☆			
	8. Communal defecation fields		☆				
	9. Communal flush toilets & on-site biogas digestion						☆
	10. Communal vault toilets with off-site co-composting						☆
	11. Communal vault toilets with off-site landfill						☆
	12. Household or shared alternating VIP latrines	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆
	13. Household or shared VIP latrines	☆☆☆	☆☆☆	☆☆☆	☆☆☆	☆☆☆	☆☆☆
	14. Household or shared simple pit latrines	☆☆	☆☆	☆	☆	☆	☆
	15. Household or shared flush toilets with on-site treatment (septic tanks and drain field / trench)				☆☆☆		☆
	16. Household / shared flush toilets & on-site treatment (anaerobic baffled reactor)			☆☆☆		☆☆☆	
	17. Household or shared flush toilets with off-site treatment (connection to existing sewer network)	☆☆☆☆	☆☆☆	☆☆☆☆	☆☆☆	☆☆☆☆	☆☆☆
	18. Household or shared twin pit dry composting toilets					☆☆☆	☆☆☆
Hard ground, floods, high water tables[2]	1. Communal raised VIP or raised trench latrines	☆☆☆	☆☆☆	☆☆☆	☆☆☆		
	2. Communal flush toilets with off-site treatment (connection to existing sewer network)	☆☆☆	☆☆☆	☆☆☆	☆☆☆		
	3. Communal flush toilets with raised on-site treatment (anaerobic baffled reactor & wetlands)	☆☆		☆☆			
	4. Communal chemical toilets with desludging	☆		☆			
	5. Communal storage tank toilets with desludging	☆		☆			
	6. Household or shared raised alternating VIP latrines	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆
	7. Household or shared raised VIP latrines	☆☆☆	☆☆☆	☆☆☆	☆☆☆	☆☆☆	☆☆☆
	8. Household or shared flush toilets with raised on-site treatment (ABR & constructed wetlands)	☆☆		☆☆		☆☆	
	9. Household or shared flush toilets with off-site treatment (connection to existing sewer network)	☆☆☆☆	☆☆☆	☆☆☆☆	☆☆☆	☆☆☆☆	☆☆☆
	10. Household or shared twin pit dry composting toilets					☆☆☆	☆☆☆
	11. Household bucket or packet toilets with off-site co-composting						☆
	12. Household bucket or packet toilets with off-site landfill disposal						☆
Lack of permission	1. Negotiate with landowner for new toilet facilities	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆
	2. Rehabilitate any existing sanitation facilities	☆☆☆	☆☆☆	☆☆☆	☆☆☆	☆☆☆	☆☆☆
	3. Find vacant land <100m from camp	☆☆☆	☆☆☆	☆☆☆	☆☆☆	☆☆☆	☆☆☆
	4. Communal chemical toilets with desludging	☆		☆			
	5. Communal storage tank toilets with desludging	☆		☆			
	6. Household or shared twin pit dry composting toilets					☆☆☆	☆☆☆
	7. Household bucket or packet toilets with off-site co-composting						☆
	8. Household bucket or packet toilets with off-site landfill disposal						☆
Lack space	1. Relocated shelters to create space	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆
	2. Find vacant land <100m from site	☆☆☆	☆☆☆	☆☆☆	☆☆☆	☆☆☆	☆☆☆
	3. Household bucket or packet toilets with off-site co-composting						☆
	4. Household bucket or packet toilets with off-site landfill disposal						☆

Note 1. This table attempts to summarize the most common excreta management technical options for refugee populations, however, the user must also take into consideration any additional cultural, environmental, geographical, technological and legal factors. Detailed description of each of the technological options, along with any advantages and disadvantages can be found in the following pages.

Note 2. Options for high water tables should only be followed where groundwater is potable. If the groundwater is saline (<1,500 μScm^{2}), then conventional pit based options may be considered in the short term.

Figure 4-2 Toilet selection tool for refugee settings



superstructures built using plastic sheeting may be upgraded to more durable designs for example using galvanized iron sheeting, wooden planks, wooden panels, bricks or concrete. If it is clear that the population will be displaced for at least six months, then UNHCR and WASH actors should start to reflect on the best ways to support refugees with the construction of household toilets, and how to smoothly transition out of the use of communal toilet facilities.

Temporary systems, to meet the most immediate needs, will have to be improved or replaced by others as soon as possible, in order to maintain adequate standards.

Post emergency phase technical options

28. UNHCR has found that the average length of time that contracted refugee situations last is up to 17 years. Therefore, if it is clear that the population will be displaced for more than six months UNHCR and WASH actors should completely phase out communal WASH facilities and ensure that every household has access to their own toilet and bathing area (or in high density urban settings, where there is insufficient space, a toilet shared with immediate neighbours if acceptable). Post emergency phase household toilet designs should be based on national guidelines, locally available materials and designs that are functional and durable, yet economical.

Technical considerations for high water table or flooded environments

29. High water tables or flooded environments add additional challenges to toilet provision. High water tables and floods can inundate existing toilet pits and allow faecal pathogens to directly contaminate the flooded environment. If the site is in a coastal region where the groundwater is saline or otherwise unfit for human consumption (i.e. has a TDS of >1500µScm^2) then conventional pit and trench based sanitation options may be considered. Otherwise, UNHCR and WASH actors must ensure that excreta management systems in high water table or flooded environments do not contaminate ground or surface waters. Generally, the best emergency phase technical option for high water table and flooded environments (if there is no existing sanitation infrastructure to connect to such as existing sewer pipes or treatment facilities) is the construction of simple raised latrines. If there is a strong cultural preference for water based sanitation then pour flush toilets with septic tanks may be constructed either directly above aqua privys (**see section 4.77**), storage tank toilets (**see section 4.58**) or connected to septic tanks (**see section 4.77**).

30. Care should be taken in high water table environments to ensure that any new sealed vault based systems do not float out of the ground (i.e. they are designed with an anti-floatation collar) and they are not at risk of inundation (the

top of any septic tank should be at least 0.5m above the highest annual recorded ground water level). The base of any infiltration or evapotranspiration systems should either be sealed or raised at least 1.5m above the highest annual ground water level. In totally flooded environments, or environments where the ground water table is very close to the ground surface, the use of raised sealed desludgable storage tank toilets (**see section 4.58**), chemical toilets (**see section 4.51**), or bucket and packet toilets (**see section 4.54**) may be considered. All of these systems require well managed collection and disposal systems and should only be considered as a short-term solution during the emergency phase.

Technical considerations for hard ground conditions

31. Hard, rocky, or frozen ground may render the construction of toilet pits impossible. Hard ground typically also has poor soil infiltration characteristics which can complicate toilet designs that rely on infiltration of liquids. In hard ground conditions the easiest solution may be to connect up to any existing sanitary infrastructure. If no existing sanitation infrastructure is available, heavy plant (mechanical excavators or rock breaking equipment such as pneumatic hammers) may be required to break through the hard ground and allow construction of traditional pit or vault based systems. If this is impractical or unfeasible, then the next best solution may be to excavate pits as deep as is possible into the hard ground and then construct raised vault based systems upwards and out of the ground. Vault sizes may be required that are wider than usual to create sufficient volume without creating structures that are too high off the ground. Both raised VIP latrines (**see section 4.67**) and raised composting toilets (**see section 4.99**) are appropriate if the population has a preference for dry systems. If there is a strong cultural preference for water based systems then care should be taken to ensure that the ground has sufficient capacity to absorb any liquid effluents see (**references** for soil percolation tests). If the ground has no infiltration capacity then the best solution may be either to use dry toilet options, or move to more complicated solutions involving either the movement of excreta for example desludgable storage tank toilets (**see section 4.58)**, chemical toilets (**see section 4.51)**, or bucket and packet toilets (**see section 4.54**) or the construction of onsite treatment systems for example septic tanks with constructed wetlands (**see sections 4.77** and **4.114)**, or waste stabilization ponds (**see section 4.112**).

Technical considerations for urban environments

32. Urban environments can present problems numerous problems for emergency excreta management as there may be problems with insufficient space for toilet facilities, land ownership issues, hard (concrete) ground, or environmental restrictions limiting pit based toilet options. During any emergency, the easiest option may be to set up temporary toilets that

connect to existing sanitation infrastructure (sewer pipes, treatment facilities). If space is available, the ground can be excavated, and there are no issues with elevated groundwater levels, it may be possible to construct either trench latrines (**see section 4.47**), simple VIP latrines (**see section 4.64**), or if water is available and preferred - simple pour-flush toilets with septic tanks (**see section 4.74**). If the construction toilet facilities is not possible then it may be possible to upgrade and extend any existing toilet facilities (within 100m) of the site. If all of these options are not possible then a final solution may options based on excreta transportation including chemical toilets (**see section 4.51**), raised storage tank toilets (**see section 4.58**), bucket toilets, or packet toilets (**see section 4.54**). All of these last options require well managed systems of collection, treatment and disposal and should only be used in exceptional circumstances for the short-term.

33. During the post-emergency phase, excreta management solutions should be selected based on existing local urban planning guidance and legislation which typically aims to reduce the impact of sanitation infrastructure on groundwater supplies. If no local legislation exists, then a solution should be found based on local knowledge and preference which may include shared of communal desludgable VIP toilets (**see section 4.69**). Alternatively, If there is a strong cultural preference for water based sanitation the most economic solution is to size septic tanks or anaerobic baffled reactors (ABRs) at the residential block level with individual connections. Septic tanks or ABRs have the added advantage of being able to treat greywater from bathing and laundering activities.

34. In many urban settings refugees end up renting or living with host families. In these cases, UNHCR and WASH actors may consider including sanitation upgrades as part of the host-family assistance package. In addition, UNHCR and WASH actors may also be able to work with urban policymakers so that tenants are able to install toilet facilities in rental properties with the cost of improvements being subtracted from rent payments.

Technical considerations for cold climates

35. Recent emergencies in Afghanistan, Bosnia, Chechnya, Georgia, Northern Iraq, Syria and Eastern Ukraine have revealed the importance of guidance for excreta management systems in cold climates. Cold climates add a host of additional complications including freezing of water and excreta, problems related to excavating frozen ground, and slowing down of biological processes in septic tanks. In general, the choice of excreta management technology should be guided by local practice and expertise however, generally simple pit based excreta management options should be considered as they avoid the problems of freezing water pipes. If excavation of pits is not possible due to hard frozen ground then the excreta management solutions for

hard ground situations (see section 4.31) such as chemical toilets (see section 4.51), raised storage tank toilets (see section 4.58), or bucket toilets or packet toilets (see section 4.54) may be considered for short durations. If there is a strong cultural preference for water based systems then they should be heavily protected with lagging and possibly passive heating options such as electrical resistivity wire. Defecating in sub-zero conditions can be unpleasant and toilet facilities may be combined with shower facilities with minimal heating and insulation to ensure that they are comfortable for use.

Design life-spans for excreta management systems

36. All communal toilets should be phased out within the first year and should therefore be sized for one year of use (plus a safety factor). Public toilets at clinics, schools and market areas are likely to be used for the duration of the refugee emergency and should be sized for at least five to size years. Household toilets should also be sized for five to six years unless an alternating design is being used and therefore each pit should be sized for two years. The exact dimensions of the chosen system will typically depend upon the number of users (see section 4.19) and the anal cleaning method (see box below for typical sludge accumulation rates). Pit based designs should allow for at least 0.5m of soil covering for decommissioning. It should be noted that accumulation of non-degradable anal cleaning materials can seriously affect the useful life.

Box: Typical toilet sludge accumulation rates

Scenario	SAR
Water based and degradable anal cleaning materials	0.04 m^3 per pers per yr
Water based and non-degradable anal cleaning materials	0.06 m^3 per pers per yr
Dry conditions and degradable anal cleaning materials	0.06 m^3 per pers per yr
Dry conditions and non-degradable anal cleaning materials	0.09 m^3 per pers per yr

Note: Where excreta is stored for shorter periods, such as in alternating pit latrines or composting toilets it is recommended to use the SAR x 2.

Source: Franceys, Pickford & Reed (1992) '*Guide to the development of on-site sanitation*'. World Health Organization, Geneva.

Ensuring toilet construction quality

37. UNHCR and WASH actors should ensure that all toilets are built to a high standard that fully contains excreta and ensures the physical safety of all users. Detailed UNHCR technical guidelines can be found on **wash.unhcr.org**. The following guidance can be found:

- Guidelines for the prevention of surface or ground water contamination
- Guidelines for pit reinforcement
- Guidelines for toilet slab strength
- Guidelines for the use of plastic sheeting in communal toilet construction
- Guidelines for toilet doors
- Guidelines for communal toilet privacy walls
- Guidelines for vector control measures for toilets
- Guidelines for protection of toilets from rain and stormwater
- Guidelines for additional WASH block accessories

- Guidelines for the collection and management of anal cleansing and women's sanitary materials
- Material specifications of common toilet construction materials

Household toilet construction

38. UNHCR and WASH actors should ensure that households are supported to build toilets to a high standard of quality. In many household toilet construction programmes it is typical for UNHCR to support households through the provision of tools, limited construction materials and technical support. Care should be taken to ensure that the refugee population fully understand the technical and programmatic details of the household toilet programme. If the refugee population are required to construct a part of the toilet structure themselves, a full package of technical assistance and capacity building should be budgeted.



Figure 4-3 Mozambican style domed slabs

39. The use of household toilets with reinforced concrete domed toilet slabs (Mozambican style) and double alternate pits is highly recommended in many contexts (see designs on **wash.unhcr.org**). Concrete toilet slabs can weigh as much as 320 kgs therefore it is highly recommended that round slabs are cast that can be easily manoeuvred on their sides. It is also highly recommended that round pits are constructed (in conjunction with the round slabs) as they have greater stability in softer soils. Wooden moulds can be used to make smooth surfaced concrete slabs without corners to facilitate cleaning. Complex moulds can even be used to fabricate foot rests or pour-flush bowls. In general, mass-production should be used to ensure a consistent quality and ramp up availability.

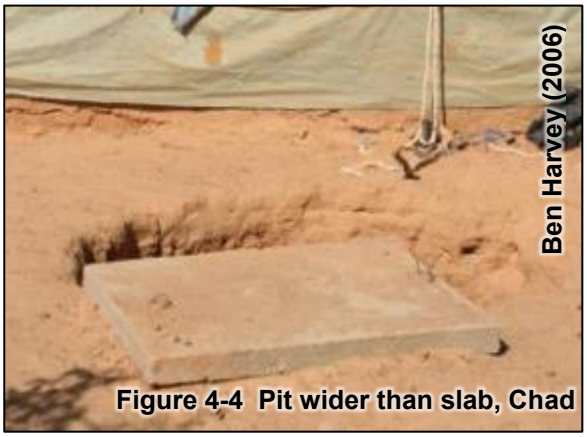


Figure 4-4 Pit wider than slab, Chad

Excreta management programmes for host communities

40. An environment free from human excreta is among the primary public health priorities for refugee settings. However, in many settings it may be the case after a period of time that the sanitation coverage of the refugees is significantly greater than the local host population around the camp. If this is the case, UNHCR and WASH actors should work with national development actors and on-going sanitation initiatives to ensure that the host community is also able to benefit from the health

gains that come from improved sanitation.

41. In areas where the refugee population are living amongst the host population (for example in urban refugee settings) it is possible that the presence of large numbers of refugees over-burden sanitation service providers or may increase the presence of open defecation. Working with municipal service providers to make sanitation improvements and upgrades may able to benefit both the refugee and host populations equally.

Community led total sanitation

42. Community-led total sanitation (CLTS) is a methodology for mobilising communities to eliminate open defecation in their environment themselves. During CLTS, a facilitator takes the community through 10 steps (see box below). At the heart of CLTS lie two core philosophies. The first is prohibition of any form of sanitation subsidy in an effort to avoid dependence. The second is that as long as even a minority of people continues to practice open defecation, everyone in the community is at risk of disease.

43. CLTS should not be used during the emergency or post emergency phases, however CLTS may be appropriate for host or refugee populations in some long-term refugee settings especially if there is evidence that the approach has already been successful. WASH actors embarking on CLTS type activities should take appropriate steps as recent studies have noted that people in extremely vulnerable situations have difficulties participating and may be unfairly stigmatized by the process. In addition, evidence has shown that despite a zero subsidy approach, CLTS programming costs can still be high due to the expenses related to social mobilization and follow up.

Box: The steps of community led total sanitation (CLTS)

Step 1: The community discuss the impacts of open defecation with an external facilitator.

Step 2: Together, they visit sites of open defecation.

Step 3: The community maps out the areas of open defecation, by drawing a map.

Step 4: The community works out how much excreta they produce in total. On average, one house generates over one metric tonne of faeces per year. Without latrines, this waste is spread everywhere, which makes people ill.

Step 5: The community draws up an action plan to tackle the situation.

Step 6: Health and Hygiene education sessions are carried out.

Step 7: The facilitator and community work out an action plan.

Step 8: Construction of latrines begins. Members of the community who are not participating in the new behaviour are shamed, for example by putting flags in outdoor faeces, or by issuing a fine.

Step 9: Latrines are now available to everyone and hygiene education continues.

Step 10: The community is awarded defecation free status and a sign is erected at the community entrance.

Source: Ten steps to total sanitation (WaterAid, 2012)

Excreta management technical options

Defecation fields

44. A defecation field is an area of land allocated divided into strips around 1.5m wide and 20m long (see figures below). During operation, users are guided into the active area using a system of ropes, or other appropriate markings, beginning with strips farthest from the entrance. If time and resources are available the defecation field should be improved by excavating shallow trenches up to 20cm deep to allow excreta to be covered with soil. In addition, a privacy screen of plastic sheeting should be established around the strip in use. When the strip has been used up, it should be safely covered with soil and a new strip opened. Land used for defecation fields should be downstream from the site and away from any water sources. The defecation field should also slope away from the refugee site. . Defecation strips should be arranged to follow the natural contour of the plot. If necessary, a shallow diversion trench should be excavated above the field to prevent any surface water running onto it. If resources are available a thorny fence should also be put around the area to discourage animals or people walking directly through the field and spreading excreta into the camp. There should always be completely separate defecation fields established for men and for women. To encourage use, defecation fields should be within walking distance.

45. UNHCR and WASH actors should ensure that at least one attendant is assigned to ensure facilities are used correctly. Functional hand-washing facilities must be installed at the defecation field exit and users should be encouraged to use them. Users should cover their excreta with ash, lime or soil to prevent the breeding of flies and reduce odours. If the users do not cover their faeces then the attendants should do it for them. Users may need to be provided with anal cleansing material or water if they cannot be reasonably expected to provide their own.

Wherever possible, avoid the use of defecation fields. Operating defecation fields beyond several weeks is not advisable.

46. The major advantage of defecation fields is that they can very quickly provide excreta control in a very short period of time. Their major disadvantage is that they are a very short term emergency solution with a limited lifespan, little privacy and dignity and they require a large amount of space (plan for 0.25m^2 per person per day). Defecation fields should only be used in exceptional circumstances.

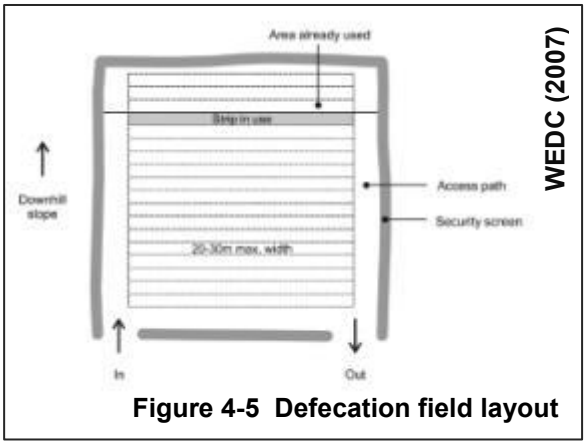


Figure 4-5 Defecation field layout

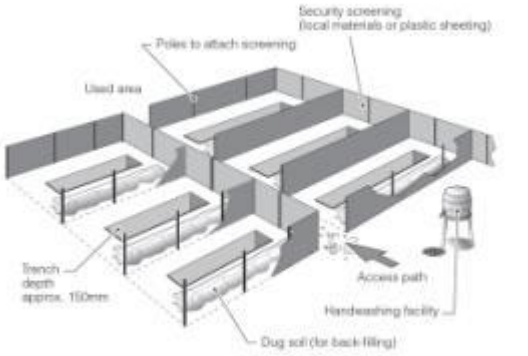


Figure 4-6 Defecation field layout

Trench latrines

47. Trench toilets consist of a long trench of up to a maximum of 6 cubicles long on top of which the 1.2m x 0.8m interagency standard plastic toilet slabs are placed. If interagency standard plastic emergency toilet slabs are not available, slabs can be constructed from a variety of materials including wooden planks, wooden poles or reinforced concrete. Trenches should always be protected from surface water and trench walls may need shoring up in soft soils to prevent pit collapse. Emergency trench latrines may also be used in some contexts with pour-flush toilets, in which case the best configuration is an offset configuration with the trench behind the privacy structure. In this case, the interagency plastic emergency toilet slab may be adapted by attaching a pour-flush toilet bowl adapter to the underside.

Trench toilets should be dug 1.8 to 2.2m deep and 90cm wide to accommodate an interagency standard plastic toilet slab (1.2m x 0.8m).

48. The trench latrine superstructure is typically made from plastic sheeting arranged over a wooden frame. Wooden frames can be constructed in-situ, however a faster approach is to mass produce panels in a dedicated facility and assemble them on-site. Panels should be bolted together so they can easily be moved at a later date. Flat wooden toilet superstructure panels may also be stored as an emergency contingency stock for future emergencies or influxes. If available, local materials such as grass matting, cloth, wood planks or boards, or galvanized iron roof sheeting may be used as an alternative covering to plastic sheeting. Good quality wooden framed superstructures allow a degree of upgrading of the latrine to be planned at a later stage.

Box: Calculating the useful life of existing trench latrines

Two months after an emergency it has been calculated that there is one toilet cubicle available for every 67 persons. What is the useful life of the existing communal trench latrine facilities?

The equation for pit sizing is as follows

Pit volume (V) = N x P x R

where

N = the effective life of the pit (years)
P = the average number of daily users
R = sludge accumulation rate (m^3 / yr)

Rearranging for the life of the pit gives

Pit life (N) = V / (P x R)

In our case, the volume (V) of one communal trench latrine block can be calculated by multiplying the pit length by the width by the depth (m). Allowing an additional 0.5m of the depth for backfilling gives us..

Pit vol. = length x width x (depth – 0.5m)
Pit vol. = 3.95m x 0.9m x (2.5m – 0.5m)

Pit volume = 7.11 m^3

The average number of daily users (P) for

the latrine can be calculated as..

Average daily users (P) = T x S

where

T = current toilet coverage (e.g. 1:67)
S = number of toilet cubicles

therefore

P = 67 x 5 = 335 users per day

Assuming non-degradable anal cleansing materials gives a sludge accumulation rate of 0.09m^3 per person per year (**see section 4.36**). It follows that

Pit life (N) = V / (P x R)
Pit life (N) = 7.11 / (335 users x 0.09m^3/yr)
Pit life (N) = 0.24 years = 3 months

In conclusion, if there is an average toilet coverage of 67 persons per cubicle the emergency trench latrine facilities will only last for a period of three months before they are full and require decommissioning.

49. Management of communal trench latrines is dependent upon the capacities of the refugee population. However, latrine attendants are typically required to ensure they are kept clean and functional (day and night). If trench latrines are constructed it is better to install a large number of small facilities than a small number of large facilities. Typically one unit for every 16 families (i.e. one community) is a good target. When the trench latrine is filled to within 50 cm of the top, it must be properly decommissioned by covering with soil and compacted.

50. The advantages of trench latrines are that they can be installed relatively quickly, especially if mechanical excavators are readily available and superstructure panels and plastic interagency squatting slabs have been stored as contingency stock. Their main disadvantage is common to most communal sanitation facilities in that they often require intensive supervision to ensure they are kept in a clean and functional condition. Trench latrines are a good short term excreta management solution that are readable upgradable and can be used in most settings where there are no complicating factors (hard ground, high water tables and floods) and the population does not want to go straight to shared facilities between four families. Trench latrines should not be used in refugee settings beyond six months. A bill of quantities and detailed technical design can be found on **wash.unhcr.org**



Figure 4-7 Trench latrines, Pakistan Quake

Chemical toilets

51. Chemical toilets consist of a pre-fabricated toilet unit, typically made from high density plastic, with a water tight vault, which is used to store excreta and urine. The vault usually contains a blue coloured chemical which breaks down the excreta and reduces smells. Chemical toilets were used with varying success during the Haiti earthquake of 2010 and for Syrian refugees in Turkey in 2013.

52. The effective management of chemical toilets is heavily dependent upon the quality, availability and capacity of specialised desludging services. Typically toilet rental, desludging, cubicle cleaning, topping up of toilet paper and deodorizing comes as part of a contracted service package with a daily charge based on the number of units being rented. It should be noted that the service package does not usually include the provision of handwashing water and supplies and this may needs to be negotiated or arranged separately. Alternatively, chemical toilets may be procured and serviced directly by the WASH agency although this option is prohibitively expensive requiring the purchase or leasing of dedicated desludging vehicles and service crews.

53. The advantage of chemical toilets is that if they can often be mobilized rapidly, especially if contracts have been pre-negotiated or chemical toilets are included in contingency stocks. Chemical toilets are also suitable for short-term use in complex environments including high water tables, floods (provided units are accessible by desludging trucks), hard ground, urban settings, or sites where the land owner has not permitted toilet construction. Their main disadvantage is that they require daily desludging which if not carried out safely can pose significant risks to the population, staff or the environment. In addition a safe final disposal site must be identified (sewer, waste treatment plant, waste stabilization ponds, lagoons). Another disadvantage is that chemical toilets can only be located in areas that are accessible by desludging trucks. Toilets must also be positioned on a perfectly flat ground to avoid tipping over. It is important to note that desludging operations are usually extremely costly and a clear exit strategy should be sought from the start. Due to their high costs and complexity, UNHCR and WASH actors should only consider chemical toilets as a very short-term, last resort option in urban, hard ground, or high water table contexts where no other option is suitable.



Figure 4-8 Chemical toilets, Turkey



Figure 4-9 Chemical toilets, Haiti

Bucket toilets and packet toilets

54. Bucket toilets consist of a storage container (typically a standard 15 – 20 litre bucket, although larger systems have been managed successfully using 200 litre wheelie bins) with some form of seat that is either attached directly to the bucket or is part of a separate

privacy structure. Packet toilets consist of a strong cardboard box type seat structure around which is placed a bio-degradable plastic sack into which the user defecates – typically within their own home.



Figure 4-10 Household bucket toilet



Figure 4-11 Communal bucket toilet

55. When full, bucket toilets can either be managed at the household level (through disposal into a pit or composting system) or at the centralized level. One effective method of managing the collection of bucket toilets is through a swop system using fully sealed plastic drums. Partially full drums are sealed (typically with a plastic screw lid) and are exchanged for cleaned, disinfected, empty drums. The partially full drums are loaded onto a pickup truck and taken to a centralized facility for treatment (see section 4.107 on co-composting) or disposal.

56. The collection of used packet toilets (excreta contained in biodegradable plastic sacks) may be organized through centralized collection. In extreme cases, biodegradable plastic sacks containing excreta may be disposed with solid waste, however mixing of waste streams is generally considered bad practice and should not be used beyond the initial few weeks of the emergency response (see section 4.121 for guidelines on short-term landfill disposal of excreta).



Figure 4-12 Packet toilet, Haiti

57. The main advantage of both bucket and packet toilets is that they can often be mobilized rapidly if they have been included in contingency stocks. They are also suitable for short-term use in environments with high water tables, floods, hard ground, urban settings, or sites where the land owner has not permitted toilet construction. Their main disadvantage is that they need systems of safe, well organised daily collection and disposal. In addition, many cultures may find it degrading to have to defecate into a bucket or plastic bag, especially within their own shelter. Therefore

UNHCR recommends that bucket or packet toilets should not be used beyond the initial weeks during an emergency response.

Storage tank toilets

58. Storage tank toilets use large volume waterproof tanks to contain excreta. A reinforced raised superstructure with a platform is installed so that users can defecate directly (or indirectly) into the tank. The desludging period can be anything from weeks to several months depending upon use. Storage tank toilets are usually managed in the same way as communal trench toilets or communal VIP toilets with a mechanism that is dependent upon the capacities of the refugee population. Where there is a lack of social cohesion, UNHCR and WASH actors may need to ensure that latrine attendants are engaged to ensure the facilities are kept clean and functional (day and night).

59. The advantages of storage tank toilets is that they can be quickly installed for short term use in environments with high water tables, floods, hard ground, urban settings, or sites where the land owner has not permitted toilet construction. In addition, large HDPE “polytanks” are usually available in many settings on the local market. Their main disadvantage is similar to chemical toilets in that they require frequent desludging operations which if not carried out correctly may impose health risks on the population, sanitary workers and the environment.



Figure 4-13 Storage tank toilets

60. If storage tank toilets are deployed then a safe final disposal site for the excreta must be used (sewer, waste treatment plant, waste stabilization ponds, lagoons). In addition, storage tank toilets should be located in areas that are easily accessible by desludging trucks. Care should also be taken to ensure separate collection of items (women’s sanitary materials, plastic bags etc.) that may block or damage the desluding equipment. Finally, it is important to note that desluding operations are costly and a clear exit strategy should be sought from the start. Storage tank toilets should only be used in exceptional circumstances in high groundwater, flood, hard ground or sites where permanent toilet construction is not permitted. A detailed design and bill of quantity for a raised communal storage tank toilet can be found on **wash.unhcr.org**.

Box: Calculating the desludging frequency of storage tank toilets

During an emergency response, an agency has constructed communal storage tank toilets with a volume of $2m^3$. Each unit has two cubicles and the toilet coverage is currently one cubicle for 126 people. Toilet paper is used for anal cleansing. How many days will these facilities last before they need desludging?

The basic equation for vault sizing is

Volume (V) = N x P x R

where

N = the desludging period (years)
P = the average number of daily users
R = sludge accumulation rate (m^3 / yr)

Rearranging for the desludge period gives

Desludge period (N) = V / (P x R)

The average number of daily users (P) for the toilet block can be calculated as..

Average number of daily users (P) = T x S

where

T = current toilet coverage (e.g. 1:126)
S = no. of toilet cubicles per block (e.g. 2)

therefore

P = 126 x 2 = 252 users per day

A sludge accumulation rate of $0.06m^3$ per person per year has been selected for wet conditions with degradable anal cleansing materials (see section 4.36). Excreta storage is of short duration so the rate has been doubled. It follows that

Desludge period (N) = V / (P x R)
Desludge period (N) = $2m^3$ / (252 x 0.12)
Desluge (N) = 0.066 years = 24 days

In conclusion, if there is an average toilet coverage of 126 persons per cubicle the storage tank toilets will need desludging approximately every 24 days.

Simple pit latrines

61. Simple pit latrines consist of a pit, a slab support structure, a squatting slab and a privacy shelter. In refugee, settings, simple pit latrines may be shared between families or may be constructed as communal blocks.

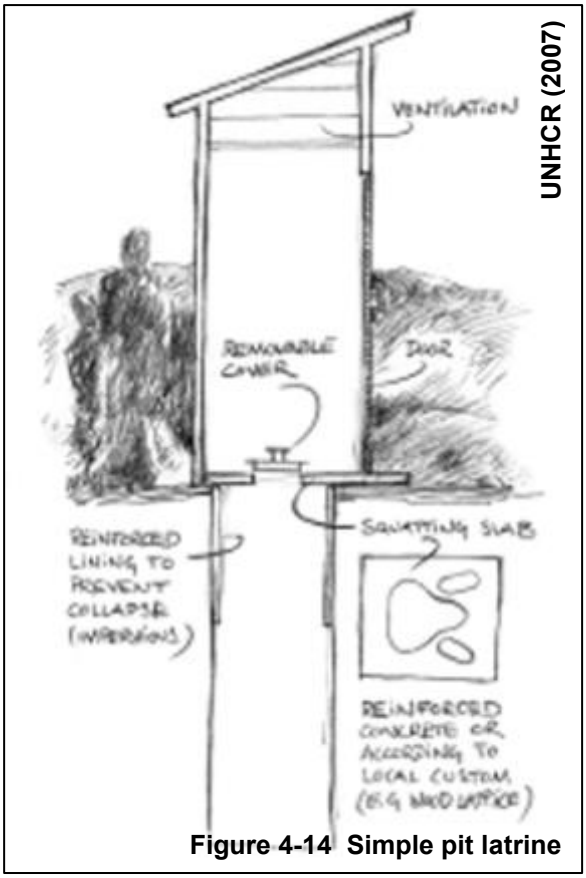


Figure 4-14 Simple pit latrine

62. Communal pit latrines are usually managed in the same way as communal trench toilets or communal VIP toilets with an approach that depends upon the level of social cohesion within the community and possibly a dedicated toilet attendant. If simple pit latrines are allocated on a household or shared basis the owners are typically responsible for any operation, maintenance and cleaning activities.

63. The advantage of simple pit latrines is that they are relatively cheap and quick to construct. Their disadvantage is that they cannot be used in high water table, hard ground and flooded situations and they are prone to problems with smells and fly infestation. These problems can be partially overcome through the use of a tightly fitting squat hole cover, however in all cases it is much better to upgrade all simple pit

latrines into the ventilated improved pit (VIP) latrine design as soon as possible. A detailed technical design and bill of quantities for a simple pit latrine can be found on **wash.unhcr.org**.

In all situations, UNHCR and WASH actors should use the ventilated improved pit latrine design over the simple pit latrine design. Any existing simple pit latrines must be upgraded as soon as possible.

Ventilated improved pit (VIP) latrines

64. The ventilated improved pit (VIP) latrine design overcomes the problems of smells and fly infestation typically encountered with simple pit latrines through the addition of a black exterior vent pipe, a darkened privacy shelter, and gauze mesh covering the vent pipe exit. The VIP latrine's advantage is that bad smells are drawn out of the toilet cubicle and up and out of the vent pipe by a combination of solar heating within the vent pipe and suction as wind passes over the top of the vent pipe. It is recommended that the vent pipe is at least 15 cm in diameter, is a dark colour, and extends at least 0.5 metres above the superstructure roof to maximize the suction effect. The vent pipe should be installed on the sunny side of the toilet for maximum convection and insect control. A lack of smells coming from the toilet interior reduces fly infestation. The interior of the toilet cubicle is kept darkened to trap flies in the latrine vault. Any flies that enter the vault are attracted to daylight shining down the vent pipe and become trapped by the vent pipe's metal fly-screen. The toilet cubicle does not have to be so dark as to deter use. A simple spring loaded door may be sufficient to keep the cubicle interior shaded most of the time.

Box: Household VIP pit latrine sizing calculation

Sizing calculation for a dry circular household VIP pit latrine with a design life of 5 years.

Pit volume (V) = N x P x R

where

N = design life of the pit (e.g. 5 years)
P = number of daily users (e.g. 6 persons)
R = sludge accumulation rate (m^3 / year)
Assuming degradable anal cleansing materials are used gives a sludge accumulation rate of $0.06m^3$ per person per year (**see section 4.36**).

It follows that

Pit volume (V) = 5 x 6 x 0.06 m^3 per year
Pit volume (V) = 1.8 m^3

Assuming a circular slab of diameter 1.5m is used with a circular pit of diameter 1.0m.

Pit vol. (V) = (π x $radius^2$) x pit depth (D)

Rearranging gives

Pit depth (D) = volume / (π x $radius^2$)
Pit depth (D) = 1.8 m^3 / (π x 0.55 x 0.55)
Pit depth (D) = 1.9 m

Allowing 0.5 m soil for decommissioning gives a total design depth of 2.4 m.

65. Communal VIP latrines are usually managed in the same way as communal trench toilets or communal storage tank toilets. If VIP latrines are allocated on a household or shared basis the owners are typically responsible for any operation, maintenance and cleaning activities.

66. The main advantage of the VIP latrine is that it overcomes the typical problems of flies and smells associated with simple pit latrines and trench latrines. The main disadvantage is that the design is not suitable for high water tables,

flooded environments, hard ground, or high density urban settings. In addition, the design is a little more complex than the standard simple pit latrine and the subtle improvements are often misunderstood and poorly implemented. In addition, the darkened interior can deter use, particularly for small children. A detailed technical design and bill of quantities for both household and communal VIP latrines can be found on **wash.unhcr.org**.

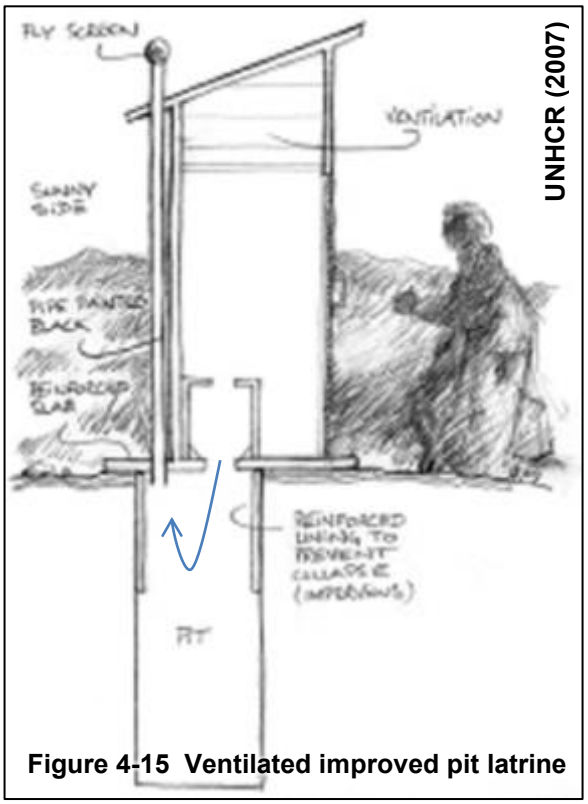


Figure 4-15 Ventilated improved pit latrine

Raised pit latrines

67. In some cases it may be difficult to excavate into hard ground, or water tables may be high, and the best excreta management solution may be to use a standard pit latrine design excavated as far as possible into the hard ground, and then extending the vault structure out of the ground. The vault will typically require additional lining material such as bricks, blocks, or tamped earth. Communal raised latrines are usually managed in the same way as communal trench toilets or communal VIP toilets. If raised latrines are allocated on a household or shared basis the owners are typically responsible for any operation, maintenance and cleaning activities. Raised pit latrines should be upgraded to the raised VIP type wherever possible.

68. The advantage of raised latrines is that the design can be used in hard (rocky) ground and contexts where the ground water table is high. Their main disadvantage is that building the latrine pit up and out of the ground requires more construction materials, greater skills on the part of the technician, and generally increased costs. Care also needs to be taken to ensure the bottom of the pit is still at least 1.5m from the groundwater table to allow sufficient distance for pathogens to be destroyed. Care should be taken if raised latrines are constructed on hard ground to ensure there is insufficient infiltration capacity. A detailed technical design and bill of quantities for a raised pit latrine can be found on **wash.unhcr.org**.

Box: Calculating the required size of raised VIP latrines

During an emergency response, a refugee settlement has been designated on volcanic rock with a thin soil covering of 60cm. An agency wants to install raised communal VIP toilets with 4 cubicles per block. A decision has been made that these should be no more than 1m high above the ground. How big do these facilities need to be to ensure adequate storage for two years?

The basic equation for vault sizing is

Pit volume (V) = N x P x R

where

N = the effective life of the pit (i.e. 2 yrs)
P = the average number of daily users
R = sludge accumulation rate (m³ per yr)

The average number of daily users (P) for the toilet block can be calculated as..

Average number of daily users (P) = T x S

where

T = the design toilet coverage (e.g. 1:20)
S = number of toilet cubicles (e.g. 4)

therefore

P = 20 x 4 = 80 users per day

A sludge accumulation rate of 0.06m^3 per person per year has been selected for dry conditions with degradable anal cleansing materials.

It follows that

Pit volume (V) = N x P x R
Pit volume (V) = 2 yrs x 80 x 0.06 m^3/yr
Pit volume (V) = 9.6 m^3

Assuming a total length of 3.65 m (4 cubicles) and a design depth of 1.6 m (1m above ground and 0.6m below ground)..

Pit width(W) = pit vol / (length x depth)
Pit width (W) = 9.6 m^3 / (3.65 m x 1.6 m)
Pit width (W) = 1.64 m

In conclusion, the communal raised VIP toilets need to be constructed 1m out of the ground with a pit width of 1.64m in order to provide 2 years storage. Note that as the raised VIP pit latrine needs to be fully lined, a better design is to upgrade to an alternating design that can be emptied – **see section 4.69**

Alternating twin pit VIP latrines

69. Alternating twin pit VIP latrines have two fully lined shallow pits side-by-side, both of which are ventilated by separate vent pipes capped with fly screens. Each pit is designed to fill up during a period of two to three years, after which the pit contents are left for at least two years to ensure that all faecal organisms are killed and the pit contents is fully decomposed. Urine diversion can be used to keep the pits in a dry state and prevent the contents becoming anaerobic in addition to reducing odours. Small quantities of sawdust, ash, dry leaves (or any other carbon rich substances including organic household refuse) may be added to enhance the anaerobic composting process. When the pit is full to within 20cm the pit should be sealed and the drop hole should be switched so that the other pit is filled. After two year, the sealed pit contents can be safely removed and the pit reused. If reuse is culturally acceptable, the pit contents may be used for agricultural purposes.

Box: Household alternating twin pit VIP latrine sizing calculation

Sizing calculation for a household alternating twin VIP pit latrine with two fully lined pits and design life of 2 years.

Pit volume (V) = N x P x R

where

N = the design life of the pit (e.g. 2 years)
P = number of daily users (e.g. 6 persons)
R = sludge accumulation rate (m³ / year)

Assuming degradable anal cleansing materials are used gives a sludge accumulation rate of 0.06 m^3 per person per year (**see section 4.36**). The rate should be doubled to take into consideration the addition of small quantities of organic material (ash, leaves, organic refuse). It follows that

Pit volume (V) = 2 x 6 x 0.12 m³ / year
Pit volume (V) = 1.44 m^3

Assuming two square lined pits of width 1.2m x 1.2m are used. It follows that.

Pit volume (V) = length x width x depth

Rearranging for depth gives

Pit depth (D) = volume / (length x width)
Pit depth (D) = 1.44 m^3 / (1.2 m * 1.2 m)
Pit depth (D) = 1.0 m + 0.2 m freeboard

Therefore two alternating pits of 1.2 m depth are required to ensure the contents are left for at least two years before the pits can be safely emptied.

70. If they are constructed as communal facilities, alternating twin pit VIP latrines are usually managed in the same way as standard communal trench latrines or communal VIP latrines. If alternating twin pit latrines are constructed on a household or shared basis the owners are typically responsible for any operation, maintenance and cleaning activities including managing the emptying of any composted excreta.

UNHCR and WASH actors are encouraged to promote the use of twin pit alternating VIP latrines in most refugee settings. The fact that there is no toilet replacement costs makes this a highly economic option for most refugee households.

71. The main advantage of alternating twin pit VIP latrines is that the life of the latrine can be continually extended and the toilet never needs to be decommissioned and replaced. In addition, after two years the pit contents have been rendered pathogen free and the high quality compost can be used to increase crop yields. Their main disadvantage is that the design requires acceptance from the community. In addition, the design is slightly more complex and expensive than simple VIP latrines requiring pit lining and urine separation infrastructure. Even where there is no willingness to reuse the composted excreta the fact that there is no toilet replacement costs makes this a highly economic option. In most refugee settings UNHCR and WASH actors should discuss this technical option with the community and encourage its use. A detailed technical design and bill of quantities for an alternating pit latrine can be found on wash.unhcr.org.

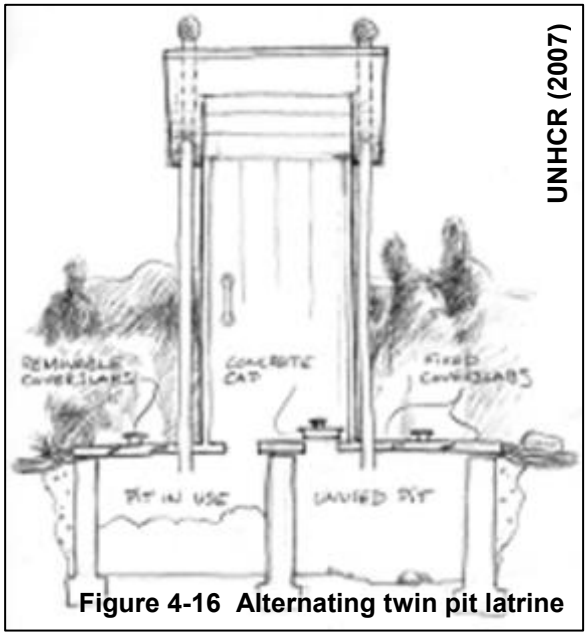
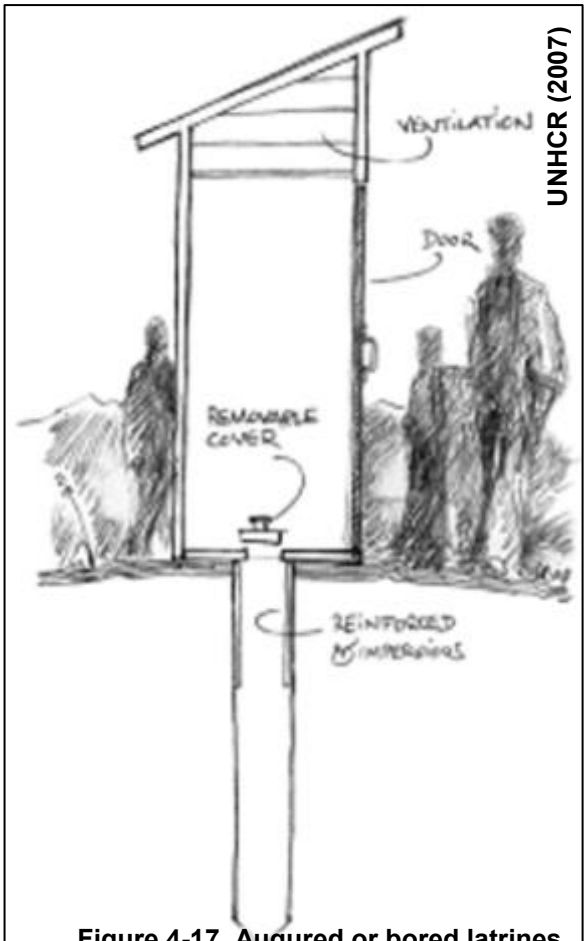


Figure 4-16 Alternating twin pit latrine

Augured or bored latrines

72. Augured or bored latrines can be constructed in soft soils using hand augers, petrol driven motorized augers, or even drilling machines. They are typically 35-45 cm in diameter and can be any depth up to 7 metres. They can be constructed as communal, shared or household facilities, either as dry pits or wet pits if used with pour-flush pans. Communal bored or augured latrines are usually managed in the same way as standard communal toilets. If bored or augured latrines are allocated on a household or shared basis the owners are typically responsible for any operation, maintenance and cleaning activities.



UNHCR (2007)

Figure 4-17 Augured or bored latrines

73. The advantage of augured latrines is that they can be constructed relatively quickly in soft soil either as blocks of communal toilets or individual household toilets. Speed of construction can be significantly increased if motorized augers or drilling machines are used. Another advantage is that in relatively hard soils, auger holes up to 20cm wide may be used directly in the short term without the need for a toilet slab. The main disadvantage of augured latrines is that they have smaller volumes and therefore a significantly shorter useful life of months rather than years. The side walls are also liable to fouling and they tend to be smellier than vented systems. Augured or bored latrines should generally only be used for very short and quick interventions. As augered or bored latrines are generally much deeper than standard pit latrines, care should also be taken to ensure that the correct safety distances are respected between the base of the hole and the maximum annual groundwater level.

Box: Calculating the useful life of bored latrines

During an emergency response, a percussion drilling rig is being used to drill 7m deep 8" inch holes that are to be used as offset pits with pour-flush toilets. The toilets are allocated on a shared basis between every 4 families, how many months will these facilities last before they are all full?

The basic equation for pit sizing is

Pit volume (V) = N x P x R

where

N = the effective life of the pit (years)
P = the average number of daily users
R = sludge accumulation rate (m^3 per yr)

Rearranging for the life of the pit gives us

Pit life (N) = V / (P x R)

In our case, the volume (V) of the bored hole can be calculated by multiplying the area by the depth. Allowing 0.3m at the top of the pit for backfilling gives us..

Pit volume = length x area
Pit volume = 6.7 m x π x (4" x 0.0254 m)^2
Pit volume = 0.22 m^3

Assuming water is used for anal cleansing gives a sludge accumulation rate of 0.04m^3 per person per year (**see section 4.36**). Storage is short so the rate is doubled.

It follows that

Pit life (N) = V / (P x R)
Pit life (N) = 0.22 / (24 users x 0.08m^3/yr)
Pit life (N) = 0.23 years = 41 days

In conclusion, a 7m deep 8" diameter bored latrine shared between 4 families will last for just under six weeks before it requires decommissioning.

Pour flush toilets

74. Pour-flush toilets are used where there is a cultural preference for water-based sanitation and the population has sufficient access to water. Pour-flush systems use a hygienic water seal between the toilet seat or slab and the disposal system eliminating problems with flies and smells. They can either be direct (the squatting slab or seat is directly over the pit or septic tank) or indirect (water and faeces travel a short distance to a pit, septic tank, or sewer). The toilet is flushed by pouring ~1-5 litres of water into the squatting pan or seat. Flushing water may be stored in a flush cistern or in an open reservoir for manual flushing with a scoop. Pour-flush toilets are suitable where water or soft toilet paper is used for anal cleaning and where the refugee population are used to flushing with water. It is not suitable where stones, corncobs, leaves or other solid materials are used for anal cleaning. The interagency plastic emergency toilet slab has recently been adapted with a pour-flush attachment that can be screwed onto the bottom of the plastic slab.

75. Communal pour-flush toilets are usually managed in the same way as communal trench latrines or communal VIP latrines. In addition to keeping the facility clean, the attendant may also take responsibility for ensuring there is flushing water available. Any major maintenance activities (for example desludging) are typically carried out by a maintenance crew. If pour flush latrines are allocated on a household or shared basis the owners are typically responsible for any operation, maintenance and cleaning activities – although in some cases, the refugee population is given support for desludging activities every few years.

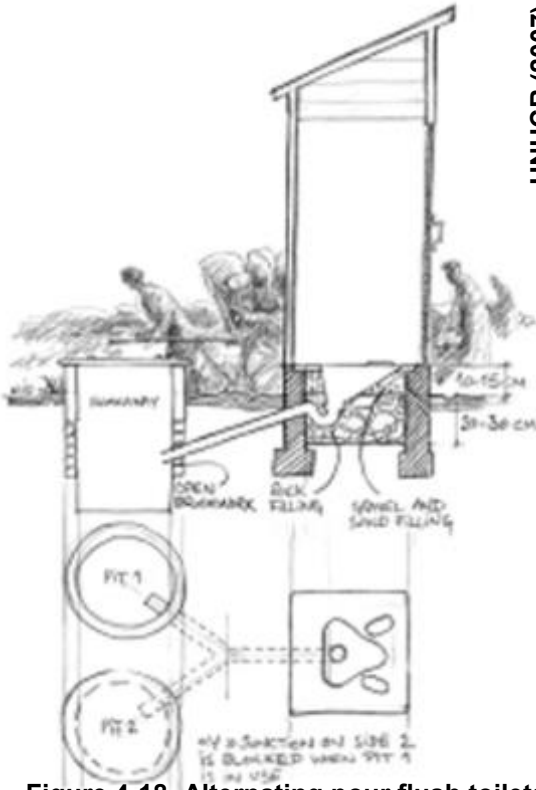


Figure 4-18 Alternating pour flush toilets

76. The major advantage of the pour flush toilet is that smells and disease vectors are isolated by the water seal. In addition, water based excreta management systems may be combined with bathing and laundering with greywater treatment being sized into the design of the pit or septic tank. The major disadvantage of pour-flush toilets is that they can waste significant amount of water and in some cases will only work properly if sufficient quantities of water are readily available. In addition, their needs to be sufficient soil infiltration capacity to absorb any liquids that are produced. A detailed technical

design and bill of quantities for a pour flush toilet can be found on **wash.unhcr.org**.

Box: Sizing a household twin pit pour flush toilet

Sizing calculation of a wet twin-pit circular household pour-flush toilet with a design life of 2 years for each pit. The soil type is sandy loam with a daily infiltration capacity of 25 litres per m^2 (**see section 4.131**).

Sludge volume (V) = N x P x R

where

N = the design life of the pit (e.g. 5 years)
P = the number of daily users (e.g. 6)
R = sludge accumulation rate (m^3 per yr)

Assuming a water based system with degradable anal cleansing materials gives a sludge accumulation rate of 0.04m^3 per person per year (**see section 4.36**).

It follows that

Sludge volume (V) = 2 x 6 x 0.04 m^3 per yr
Sludge volume (V) = 0.48 m^3

Assuming a circular pit of diameter 1.0m.

Sludge vol (V) = (π x radius^2) x depth (Ds)

Rearranging gives

Sludge depth (Ds) = volume / (π x radius^2)
Sludge depth (Ds) = 0.48 m^3 / (π x 0.5^2)
Sludge depth (Ds) = 0.62 m

Assuming the toilet is flushed 12 times a day and each flush requires 3 litres.

Daily inflow (Q) = 12 x 3 litres = 36 litres

The soil is sandy loam with a daily infiltration capacity (K) of 25 litres per m^2.

Infiltration area (Ai) = Q / K
Infiltration area (Ai) = 36 litres / 25 litres/m^2
Infiltration area (Ai)= 1.44 m^2

therefore

Infiltration depth (Di) = Ai / (2π x radius)
Infiltration depth (Di) = 1.44 m^2 / (2π x 0.5)
Infiltration depth (Di) = 0.46 m

Allowing 0.3 m freeboard gives a total depth of 0.62m + 0.46m + 0.3m = 1.38 m.

In conclusion, a pour flush household toilet supplying two alternating 1.4 m deep and 1.0 m diameter pits will provide a design life of two years allowing destruction of pathogens and the pits to be alternated.

Septic-tanks, aqua-privys and anaerobic baffled reactors

77. A septic-tank is a water-tight excreta settling tank that typically receives excreta from a pour flush toilet and occasionally grey water from bathing and washing. An aqua-privy is a simple pour-flush toilet that is installed directly over a septic-tank (typically with a single chamber made from concrete rings) and is very common in many refugee camps in Asia. An anaerobic baffled reactor (ABR) is an improved septic tank design that can achieve higher degrees of sludge settling, digestion and BOD reduction and more suited to large scale urban projects where there are stricter environmental controls. Basic septic tanks may have a single compartment, although two or more are better to reduce hydraulic disturbance caused by flushing. ABR's have three to four compartments for improved treatment rates. Smells from the septic tank are prevented by the water seal.

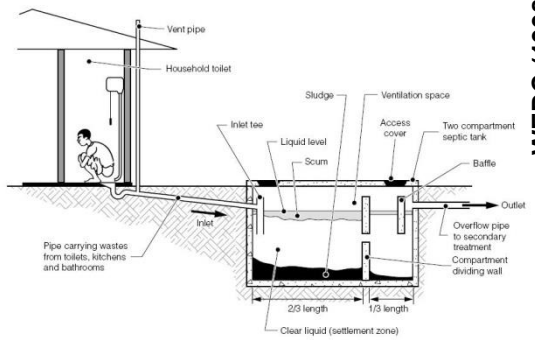


Figure 4-19 A simple septic tank

78. Treatment in septic tanks occurs through a combination of settlement, floatation and sludge digestion. During settlement, heavy solids fall to the base of the tank to form sludge. In addition, grease and oils in the septic-tank float to

the surface to form a layer of scum, which is usually removed during desludging. Over time, the sludge at the bottom of the tank is compressed by the weight of new material settling on top, increasing its density. In addition, organic matter in the sludge is broken down by bacteria which convert it to liquid and methane gas. Care should be taken to ensure that this gas, which is explosive) is not allowed to build up and septic tanks are usually equipped with vent pipes.

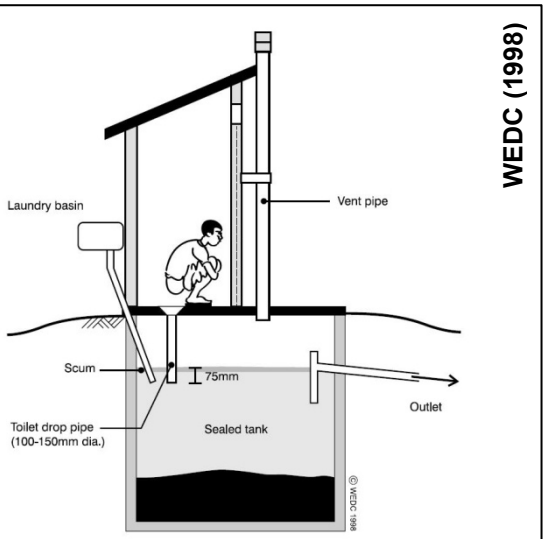


Figure 4-20 Aqua privy

79. Since it contains fresh excreta, septic tank sludge must be disposed of safely. Some simple designs of septic-tank allow this liquid to percolate directly into the ground through the unlined base of the tank. Improved designs channel the effluent via an overflow into a separate infiltration pit, trench, or drain field. In high groundwater situations, this effluent should be further treated either using a hydraulically isolated on-site wetland or off-site using tertiary treatment.

Box: Household pour flush aquaprivy sizing calculation

Sizing calculation for a household pour flush toilet above a single compartment aquaprivy made from concrete rings that has a desludging period of 3 years.

Total aquaprivy volume = A + B

where

A = daily liquid volume entering the tank
B = volume of sludge and scum

where

Daily liquid volume (A) = P x q
Vol. of sludge and scum (B) = P x N x S

where

P = number of daily users (6 persons)
q = sewage flow (5 litres/person/day)
N = period between desludge (3 years)
S = sludge & scum acc. rate (0.04 m^3/yr)

It follows that

Daily liquid volume (A) = 6 pers x 5 litres
Daily liquid volume (A) = 30 litres

Vol. of sludge and scum (B) = 6 x 3 x 0.04
Vol. of sludge and scum (B) = 0.72 m^3

therefore

Aquaprivy volume = 0.030 m^3 + 0.720 m^3
Aquaprivy volume = 0.75 m^3

Assuming a single compartment aquaprivy made from concrete rings of 1.1m internal diameter it follows..

Privy vol. (V) = (π x radius^2) x depth (D)

Rearranging gives..

Depth (D) = volume / (π x raduis^2)
Depth (D) = 0.75 m^3 / (π x 0.55 x 0.55)
Depth (D) = 0.79 m

Allowing 0.2m for freeboard gives a total aquaprivy depth of 1.0m.

80. In high density urban settings there is usually legislation in place to protect the aquifer and septic tank effluent should either be directed to the sewer network or the anaerobic baffled reactor type design should be used with additional tertiary treatment (such as constructed wetlands). In some extreme cases, it may be

permissible to direct effluent on a short-term emergency basis to stormwater drains provided a sufficient degree of treatment has taken place within the septic tank. Septic tanks are generally sized for desluding every 2-3 years. The most appropriate method for removing the sludge is with a vacuum tanker. UNHCR and WASH actors must ensure that public health and environmental precautions are taken when removing, transporting and disposing of the sludge.

Box: Septic tank sizing calculation for an urban collective

Sizing calculation for a septic tank serving refugees staying in an urban collective centre containing 50 families (300 persons). The septic tank is designed to receive both greywater (from communal showers and laundry points) and blackwater (from pour-flush latrines). Total per capita water consumption estimated at 45 litres per person per day and biodegradable anal cleansing materials are being used. The average ambient temperature is < 10°C during winter and desluding is planned for every two years.

It follows..

Total septic tank volume = A + B

where

A = daily liquid volume entering the tank
B = volume of sludge and scum

where

Daily liquid volume (A) = P x q x T
Vol. sludge and scum (B) = P x N x F x S

where

P = number of users (e.g. 300 persons)
q = sewage flow (litres/person/day)
T = retention time (typically 1 day)
N = period between desludge (2 years)
F = sizing factor
S = sludge & scum accumulation rate (0.04 m^3/year)

Assuming 90% of daily per capita water consumption ends up as sewage flow it can be estimated that..

q = 45 l/person/day x 0.9 = 40 l/pers/day

It follows that

Daily liquid vol (A) = 300 pers x 40 litres
Daily liquid vol (A) = 12 m^3

Since this is a large septic tank and (A) is greater than 6m^3 per day, a retention time of [33 – 1.5A] i.e. 15 hours instead of 24 hours is allowed – see table below.

Daily volume (A)	Retention (T)
If A > 6m^3/day	T = 24 hours
If A is 6m^3 – 14m^3/day	T = 33 - 1.5 A
If A < 14m^3/day	T = 12 hours

Source: Franceys, Pickford & Reed (1992) '*Guide to the development of on-site sanitation*'. World Health Organization, Geneva.

therefore

Daily liquid (A) = 12 m^3 x (15/24) = 7.5 m^3

In addition

Sludge & scum vol. (B) = P x N x F x S

Where F can be found from the following.

Desludge	Ambient Temperature		
Period	>20 °C	>10 °C	<10 °C
1	1.3	1.5	2.5
2	1.0	1.2	1.5
3	1.0	1.0	1.3
4	1.0	1.0	1.2
5	1.0	1.0	1.1
6+	1.0	1.0	1.0

Source: Franceys, Pickford & Reed (1992) '*Guide to the development of on-site sanitation*'. World Health Organization, Geneva.

therefore

Sludge & scum (B) = 300 x 2 x 1.5 x 0.04
Sludge & scum (B) = 36 m^3

finally

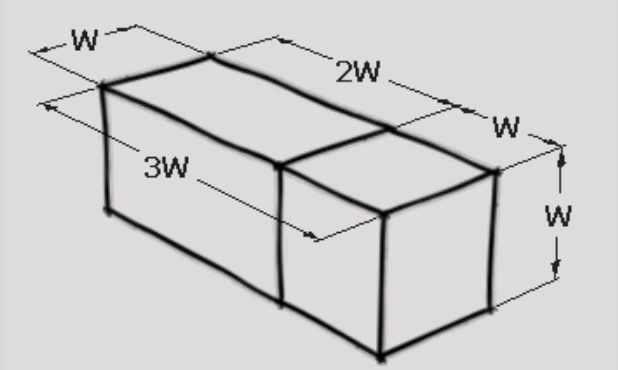
Total volume = 7.5 m^3 + 36 m^3 = 43.5 m^3

Assuming a dual compartment septic tank with the first compartment (of length 2W) twice as long as the second compartment (of length, width and height W) we end up with a septic tank with the following dimensions:
Volume = length 3W x width W x height W
Volume = $3W^3$ = 43.5 m^3

Rearranging we get

$$W = \sqrt[3]{\frac{43.5}{3}} = 2.44 \text{ m}$$

Adding 0.3m of freeboard we end up with the following septic tank dimensions:



Compartment	Length	Width	Height
#1	4.8m	2.4m	2.7m
#2	2.4m	2.4m	2.7m

81. Large communal septic tanks in refugee settings are usually managed by centralized maintenance crews and desludging is typically contracted out to specialized private companies that are responsible for assuring safe handling of excreta and adequate final disposal. If smaller household or shared septic tanks are in operation, the owner is typically responsible for operation, maintenance and cleaning - although support is typically given for desludging.



Figure 4-21 Septic tank drain field

82. The main advantage of septic tanks is that they are suited to refugee settings where water is used for anal-cleansing and toilet flushing. Their main disadvantages are higher construction costs than simple pit based systems and the fact that they require relatively large volumes of water to function efficiently. Another disadvantage is that septic tanks require desludging in addition to space for infiltration trenches or drain fields. Detailed technical designs and bill of quantities for septic tanks, aqua-privies and anaerobic baffled reactors can be found on **wash.unhcr.org**.

Box: Sizing calculation for a septic tank drain field

Sizing calculation for a drain field receiving effluent from a septic tank serving refugees in an urban collective centre containing 50 families (300 persons). The septic tank receives both greywater (from communal showers and laundry points) and blackwater (from pour-flush latrines). Total per capita water consumption estimated at 45 litres per person per day. Assuming 90% of daily per capita water consumption ends up as sewage flow it can be estimated that..

Daily sewage vol. (Q) = 300 x 45 x 90%
Daily sewage vol. (Q) = 12 m^3

Assuming a drain field in loam soil with an infiltration capacity of 25 litres / m^2 (**see section 5.131**). The total length of trench required is given by

Drainage trench length (L) = Q / 2DI

where

Q = the daily sewage flow (12,000 litres)
D = the effective depth (e.g. 1.5 metres)
I = infiltration capacity (e.g. 25 litres/m^2)

It follows

Trench length (L) = 12,000 / (2 x 1.5 x 25)
Trench length (L) = 160 metres

Assuming a square drain field design with a trench spacing of every two metres gives us a drain field with eight trenches of 20 m length.

In conclusion, a septic tank drain field in sandy loam soil for 50 families including pour-flush toilets, laundering and bathing water would need to be 20m x 20m.

Conventional, simplified and settled (small bore) sewerage

83. In some urban refugee settings, it may be necessary to rehabilitate or connect toilets to existing sewerage networks to safely transport excreta (and wastewater) from locations where it is generated to locations where it can be safely treated, disposed or reused.

84. Conventional sewerage systems consist of a network of large diameter underground pipes used to collect sewage from households and convey it to a treatment facility. The term 'conventional' describes the sort of sewerage network that is often found in developed nations or modern cities and is based on conservative pipe diameters, burial depths, gradients and manhole specifications. The cost of conventional sewerage can be very high (as much as thousands of USD$ per household). Conventional sewerage systems often need 100-120 litres of wastewater per person per day to function adequately without blocking.



Figure 4-22 Small-bore sewerage network

85. Simplified sewerage systems function in a similar manner to conventionally designed sewerage systems but are based on much less conservative engineering principles such as smaller diameter pipes, shallower depths, smaller gradients and less frequent manholes. They are often used in low-cost settings. The cost of simplified sewerage is about half that of conventional sewerage.

86. Settled sewerage systems (also known as small-bore sewerage, or interceptor sewerage systems) are low-cost systems that use septic tanks to retain suspended and coarse solids so the sewerage system can be built to carry liquid effluents only with smaller diameter pipes, shallower depths, smaller gradients and less frequent manholes. The cost of settled sewerage is about a quarter of conventional sewerage and half that of simplified sewerage.

87. Sewerage should only be considered as a last resort in refugee settlements and generally only to connect the refugee population to an existing system. Sewerage systems can be costly and complicated, requiring skilled engineers and a great deal of coordination and cooperation during installation. In addition, trained personnel are needed for operation and maintenance otherwise the system could become a health risk. Construction or rehabilitation of sewerage systems in refugee settings should only be carried out by professional and qualified engineering personnel.

88. Operation and maintenance of conventional, simplified and settled (small-bore) sewerage networks in refugee settings is usually managed by centralized

maintenance crews. If households connect to the sewer networks, either directly, or via septic tanks, then responsibility for operation and usually rests with the owner up to the connection point.

In all settings it is highly recommended that UNHCR and WASH actors choose simple methods of on-site treatment, disposal and reuse rather than off-site methods that require the use of sewerage or excreta transportation that can be complex, expensive, and can bring huge public health and environmental risks if poorly managed.

89. The main advantage of sewer networks is that they are suited to transporting excreta in high density urban environments where there is insufficient space for on-site treatment. Their main disadvantages are high construction and operation and maintenance costs and the fact that they require relatively large volumes of water to function efficiently which may not be available in refugee settings. Another disadvantage is that the installation of sewerage networks, particularly in urban settings, required high levels of coordination and communication and much disruption during installation especially if retro-fitted. Finally, all sewerage requires a properly sized and functioning final treatment plant downhill and preferably down-wind of the settlement. Detailed technical designs and bill of quantities for conventional, simplified and settled (small-bore) sewerage systems are beyond the scope of this manual, however references to design guidelines can be found in the **references section**.

Excreta transportation

90. Transportation of excreta may be required to empty existing excreta management systems, such as lined latrine pits, septic tanks, storage tank latrines, or chemical toilets that have become full. Transportation of excreta is typically carried out using either mechanized desludging tankers or manual desludging and cartage. Regular desluding and transportation of excreta may be the only possible option in urban, hard ground or high water table refugee settings.

91. The main disadvantage of transporting excreta is that it can be a risky and costly business. UNHCR and WASH actors must ensure that all operations involving the removal, transportation and final disposal and treatment of excreta is carried out by professional and qualified organisations with adequate safety and public health monitoring protocols. Care must be taken to ensure that desludging operations do not pose risks on the population, the environment, or the personnel carrying out the service. A safe final treatment or disposal site is required for the excreta (sewer, waste treatment plant, waste stabilization ponds, lagoons). UNHCR and WASH actors should only consider excreta transportation as a last resort option short-term option.

Mechanized desludging and excreta tankers

92. Mechanized desludging tankers are able to remove the contents of a sealed toilet vault or septic tank using a vacuum created inside the storage vessel or vacuum pump. The method is generally suited to faecal material with high water content (e.g. the contents of chemical toilets or septic tanks). Additional water and agitation may be needed to remove excreta that has settled and compacted for example in the base of a septic tank. Excreta is removed using a suction lance which is typically inserted through the toilet seat or squat-hole into the toilet vault or into the septic tank access cover. A valve on the lance is opened, rapidly sucking the vault contents into the storage vessel. Desludging tankers typically have a storage volume of between 10,000 – 15,000 litres although smaller models can be found. In some refugee settings, plastic waterproof tanks mounted on pick-up trucks have been used successfully for septic pit desludging operations using diaphragm based solids handling pumps (e.g. the Pelican brand).

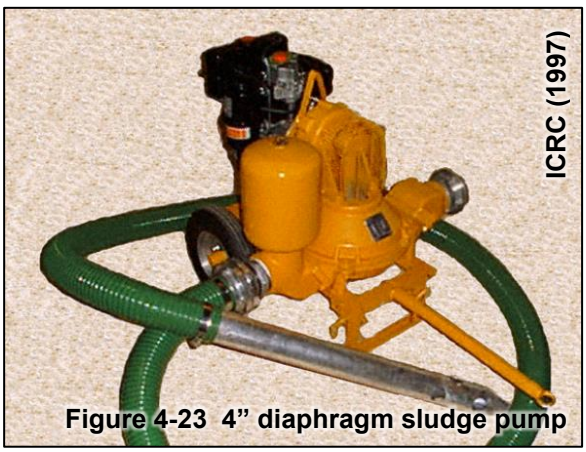


Figure 4-23 4" diaphragm sludge pump

93. Care must be taken to ensure that desludging operations do not pose risks on the population, the environment, or the personnel carrying out the service. Care should also be taken to ensure that users do not put items that could easily block the suction hose into the toilet vault (such as women's sanitary pads, stones, leaves, plastic bags etc.). Desludging trucks cannot be easily maneuvered down narrow streets.



Figure 4-24 Desluding, Tham Hin Camp

94. Excreta desludging using vacuum tankers has been used with varying degrees of success following the Haiti earthquake and in refugee camps in Turkey and Jordan. However, desludging should be used as a last resort in urban, hard ground, or high water table contexts where no other option is suitable. Desluding operations are very costly (33 USD$ per daily toilet desludge in Haiti 2010) and there should be a clear exit strategy from the start.


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Manual desludging and cartage

95. Manual desludging may be achieved using hand operated vacuum pumps, diaphragm pumps, mechanical gobblers, scoops or buckets. The pit or tank contents are usually emptied into sealed 40 litre plastic drums and loaded onto transportation. Additional water may need to be brought to the site to help liquefy the contents of the pit before excavation takes place. UNHCR and WASH actors should engage manual emptying as a last resort and only if all of the following conditions are met.

    a. The pit or tank contents have been left to safely digest for at least two years and are free from pathogens.
    b. The pit is lined or sealed and there is no risk of collapse.
    c. Staff have adequate personal protective and safety equipment and have been training in the infection control standard precautions.
    d. There is absolutely no risk that personnel will come into direct contact with faecal material.



Figure 4-25 Manual desludging poo pump

96. The only advantage of manual desludging is that the relatively small size of equipment allows personnel to empty pits and vaults in high density settings where mechanized desludging tankers have no access. The main disadvantage is that that manual desludging methods are generally more risky to public health and personnel than mechanized methods. In all cases, a safe final treatment or disposal site is required for the excreta and care must be taken to ensure that desludging operations do not pose risks on the population, the environment, or the personnel carrying out the service.

Under no circumstances whatsoever should personnel be allowed to enter a toilet pit or vault during maintenance or desludging operations.

Sludge drying beds

97. Sludge drying beds are used to reduce the water content of sewage and stabilize excreta prior to further treatment, disposal or reuse. The excreta sludge is usually arranged in concrete bays on a layer of gravel and sand and is dried by a combination of drainage, sunlight and evaporation.

98. The main advantage of sludge drying beds is that they can be used in high water table, hard ground, flooded or high density urban environments in combination with some form of transportation system to partially treat excreta from storage vault based toilets (such as chemical toilets, storage tank toilets, or septic tanks). Their main disadvantage is the fact there are always additional public health risks whenever excreta is handled,

transported or processed. In addition their additional costs for construction, transportation, operation and maintenance often make them uneconomic. Another disadvantage is that they require large areas of space and need to be located downwind and away from settled areas. Finally, the dried excreta needs to be deposited to a pit, or better still, composted further to make agricultural fertilizer. In many cases, the risks of using sludge drying beds outweigh the benefits and they should generally be avoided or only used if the systems are already existing in the refugee context and functioning well.

Composting toilets

99. Composting of human excreta can be carried out at the household, communal and centralized levels. Household composting toilets typically consists of a pair of waterproof vaults which are used alternately to turn excreta into nutrient rich compost suitable for agriculture. Decomposition occurs in one vault while the second vault is being filled. The vaults are designed to have an accumulation time of one year during which all pathogens are eliminated and rich non-odorous compost is produced. Most systems require the separation of urine and addition of carbon rich bulking material (such as sawdust, straw, ash, etc.) to ensure an optimum carbon-nitrogen ratio. If optimal conditions are produced for aerobic composting, then all pathogens (including the most resilient namely ascaris eggs) can be eliminated within a period of 6 months to 1 year through a number of processes including elimination by soil-based micro-organisms, unfavourable temperature, unfavourable pH, competition for food and antibiotic action.



Figure 4-26 Dry compositing toilet, Haiti

100. Communal compost toilets may be organised either as on-site twin vault systems or as bucket toilets with collection, transportation and centralized composting (see section 4.180). Daily operation and management of communal composting toilets is similar to communal trench latrines or communal VIP latrines. One of the most important jobs of the toilet attendant is to ensure that users understand how to use the toilet and that there is an available supply of carbon rich bulking materials in each cubicle. If composting is carried out on-site, the toilet attendant also needs to ensure the correct conditions are maintained for composting. If composting toilets are allocated on a household or shared basis the owners are typically responsible for any operation, maintenance and

cleaning activities including monitoring of the moisture and carbon-nitrogen balance.

101. The obvious main advantage of composting toilets is the production of compost with a high quality fertilizer value. However, additional advantages include the fact the approach can be used in high water table, hard ground and flooded settings. Furthermore, as the composting vaults are routinely emptied they do not need replacing over time which makes it cost effective solution in the long-term.

Box: Household alternating compost toilet sizing calculation

Sizing calculation for a household alternating twin VIP compost toilet with two fully lined vaults, urine separation and design life of 1 year.

Vault volume (V) = N x P x R

where

N = the design life of the vault (e.g. 1 yr)
P = number of daily users (e.g. 6 persons)
R = sludge accumulation rate (m^3 / year)

Assuming dry conditions with degradable anal cleansing materials gives a sludge accumulation rate of 0.06 m^3 per person per year (**see section 4.36**). The rate should be doubled to take into consideration the addition of small quantities of organic material (ash, leaves, organic refuse). It follows that

Pit volume (V) = 1 x 6 x 0.12 m^3 / year
Pit volume (V) = 0.72 m^3

Assuming two square lined pits of width 1.2m x 1.2m are used. It follows that.

Pit volume (V) = length x width x depth

Rearranging for depth gives

Pit depth (D) = volume / (length x width)
Pit depth (D) = 0.72 m^3 / (1.2 m * 1.2 m)
Pit depth (D) = 0.5 m + 0.2 m freeboard

Therefore two alternating pits of 0.7 m depth are required to ensure the contents are left for at least two years before the pits can be safely emptied.

102. The main disadvantage of composting toilets is that the composting toilet needs optimal conditions and careful monitoring on behalf of the user to take place including a moisture content of 50% - 60%, a carbon to nitrogen ratio within the range 15:1 to 30:1 and an average daily temperature of at least 15°C to be viable. In addition, all system involving the reuse of excreta must be carried out safely with no risks to public health. Great care should be taken to ensure that composting is actually occurring in the composting latrine and pathogens are being destroyed. Finally, the reuse of excreta is a cultural taboo in many cultures and care should be taken to ensure the approach is culturally acceptable.

103. UNHCR recommends that if composting toilets are suitable for the context, they are only promoted at the household level as any systems that involve the collection, transportation, handling and processing of excreta introduces additional public health risks and can be costly in terms of vehicle, fuel, land and labour. If compost toilets are used at the household level, then co-composting with degradable household refuse should be strongly encourage to ensure a steady supply of carbon rich material and reduce the strain and cost of solid waste collection services. A detailed technical design and bill of quantities for household and communal compost toilets can be found on **wash.unhcr.org**.

Box: UNHCR considerations for composting of human excreta

Human excreta is a valuable resource and should be re-used wherever practicable, however composting toilets and co-composting of excreta are not suitable approaches for the emergency or transition phases of a refugee emergency. Before piloting the use of composting toilets or co-composting, UNHCR and WASH actors should ensure the following criteria are met:

- ☐ There is a clear and immediate demand for compost within 1,000m of the production site.
- ☐ Reuse of excreta is culturally accepted by the population.
- ☐ The average ambient temperature is at least 15°C.

Systems involving the collection, transportation, handling, processing and reuse of excreta must be carried out safely with no risks to public health or the environment. Great care should be taken to ensure that full thermophillic composting conditions are being created and pathogens are being destroyed. Pile thermometers and the daily monitoring of pile temperature is obligatory. The compost moisture content must be maintained between 50% - 60%, the carbon to nitrogen ratio must be within the range 15:1 to 30:1. Reuse systems are more complicated than traditional sanitation methods and require a great deal of community education and users to take an active part in system operation and maintenance. Systems involving the transportation, handling and processing of excreta are usually not economically viable at the centralized levels and a full economic analysis should be undertaken before any large programmes are initiated. Composting is better suited to the communal and household levels.

Waste stabilization Urine Diverting Dry Toilet (UDDTs)

104. UDDT toilets (Urine Diverting Dry Toilet) are designed with a divider so that urine is separated at the front of the toilet pan or slab, while faeces fall through a large squat hole in the back. The urine and faeces are collected in different chambers and drying material such as ash, earth, or lime should be added to the faecal chamber after use. The aim of UDDT is to evaporate and dry out the excreta. The moisture content is reduced as low as possible by different means including passive solar heating, ventilation and absorbent material addition. The addition of ashes (or any alkaline absorbent) increase pH and can plays a significant role in the enhancement of the pathogen die off, reduction of fly breeding and odour control. The act of separating urine and drying out the excreta significantly reduces the unpleasant odours and fly breeding associated with latrines. If the faeces remain dry then pathogens are not able to migrate and easily contaminate groundwater. After a stabilization period of up to 2 years, it is then possible to collect the dried excreta safely and use it as fertilizer (Guidelines for the Safe use of Wastewater, Excreta and Greywater, WHO 2006). In some designs there is a third hole for collecting anal cleansing water to a separate soak pit. A separate wall mounted urinal can also be

mounted within the toilet cubicle for optimal collection.

105. The advantages of UDDT toilets relate to the potential of reuse of waste as fertilizer, the reduction of groundwater contamination, and the benefit of a toilet structure which can be continuously emptied and reused thus offering high value for money in the long term. UDDTs can be built with locally available materials and have low capital and operating costs. UDDTs should also be considered in situations where there is need for alternatives to pit latrines for example in places which have a high groundwater table, are prone to flooding, or are hard to excavate. UDDTs have been piloted by Oxfam GB at household level in Hiloweyn camp in 2012 with success in user acceptance, longevity of use, value for money and environmental impact (see references section).



Figure 4-27 UDDT toilet interior

106. The major disadvantage of UDDT is that unless the users both understand how to use the UDDT and use it properly, then there is the increased risk that the intended advantages of the system will not be achieved. Another disadvantage is that vault sizes are much smaller than in standard latrines and users may be put off by proximity to the faecal pile. In some cases, children may have trouble using the UDDT properly and assistance is needed so their urine doesn't end up in the hole for faeces.

Co-composting of excreta

107. Co-composting is the process of composting excreta with organic household wastes (such as food wastes, paper, cardboard, sawdust, leaves, yard sweepings). Excreta has a high nitrogen content while organic solid wastes have a high carbon content. By composting the two together it is possible to obtain high quality nitrogen rich compost. Co-composting can be carried out at the household, communal and centralized levels. However it is better suited to the household level since any system requiring the handling or transportation of excreta introduces additional expense and public health risks.



Figure 4-28 Co-compositing windrows

108. If co-composting is carried out at the household level, it is best undertaken in a twin pit compost toilet (see section 4.99). If co-composting is carried out at the communal (16 household) level, it is best undertaken in a communal alternating twin vault composting toilet rather than a bucket system where households bring excreta to a centralized co-composting facility. If co-composting is



undertaken at the centralized level, a system needs to be established involving collecting excreta from networks of communal bucket toilet blocks and refuse bins. At the processing site, excreta and organic solid waste can piled together, mixed and arranged into long composting heaps called windrows. Windrow piles are turned periodically to provide oxygen and ensure that all parts of the pile are subjected to the same heat treatment. Windrow piles should be 1m – 3m high, and should be insulated with compost or soil to promote an even distribution of heat inside the pile. Care should be taken to ensure that leechate from composting windrows does not pose a risk to groundwater. Any run-on and run-off at the site should be carefully managed. Depending on the climate and available space, the windrows may be covered with plastic sheeting to prevent excess evaporation and protection from rain. The composting process needs to be carefully managed to ensure that pathogens are being destroyed. WHO (1989) recommends themophilic composting for one month at 55-60°C, followed by two to four months of curing to stabilize the compost.

109. The obvious main advantage of co-composting toilets is the production of compost with a high quality fertilizer value from two waste substances (excreta and organic household wastes). An additional large advantages includes the fact that approach can be used in high water table, hard ground, flooded and high density urban settings. Furthermore, as the bucket toilets are routinely emptied the infrastructure should never need decommissioning which makes it an economically viable solution in the long-term.

110. At the household level there are virtually no disadvantages to co-composting other than the fact the process needs careful monitoring and reuse of excreta may not be culturally acceptable. At the communal and centralized levels, the main disadvantage of co-composting is that is requires the collection, transportation and processing of excreta and refuse which brings many public health risks and can be costly in terms of vehicles, energy and manpower. There also needs to be a clear and immediate demand for composted fertilizer close to the production sites as escalating fuel costs may render the process economical.

111. A final disadvantage is that the composting process needs careful monitoring including ensuring the moisture content is maintained between 50% - 60%, the carbon to nitrogen ratio is within the range 15:1 to 30:1. In addition, the process needs an average daily temperature of at least 15°C to be viable. All systems involving the reuse of excreta must be carried out safely with no risks to public health. Great care must be taken to ensure that composting is actually occurring and pathogens are being destroyed. UNHCR recommends that pile thermometers are installed to monitor temperatures and ensure thermophillic conditions. Finally,

the reuse of excreta is a cultural taboo in many cultures and care should be taken to ensure the approach is culturally acceptable. A detailed technical design and bill of quantities for a community co-composting plant can be found on **wash.unhcr.org**.

Waste stabilization ponds

112. Waste stabilization ponds are a sequence of artificial ponds containing anaerobic microorganisms which digest pathogens and sludge. The ponds work in a similar way to a scaled up septic tank. The anaerobic pond is small and deep and receives the raw sewage. The facultative pond is shallower with a large surface area and consists of an aerobic zone close to the pond surface as well as a deeper anaerobic zone. The maturation pond is very shallow with a large surface area, resulting in aerobic conditions. It further purifies the sewage for discharge into the environment.

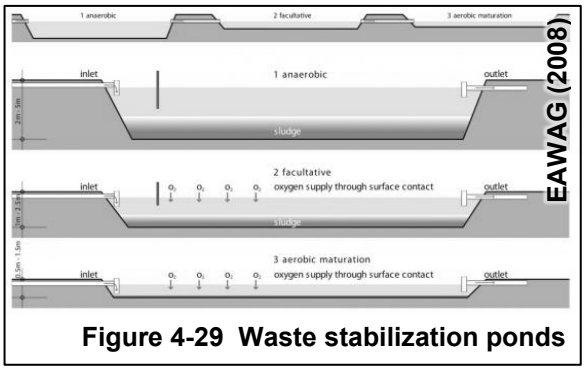


Figure 4-29 Waste stabilization ponds

113. Waste stabilization ponds are usually operated and maintained by dedicated and qualified staff. The main advantage of waste stabilization ponds is their ability to treat human wastes in a low-tech way with very few moving part, machines, or energy requirements. The main disadvantage of waste stabilization ponds is their need for large areas of space in addition to excreta transport mechanisms to bring excreta to the site for treatment. They are only suitable in temperate climates (the tropics) and are only suitable for large volume treatment of sewage at the centralized level. The construction and operation of waste stabilization ponds requires expert engineering knowledge and should generally not be undertaken by UNHCR or WASH actors without technical support. In general, it is highly recommended to use much simpler methods of on-site sanitation unless there are no alternatives. Detailed technical designs and bill of quantities for waste stabilisation ponds are beyond the scope of this manual, however references to design guidelines can be found in the **references section**.

Constructed wetlands

114. Constructed wetlands are typically used to treat septic tank or waste stabilization pond effluent that has already been partially treated before it is discharged into the environment. They are typically constructed in a large gravel and sand-filled channel that is planted with aquatic vegetation. There are a number of variations available with different flow arrangements however typically as the wastewater flows through the channel, the gravel and sand filters out particles and pathogen removal is accomplished by natural decay, predation by higher organisms, and sedimentation.

115. The water level is generally kept to at least 15cm below the surface of the gravel and sand to prevent overland short-circuiting and the

bed is typically lined with clay or plastic sheeting to prevent leaching into the environment. Any aquatic wetland plants with large root systems can be used with the system, however aquatic reeds and grasses are often selected.

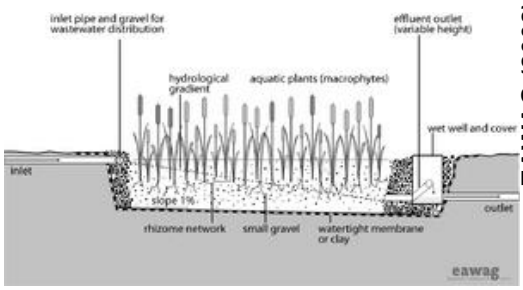


Figure 4-30 Constructed wetlands

116. Communal or centralized wetlands are are usually managed by centralized maintenance crews. Where constructed wetlands are constructed on a household level the owners are typically responsible for any operation, maintenance activities.

117. The main advantage of constructed wetlands is their ability to carry out tertiary treatment of effluents from septic tanks in a low-tech way in situations where there is tight control over environmental discharges (such as high water tables, flooded environments, or urban environments). Their main disadvantage is that they take up large areas of land and need careful monitoring to ensure they are functioning as intended. In most settings, constructed wetlands will not be required as the effluent can pass directly into adequately designed infiltration pits, infiltration trenches, or drain fields. Detailed technical designs and bill of quantities for constructed wetlands are beyond the scope of this manual, however references to design guidelines can be found in the **references section**.

Biogas digesters

118. Biogas reactors digest excreta and other organic matter anaerobically to create methane gas which can be used for heating or lighting. Biogas reactors may be considered as an alternative option to a conventional septic tank, since it offers a very similar level of treatment, but with the added benefit of capture of any methane that is produced. It is estimated that there are over 1 million biogas units in use in India, China and North Korea alone.

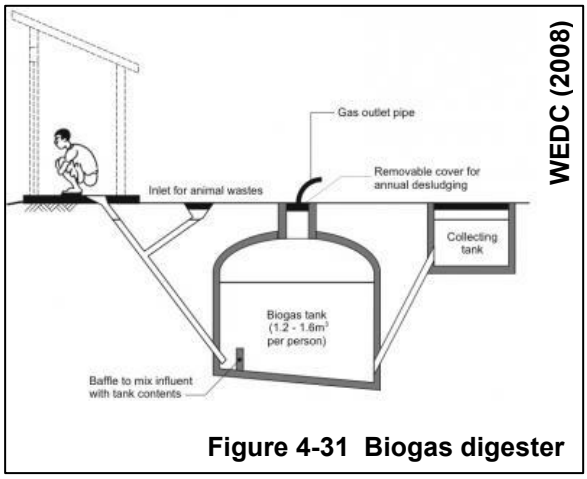


Figure 4-31 Biogas digester

119. There are three main types of biogas digester classified by the way they store the gas that is produced; floating drum, expanding bag, and water displacement. In the floating drum digester, a metallic drum collects bubbles of biogas and rises out of the sludge as more gas is created, pressurizing the biogas at the same time. In the water displacement digester, water is displaced out of the main reactor as bubbles of biogas rise and accumulate in the dome. As more water is displaced the biogas is

pressurized. The water displacement type of digester is generally recognized as the most durable design having no moving parts and without problems caused by corrosion. There are displacement type biogas units around the world that have been operational for over 20 years.

120. The obvious main advantage of biogas systems is the production of methane gas which can be used for cooking or lighting. An additional advantages includes the fact that since the reactor is watertight, the approach can be used in high water table, hard ground and flooded environments. Furthermore, as the vault is routinely emptied (similar to a septic tank - typically every few years) the toilet block should never need decomissioning which makes it an economically viable solution in the long-term. The major disadvantage of biogas units is their large initial construction costs, which can be up to twice the cost of a similarly sized septic tank, in addition to their need for careful follow up and control to ensure they are functioning correctly. Furthermore, biogas production only starts to be effective above an ambient temperature of 25°C and therefore UNHCR and WASH actors should not consider biogas production outside of the tropics. In general, UNHCR and WASH actors should only consider biogas related projects if there is a genuine market for the gas that is produced. Biogas digesters are only suitable in refugee settings for communal or public toilets where water is used for anal-cleansing and toilet flushing. Biogas digesters contain fresh faecal matter and so any desluding that takes place needs to be carried out following the same public health and environmental protocols as desluding of septic tanks. Biogas digesters should never be considered in the emergency or stabilization phases. Detailed technical designs and bill of quantities for biogas digesters is beyond the scope of this manual, however design guidelines can be found in the **references section**.

Landfill disposal of excreta

121. Landfill disposal of excreta involves collecting the contents of household, communal or public toilets (for example bucket toilets, chemical toilets, packet toilets, storage tank toilets, or septic tanks) and dumping it with refuse at an existing landfill site.

122. Generally landfill disposal of excreta should only be considered during extreme emergency conditions as a short-term solution where no alternative method of disposal is possible. It is considered very bad practice to mix waste streams (municipal wastes and human wastes) and a much better solution may be to identify a suitable site for the construction of holding pits or, better still, waste stabilization ponds. Due to the public health and environmental health risks and high costs involved with the transportation of untreated or partially treated excreta, the best solution in all cases is simple on-site treatment.

Hand-washing facilities

Beneficiary participation in the design of hand-washing facilities

123. The design of hand-washing facilities and suitable mechanisms so that they are always functional should be carried out in discussion with representatives of the refugee communities. Beneficiary participation is needed to ensure hand-washing facilities and management mechanisms are acceptable and sustainable.

Hand-washing with soap is the single most cost-effective measure for reducing the transmission of diarrheal diseases. UNHCR and WASH actors should ensure that all public, communal, shared and household have hand-washing facilities and mechanisms are in place so they remain functional.

Ensuring rapid provision of hand-washing facilities

124. UNHCR and WASH actors should ensure that all toilets have convenient and functional hand-washing facilities close by. During the initial emergency response the provision of basic hand-washing equipment (for example jugs of water, soap, with a plastic bowl for grey-water collection) is better than delayed provision of improved systems.



Figure 4-32 Hand-washing post, Haiti

Hand-washing design options

125. Hand-washing units come in many different sizes and materials ranging from plastic or metal cisterns with taps, to open containers with dippers or bowls. In all cases the quality of the devices needs to reflect the importance that hand-washing with soap has on reducing diarrheal disease. Improvised or poor quality solutions risk easily breaking, getting dirty, or being stolen.



Figure 4-33 Hand-washing post, Haiti

Ensuring the availability of hand-washing water

126. The supply of water for hand-washing is critical. When there is no piped tapstand, or point water source (i.e. well, handpump, spring) within 30m proximity of the toilet, provision must be made for direct water storage and replenishment at the toilet block. This typically requires water collection with jerry cans and a wheel barrow or delivery by water tanker. During the rainy season, the use of rainwater for hand-washing should be encouraged. All public and communal toilet facilities should be equipped with guttering and a storage reservoir to collect rainwater for handwashing.

127. UNHCR and WASH actors must plan for at least one functional hand washing dispenser per communal or public toilet block, ensuring at least one hand-washing dispenser for every five toilet cubicles. Hand-washing dispensers should be conveniently located within 10m of each toilet exit and their use should be actively promoted. The water dispensing device and soap must be located within easy reach of all users, especially children. Liquid soap, or bars attached to string, may be used if there is soap theft. All handwashing units that use bars of soap should have a fixed self-draining dish where the soap can be placed between use without getting dirty or becoming mislaid.

Guidelines for hand-washing water storage container size

128. Hand-washing water storage containers should be sized to hold at least half a day of hand-washing water. To conserve water and avoid wastage, the hand-washing taps may need to be restricted with orifice plates to flows of 50 cubic centimetres per second (0.05 litres per second). Calculation of the total volume of hand-washing water required should be based on 0.5 to 1.0 litre of water per person per day. Hand washing reservoirs must be covered to prevent contamination or vector breeding.

The importance of hand-washing campaigns

129. Hand-washing facilities have no impact if they are not used. Measures must be taken to actively encourage users to wash their hands after toilet use. Handwashing messages must be repeated as often as possible. The linkages between excreta and disease must be clearly understood by all.



Figure 4-34 Hand-washing messages, Haiti

Management arrangements for hand-washing facilities

130. UNHCR and WASH actors must ensure there are mechanisms in place to ensure that hand-washing facilities are kept continuously topped up with clean water and soap (before they become empty). In the case of communal toilet blocks, this may require the use of an attendant.

Grey water disposal

131. Hand-washing rinse water should drain properly into an adequately designed gravel filled soak-away pit. The infiltration area of the pit should ideally be calculated using actual soil infiltration rates derived through infiltration tests. If this is not possible, the box below describing typical soil type infiltration rates may be used to estimate infiltration capacity. The bottom of the pit should be at least 1.5 metres above the water table and should be at least 30 metres from any groundwater sources. The surroundings around the hand-washing station should be dry, slip

free and free from surface water that may deter use.

Box: Hand-washing soak pit infiltration capacity design values

Infiltration capacities (litres per m^2 per day)	
Coarse or medium sand	50
Fine sand, loamy sand	33
Sandy loam, loam	25
Porous silty clay and porous silty clay loam	20
Compact silty loam, compact silty clay loam and non-expansive clay	10
Expansive clay	<10

Actual infiltration capacity to be determined on-site. Source: Franceys, Pickford & Reed (1992) '*Guide to the development of on-site sanitation*'. World Health Organization, Geneva.

Monitoring of the coverage and condition hand-washing facilities

132. UNHCR and WASH actors must ensure that the coverage and condition of hand-washing stations is routinely monitored. Any problems with hand-washing facilities must be rectified immediately.

Cleaning and maintenance of toilet facilities

The importance of effective cleaning and maintenance arrangements

133. If communal toilet facilities are established, UNHCR and WASH actors must ensure that there is an effective cleaning and maintenance system in place that ensures that facilities are clean, functional and available at all times. Even well designed toilet facilities will quickly deteriorate if they are not properly looked after.

Even when in working order, toilets will not be used unless they are clean. Communal toilets should be cleaned at least four times daily or as many times is as necessary so as not to deter use.

Beneficiary participation in planning cleaning and maintenance initiatives

134. UNHCR and WASH actors should ensure that an operation and maintenance plan has been developed and agreed for each communal facility (typically serving 16 households) before the facilities are completed. The operation and maintenance plan should define the responsibilities of the different stakeholders from filling up the hand-washing water containers, and keeping the surroundings clean, to providing maintenance. An example community agreement can be found on **wash.unhcr.org**.

A good operation and maintenance plan will not only indicate who is responsible for cleaning and maintenance, it will also ensure involvement of the refugee community.

135. In many cases, members of the community may be willing to volunteer to manage toilet facilities since it gives people something to do, prestige and possibly a source of income. However, it should be assumed that communal toilet supervision may not be a popular job and it may be necessary to provide an incentive to those who are keeping communal toilets clean and operational. In all cases, discussions should take place with the community to identify a toilet supervisor from the households

directly using the facilities (within 100m) and the users should decide what they think will work best.



Figure 4-35 toilet attendant, Haiti

Human resources for cleaning and maintenance

136. The day-to-day management of a sanitation programme requires a substantial team of dedicated personnel. If possible, managerial, officer and technician level positions should be directly recruited from among the refugee community. As a general planning figure, one sanitation team member should be recruited for every 500 persons. In addition, there should be one maintenance crew member for every 200 communal toilet cubicles. Maintenance crews will require transportation (e.g. bicycles, motorbikes, or pick-ups) for getting around the site and carrying out maintenance activities. An example staffing structure for a typical sanitation programme can be found in **section 8.21**.

137. Poor planning for operation and maintenance is one of the most common deteriorating factors for toilet infrastructure. UNHCR and WASH actors should ensure sufficient budgeting for preventative operation and maintenance in addition to back-up capacity for surges in new arrivals, and decommissioning and replacement of aging infrastructure. Operation and maintenance costs for communal toilets can use up an enormous part of the WASH budget. Therefore, UNHCR and WASH actors should ensure that there is a clear strategy to transition into shared or household toilets and decommission of communal toilet blocks as soon as possible.

Personal protective equipment and health and safety training

138. UNHCR and WASH actors must ensure that staff have adequate personal protective equipment for the tasks they are performing (waterproof gloves, aprons, boots, overalls). All staff working in the sanitation programme must be correctly trained in health and safety procedures and the infection control standard precautions (see **section 8.12-13**).

Public and communal toilet cleaning frequencies

139. All surfaces that are either directly or indirectly in contact with faeces and urine should be impermeable, durable, and should be able to withstand frequent use and cleaning. It is recommended that communal toilet units and the floors of communal toilets are cleaned with detergent at least four times a day or as many times is as necessary so as not to deter use. During disease epidemic or times at risk of disease epidemics, all public and communal toilets must be cleaned with 0.2% chlorine

solution following cleaning with detergent.

Cleaning of toilets in health facilities

140. Particular attention should be given to the maintenance and cleanliness of toilets in health centres. As per WHO guidelines, toilet blocks should be routinely cleaned with a 0.2% chlorine solution, with separate cleaning equipment for the toilets and the rest of the health facility.

141. UNHCR and WASH actors should provide sufficient materials (detergent, mops, buckets, chlorine, shovels, and wheel barrows) to routinely clean and disinfect communal toilet blocks and ensure that the environment is free from excreta. Guidance on recommended sanitary supplies for toilet blocks per month can be found in the box below.

Box: Recommended sanitary supplies toilet block (6 cubicles) per month

Item	Qty
Liquid detergent	20 litres
Bleach (5% - 7%)	5 litres
Bucket	1pc
Mop	1pc
Stiff brush	1pc
Hand-washing soap	4kg (20 pc)
Toilet paper	200 rolls

Note: Quantities for approximate guidance only.

Monitoring the condition of public and communal toilet facilities

142. UNHCR and WASH actors should ensure that the condition of any public or communal toilet facilities is closely monitored on a monthly basis. Blocked toilets, full toilets, fly infestations, the presence of faecal material on or around the toilet seat or slab, lack of privacy, lack of security, lack of anal cleansing or flushing water, or broken or leaking vaults are some of the problems that may be faced. Map showing the location and condition of communal toilet facilities should be included in the site WASH plan/strategy along with updated coverage rates and an analysis of historical trends.

Provision and management of anal cleansing material

143. UNHCR and WASH actors should ensure that communal toilets are provided with appropriate anal cleaning materials where users cannot reasonably be expected to provide their own. Where water is used for anal cleansing, management mechanisms should be put in place so that anal cleansing water is always available. At least 2-3 litres of anal cleansing water should be planned for per person per day. Water reservoirs for anal cleansing should be covered to prevent disease vector breeding.

144. Any systems to collect anal cleansing materials should be well organised to avoid contamination and nuisance from flies or odours. Containers should be emptied and cleaned on a daily basis and disposed of in a separate pit that will not allow it to come into contact with drinking water sources.

Management of used sanitary protection products

145. UNHCR and WASH actors must ensure that female communal


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toilets are provided with appropriate and discrete collection and disposal mechanisms for used sanitary protection products. If required, disposal facilities must be designed to ensure total privacy, security, and dignity in full consultation with women and girls to ensure they are culturally acceptable. Used sanitary protection products contain blood and pose a high risk for the transfer of infectious diseases and must be collected, transported and disposed of safely and discretely without coming into contact with sanitary workers, water sources, or the environment. Any systems to collect used sanitary products should be well organised to avoid contamination and nuisance from flies or odours. Containers should be emptied and cleaned on a daily basis and disposed of in a separate pit that will not allow it to come into contact with drinking water sources.

Exit strategies out of prolonged toilet facility operation and maintenance

146. The best guarantee of proper cleanliness and maintenance is the allocation of toilets on a shared or household basis where the owners take responsibility for operation and maintenance. UNHCR and WASH actors should transition as quickly as possible into the construction of shared and household toilets if it is clear that the timeframe of the humanitarian situation will be longer than six months.

5. Solid Waste Management

Inappropriately managed waste from households, market places, health-care facilities, and human activity can attract rodents and insects, and can harbour pathogens. An environment free from solid waste is essential to life, health and dignity.

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Introduction

The importance of solid waste management in refugee settings

1. UNHCR and WASH actors must ensure that the environment inhabited by refugees is free from wastes that are a public health risk. This is regardless of whether the refugees are living in camps, collective centres, spontaneous unplanned camps, with host families, in rented accommodation, or they are occupying land or buildings.
2. Inappropriately managed domestic waste can attract rodents and insects, and can harbour pathogenic organisms. Hazardous substances found in domestic wastes such lead-acid batteries, used paints and oils, and broken electrical equipment can have a major impact on public health. Exposure to wastes, particularly when they are burned, can cause various other diseases including cancers. Toxic waste materials can contaminate surface water, groundwater, soil and air which causes more problems for humans, other species and ecosystems.
3. The psychological benefits of proper solid waste management should not be underestimated. The timely removal of waste is an important contribution to lifting the morale of a refugee population.

A comprehensive public health approach

4. An efficient solid waste management programme should be planned as part of the larger preventative health strategy for the refugee population. Messages concerning the importance of an environment free from human wastes must be incorporated into the community health and education programmes. The link between unmanaged solid waste and disease vectors, and hazardous wastes and disease, must be clearly understood by all.

The importance of seeking expert professional advice

5. The implementation of solid waste collection, treatment, disposal and recycling programmes in refugee contexts can be complicated by additional constraints that include:

   i). Inappropriate sites that are difficult to access with waste collection vehicles;
   ii). Lack of adequate final waste disposal sites;
   iii). Lack of adequate and safe waste collection and processing equipment;
   iv). Unfamiliarity or unwillingness of the population to use waste collection containers, or reduce, recycle or reuse.
   v). Complex environmental or public health legislation controlling waste activities.
   vi). Complex urban environments.
   vii). Reliance on existing waste facilities that have been poorly managed for decades.

   In large refugee settings it is essential to seek expert advice from professionals who are familiar with the context. Solid waste vehicles, waste containers, processing equipment, treatment and disposal technology that work well in one context may completely fail in another. In all cases, the approaches used must build on

local practice, and the expertise of local specialists.

6. Assistance can be sought locally from sources such as government departments, the UN system, NGOs, universities, consultants or contractors. If these cannot meet the need, UNHCR Headquarters assistance should be requested.

The importance of respecting UNHCR's WASH philosophy and principles

7. In addition to the guidance in this chapter, all solid waste management programmes must be designed and carried out in full accordance with UNHCR's general WASH principles including (please click the links below or consult the relevant section in Chapter 2 for more information).

   - Safety and protection
   - A timely and adequate response
   - Participation of stakeholders
   - Universal access
   - Child friendly facilities
   - Designs and construction that meet minimum quality standards
   - Value for money and cost effectiveness
   - Appropriate technology selection
   - Durable solutions
   - Reinforcing the capacity of stakeholders
   - Monitoring the effectiveness of WASH interventions
   - Protecting the environment
   - Planning for contingencies

Priority actions

An immediate response to solid waste

8. UNHCR and WASH actors must ensure that solid waste management systems are established from the outset of a refugee emergency. The speed at which they are established must be given the same emphasis as provision of safe water supply and sanitation. The provision of basic systems (for example cleaning up wastes of public health importance and designating places where domestic waste can be stored for bi-weekly collection) is better than delayed provision of improved systems.

Triage of existing wastes and clean-up campaigns

9. During a refugee emergency, unmanaged wastes may start to accumulate posing a public health risk. In all settings and phases it is recommended that UNHCR and WASH actors use the waste hierarchy system (see **section 5.41**) to rapidly triage wastes into those that are a public health risk and need to be dealt with immediately, and those that are relatively inert and need a medium term approach. Sanitation brigades may be mobilized to clean up wastes from locations of high risk. UNHCR and WASH actors must ensure that these brigades are provided with appropriate tools and personal protective equipment for the tasks they are performing (see **sections 8.12 – 8.13**). In addition, any wastes that are collected must be disposed of safely in a location that does not pose further risks to public health or the environment. Following an initial clean-up campaign, street sweepers and waste collectors may need to be



employed on a permanent basis to ensure public areas of the refugee setting are kept free from wastes (see **section 5.17**).

Protection of existing water supplies and the environment

10. UNHCR and WASH actors must ensure that any dumped wastes, waste collection points, transfer stations, sorting plants, composting plants, disposal pits, or sanitary landfills do not leech contaminants into surface water or shallow groundwater sources that may be used for drinking. Rainwater and stormwater should be diverted away from the wastes to reduce the risk of leechates contaminating soils and water sources (see **section 5.112**). The selection of sanitary landfill sites must be carried out in full cooperation with the local authorities and population (see **section 5.113**). The siting of permanent landfills for populations >20,000 persons must be based on a study evaluating risks to the environment and hydrogeology (**see section 5.114**).

Solid waste container coverage targets

11. In many planned settlements it is common for UNHCR site planners to layout shelters in communities of 16 families following the UNHCR master planning approach (see **section 1.33**). In all settings, it is recommended that UNHCR and WASH actors ensure that waste collection points are conveniently located on the basis of one waste collection point for every group of 16 families.

12. Identification of waste collection points should ideally be undertaken within the first three (3) days of the response in collaboration with each group of 16 families. Each communal waste collection point should be clearly marked so that everyone is aware of the agreed designated location. The group of 16 families should also understand that in order to be able to run an efficient service, it is only possible to collect wastes from designated points and it will be their responsibility to move any additional waste piles to the agreed location.

13. As soon as is possible, the designated waste collection points should be equipped with durable waste containers. During the emergency phase UNHCR and WASH actors should plan for at least 200 litres of waste container volume per 16 families. If manual emptying of wastes is being undertaken the weight of fully loaded containers should not exceed 80kg (see **section 5.67**).

14. During the care and maintenance phase, the volume of waste containers allocated to communal waste collection points should be re-evaluated based on a comprehensive assessment of the types and volumes of wastes being created (see **section 5.24 and 5.65**).

15. In settings where refugees are integrated into the host population, UNHCR and WASH actors should ensure that the refugee population receives the same quality of waste collection services as the host population prior to the influx. More guidance for urban settings can be found in **section 5.67**.



The best guarantee that people will dispose of their household wastes is to create designated waste collection points within convenient distances and commence waste collection services as quickly as possible.

16. Waste container coverage and condition should be tracked on a weekly basis as part of the emergency WASH monitoring system. Provision of waste containers should be scaled up if coverage is behind target.

17. Waste containers should also be allocated to public institutions. Waste containers should be available within convenient distances in all public areas spaced on a grid every 50m - see box below. In communal areas the refugees should be encouraged to organise their own street sweeping activities, however in public areas it will be necessary to employ street sweeping staff to ensure that litter and other wastes are cleaned up and moved to waste containers, where they can be conveniently managed. Plan for at least one street sweeper per 1,000 refugees.

Box: Waste container coverage targets for public institutions

Institution	100 litre container
Schools	1 per classroom 1/50m in public areas
Health facilities	1 per room 1/50m in public areas
Market areas	1/50m in public areas
Feeding centres	1 per room 1/50m in public areas
Transit centres	1/50m in public areas
Offices	1 per room 1/50m in public areas

Planning for long term waste management from the start

18. The most expensive mistakes are typically made during the start of the refugee emergency, especially if attention is not given to waste activities or wastes are dumped or stockpiled 'out of sight, out of mind'. This leads to subsequent work to move the wastes to a final disposal site.

19. It is UNHCR's experience that the average lifetime of a refugee camp is 17 years. Since it is almost impossible to estimate the duration of most emergencies, UNHCR and WASH actors should start to consider the selection and construction of long term solid waste processing and disposal facilities as early as possible. Well planned solid waste programmes from the start of the emergency can save a lot of headaches later.

Working in collaboration with local service providers and local authorities

20. It is highly critical that UNHCR and WASH actors do not undermine or replace the local authorities or service providers responsible for solid waste management. In all scenarios, solid waste management should be carried out in close collaboration with national actors and in full compliance with national solid waste and environmental legislation. Where possible, existing services should be extended to the refugee population. In urban settings, local authorities or service providers responsible for solid waste management may be overwhelmed by the additional burden created by


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the refugee population and may require support to bring back service levels to the same as before the refugee influx.

Waste collection frequency

21. UNHCR and WASH actors should ensure that waste containers are emptied and cleaned at least twice a week, or more frequently if required. In temperate climates, fly eggs laid in organic wastes can develop into maggots in 4 days and adult flies can emerge after 8 days. It is estimated that 1kg of organic waste can serve for the reproduction of 70,000 flies. For these reasons, collection twice a week is a bare minimum to ensure the breeding cycle of flies within the refugee setting is eliminated.



Figure 5-1 Spraying for vectors, Gaza

Waste collection timing

22. It is generally inefficient for waste collection vehicles to be sitting in traffic jams when they could be out collecting wastes and so waste collection routes are typically scheduled so that collection in locations with the greatest traffic problems are scheduled for collection during the time of day with the least amount of traffic (typically the early hours of the morning). Collection routes that have less problems with traffic jams can be scheduled for later in the morning. Collection vehicle maintenance activities are usually scheduled for the time of the day when waste collection activities are not taking place – typically when there are high levels of traffic congestion in the afternoons. The efficient scheduling of waste collection may not be problem in planned refugee sites, however it is an important factor if the refugee population are located in an urban setting. Even with adequate maintenance, waste collection programmes should have sufficient waste collection vehicles resources to allow for the downtime of at least 20% of the waste collection fleet.



Figure 5-2 Communal container, Jordan

Incorporating assessment of solid waste into observation walks

23. An observation walk of the refugee site does not have to take long, and can easily be incorporated into the general needs assessment schedule. For safety and security reasons it should generally be undertaken using a member of the refugee population as a guide. This also allows the possibility to pose questions and collect first-hand information about problems and solutions related to waste management.

During the observation walk, try to visit as much as possible of the existing waste infrastructure in addition to places where waste dumping is taking place. Try also to obtain an even balance of places the guide wants to show you and places they may not want you to see.

Assessing waste types and quantities through the use of waste surveys

24. During the stabilisation phase it is important to take a moment to fully understand the types and volumes of wastes that are being generated in the refugee setting. Solid waste generation rates vary considerably depending upon the country, culture, geographic setting, emergency context and degree of economic development. In industrious nations the population may create up to 2 kg of waste per person per day. This waste is typically of low density containing a high proportion of paper and plastic packaging. In many refugee settings, waste generation is lower of between 0.3 to 1.0kg per person per day and the waste is much denser containing a greater proportion of organic matter – see the boxes on the right hand side. In all settings, once the types and characteristics of the waste are known, an efficient and effective programme can be designed for each waste type that may include interventions for reduction, reuse, recycling and disposal. At the most basic level it is essential to know the accumulation rate and the bulk density for planning purposes.

25. The most reliable method of determining the waste accumulation rate, and bulk density is through direct sampling. At the start of a programme it is recommended that waste sampling is undertaken in four to eight randomly selected community waste collection points that are representative of each of the main socio-economic groups in the refugee setting. In order to assess the rate at which waste is being created it is first necessary to establish a baseline by cleaning all wastes from the selected locations and then assessing the amount of waste that accumulates during a known duration (typically half a week). A rapid census is also required at each collection point to understand how many people are generating the waste.

Box: Typical daily per capita urban waste creation rates

Location	Rate (kg/cap/day)
India	0.3 to 0.55
Guatemala	0.3 to 0.6
Philippines	0.4
Brazil	0.54
Indonesia	0.6
Mexico	0.68
Chile	0.9 to 1.2
Fiji	0.91
Singapore	1.0
France	1.43
Hong Kong	1.68
Australia	1.87
South Korea	2.0
New Zealand	2.0

Source: Diaz L.F., Savage G.M, Eggerth L.L. (2005) '*Solid Waste Management'*, United Nations Environment Programme, UNEP, Geneva.

Box: Typical urban waste bulk density values

Country	Density (Kg/m3)
United States	100
United Kingdom	150
Singapore	175
Tunisia	175
South Korea	200 to 450
Nigeria	250
Thailand	250
Mexico	300 to 500
Tanzania	330
Burma	400
Indonesia	400
Sri Lanka	400
India	400 to600
Pakistan	500
Bangladesh	600
Nepal	600

Source: Diaz L.F., Savage G.M, Eggerth L.L. (2005) '*Solid Waste Management',* United Nations Environment Programme, UNEP, Geneva.

26. Wastes that have accumulated during the evaluation period (half week) should be collected in containers or sacks, labelled with the location, and brought back to the sanitation yard for analysis. Before the waste is sorted it should be weighed, and its uncompressed volume should be measured by filling a waste container of known volume. This allows an estimation of the waste bulk density to be calculated which is an important factor when planning collection.



Figure 5-3 Waste composition analysis

27. Once the total weight and volume of waste created is known, the waste production rate should be calculated by dividing these figures by the population that uses each collection point. The figure should then be divided further by the waste accumulation period (in this case 3 days) to end up with an average daily waste creation rate in terms of kg per person per day.

Solid waste accumulation rates vary from context and can be anything from 0.35 kg to several kgs per person per day. In a refugee population of over 40,000 people this can quickly add up to many tons of waste that is generated per day.

Box: Example waste analysis by percentage and weight

Waste constituent	Kg	%
1. Paper	55.5	14%
2. Metal	19.8	5%
3. Glass	15.8	4%
4. Textiles	11.9	3%
5. Plastics and rubber	7.9	2%
6. Bones	4.0	1%
7. Misc combustible	7.9	2%
8. Misc incombustible	15.8	4%
9. Inert matter <10mm	39.6	10%
10. Organic >50mm	39.6	10%
11. Organic 10-50mm	138.7	35%
12. Organic <10mm	39.6	10%
TOTAL	396.2	100%
DENSITY (kg/m^3)		387.4

Note
The presence of additional wastes should be noted such as light industrial wastes, batteries, used vehicle oils, paints, solvents, varnishes, aerosols, and broken electrical apparatus (inc. strip lights).

28. Once the overall waste density and daily waste production rate has been calculated the waste

should be manually separated into their constituent types (see the example in box above) and the weight of each constituent can be recorded. A sieve should be used to grade the organic wastes into >50mm, 10mm-50mm and <10mm. It is important to recognize that the waste analysis undertaken will generally be an under-estimate of the total waste that is being generated. A significant amount of waste may have already been reused or recycled either by the household themselves or by waste scavengers before analysis. However this does give a good indication of the amount of waste that needs to be managed by the WASH agency.

29. Once analysis of the waste composition analysis has been completed, a plan should be established for each waste constituent. In general there are four options available including

    1. Landfill
    2. Sort, recycle, compost, reuse
    3. Incineration
    4. Do nothing

    A cost-benefit analysis should be used for each waste constituent to identify the technical requirements, cost, public health impacts, environmental impacts, and social impacts of the options available. The wastes should also be prioritized into those that are a risk to public health or the environment and need addressing immediately and those that are relatively inert and need a longer term approach.

30. Due to the changing nature of refugee emergencies, UNHCR and WASH actors should aim to conduct a waste survey at least once every 6 months to modify and update the waste management programme to the evolving circumstances.

Waste types, characteristics & management options

Characteristic and management of domestic solid wastes

31. Domestic waste is defined as non-liquid waste material arising from domestic activities. Domestic wastes in refugee settings typically account for up to 75% of the total amount of waste to be managed and can contain such items as food wastes, packaging waste, rags, paper, glass, metal, plastic, rubber, animal wastes, dust, sand, ash and floor sweepings. In addition, small quantities of special wastes may be encountered such as batteries, used vehicle oils, paints, solvents, varnishes, aerosols and broken electrical apparatus. In settings where sanitation is limited, the waste may also contain excreta.



Figure 5-4 Overflowing waste containers

Characteristics and management of market and commercial wastes

32. Markets may create large amounts of waste including product packaging waste (paper, plastic), animal slaughter wastes, perished fruit and vegetable

wastes, food stall waste and floor sweepings.

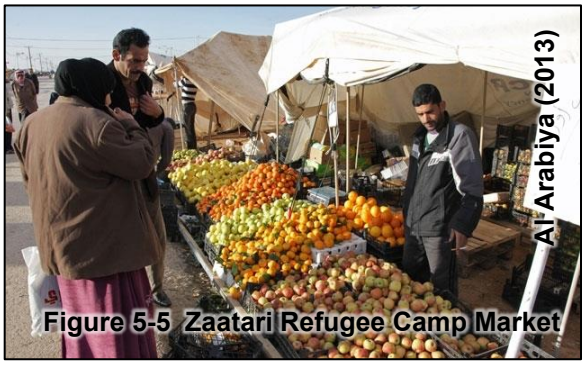


Figure 5-5 Zaatari Refugee Camp Market

33. UNHCR and WASH actors should work with market vendors and small businesses to design a waste management plan that deals safely with each type of waste and ensures that public health risks, disease vectors, smells, flies and other nuisances are minimized. At a minimum this should entail that each market vendor has their own 100 litre waste container and public waste containers are positioned throughout the entire market area at a minimum interval of every 50m.



Figure 5-6 Zaatari Refugee Camp Market

34. In most settings, paid cleaners will be required to sweep any litter that is created and bring the wastes to a centralized collection point. It is often advantageous to position a large volume bulk refuse container or construct a transfer station near the market area (or in fact any area that is a large producer of waste).

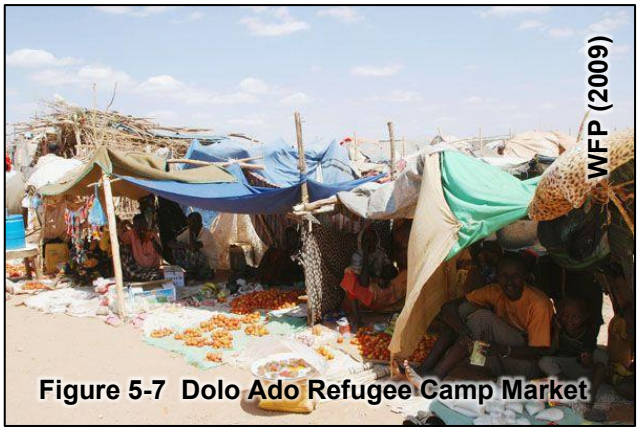


Figure 5-7 Dolo Ado Refugee Camp Market

35. A high proportion of market wastes are organic in nature and UNHCR and WASH actors are strongly encourage to facilitate separate collection of spoiled organic wastes directly from vendors. In temperate climates, market wastes should not be allowed to fester and should be collected daily. It is highly desirable that separate collection of 'wet' putrescible mixed waste for landfilling and 'dry' (paper, plastic packaging) wastes is organised in market settings. Ideally the organic waste stream should be diverted from being disposed in the landfill through a programme of composting (see **section 5.53**). Additional infrastructure may need to be constructed in animal slaughter or fish market areas to allow the area to be washed, cleaned and disinfected. This may require the construction of dedicated soak pits equipped with grease traps.



Figure 5-8 Zaatari Refugee Camp Market

Characteristics and management of hazardous wastes

36. In all refugee contexts, UNHCR and WASH actors must ensure that hazardous wastes from domestic or small-scale commercial activities are adequately managed. Examples of these wastes include used motor oils (a source of heavy metals), antifreeze, car batteries (containing lead, mercury and acid), discarded tyres (containing complex synthetic rubber compounds), used oils (containing various synthetic compounds), asbestos, oil-based paints, paint thinners, wood preservatives, pesticides, or electronic waste (a source of hazardous materials including cadmium, mercury, arsenic and lead). Great care must be taken as even small quantities of these wastes can cause significant risks. In all cases, UNHCR and WASH actors must ensure that steps are taken to ensure these wastes do not enter the general mixed domestic waste stream where they can pose a danger to the health and safety of workers, scavengers, or the environment.

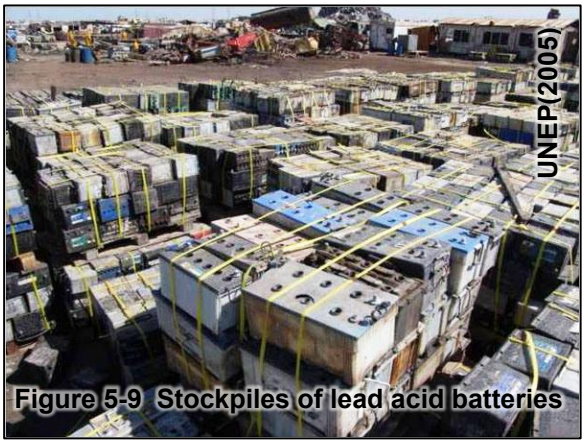


Figure 5-9 Stockpiles of lead acid batteries

37. In every setting, UNHCR and WASH actors should facilitate the separate collection of these wastes at source. Every context is different however strategies to ensure that these wastes do not enter the domestic waste stream including establishing hazardous waste collection points, facilitating separation of hazardous wastes from the domestic waste stream during collection, door-to-door collection, use of incentives (e.g. small gifts, or cash for certain types of hazardous wastes such as car batteries), outlawing certain types of harmful products.

38. In every setting, UNHCR and WASH actors should ensure that facilities exist for the safe collection, bulk storage and transfer of these wastes to competent authorities where they can be dealt with safely. All hazardous wastes should be clearly labelled during storage and transportation with the name, date and type of waste in addition to internationally recognized hazard warning symbols. In all cases, UNHCR and WASH actors should seek expert advice related to the handling, moving, storage and transportation of hazardous wastes.

In all settings, UNHCR and WASH actors s must make special provision for the separate collection of special domestic wastes including car, motorcycle or small domestic batteries, used vehicle oils, paints, solvents, varnishes, aerosols, pesticides, asbestos, and broken electrical apparatus. These wastes even in small quantities can cause large damage to the environment and they must not be allowed to enter the domestic waste stream.

Characteristics and management of medical wastes

39. Medical waste is generally defined as all infectious and non-infectious waste material arising from health-care related activities. In all settings, UNHCR and WASH actors must ensure that medical wastes are segregated at source and treated appropriately without risk to staff, patients or the public environment regardless of the emergency setting or type of health-care facility (temporary, permanent or mobile). More information concerning the safe management of the different types of medical wastes can be found in **section 5.128**.

Evaluation of public health risks along each waste management chain

40. UNHCR and WASH actors must ensure that each of the different types of wastes are stored, collected, transported, treated, reused, or disposed in a way that does not expose refugees or sanitary workers to harmful pathogens or substances, minimizes offensive odours in populated areas and minimizes the impact on the environment. Sanitary surveys (**see Annex**) of each step of the solid waste management chains should be carried out to assess public health risks and formulate a prioritised plan of action. Copies of recent sanitary surveys should be included in the site WASH plan/strategy.

Reduction, recycling and reuse in refugee settings

The waste hierarchy

41. The waste hierarchy is a classification of waste management options in order of their public health and environmental importance. It has been adopted in various forms by most industrialized countries through international conventions.

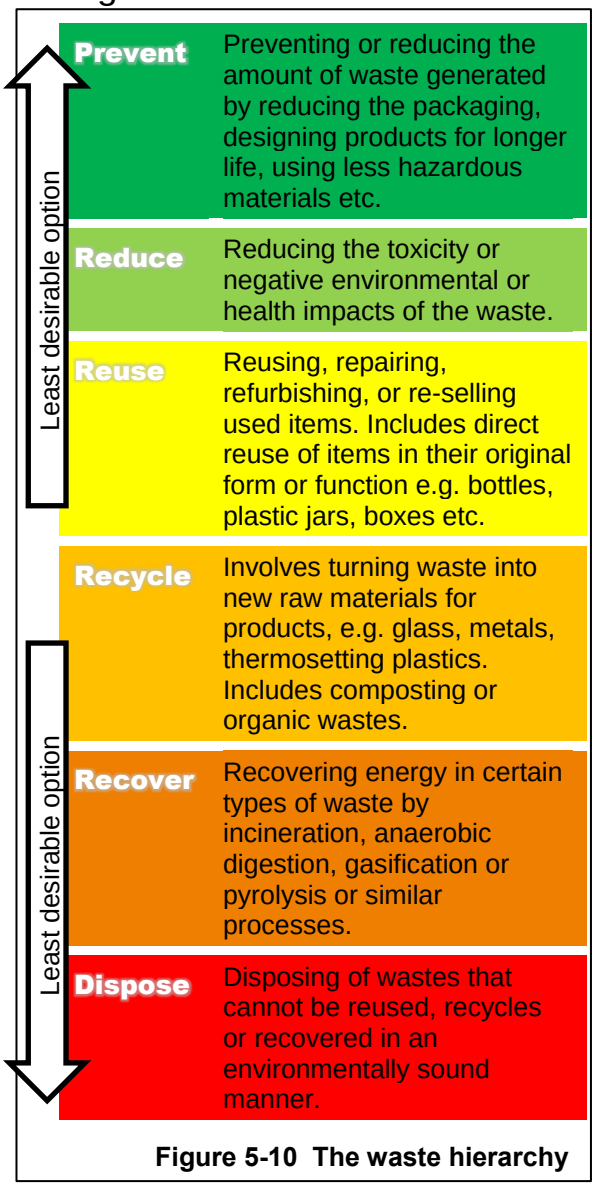


Figure 5-10 The waste hierarchy

42. The waste hierarchy is a useful tool for helping UNHCR and WASH actors prioritize waste interventions in refugee settings. For example, activities that prevent the generation of waste should be prioritized over recycling. In addition, the waste hierarchy shows us that interventions that reduce the toxicity or negative impacts of waste must be


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prioritized over interventions to reuse, recycle or dispose of waste. An example of this in a refugee setting is prioritisation of the correct management of medical wastes or toxic special wastes of which small quantities can have a major impact on public health and the environment (e.g. such as lead-acid batteries, household batteries, used engine oils, used paints, varnishes and oils, broken electrical equipment). Getting this right must be a greater priority for UNHCR and WASH actors than the day-to-day management of relatively inert household wastes that have a lower impact on public health and the environment.

Waste prevention

43. Any efforts to reduce the amount of waste that is generated can greatly reduce the burden and cost of waste collection, processing and disposal. Following the waste assessment (see **section 5.24**) it is important to look at each type of waste and identify steps to reduce the amount that is generated.



Figure 5-11 Emergency packaging wastes

44. One practical step that can be taken by UNHCR and WASH actors is to ensure that all items that are distributed to the refugee population are free from any unnecessary packaging. UNHCR and WASH actors may wish to work with representatives of the refugee population to change practices related to certain types of problematic wastes – e.g. plastic bags from market vendors. Alternatively, the refugee population can be empowered to create their own legislation preventing certain types of waste.

Waste reuse and recycling

45. Waste reuse involves repairing, refurbishing, re-selling or reusing items in their original form or function e.g. bottles, plastic jars, boxes. In refugee settings there may be a significant market for the repair of broken goods, or the sale of used goods. In all settings, UNHCR and WASH actors should examine what support can be done to strengthen or reinvigorate these essential services.

46. Not all "waste" is waste and in most refugee settings, metals, glass and plastic in addition to any materials that can be burned (wood, cardboard, paper, rubber and plastic) are usually scavenged very quickly. Recycling and reuse is also very common at the household level particularly any materials that can be burned (wood, cardboard, paper, rubber and plastic), any material that can be fed to animals, or any material (metal, glass, plastic) that can be turned into something else.

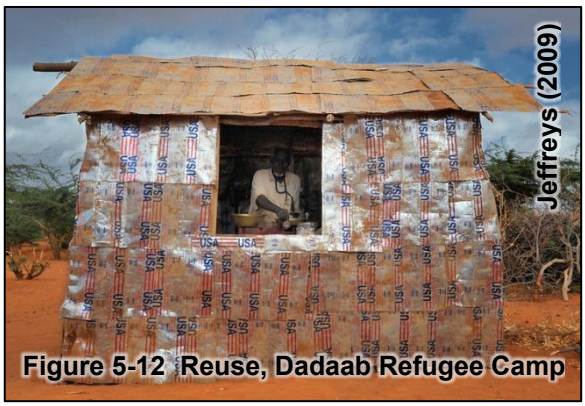


Figure 5-12 Reuse, Dadaab Refugee Camp

47. Due to the social and economic nature of recycling, it should always be organised in close collaboration with representatives of the refugee population and preferably directly by the refugee population themselves. UNHCR and WASH actors may wish to support or facilitate the process by creating or reinforcing market linkages with recycling companies outside of the refugee setting - for example in the Burmese refugee camps along the Thai-Burma border, the IRC facilitates monthly visits of recycling wholesalers for the purchase of recyclable materials.



Oxfam GB (2009)

Figure 5-13 Recycling prices , Indonesia

Recycling of glass

48. Glass is one of the easiest and most profitable resources that can be recovered. New glass objects can be produced using as much as 80−100 per cent recycled glass. The price per ton of recovered glass depends on its cleanliness and colour. Clear glass can be recolored and therefore fetches a higher price than mixed glass. For clear glass to fetch a high price, absolutely no coloured glass should contaminate the lot. In some refugee settings, UNHCR and WASH actors may consider small-scale income generation initiatives cleaning waste glass and creating decorative objects such as tumblers or candle-holders. With some investment a glass workshop can be established to melt glass and blow it into decorative objects.


Clusttersinafrica.blogspot.com (2012)

Figure 5-14 Glass bead production

Recycling of metal

49. The recycling of metal tins and cans can also be profitable. Scavengers often use heavy−duty tin openers or scissors to remove the top and bottom rims of the cans and to cut the remaining tube into rectangular pieces of sheeting which can easily be cleaned, flattened and bundled. Aluminium cans from soft drinks also have

very high retail value because of the high quality of aluminium used. They are either crushed and stored in large sacks or used directly in producing decorative objects (see Figure 5-16). In some refugee settings, UNHCR and WASH actors may consider supporting or establishing cooperatives to produce decorative objects such as toys, jewellery or candle-holders. Fancy and artistic pieces of work can be produced by hammering the metal plates on wooden or steel moulds.

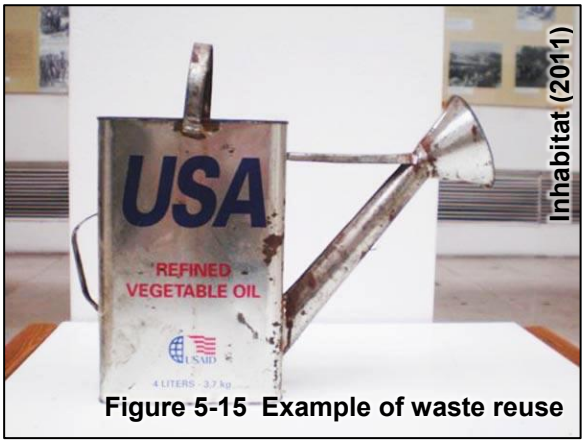


Figure 5-15 Example of waste reuse



Figure 5-16 Toy car from tin can

Recycling of paper

50. The manufacture of paper from new raw materials requires a lot of energy and so recycling paper can be a profitable. The price per ton of recovered paper depends on the type, grade and cleanliness. It is an advantage to make sure the different grades are not mixed to get the best price. Typical classifications include cardboard newspaper, office paper, magazines, and waxed or plasticized paper packaging. Most printed paper needs to be de-inked which may lower the price. Magazines and newspaper can be used in paper-mache to create decorative objects.

Recycling of plastics

51. There are two main types of plastic found in quantity in refugee settings; thermoplastics and thermosets. Only thermoplastics (such as PVC, polypropylene and polyethylene) can be moulded after heating and keep their shape at normal temperatures are therefore profitable for recycling. Thermosets that are typically used in kitchen items, or electrical appliances, have no recyclable value. The price per ton of thermoplastics depends on the cleanliness, type, quality and colour. Washing, drying and sorting plastics into colour increase its value. Typically plastics are sold on to waste dealers with extruder/pelletizer machines which partly melts the plastic and presses it out into strings which are then chopped into pellets. Bags of coloured recycled pellets are then sold to the manufacturers of low−quality plastic objects, such as cups, dolls, toys and packing containers. Plastics that are recovered earlier in the waste stream require significantly less cleaning. By the time plastics have arrived at a dumpsite, the effort and time required to sort and clean the plastic may render the recycling process unviable.

Recycling of rubber

52. The main source of rubber in a refugee setting is used car or bicycle tyres. These can be used to manufacture sandals, straps, or even small waste containers. Sandals from recycled car tyres are widely accepted because of their durability.

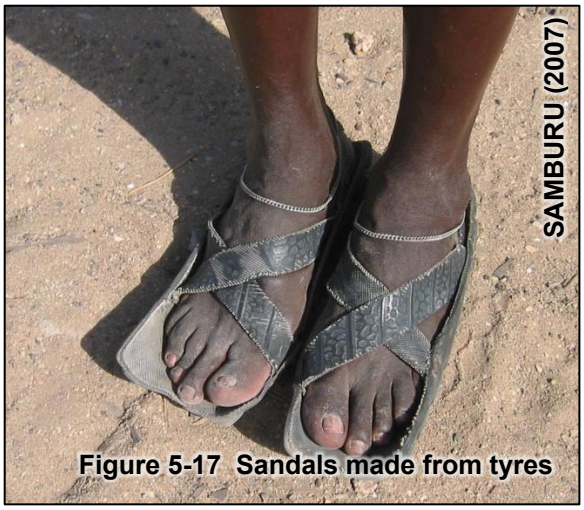


Figure 5-17 Sandals made from tyres

Recycling of organic wastes

53. Organic waste is usually the largest waste component in refugee settings and in some circumstances can be as much as 70% of the waste created. Aerobic composting is a natural process by which microorganisms convert organic wastes into a beneficial compost material which can be used to condition and fertilize soil. The process can take between three and ten weeks and involves careful control of the moisture and air content.

54. In many refugee settings the costs associated with large scale centralized composting projects may be uneconomical, especially if there are no significant agricultural activities within 5km of the composting locations. The reality is that with escalating transportation costs, most waste composting projects cannot be expected to make a profit. However, even if there is no market for composted waste, there is still a small operational and environmental saving in ensuring this material gets diverted from the domestic waste stream and is not dumped in a landfill. In most refugee settings, the best approach is often promoting and facilitating composting at the household level in collaboration with nutrition interventions such as kitchen gardens. This not only has the advantage of productively using organic wastes, but also allows household to produce crops for nutritional supplementation or small income generation purposes.



Figure 5-18 Small refugee kitchen garden

55. For these reasons it is highly recommended that UNHCR and WASH actors support, educate and encourage refugee populations to source separate and generate compost at the household level before wastes even enter the waste stream. Every ton of organic material that is prevented from entering the waste stream at the household level is a ton of waste that is saved from collection, transportation, handling, processing and disposal / reuse. Small investments in supporting household composting

can yield large savings in programme expenditure.



Figure 5-19 Small refugee kitchen garden

Manual waste sorting

56. Manual sorting of wastes at a centralized level can be reasonably successful provided that some degree of source separation has been facilitated at the household and communal level. At a most basic level, this requires the refugee population is sufficiently informed and motivated to source separated their wastes into 'wet' putrescible mixed household wastes that should go straight to the landfill and 'dry' non-putrescible waste that may be later sorted into paper, rags, plastics, glass and metals.

The most important aspect of manual sorting is the comfort, safety and dignity of the waste sorters. UNHCR and WASH actors must ensure that waste sorting is carried out in complete safety.

57. Manual sorting requires at a minimum a clean yard area onto which the waste can be tipped and bins into which the materials can be manually sorted (paper, glass, metal, plastic etc.). Improved setups use a sorting table with large corner holes into which wastes can be sorted into bins without bending over.

58. Attention should be paid to identify potentially dangerous materials that may appear in the waste and may have to be handled with special care. There might be containers with dangerous liquids, gas, inflammable materials, or poisonous objects. The waste sorting area should be equipped with an enclosed section where such material can be kept separately for special disposal.

59. UNHCR and WASH actors should ensure that waste sorters have good access to hand washing and showering facilities. All waste sorters should be wearing personal protective equipment suitable for the tasks they are performing (a minimum of gloves, overalls, protective boots and face-mask) and should have received training in the infection control standard precautions. Waste handling and sorting frequently requires moving loads of waste and this should be facilitated with handcarts and wheelbarrows. The site should also have one hoist which is invaluable if the process bales of recycled materials need to be loaded into a vehicle. A set of scales is also essential to document the amount of recycled material that is produced. Finally, fire extinguishers, buckets with sand and alarm bells at several locations on the site should be placed in very visible locations, preferably suspended from posts.

Mechanized waste sorting

60. A simple conveyor system with a picking line can dramatically improve waste sorting conditions

(see Figure 5-20). Various machines exist for sorting waste including electromagnetic, fluid dynamic and visual recognition, however in most refugee settings the cost and complexity of these machines renders them unviable.



Figure 5-20 Waste recycling, Gaza

Box: Manual waste sorting rates and efficiencies

Material	Sorting Rate Kg/hr/person	Recovery Efficiency %
Paper	700 – 4,500	60 – 95
Cardboard	700 – 4,500	60 – 95
Glass	400 – 800	70 – 95
Plastic	140 – 280	80 – 95
Aluminium	45 – 55	80 – 95

Note: These rates are based on a processing stream of predominantly metal, glass and plastics.

Source: Diaz L.F., Savage G.M, Eggerth L.L. (2005) '*Solid Waste Management',* United Nations Environment Programme, UNEP, Geneva.

Working with waste scavengers

61. It is estimated that more than 2% of the population in developing countries earns their living from scavenging and it can be very difficult to prevent. In refugee settings, it is recommended that UNHCR and WASH actors work with scavengers in a way that complements on-going waste collection, rather than outlawing it. In general, any scavenging activity that removes recoverable materials from the waste stream reduces the waste disposal costs and therefore scavengers should be recognized for their contribution.

62. One way to work in a complementary way with scavengers is to define where and how scavenging can take place so that it minimises public health risk and doesn't disrupt waste collection or create additional mess than needs to be cleared up. One possibility to reduce the risk to scavengers is to institutionalize a system of household separation of wastes into 'wet' putrescible mixed household waste that should go straight to landfill and 'dry' non-putrescible waste that contains items that may be recycled e.g. paper, rags, plastics, glass, metals. Another approach is to formalise scavenging and give exclusive rights to waste collection points, provided that the allocated scavenger keeps the area tidy. Another possibility is to allow waste scavengers to recover wastes in a controlled environment for example a combined transfer station / resources recovery facility (see **section 5.104**).



Figure 5-21 Waste scavenging

63. In all cases, UNHCR and WASH actors should work with the refugee population to reduce, control and mitigate the many serious health risks associated with scavenging. UNHCR and WASH actors may consider training waste scavengers in the infection control standard precautions and providing

professional scavengers with protective clothing (in particular footwear and gloves). In all cases, the scavenging of health-care wastes must be absolutely forbidden.



Figure 5-22 Waste scavenging, Aleppo

Technical options for waste storage and collection

Household solid waste containers

64. Solid waste collection containers vary immensely from context to context and come in many materials and sizes. Typical household and communal waste container options include..

    1. Metal/plastic buckets (10-20 litres)
    2. Metal/plastic bins (20-60 litres)
    3. Reed baskets (40-80 litres)
    4. Truck tyre buckets (40-60 litres)
    5. Classic metal dustbin (~100 litres)
    6. Half oil drums (~100 litres)
    7. Complete oil drums (~200 litres)
    8. Wooden containers (40-200 litres)
    9. Plastic wheelie bins (~100 litres)
    10. Metal containers (~1m^3)
    11. Wheeled metal containers (~2m^3)
    12. Metal skips (~4m^3)
    13. Static refuse trailers (~6m^3)

    In most refugee settings it is typically the responsibility of the refugee family to organise their own waste collection at the household level with UNHCR and WASH actors undertaking responsibility for providing waste collection containers and services at the communal level. In some settings UNHCR may consider distribution of household waste containers if it encourages source separation of wastes.



Figure 5-23 Household waste, Myanmar

Communal solid waste containers

65. Solid waste containers are one of the most critical, yet most often overlooked, elements in any solid waste management programme. The root cause of many problems associated with solid waste collection can often be traced back to poor waste container selection. The choice of communal waste container should be compatible with local practice and collection mechanisms.

66. It is prudent to assess the waste generation rate (see **section 5.24**) and then slightly oversize the waste containers as the cost, time-wasted, and public health risk of cleaning up wastes from overflowing containers more than justifies the additional cost of larger containers. In addition, containers that are never 100% full reduce the risk of wind dispersion. It is recommended that a safety factor of an additional 100% is allowed to

accommodate public holidays and unavoidable service disruptions.

67. The optimal sizing of waste containers depends upon the number of household using the waste container, the collection frequency and the waste production rate. In previous guidance documents, UNHCR has recommended that WASH actors plan to install half an oil drum (100 litres of waste collection capacity) for every 10 families. Assuming collection takes place bi-weekly this provides 0.24 litres of available waste collection capacity per person per day (allowing a safety factor to prevent the container becoming completely full and facilitating wind dispersal). This may serve as a rough estimation for an initial emergency response in a non-urban setting, however as soon as possible, UNHCR and WASH actors should undertake a proper assessment of waste accumulation rates (see **section 5.24**) and should recalculate the optimum waste collection volume for the context. In general, it is recommended that the largest sized containers that are compatible with collection vehicles are installed. In planned settlements or low density, single storey settings, each waste collection point serving 16 families will typically require between 200 litres and 400 litres of waste storage capacity. In high-density urban settings, with multi-storey buildings, it is highly likely that waste container sizes will need to be between $2m^3$ and $4m^3$ per waste collection point spaced every 50m along access roads.

    Finally, it is essential that the container size and type that is selected is compatible with the collection vehicle being deployed. There is no point procuring $2m^3$ waste containers, $4m^3$ waste skips, or $6m^3$ static waste trailers if the location cannot be accessed by waste collection vehicles.

Box: Optimal waste bin size for an urban collective centre.

An urban residential housing block is accommodating 50 refugee families. Waste collection is planned for twice a week. It is estimated that the waste accumulation rate is 1.2kg / person / day and the waste density is 350 kg/m^3. What is the optimal waste container size?

The total daily volume of waste generated within the residential block is as follows

Daily waste volume (V_{day}) = N x R / ρ

where

N = the block population (50 x 6 = 300)
R = waste production rate (1.2 kg/per/day)
ρ = the average waste density (350kg/m^3)

it follows

Daily waste volume (V_{day}) = 360 / 350
Daily waste volume (V_{day}) = 1.03m^3 / day

Optimal waste bin size = V_{day} x F x SF

where

F = the frequency of collection (3.5 days)
SF = safety factor (additional 100%)
Optimal waste bin size = V_{day} x 3.5 x 2

Optimal waste bin size = 7.2m^3

In conclusion, four waste containers of $2m^3$ each need to be allocated to the residential housing block to ensure there is sufficient capacity if collection is organized twice a week.

    If manual lifting is required, then the waste containers must not weigh more than the maximum load that two labourers can safely lift onto a waste collection vehicle. This is typically around 60-80kgs. The size may need to be reduced if the waste is loaded into a

collection vehicle that is more than 2m off the ground. A much safer and more efficient primary collection system avoids manual lifting through the use of $2m^3$ wheeled metal containers, $4m^3$ metal skips or $6m^3$ static refuse trailers.



Figure 5-24 Manually loaded waste truck

In many refugee settings, 200 litre oil drums are commonly procured for use as waste containers. This practice is strongly discouraged by UNHCR as it is detrimental to the health and safety of waste collectors. These containers typically weigh 16-18kgs when empty and up to 150kg when full. If oil drums are used, they should be first cut in half (100 litres).

Waste containers should be high enough off the ground to prevent animals (goats, cows) accessing the waste yet still low enough for children of at least six years old to use. A compromise between these two competing requirements is a target height of 1 metre. In addition, the waste container cover opening and closing mechanism should be light enough that it can be operated by all users.

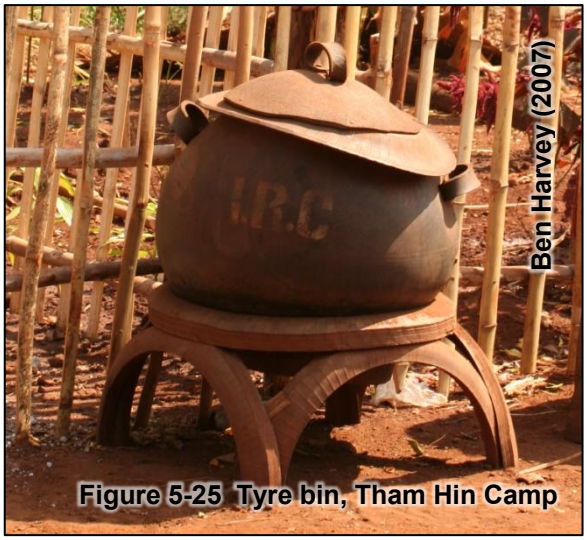


Figure 5-25 Tyre bin, Tham Hin Camp

68. The cost per ton of sweeping up wastes that have been dumped on the floor can be over ten times as much as the cost per ton of emptying waste that has been placed in a container and so it is essential that containers are conveniently located and accessible throughout the refugee setting to prevent littering, and containers are always emptied before they become full. In planned settlements one functional waste collection point should be established for each community of 16 families with provision of waste containers of sufficient volume (see **section 5.67**). In settings where the refugee population is integrated into the host population, UNHCR and WASH actors should ensure that the refugee population receives the same quality of waste collection services as the host population prior to the influx. A general guidance figure for urban settings with multi-storey buildings is provision of waste containers of sufficient volume (see **section 5.67**) placed along streets at a maximum interval of every 50m to provide access within 25m of every residence block.


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69. UNHCR and WASH actors should ensure that containers have sufficient strength to be able to hold the waste securely without deforming in addition to being able to withstand the loads exerted during loading and emptying in addition to occupational misuse (knocks and scratches). Since wastes in refugee settings are typically much denser than wastes in conventional settings, it is prudent to purchase the most durable containers possible. In addition, solid wastes can become extremely corrosive if the waste become wet. Plastic containers may be preferable to steel containers in settings that experience high rainfall.



Figure 5-26 Wooden waste bins, Indonesia

70. Fire-setting of containers is a common practice in many refugee settings either to create space in the container, for warmth, for entertainment, or by accident. In some refugee settings it may be prudent for UNHCR and WASH actors to select waste containers that are constructed from heavy sheet metal that is able to withstand repeated fires. Containers made from wood or plastic, or metallic containers with wheels, should be avoided in these settings.



Figure 5-27 Metallic bins, Ingushetia



Figure 5-28 Metallic bins, Ingushetia

UNHCR and WASH actors should, at a bare minimum, ensure that solid waste containers are durable, vector proof, weather proof, washable and robust enough to survive daily handling and use.

71. Covers on most communal waste containers are nearly always a



failure because people are unwilling to open or replace them (either because they are heavy, dirty or inconvenient). However, all solid waste containers should have covers to protect the contents from the rain, reduce littering caused by winds, and reduce vector populations and smells. Rainwater should be prevented from mixing with wastes at all costs as it causes wastes to fester, causes corrosion, and increases the gross weight of wastes putting additional load on collection and transportation equipment and staff.



Figure 5-29 Foot operated cover

72. In general, container lids should be light enough to allow access to the population using them, preferably without using their hands and with a mechanism for self-closing. An ideal system is the European container model that uses a large foot pedal to open the cover (see Figure 5-29) without having to touch the container. If waste containers do not have a lid (for example 4m^3 metallic skips or 6m^3 waste trailers) then another option to protect them from the rain is to construct a simple shelter (see Figure 5-33 from Tham Hin Refugee Camp). Holes should be drilled into the bottom of all waste containers to facilitate drainage of rainwater.

Wheeled waste containers

73. Many medium sized waste containers are equipped with wheels to allow the container to be manipulated into position for the lifting mechanism to engage and empty the container into the collection vehicle.



Figure 5-30 Wheeled bin – 1.5m^3

However, the tiny wheels are typically a point of weakness. Their failure can cause problems and delays to the loading procedure and a problem with the wheels can mean the whole container needs to be taken out of service and repaired. Wheel based container systems can be completely impractical in sites that are not surfaced. Wheeled containers should also not be used where there is a practice of fire-setting as they are easily damaged by heat and fire.



Figure 5-31 Wheeled bin failure, Zaatari


UNHCR/

Trailer based waste containers

74. Often the most efficient and cost-effective system for the collection and transfer of waste is the use of static waste trailers. This system is very economical as it does not require the purchase of specialised waste trucks and in many refugee settings, the same light four wheel drive vehicle that is used to bring staff to the camp to work in the mornings can be used to shuttle wastes to the landfill during the day. The system also avoids manual secondary handling of wastes. In general, this system is highly recommended by UNHCR provided that the distance to the landfill is short.



Figure 5-32 Simple waste trailer, Uganda

75. Trailers should be placed under a rain protection shelter to avoid the complications of handling wet wastes. A tarpaulin should be used to cover the wastes to avoid littering during transit. .



Figure 5-33 Rain protection, Thailand

Waste container lifting and tipping mechanisms:

76. Manual transfer of waste (using labour and shovels, rakes, or picks) is unhygienic, time consuming and inefficient. In all settings, UNHCR and wash actors must ensure that waste is handled as little as possible, preferably only once by the user when they place their waste into the start of the waste chain.



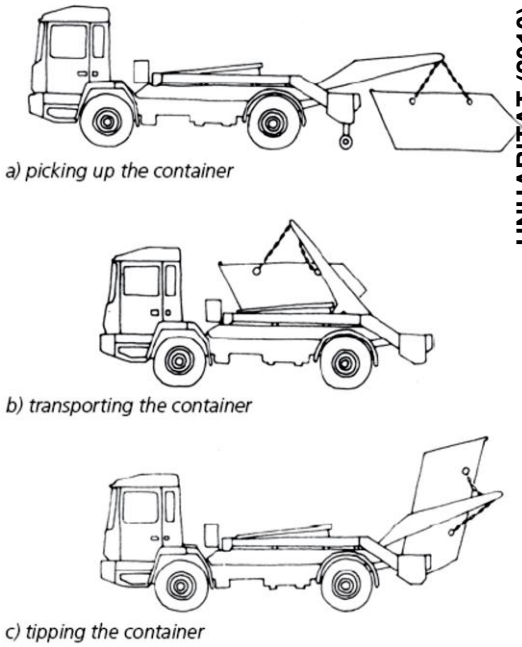
Figure 5-34 Mechanized emptying, USA

77. Dumper placers (also known as skip-lifts or container hoists) are trucks equipped with a pair of hydraulically operated lifting arms designed to transport, place and also tip a 4m^3 metallic skip. The main disadvantage of skips is that they are generally optimized to collect rubble and waste from building sites and so if they are used for solid waste end up using only a fraction of their permissible payloads. Another disadvantage of dumper placer systems is that the designs of skips do not lend themselves to being covered so they often suffer from rain ingress, fly populations and smells. If the skip has no covers, it should be covered with a simple net during transportation to avoid littering.




T. FAEZ (2014)

Figure 5-35 Skip unloading



UNHABITAT (2010)

Figure 5-36 Dumper-placer (skip lift)

78. A major weakness of many lifting and tipping systems is that containers need to be positioned into exactly the right location so the lifting mechanism can be engaged. This can take considerable effort if the wheels on the container are damaged or access to the container is restricted. To solve this problem a crane-lift system was developed by the UN in Gaza (see Figure 5-37). The disadvantage of this system is that it is reliant on imported equipment that needs to be imported and requires specialist parts and maintenance.


UNDP (2010)

Figure 5-37 Mechanized emptying, Gaza

Waste container cleaning and disinfection

79. All waste collection containers become dirty and contaminated over time from decomposing or wet wastes and need routine cleaning to avoid harbouring of disease, attracting disease vectors and becoming a public nuisance. In all refugee settings, communal waste collection containers should be periodically cleaned using mobile cleaning crews equipped with detergent and stiff brushes. Alternatively if a swop system is in place, waste containers may be cleaned at the transfer station after emptying and before going back into service. In all settings, it is recommended that communal solid waste containers are cleaned at least once a month.

Masonry waste collection bays

80. In some refugee contexts, it is common to see masonry waste bays used for solid waste collection (see Figure 5-39). The advantage of this system is that damage or theft of containers is reduced. However, this type of system faces a major disadvantage in that wastes need to be shovelled manually from the


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ground into a collection truck or cart which is slow, inefficient, unsanitary and is a public health risk to labourers. In all settings, UNHCR and WASH actors must avoid this system of waste collection. If there is a problem of damaged or missing containers, a formal investigation should be established via the camp committee.



Figure 5-38 Masonry waste bay



Figure 5-39 Masonry waste bay, Pakistan

UNHCR and WASH actors should ensure that in all settings, waste storage and transfer mechanisms are in place that prevent waste being handled or transferred manually. The most low-tech way to achieve this is with tippable static trailers.

Containers for source separation and recycling

81. During the care and maintenance phase, UNHCR and WASH actors should provide two clearly distinguishable types of waste container at each communal waste collection point. One for 'wet' putrescible household wastes for direct landfill disposal and the other for 'dry' mixed wastes that can be sorted and recycled. The size and type of containers for recyclable materials will depend greatly upon the context and the available resources within country. In many refugee settings the simplest solution to facilitate source separation and collection of recyclables is often to use exactly the same container type that is used for general waste and to paint it a different colour (e.g. green).



Figure 5-40 Recycling containers

Bulk refuse containers

82. Bulk refuse containers are typically between 30m^3 and 40m^3 and are the most economical way of hauling wastes over longer distances to a final waste disposal location that is a long distance from urban residential areas. They are typically left in situ at a transfer station to receive wastes from primary collection vehicles.



Figure 5-41 Bulk refuse container



Technical options for waste transportation

83. All waste solid waste programmes involve transferring the wastes from the point of collection to a place of sorting, treatment or final disposal. In refugee settings, transportation methods can include anything from wheelbarrows, handcarts, donkey carts, to trucks, tractors, dumper placers, mini dumpers, light vehicles with trailers, or compactor trucks. The cost of moving wastes is often the most expensive part of waste management and UNHCR and WASH actors should carefully evaluate the options available to select the most appropriate in terms of quality, efficiency and cost-effectiveness.

Communal container exchange vs. container tipping

84. In some contexts, UNHCR and WASH actors may need to make a decision between waste container tipping and waste container exchange systems of collection. In the tipping model, waste containers are lifted and emptied into the primary collection vehicle and are then returned to the same location. In the exchange model, empty containers are brought to each waste collection point and each full container is swopped with a clean empty one. Examples that use this model include the use of $4m^3$ metallic waste skips, or $6m^3$ waste trailers. The advantage of the exchange system is that there is no on-site transfer of wastes which reduces the risk of littering and contamination. In addition, bins can be routinely cleaned in a centralized location reducing the risk of disease vectors and smells. Many medical waste collection schemes use this model. The disadvantage of this system is that waste collection may be less efficient as containers may be taken back half-full and vehicles may be working at less than rated tonnage.

Primary collection vehicle size

85. The efficient transportation of waste occurs when the capacity of the waste collection vehicle is optimized to the volumes of waste that are generated and the distances over which waste is transported are kept as short as possible. For each context, it is essential to calculate the total volumes of waste generated per geographic sub-division (i.e. block or sector) and compare the cost per ton per km for each available transport option. In general, the cost per ton per km of waste transportation decreases as the volume of the transport vehicle is increased so usually the most cost-effective option is to use the largest primary collection vehicle possible that can physically access the waste collection points.

The efficient transportation of waste occurs when vehicles are loaded to their rated tonnage. Many vehicles (for example trucks or skip carriers) are designed to carry high density construction materials and therefore are inefficient for transportation of wastes with low densities unless fitted with volume extension panels.

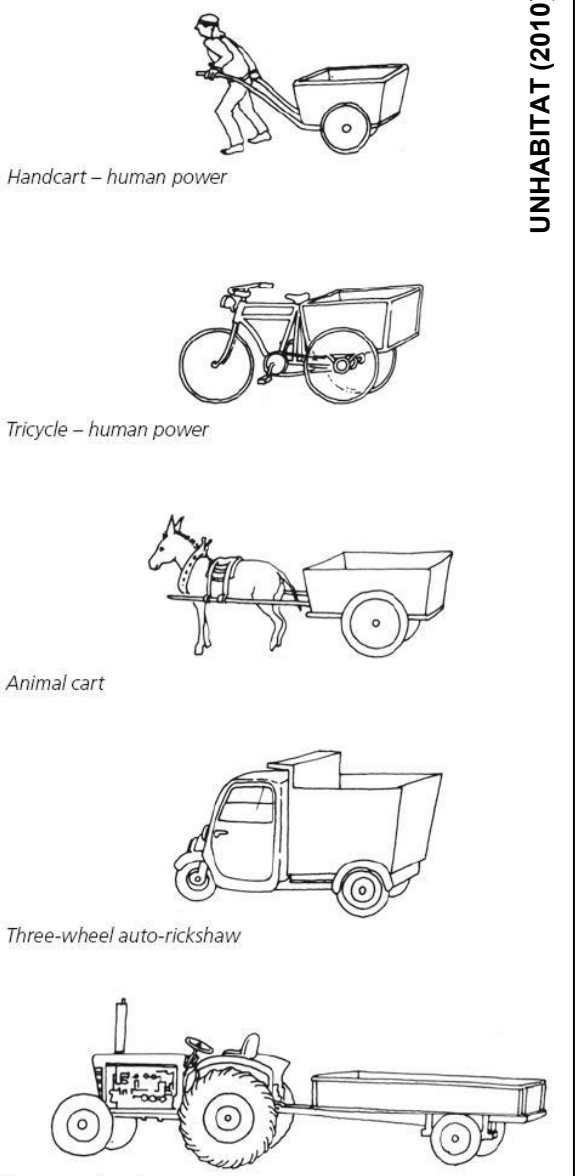


Figure 5-42 Waste collection vehicles

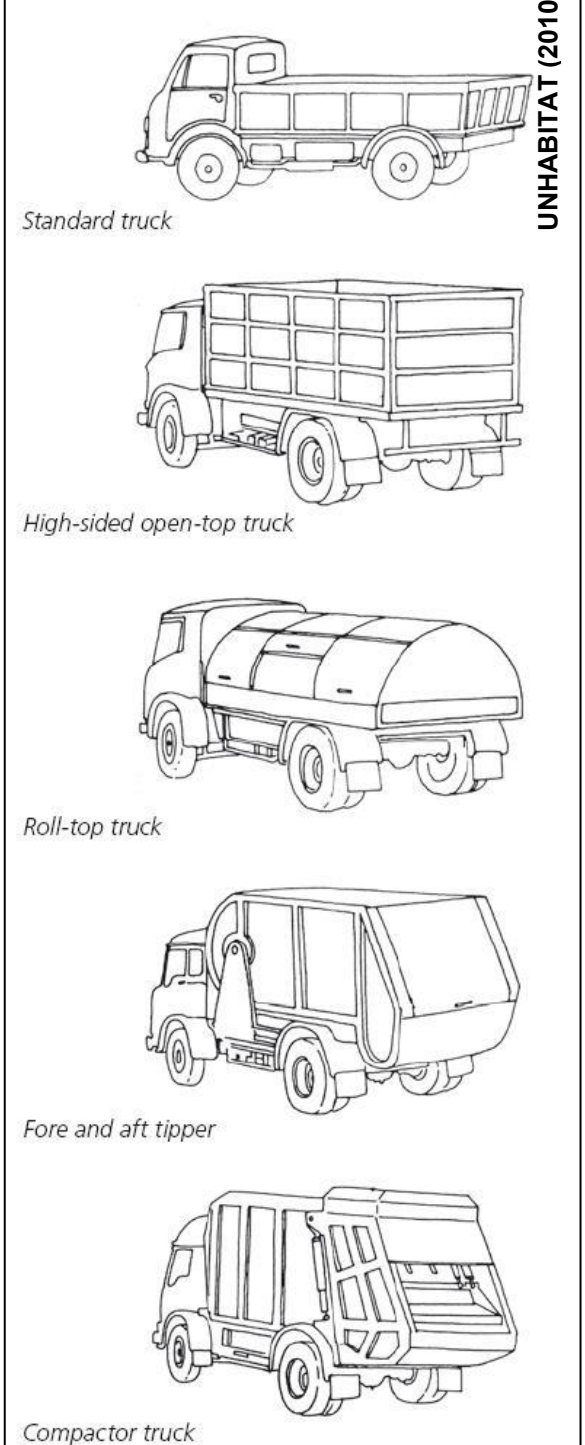


Figure 5-43 Waste collection vehicles

86. In many high-density settings, it may not be possible for large waste collection vehicles (e.g. waste collection trucks) to directly access the waste collection points. If access is difficult, primary collection may have to be undertaken using manual labour or small carts that are able to negotiate the narrow access passageways. In this case, groups of waste containers that can be comfortably and safely lifted or transported by a single person (60-80 litres) should be located within 25m of every household.

Wheelbarrows

87. Wheelbarrows are generally cheap and found in almost every corner of the world in some shape or form. They can be locally manufactured and are generally very easy to manoeuvre, even in rough unpaved terrain. However, wheelbarrows should only be

considered for special clean-up campaigns as they are too small and too inefficient to form part of the day-to-day waste collection system. The use of wheelbarrows also requires manual loading and puts waste personnel at risk from direct contact with wastes.



Figure 5-44 Wheelbarrow clean-up, Bangui



Figure 5-45 Wheelbarrow, Pakistan

Handcarts

88. Handcarts can be an efficient and cost-effective option in refugee settings under the following conditions:

    Limited access: The size and manoeuvrability of small waste collection carts are well suited to narrow, unplanned, unpaved refugee settlements, or locations that cannot be accessed with motorized vehicles.

    Flat terrain: Due to the problems in controlling and braking loaded handcarts on steep terrain, they are best suited to high density refugee settings that are flat and don't have too many potholes or rough roads.

    Low labour costs: If haulage distances are small, the cost per ton for collection may be cheaper than using motorized collection. However, manual waste collection using handcarts is unproductive if the waste collection points can be accessed by a larger vehicle or waste needs to be moved over large distances.

    Litter sweeping: Handcarts are desirable if manual collection is used to pick litter from the ground in public locations.



Figure 5-46 Modern sweeping cart

89. In all cases where handcarts are deployed, the most productive system is to establish transfer stations as close as possible (within 500m) to the zones of operation. If there is no space to establish transfer stations handcarts may be coordinated to 'meet up' with larger waste collection trucks at designated locations and times in the day.

90. There are many different types of handcarts for waste collection however the optimum design is where the centre of gravity of the load is directly over the wheels (i.e. the wheels are placed in the centre of the cart) and the cart is balanced. This means that all the user has to do is to push the load, rather than lift and push the load

Some handcarts may have more than two wheels so that all the user needs to do is to propel the vehicle forward. The most reoccurring problem with handcarts is typically associated with poor quality bearings and poor structural quality. The wheels should be as large as possible to allow the cart to ride over potholes.



Figure 5-47 Waste collection handcart

91. Containerized handcarts allow waste collectors to classify, sort and recycle waste on the move. This has a beneficial effect of also reducing the amount of waste entering the waste system. Waste collectors may be motivated to separate recyclable materials if the proceeds from the sale of this material is allowed to supplement their income.



Figure 5-48 Containerized handcart

92. The mechanism for transferring the waste from the handcart to the waste transfer container should be quick, easy, convenient and hygienic and should not involve handling the waste. Most handcarts are emptied by tipping the whole handcart, or by tipping individual bins loaded onto the handcart. A split level system can facilitate transfer into a bulk refuse container (see **section 5.104**).

Tricycles

93. Tricycles and waste rickshaws are used extensively throughout Asia and can carry loads on flat terrain of up to half a ton. These designs rely on standard bicycle wheels and bicycle parts and can be cost efficient to operate and maintain if labour costs are low. Waste tricycles are often overloaded and often have ineffective brakes.



Figure 5-49 Waste tricycle

Animal carts

94. Animal carts can be designed to carry volumes of $2m^3$ to $4m^3$ and loads of up to a ton and may be cheaper than motor vehicles for primary waste collection under distances of 3km. The use of animal carts should be combined with transfer stations if the waste disposal site is over 3km. Animal carts may be inappropriate in high density urban refugee settings where the presence of animals may present a public health risk. UNHCR and WASH actors should always ensure that animals are not malnourished, abused, or mistreated.



Figure 5-50 Donkey cart, Gaza

Motorized tricycles

95. Motorized two-stroke tricycles are a common means of transportation in Asia and a viable solution for waste transportation. Motorized tricycles can be useful in unplanned refugee settings where larger motorized vehicles



Figure 5-51 Motorized tricycle

are unable to travel. They can carry loads of up to half a ton with a range of up to 10km. Motorized tricycles do not function well on poorly maintained roads or landfill access roads and so may require some form of transfer network.

Pickup trucks and trailers

96. Often the most efficient and cost-effective system for the collection and transfer of waste is the use of static waste trailers. This system is often economical as it does not require the purchase of specialised motorized waste vehicles. In many refugee settings, the same light four wheel drive vehicles that are used to bring staff to the camp to work in the mornings can be used to shuttle wastes to the landfill during the day. Vehicles with 4 wheel drive should be used as access to most landfill sites can be difficult under wet conditions. Trailers should be easy to manoeuvre and tip. Split levels may be installed to reduce the height to which waste has to be lifted to fill the trailer.



Figure 5-52 Small pickup waste trailer

Commercial trucks

97. Motorized trucks of various shapes, sizes and tonnage are typically available in almost all refugee settings all over the world. However, they are generally not optimized for the transport of waste and require volume extension panels to be fitted so that they can be used up to their rated tonnage. The problem with this is that it often makes it difficult for waste to be loaded. Where possible, UNHCR and WASH actors should use tipping trucks to prevent the public health risks associated with manually unloading waste. The trucks should be able to tip to at

least 80 degrees so that the waste can slide out cleanly without sticking.



Figure 5-53 Tipping waste truck

98. Loading height is another important factor for truck selection. If the truck is to be loaded manually, the chassis and sides of the truck should be low enough to avoid the risk of having to lift the solid waste to great heights which increasing the fatigue of the loaders and makes the operation hazardous from the risk of wastes falling on the labourers' heads. Additional labourers may also be required to stand in the rear of the truck to receive the waste also increasing the costs of waste operations.



Figure 5-54 Manual loading of waste

99. The working conditions for waste trucks are often arduous as they often have to negotiate rough and soft ground at landfill sites, in addition to congested traffic. All trucks should have a functional four wheel drive gearbox and should be rugged enough to cope with the terrain they are operating. All trucks should be covered during transportation to avoid littering. This can be as simple as covering the waste in netting attached in each corner.

Tractors and trailers

100. Tractors and trailers are very commonly used for waste collection in refugee settings. Tractors have a large advantage in that they are able to operate in very poor ground conditions and they can also be easily equipped with front loader, grader and backhoe attachments for maintaining landfills. The combination of a single tractor and multiple trailer waste collection units can be a very cost efficient setup. Tractors can travel at a maximum speed of 15km/hr and so are not suited to transporting wastes over distances of 5km.



Figure 5-55 Waste tractor, Uganda

Dumper placers (skip-lifts)

101. Dumper placers (also known as skip-lifts or container hoists) are trucks equipped with a pair of hydraulically operated lifting arms designed to transport, place and also tip a 4m^3 metallic skip. Their disadvantage is that they are generally optimized to collect rubble from building sites and so

are not optimised for waste collection, using only a fraction of their permissible tonnage. Skips should be covered with nets during transportation to avoid littering.



Figure 5-56 Dumper-placer (skip lift)

Compactor trucks

102. Trucks equipped with compaction mechanisms are only viable in settings where the weight density is low, typically due to the presence of large amounts of paper and plastic packaging. In most refugee settings, any paper and plastic is quickly scavenged and the density can be as much as five times as industrialized nations. Compaction mechanisms have a reputation of adding a layer of cost and complexity to waste operations. In most refugee settings UNHCR and WASH actors will not need to consider compactor trucks.



Figure 5-57 Compactor truck

Transfer trucks

103. Transportation costs make up a significant proportion of waste management programmes and in many cases it is more cost efficient for large trucks to make the final journey to the waste disposal site. Bulk refuse carriers typically have a body capacity of up to 40m^3. The most efficient types are articulated so multiple container bodies can be filled while the cab and driver are performing haulage.



Figure 5-58 Waste transfer truck



Figure 5-59 Waste transfer truck

Transfer stations

104. As a general rule, a transfer station should be installed if a waste collection vehicle is spending more than 15% of its time on haulage rather than collection. Transfer stations are usually sited as close as possible to the waste collection area and consist of a yard area with parked bulk refuse carriers and a split level facility. The split level setup for transferring wastes is encouraged as it avoids secondary handling and results in efficient gravity transfer without the need for expensive lifting technology. Refuse transfer containers may be over 4m high and therefore it is worth selecting a site that facilitates the design of a split level

facility and takes advantage of any natural gradients.

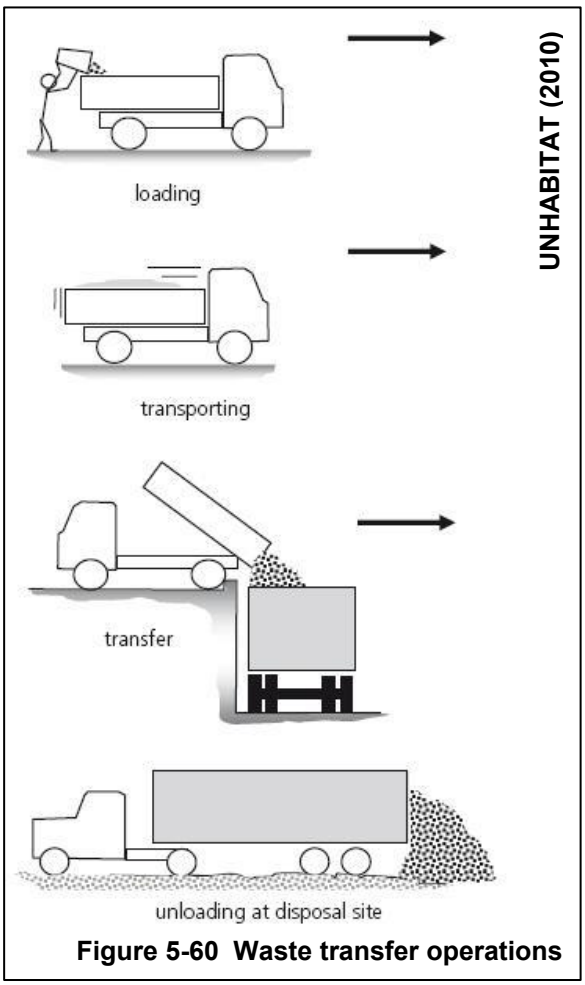


Figure 5-60 Waste transfer operations

105. Transfer stations can also be developed as combined transfer / resource recovery and recycling centres reducing the amount of waste that ends up entering the landfill. They can also be used as collection centres of common domestic hazardous wastes that must not be allowed to enter the domestic waste stream.



Figure 5-61 Small waste transfer ramp

106. In refugee settings with over 20,000 persons, transfer stations should include facilities for changing, toilets, showers, an area for servicing vehicles or handcarts and a manager's office. As the transfer station is typically located within the residential area of the refugee settlement, it is essential that it is kept as clean as possible to reduce smells, vectors and complaints from local residents.

107. The number of transfer stations required in a refugee setting depends upon the operational range of the primary waste collection vehicles that are being deployed, and the distance between the refugee setting and the waste processing area and landfill. The need to establish a network of transfer stations depends upon the type and capacities of collection vehicle being used and the distances to the landfill. If waste collection is carried out using motorized vehicles, and the distance to the landfill is short, it may not be necessary to install a transfer station at all.

Technical options for waste disposal

Illegal / uncontrolled dumping

108. Uncontrolled / illegal dumping of solid waste in any location that has not been designated an official solid waste disposal site is common in refugee settings and is a major public health and environmental risk. UNHCR and WASH actors should ensure that waste dumping is prevented at all cost. The clean-up of uncontrolled dumping is often significantly more

costly in terms of time, public health risks, and resources than if the waste had been dealt with in the first place.



Figure 5-62 Illegal dumping, Shoafat

Legal / controlled dumping

109. A legal or controlled dumpsite is a piece of land that has been designated by the local authorities as a site onto which solid waste may be dumped. Even though it may look the same, controlled dumping is better than illegal dumping as it allows a site to be identified with the least possible public health and environmental impact and allows legislative procedures to be implemented to prosecute illegal dumping. It also allows monitoring of the size, types and volumes of wastes generated and keeps the problem in one location rather than all over the place. Over time, it may be possible to upgrade the site with surface water diversion and daily covering to prevent vectors.



Figure 5-63 Controlled dumping, Gaza

Sanitary (engineered) landfill

110. Sanitary landfill is the process of disposing of solid waste in such a way that it causes minimum impact on the environment. Once a landfill has been filled, it is possible that it can be put to use for recreation, agriculture, construction or other purposes. The landfill location is usually carefully selected to have the best hydrogeological conditions to avoid surface and groundwater pollution. Typically the site has either soils with high clay content or an impermeable rock base, in addition to a long distance to the groundwater table and no surface water sources. In a sanitary landfill, animal and insect vectors are eliminated by a daily covering with 10cm-20cm of clay soil. This also serves to kick start biological decomposition and to divert rainwater, reducing the amount of leachate that is produced within the waste. Over a period of years, the waste is decomposed by natural biological and chemical processes (principally anaerobic decomposition) to render the wastes inert. Sanitary landfill is a simple approach that requires no imported technology and is well suited to refugee settings.



Figure 5-64 Sanitary landfill daily cover

111. A common misconception is that landfills can be used to dispose of any wastes. This is completely false and UNHCR and WASH actors should ensure that



landfills only receive wastes that have been deemed 'acceptable' for the site. Special wastes such as batteries, used vehicle oils, paints, solvents, varnishes, aerosols, pesticides, asbestos, and broken electrical apparatus must not be allowed to enter the domestic waste stream and must not enter the landfill.

UNHCR and WASH actors must ensure that the lifetime of the sanitary landfill is protected in all settings through strategies to reduce the quantity of wastes that are dumped in particular separation, recycling and reuse.

112. Sanitary landfills produce a foul black liquid from the decomposition of wastes called leachate. If the leachate is contained within the landfill it is slowly treated over time by a number of biological processes. UNHCR and WASH actors must take every precaution to ensure that leachates stay within landfills and the volume of leachate produced is as small as possible by protecting the site from rainwater and stormwaters. The natural anaerobic decomposition of waste also produces copious quantities of gases including methane, carbon dioxide, hydrogen sulphide and ammonia. These can be highly explosive and should be prevented from building up by installing vent pipes. Smoking should be prohibited.

Identifying a suitable location for a landfill

113. Site selection for a sanitary landfill can be a controversial activity and must be carried out in full cooperation with the local authorities and local population. The process of site selection is generally carried out by considering a number of potential sites within the vicinity of the refugee (see box below) and selecting the best available site based on minimizing risk.

Box: Sanitary landfill site selection criteria

- ☐ **Geology:** The geology of the ground should minimize the risk of leachates passing directly into groundwater supplies.
- ☐ **Cover material:** The site should have a large quantity of clay soil available for daily cover material.
- ☐ **Distance:** For efficiency, the site should be as close as possible to the population.
- ☐ **Access:** The condition of access roads should be capable of handling waste haulage traffic.
- ☐ **Topography**: There should be no surface water features running through the site and no surface water bodies downstream.
- ☐ **Nuisances:** The site should be downwind from residential areas.
- ☐ **Potential volume:** The site should have a sufficiently space for at least 10 years of use.

Source: Flintoff F. (1976) '*Management of Solid Wastes in Developing Countries'*, WHO, Geneva.

114. The primary consideration when identifying a landfill for a refugee population is water pollution. Ideally, the geology and topography of the site will prevent all leachate from the landfill reaching water resources. If the site has no natural clay soils or impermeable natural rock barriers

then UNHCR and WASH actors should install an artificial barrier from either 30cm of imported 'puddled' clay or a PVC membrane – which can be expensive and time and resource intensive. The clay content of the soil can be rapidly assessed by visual inspection and a simple soil percolation test (**see annex**).

UNHCR and WASH actors must ensure that new landfills in settings of over 20,000 persons are subject to evaluation by a hydrogeologist. The site must be rejected if there is any risk of contaminating water supplies.

115. If the landfill site is carefully selected, well managed and strict controls are in place to ensure that surface water and hazardous wastes do not enter the site, it should be possible for the physical, biological and chemical processes present in nature to render the wastes completely inert with no negative environmental effects.

Box: Calculating the land required for a long-term sanitary landfill facility

A decision has been taken to identify a permanent landfill site for a refugee camp of 60,000 people. A detailed waste audit has shown that the landfill fraction of waste is currently 0.3 kg per person per day. A permanent landfill location is required with a design life of at least 10 years. What area of land needs to be found and developed?

Projected Pop (P) = Pop / $(1 – R)^N$

Where

Pop = the current population (60,000)
R = the population growth rate (3%)
N = the number of years (10 yrs)

It follows..

Projected Pop (P) = 60,000 / $(1\text{-}0.03)^{10}$
Projected Pop (P) = 81,364 persons

The volume of landfill waste that will be accumulated is as follows

Volume (V) = [N x P x R x 365 x F] / ρ

Where..

N = effective life of the landfill (10 yrs)
P = the projected population (81,364)
R = waste acc. rate (kg/per/day)
F = factor for daily soil cover (1.25)
ρ = compacted waste density 550kg/m^3

It follows..

Vol = [10x81,364x0.3x365x1.25] / 550
Vol = 202,485 m^3

Assuming a flat site and a landfill total height of 4m, gives a landfill area of..

Landfill area (A) = volume / depth
Landfill area (A) = 202,485 / 4
Landfill area (A) = 50,621 m^2

Assuming a square site, the dimensions of the landfill site will be..

Length (L) = Area $(A)^{0.5}$
Length (L) = $50{,}621^{0.5}$ = 225m

In conclusion, a refugee camp of 60,000 people will create 202,000 m^3 of waste and will require a landfill site of at least 225m x 225m to provide sufficient landfill space for 10 years.

Preparing a landfill

116. How the landfill is prepared depends primarily upon the topography and dimensions of the site. Typically the landfill is organised as a series of cells arranged either using the trench method (see Figure 5-65) or the area method (see Figure 5-66). A master plan for the site is prepared dividing the site into cells starting at the lowest elevation and the point furthest from the entrance. On sloped land the cells should follow the contour of the land.

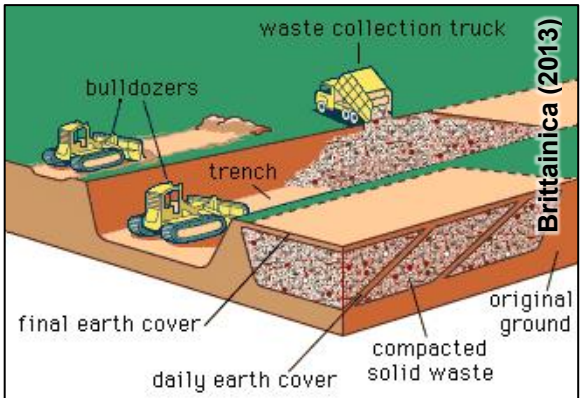


Figure 5-65 Trench method of landfilling

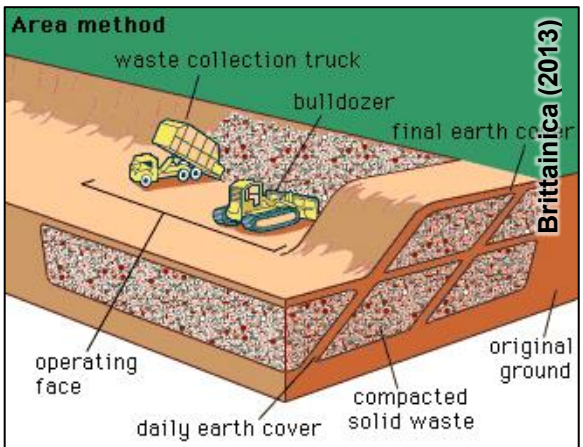


Figure 5-66 Area method of landfilling

117. The width of the cells depends upon the number of vehicles that are likely to offload their waste at the same time during peak operation In terms of management it is best to have the smallest operating face possible and even in large refugee settings it is unlikely that more than one waste collection vehicle will be arriving to offload wastes at any one time and so UNHCR and WASH actors should plan for a maximum cell width of 10m.



Figure 5-68 Dadaab Refugee Camp Landfill

118. During operation, wastes are tipped into the receiving pit and are scooped and bulldozed onto the landfill working face in successive layers of approximately 30cm. The

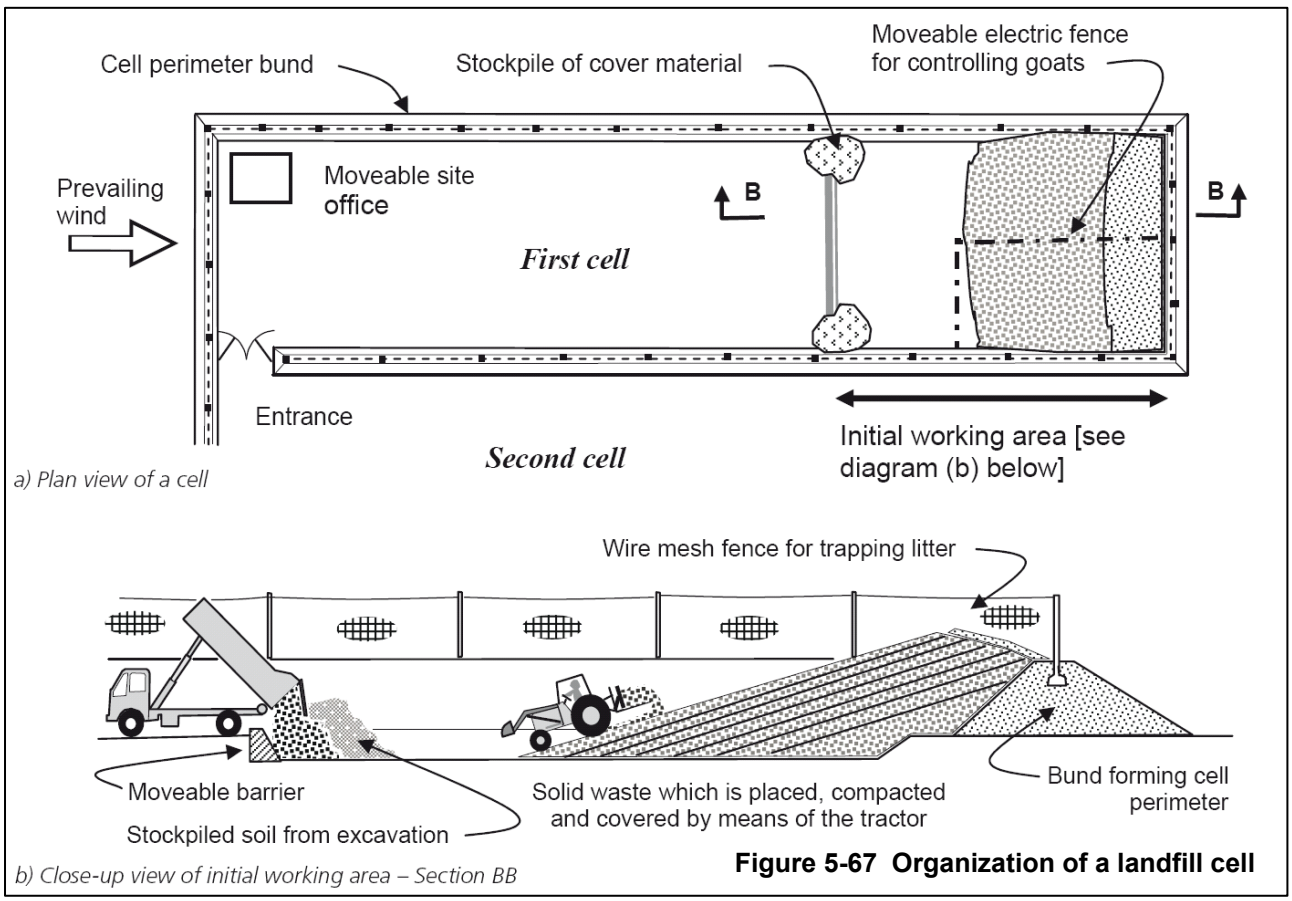


Figure 5-67 Organization of a landfill cell

slope of the working face is maintained at approximately 1:3 (greater slopes result in an undesirably large working face). As the earthmoving equipment moves backwards and forward the waste is compacted to over twice its original density. The cell is slowly built up to between 2m and 4m high. At the end of the working day, the working face is completely covered with a 0.3m layer of compacted soil to form a closed barrier. Only one cell should be in operation at any one time.

119. An important factor when managing the landfill is that there are sufficient quantities of daily soil cover material. Small landfills can require large quantities of soil cover material (see Figure 5-67) and UNHCR and WASH actors should plan for at least $1m^3$ of soil cover material for every $1m^3$ of waste that is deposited. The primary source for this cover soil is the waste cell itself. The cover soil should contain a high proportion of clay in order to prevent rainwater and surface water from entering the landfill and creating additional leachate. Finally, methane gas venting pipes should be installed to stop the build up of explosive gases under the cover soil.

Machinery required for preparing and managing a landfill

120. Heavy machinery is required for preparing cells, spreading waste material, compacting and levelling wastes, spreading soil cover material, constructing and maintaining access roads, and final capping of each cell after it is filled. The most cost-effective solution for a large refugee setting of up to 80,000 persons is to use a 75hp four-wheel drive tractor equipped with a wide front loader bucket, a rear digging bucket (backhoe), and a grader attachment. Several 6 ton capacity two-wheeled tipping trailers are also useful for moving large quantities of soil cover material. The site should have an enclosed garage, fuel storage and the cost of servicing and backup should be budgeted.



Figure 5-69 Tractor loader and backhoe

Managing a landfill

121. UNHCR and WASH actors should take every necessary step to ensure that unauthorized persons are prevented from accessing the waste site. The best way to achieve this is to work in a complementary way with waste scavengers (see **section 5.61**) to define where and how scavenging can take place and to ensure there is no waste with recoverable value in the final landfill material. All landfills should be properly fenced and guards may need to be contracted to ensure that scavenging does not take place.

122. In industrialized nations, it is possible to install sophisticated chemical, biological and physical (typically ultra-filtration) treatment processes to treat the leachates that are being produced in the

landfill. All of these measures are highly complex and are beyond the scope of most refugee settings. A much better approach is to ensure the following steps are taken to reduce leachate volumes and encourage natural biological decomposition processes. In all settings, UNHCR and WASH actors should ensure the following:

A) The site is properly sealed from groundwater resources by either a natural or artificial barrier.
B) All hazardous wastes are diverted from the landfill through screening or collection.
C) No rainwater, stormwater or surfacewater is allowed to enter the site through the application of daily soil cover and the use of diversion ditches.
D) Capped waste cells are planted with plants including grasses to encourage leachate reduction via evapotranspiration.

123. UNHCR and WASH actors should ensure that all landfills are equipped with at least three monitoring wells installed 10m, 20m and 50m in the direction of predominant groundwater flow. The water quality parameters in the box on the right hand side should be monitored once every 6 months.

124. UNHCR and WASH actors should ensure that accurate records are kept concerning the types and volumes of waste that are being disposed at the landfill. The simplest method to achieve this is to ensure that every vehicle is weighed and registered on a load cell as it enters the site.

Box: Water quality monitoring parameters for landfills

Parameter	Surface Water	Ground Water	Leachate
pH	X	X	X
Biochemical oxygen demand (BOD) (mg/l)	X	X	X
Chemical oxygen demand (COD) (mg/l)	X	X	X
Total iron (mg/l)	X	X	
Nitrates (mg/l)	X		X
Chlorides (mg/l)	X	X	X
Sulfates (mg/l)		X	X
Total colony count , (colonies/ml)	X	X	X
Conductivity, (µS/cm)			X
Total suspended solids	X		X
Heavy metal (Hg, Cd, Pb, Cr, e, Zn, Cu, i)			X

Jaramillo J. (2003) *'Guidelines for the design, construction and operation of manual sanitary landfills'.* Pan American Health Organization

Decommissioning a landfill

125. When each cell within the landfill has reached capacity and is due for decommissioning it should be completely capped with 0.5m of soil and landscaped back to its natural appearance. Plants, including grasses, may be planted into the final capping layer to stabilize the soil and reduce leachate quantities through evapotranspiration.

Waste incineration

126. Incineration is high-temperature combustion under controlled conditions. Modern high temperature incinerators, built within the last ten years, produce virtually no smoke, and completely


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neutralize any unsafe substances being burned. In addition, any heat that is produced can be turned into electricity which can be sold to offset some of the operational costs. Despite the success of modern incinerators, great care must be taken in refugee settings to ensure that the technology is appropriate. Wastes in refugee settings often have a higher density and a lower calorific value which may deem them unsuitable for incineration.

127. Any incineration that does not take place in a modern high temperature incinerator, for example the open burning of waste at a waste dump, is extremely dangerous to public health and can produce harmful or carcinogenic substances including dioxins. UNHCR and WASH actors must ensure that the burning of wastes does not take place under any circumstances.

Medical waste management in refugee settings

Medical waste segregation

128. In all settings, UNHCR and WASH actors must comply with WHO protocols to ensure that health-care wastes are segregated at the point of generation according to four categories:

- ☐ Sharps (needles, scalpels, etc.), which may be infectious or not
- ☐ Non-sharps infectious waste (anatomical waste, pathological waste, dressings, used syringes, used single-use gloves)
- ☐ Non-sharps non-infectious waste (paper, packaging, etc.)
- ☐ Hazardous waste (expired drugs, laboratory reagents, etc.).

Steps should be taken to ensure that waste is segregated and treated appropriately without risk to staff, patients or the public environment regardless of the emergency setting or type of health-care facility (temporary, permanent or mobile).

129. All healthcare waste should be collected in dedicated colour-coded and labelled containers according to its contents for safe handling. Colour-coding facilitates easy identification and segregation on the basis of waste hazard classification and suitability of treatment and disposal. Colour-coding also makes the segregation process understandable for low-skilled workers with limited literacy. It is essential that the adopted colour-coding system is used consistently throughout the health-care waste management chain (segregation, collection, storage, transport and disposal) to avoid confusion and mismanagement of the waste.

Management of sharps

130. Sharps should be placed immediately in yellow puncture-proof and covered safe sharps containers, which are regularly collected for disposal. Sharps are potentially the health-care waste item that represents the most acute potential hazard in a health-care facility. Hypodermic syringes should not be manipulated or dismantled after use and sharps boxes should be large enough so that hypodermic syringes can be inserted fully after use, complete with their needles. If puncture-

resistant containers are not available, the health-care facility may choose to adapt existing puncture-resistant containers, such as empty water, oil, or bleach bottles made from sturdy plastic. Waste containers for sharps should be available within easy arm's reach of all locations where these wastes are generated.

131. Sharps should be disposed of in a sharps pit (buried drums in small health centres or emergency structures; concrete-lined pits in other settings). In low-cost settings, burning with limited means is too complicated and too energy (fuel) consuming and it is recommended that sharps should be disposed of directly in a sharps pit. Off-site treatment in a centralised facility is not advisable for safety reasons but may be necessary in an urban area where onsite treatment is not feasible because of lack of space.



Figure 5-70 Sharps safety box

Management of non-sharp infectious medical wastes

132. Non-sharps infectious wastes should be placed immediately in yellow or red waste bags or containers (15–40-litre capacity, with lids). Containers should be collected, emptied, cleaned, disinfected and replaced after each intervention (e.g. each delivery in a maternity unit) or twice daily. Waste containers for non-sharp infectious wastes should be available within easy arm's reach of all locations where these wastes are generated.

133. Health-care waste containers should be collected frequently, not waiting until they become overflowing. When containers are collected, new or clean containers should be provided in return. Waste containers should be transported carefully to avoid spillage. Bags should be delicately handled by the neck, to prevent tearing and spillage. Any leakages or spills of medical waste should be cleared up according to infectious waste handling protocols for the clean-up of blood and other body fluids.

134. Non-sharps infectious waste should be buried on-site in a pit fitted with a sealed cover and ventilation pipe in small health-care facilities. Arrangements may be needed for disposing of placentas, according to local custom.



Figure 5-71 Unmanaged medical waste

Management of non-sharp non-infectious medical wastes

135. Non-sharps non-infectious black waste containers (20–60 litre capacity) should have fitting lids and should ideally be operated with a foot pedal to prevent contaminating hands. Waste containers should be lined with black coloured sacks and should be collected, emptied, cleaned and replaced daily. Temporary covered waste collection containers (e.g. buckets with covers, plastic drums etc.) may be used for the short-term in an emergency provided that they are durable, adequately labelled and sufficiently leak-proof to safely contain the waste from the point of creation to the point of disposal. It is recommended that there is at least one waste container in every room and at least one set of waste containers per 20 beds in a ward.

136. Non-sharps non-infectious waste should be buried in a pit or a landfill site. If space is limited, non-sharps non-infectious waste should be incinerated in a low-temperature incinerator (in emergency settings this may be a simple as an oil-drum type incinerator). Ashes and residues should be buried in a pit. Some wastes, such as pharmaceutical wastes, cannot be disposed of in low-cost settings and should be sent to a large centre for destruction or returned to the supplier. In all cases, national legislation should be followed.

Medical waste disposal sites

137. In some refugee settings it may be beneficial to establish a dedicated medical waste disposal zone at the health-care facility. If a waste-disposal zone is created, it should be situated at least 50m / 150ft (preferably downhill and downwind) from any buildings or public areas. The site should be fenced off and locked and all pits should be adequately locked and covered. The waste-disposal zone should have a water point with soap or detergent and disinfectant for handwashing or to clean and disinfect containers and tools, with facilities for wastewater disposal into a soakaway system or sewer. Ideally there should be a storage area where tools and containers can be dried and stored. The waste-disposal zone should also be located at least 30m / 90ft from groundwater sources with any pits at least 1.5m / 5ft above the groundwater table. Where an incinerator is used, it should be located to allow effective operation with minimal local air pollution in the health centre, nearby housing and crops, and it should be large enough for extension if new pits or other facilities have to be built. Surface water run-on should be managed so that no surface water enters the waste disposal zone area (this may require a surface water diversion canal).

6. Disease Vector Control

Diseases transmitted by mosquitoes, flies, fleas, lice, ticks, mites, snails and rodents are among the major causes of illness in many refugee settings. The control of disease vectors is an essential activity to protect the population and reduce the impact of vector related diseases.

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Introduction

The importance of disease vector control in refugee settings

1. UNHCR and WASH actors must ensure that the environment inhabited by refugee populations is free from high-risk disease vectors. This is regardless of whether the refugee population are living in camps, collective centres, spontaneous unplanned camps, with host families, in rented accommodation, or they are occupying land or buildings. Inappropriately managed waste can attract rodents and insects that harbour and spread pathogenic organisms. Poorly maintained latrines can provide a breeding site for flies and stagnant water can provide a breeding site for mosquitoes. The presence of disease vectors of public health risk importance is a critical factor when evaluating a site for the settlement of refugees. The psychological benefits of proper disease vector control should not be underestimated. The control of disease vectors of public health importance is an important contribution to lifting the morale of a refugee population.

Vector control as part of a comprehensive public health approach

2. Disease vector control interventions should be planned as part of the larger preventative health strategy for the refugee population. Messages concerning the importance of an environment free from domestic wastes and stagnant water, the importance of proper latrine construction, and the importance of personal protective measures, must be incorporated into the community health and education programmes. The link between breeding sites, disease vectors, and disease must be clearly understood by all.

The importance of seeking expert professional advice

3. UNHCR and WASH actors should ensure that the advice of an entomologist/environmental disease vector control specialist has been sought when designing a vector control programme. The specialist is essential to help:
    i). Identify the vectors responsible for local transmission of disease,
    ii). Determine the factors that influence transmission,
    iii). Locate breeding grounds, and adult resting habits,
    iv). Decide which control measures need to be implemented,
    v). Decide which specific chemical control measures to use,
    vi). Decide which chemicals to use,
    vii). Decide the method and interval of application,
    viii). Decide the time and place of application,
    ix). Decide the safety precautions necessary in the storage and use of hazardous chemicals.
4. Disease vector control expertise may be available locally from sources such as government departments, the UN system, NGOs, universities, or private consultants. If these cannot meet the need, UNHCR Headquarters assistance should be requested.


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The importance of respecting UNHCR's WASH philosophy and principles

5. In addition to the guidance in this chapter, all disease vector control programmes must be designed and carried out in full accordance with UNHCR's general WASH principles including (please click the links below or consult the relevant section in Chapter 2 for more information).
   - Safety and protection
   - A timely and adequate response
   - Participation of stakeholders
   - Universal access
   - Child friendly facilities
   - Designs and construction that meet minimum quality standards
   - Value for money and cost effectiveness
   - Appropriate technology selection
   - Durable solutions
   - Reinforcing the capacity of stakeholders
   - Monitoring the effectiveness of WASH interventions
   - Protecting the environment
   - Planning for contingencies

Priority actions

An immediate response

6. UNHCR and WASH actors must ensure that high-risk disease vector populations are immediately controlled from the outset of a displacement emergency. The speed at which disease vector control programmes are established must be given the same emphasis as provision of safe water supply and sanitation. The provision of basic disease vector control interventions for example cleaning up festering piles of wastes to reduce fly populations, or improving drainage around water points, are better than delayed provision of improved systems. A risk based approach should be used to prioritise the highest-risk disease vectors first. The presence of vectors does not necessarily imply a public health risk.

Refugee site selection that limits exposure to disease vectors

7. UNHCR and WASH actors must ensure wherever possible that any site selected for the settlement of refugees is free from large numbers of disease vectors. Local knowledge must be sought in all cases and sites within 5km of large bodies of water or marshland must be avoided if possible. While this is an ideal, the selection of sites for refugees is often highly political and very often refugees are often forced to settle on marginal sites that may be at high risk from disease vectors. It is for these reasons that disease vector control programming must be initiated from the start of the emergency.

Immediate solid waste interventions

8. UNHCR and WASH actors must ensure that any dumps of domestic waste, food waste, faeces, or any other potential breeding sites for high risk disease vectors are immediately cleaned up (see **section 5.9**). All domestic, market and commercial waste must be collected at least twice a week, or more frequently if required. All wastes at landfill sites must be completely covered every day with at least 10-20cm of soil. Within communal areas the refugees

should be mobilized to keep their living areas free from wastes. Within public areas, a system of employed "street sweepers" may need to be established. The cleanliness of public areas, waste collection points, and toilets should be routinely monitored through the use of observation walks and sanitary surveys.



Figure 6-1 Overflowing solid waste

Immediate dissemination of disease vector control messages

9. UNHCR and WASH actors should ensure that the displaced population has the knowledge to protect themselves from high-risk disease vectors on immediate arrival and consistently throughout the displacement emergency. The messages should ideally be in their own native dialect, and should target the most critical high-risk disease vectors for the context. Messages should raise awareness of the risks and should explain methods to protect the household, and reduce the vector populations. A disease vector communication plan describing WHO, WHAT, WHY, WHEN and HOW in addition to an analysis of seasonal disease vector risks should be included in the site WASH plan/strategy.

Immediate distribution of basic vector control items

10. UNHCR should ensure that all families within the displaced are provided with essential household vector control items on immediate arrival in the displaced setting based on an assessment of disease vector related risks. Distributions of any basic vector control items (for example mosquito nets) must be accompanied with an explanation concerning why the item is important and how to use it safely and effectively. UNHCR should also ensure the population has sufficient quantities of soap, laundry and bathing supplies, to facilitate good personal hygiene and reduce bedbug, flea and body lice populations. Tracking of the coverage of basic vector control items should be included in the site WASH plan/strategy. Post distribution monitoring should be carried out after every distribution of supplies used for disease vector control. This is not only to ensure that the items actually reach their intended beneficiaries but also to ensure that supplies are appropriate for the context and are being used as intended.

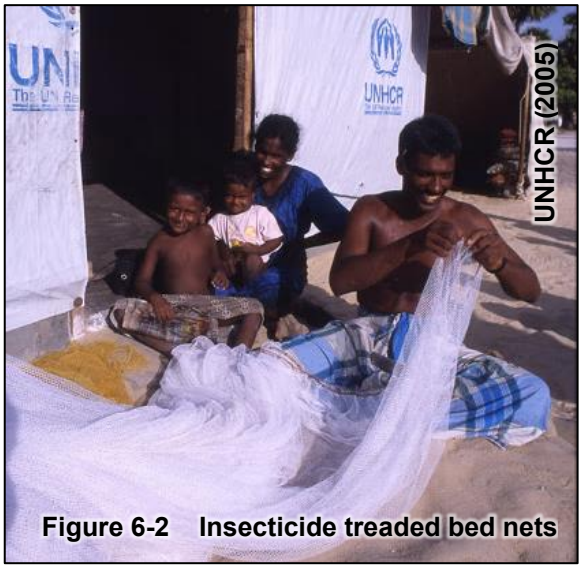


Figure 6-2 Insecticide treaded bed nets

Disease vector assessments

11. A rapid assessment of disease vector related risks should be carried out within the first few days of any refugee emergency. This is best achieved using a combination of observation walks, key informant interviews and focus group discussions. Following the rapid assessment a prioritised disease vector control action plan should be developed that includes short, medium and long term strategies to reduce and control key disease vector populations. The disease vector risk assessment should be analysed using a seasonal analytical framework taking into account future risks not just those that are currently present. Mosquito and fly populations in particular are closely linked to seasonal rain, temperature and harvest seasons (particular the fruit season in the case of flies).

12. Copies of the disease vector risk assessment, action plan, disease vector seasonal calendar, and short, medium and long-term strategies for reducing disease vectors should be included in the site WASH plan. The vector control strategy should clearly describe the priority at-risk groups, the targeted disease vectors, the key interventions (in terms of WHO, WHAT, WHERE, WHEN, HOW and WHY) and any indicators to be monitored. The vector control strategic plan should be prepared within the first three months of the displacement emergency and should be revised every six months based on feedback from monitoring mechanisms.

A comprehensive approach

13. UNHCR and WASH actors should plan disease vector control programmes using a complementary balance of environmental control measures, chemical control measures, barrier control measures, breeding site management, traps and behavioural change activities. Programmes that rely on one or two methods alone are highly likely to fail and all other methods must be prioritized before resorting to chemical control measures which are costly and run the risk of increasing chemical resilience. The short, medium and long term strategies for a disease vector control comprehensive approach should be clearly described within the site WASH plan/strategy.

Chemical control safety

14. UNHCR and WASH actors should ensure that any chemical control measures are implemented following expert supervision using only internationally approved vector control chemicals and following internationally approved application protocols. Care must be taken during the transportation, storage, application and disposal of vector control chemicals to ensure there are no risks to refugees, staff, or the environment. UNHCR and WASH actors must ensure that all staff involved in disease vector chemical control application programmes have adequate personal protective equipment and safety training for the tasks they are carrying out. A chemical safety and impact assessment must be included in the site WASH plan/strategy.



Coordination with local authorities

15. In many settings, it is likely that the local health Authorities will have ongoing seasonally planned disease vector control activities planned for the local host population. UNHCR and WASH actors should ensure that any disease vector control programmes planned for the refugees are well coordinated with the local relevant Authorities and that any chemicals, protocols and approaches are locally approved. In some cases it may be possible for qualified National Authorities to expand ongoing disease vector control activities to the refugee setting. National Authorities may have access to expert entomologist /disease vector control specialist that can help with the programme design. Details of joint planning with local authorities should be updated in the site WASH plan/strategy.

Linkages with behaviour change programming

16. UNHCR and WASH actors should not assume that if people are provided with knowledge and resources to avoid disease vector risks this will automatically translate into good practice. Factors related to changing attitudes to disease vectors can be varied and complex and in all settings UNHCR and WASH actors should take time to fully investigate what stops people from protecting themselves against disease vectors and what makes it easier and more convenient. Copies of focus group discussions related to disease vector practises should be included in the site WASH plan/strategy.

Coordination with the Community Health Programme.

17. UNHCR and WASH actors should ensure that any disease vector related behaviour change activities are organized in full collaboration with the Community Health Programme. It is important that activities not only deliver key disease vector related information but also incorporate messages related to health seeking behaviour and curative health.

Control of disease vectors in refugee settings

Control of mosquitoes in refugee settings

18. The most important mosquitoes in terms of disease transmission in refugee settings include Anopheles (Malaria, Filariasis), Culex (Filariasis, Encephalitus), Aedes (Yellow Fever, Dengue) and Mansonia (Filariasis). Anopheles mosquitoes breed around the edges of unpolluted water bodies. Culex breed in any stagnant dirty water, including latrines. Aedes breed in water receptacles found close to human habitats such as bottles, buckets, tyres etc. Mansoni breed in areas where there are aquatic plants eg. ditches, ponds and swamps.

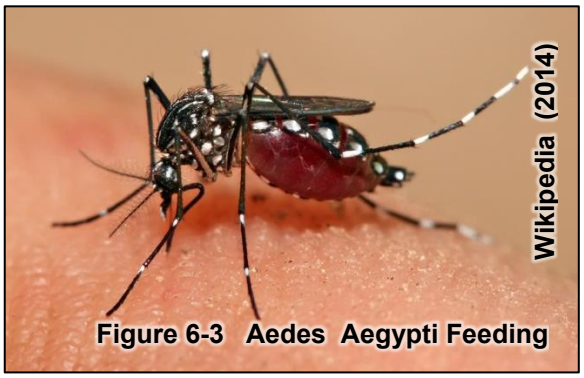


Figure 6-3 Aedes Aegypti Feeding



19. Control and prevention strategies depend upon the type of mosquito but generally include:

- Educating the refugees on modes of transmission and protection.
- Controlling larval stages of mosquito development by elimination of mosquito breeding sites.
- Treat latrines with polystyrene beads or larvicides.
- Conducting larvae surveys and observation walks to identify the most productive larval habitats and implement plans for their elimination, management, or treatment with appropriate larvicides.
- Encouraging insecticide treated bednet use.
- Conducting indoor residual spraying with insecticides (IRS).
- Encouraging the population to avoid going out between dusk and dawn when anopheline mosquitoes commonly bite.
- Encouraging the population to wear long sleeved clothing and long trousers when going out at night.
- Encouraging the population to apply insect repellent to exposed skin at night.
- Using screens over doors and windows.
- Using anti-mosquito sprays or pyrethroid mosquito coils in bedrooms at night.

20. Generally it is recommended that sites for settlement are at least 2km upwind from mosquito breeding grounds (SPHERE 2004). On permanent structures, screens (typically a mesh <1.5 mm) can be used on doors, windows, eaves and other openings to prevent mosquito access.

21. Filling or draining areas of standing water and clearing drains to reduce breeding sites can be locally effective at reducing populations. Eucalyptus trees can be planted to dry up marshy areas. Breeding sites such as wells should be fitted with a handpump or tight cover. A layer of small polystyrene beads or light oil can be added to latrines or septic tanks to form a floating barrier.

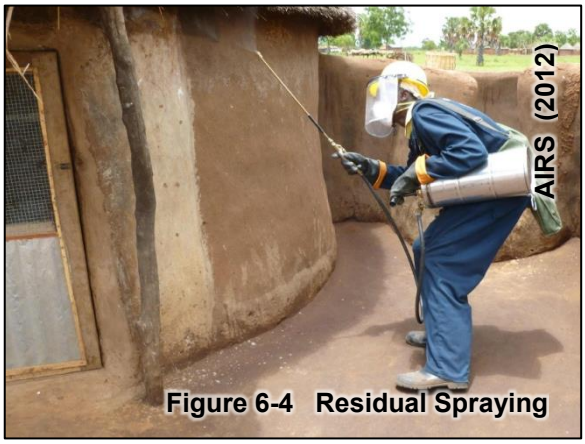


Figure 6-4 Residual Spraying

22. Indoor residual spraying involves spraying insecticides onto interior surfaces of dwellings. Sprayed surfaces kill or irritate mosquitoes on contact and should remain active for two to three months. Modern mosquito treatments and chemicals are cheap, effective, and generally safe to humans, animals and the environment, however in some areas, mosquitoes may be resistant. People may object to residual spraying as it tends to leave a visible deposit and they may be reluctant to let strangers into their houses. Spraying programmes require detailed studies, trained professionals, specialized equipment and close consultation with local authorities. Care must be taken when handling insecticides


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and spraying personnel must have full protective clothing and a face mask.

23. Insecticide treated mosquito nets kill mosquitoes on contact. The use of impregnated bednets also leads to the reduction of other pests such as bedbugs, lice, ticks and flies. Treated bednets should be retreated at the beginning of each transmission season. Personal mosquito repellants, fumigants (coils) and sprays contain controlled quantities of insecticide and can be very effective yet costly.



Figure 6-5 Insecticide Treated Bed Net

Control of flies in refugee settings

24. Flies are not only a nuisance, but are an important disease vectors for enteric diseases (dysentery, diarrhoea, typhoid and cholera), eye infections (trachoma and epidemic conjunctivitis) and skin infections. The most important fly species include the common housefly Musca Domestica, the filth fly Musca Sorbens and the blow fly Chrysomya. Both Musca Domestica and Musca Sorbens are 6-7 mm long and greyish in color (Domestica has four dark stripes on its back, Sorbens has two). Chrysomya are 10 mm in length and are shiny blue/green in color. Chrysoma have a strong preference for breeding in open latrines, decomposing meat or fish, garbage and animal excrement. Contrary to popular belief, Domestica and Sorbens do not lay their eggs in latrines or rotting meat but prefer organic waste including garbage and animal excrement. Sorbens are often implicated in transmission of the eye-disease trachoma. Adult flies are mainly active during the day. At night they normally rest, although some flies adapt to artificial light. Fly numbers peak where average temperatures are in the range 20-25 ºC. Flies are rarely found where temperatures are below 10 ºC or above 45 ºC.



Figure 6-6 Flies Feeding

25. Control and prevention strategies generally include:

- Educating the refugees on modes of transmission and protection.
- Increasing water quantity and soap availability.
- Encouraging proper food hygiene practices including storing food and cutlery in closed covered containers.
- Preventing open defecation.
- Increase the coverage of clean and fly-proof latrines and encourage use.
- Controlling fly populations through measures including improved solid waste management, baits, traps,


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preventing open defecation, and latrine improvements.
- Installation of fly meshes, barriers and self-closing doors in shelters.
- Spraying of exteriors and interiors of doorways and other openings if fly infestation occurs in dwellings.
- Encourage the population to use insecticide treated bed nets or apply insect repellent to exposed skin for biting flies.

26. Solid waste collection and disposal systems reduce breeding sites especially where collection containers have closed covers. In tropical locations, garbage must be collected at least twice a week. Landfills should be covered with at least 10-20 cm of earth. Latrine use prevents flies encountering pathogens. Efforts should be taken to ensure that any open defecation in particularly children's faeces are safely disposed of. Pit latrines should have a sealed slab with either a water-seal or fly-proof vent and tightly fitting lid.



Figure 6-7 Fly Infestation in Solid Waste

27. Strategies to reduce the risk of disease transmission from flies not only requires controlling breeding sites but also installing barriers to prevent contaminated flies coming in contact with food or food utensils. Food and utensils should be kept out of the reach of flies either in a chest or screened box. Screens (typically a mesh <1.5 mm – also used to prevent mosquitoes) and self-closing doors can be used to reduce the number of flies on permanent structures. Aerosol insecticide, traps, sticky tapes, fly swotters, or electrocution devices can be used to kill any flies that make it into a dwelling. Education is important so the refugee populations fully understand the linkages between an insanitary environment, fly breeding, and disease, and they actively participate in fly reduction programmes.

Control of bedbugs in refugee settings

28. Bedbugs, fleas, lice, ticks and mites are parasites that feed on blood and live on the body, and in clothing and bedding. These parasites are responsible for transmitting various human diseases including typhus, relapsing fever, plague and murine typhus, Lyme disease and scrub typhus.



Figure 6-8 Adult Bedbug

29. Bedbugs are have a flat, reddish brown oval-shaped body with no wings and are 4–7mm long. Both male and female bedbugs feed on the blood of sleeping persons at night. The bugs are frequently abundant in bedrooms in warm



climates. Bedbugs are not considered vectors of disease. They are mainly important as a biting nuisance. Control and prevention strategies for bedbugs include:

- Educating the refugees on modes of transmission and protection.
- Increasing water quantity and soap availability.
- Light infestations can be treated by thoroughly cleaning infested articles, pouring boiling water over them and exposing them to sunlight.
- Mosquito nets impregnated with a long-lasting pyrethroid insecticide are effective in repelling and killing bedbugs.

Control of fleas in refugee settings

30. The most important type of flea in refugee settings is the rat flea Xenopsylla Cheopis and the human flea Pulex Irritans. Adult fleas are 1–4mm long and have a flat narrow body. They are wingless with well developed legs adapted for jumping. They vary in colour from light to dark brown. The larvae are 4–10mm long and white; they have no legs but are very mobile. The cocoon (pupal stage) is well camouflaged because it is sticky and soon becomes covered with dust, sand and other fine particles.

31. Fleas breed close to the resting and sleeping places of the host, in dust, dirt, rubbish, cracks in floors or walls, carpets, animal burrows and birds' nests. High humidity is required for development. The larvae feed on organic matter such as the faeces of the host, small dead insects and undigested blood expelled by adult fleas. Fleas avoid light and are mostly found among the hairs or feathers of animals or in beds and in people's clothing. Fleas and their eggs, larvae and cocoons can be effectively removed by keeping shelters well swept and floors washed.

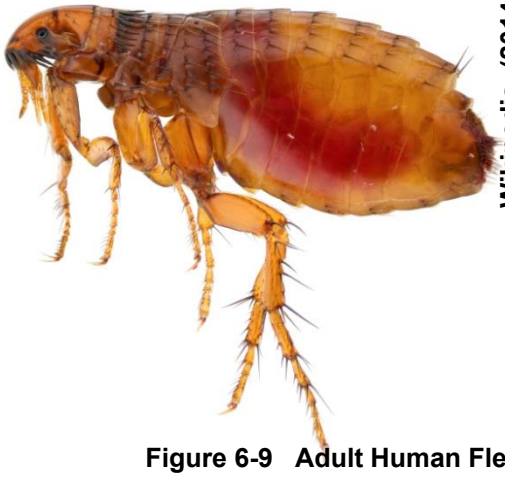


Figure 6-9 Adult Human Flea

32. Flea-borne typhus, also called murine typhus fever, is caused by Rickettsia typhi and occurs sporadically in populations of rats and mice. It is transmitted mainly by rat fleas and cat fleas, and humans can become infected as a result of contamination from the dried faeces and crushed bodies of the fleas. The disease occurs worldwide and is found in areas where people and rats live in the same building. Control and prevention strategies for fleas include:

- Educating the refugees on modes of transmission and protection.
- Avoiding flea bites by use of insecticides and repellents.
- Reducing rat flea populations through the application of insecticide powders to rat runs, burrows and harbourages.
- Controlling rat populations through proper storage and disposal of food and refuse.
- Suppressing rat populations by trapping and poisoning. Rat



control should always be preceded by measures to control fleas to avoid the fleas migrating to the human population.
- Encouraging cleaning and residual spraying of shelters.
- Encouraging insecticide treated bednet use.

33. The treatment of floors with detergents, insecticides or a solution of naphthalene in benzene can be used in some settings; care should be taken to avoid inhaling benzene fumes. Heavy infestations can be controlled by spraying or dusting insecticides into cracks and crevices, corners of rooms and areas where fleas and their larvae are likely to occur. Insecticides can also be applied to clothing and the fur of animals.

34. Plague is a disease caused by the bacterium Yersinia pestis. It occurs primarily in wild animals, such as rats and other rodents. Plague bacteria are transmitted by fleas, and humans may be infected by fleas that have fed on infected animals. Plague is still dangerous because it occurs widely in rodent populations. Rural or sylvatic plague may be contracted in the western USA, South America, Africa, the former USSR, parts of the eastern Mediterranean area, and central and southeast Asia. Human plague frequently occurs in several countries in Africa, Bolivia/north-eastern Brazil, Ecuador, Myanmar, Peru and Viet Nam. Rat fleas (Xenopsylla species) that normally feed on rats may occasionally feed on humans and thus spread the disease to them. Control and prevention strategies for Plague include:

- Educating the refugees on modes of transmission and protection.
- Avoiding flea bites by use of insecticides and repellents.
- Reducing rat flea populations through the application of insecticide powders to rat runs, burrows and harbourages.
- Controlling rat populations through proper storage and disposal of food, garbage and refuse.
- Suppressing rat populations by trapping and poisoning. Rat control should always be preceded by measures to control fleas to avoid the fleas migrating to the human population.
- Encouraging cleaning and residual spraying of shelters.
- Encouraging insecticide treated bednet use.

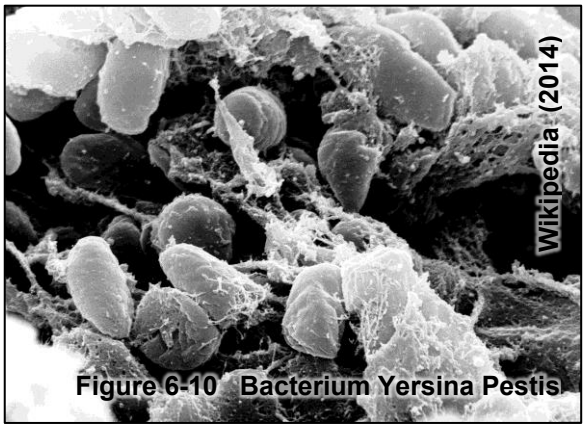


Figure 6-10 Bacterium Yersina Pestis

Control of lice in refugee settings

35. There are three main species of lice that affect humans. The body louse Pediculus Humanus, the head louse Pediculus Capitis and the pubic louse Pthitrus Pubis. Only the body louse is a vector of disease (typhus, relapsing fever and trench fever). The others do not transmit disease but may cause severe



irritation. Lice are spread by close contact between humans. Body lice are found attached to clothing in close contact with the skin. The adult louse is about 3-4 mm long. Control and prevention strategies for lice include:

- Educating the refugees on modes of transmission and protection.
- Increasing water quantity and soap availability.
- Improve living conditions with provisions for adequate bathing and laundering of clothes and bedding.
- Encouraging cleaning and residual spraying of shelters.
- Encouraging insecticide treated bednet use.
- Carrying out delousing campaign using residual insecticide powder applied to clothes and persons.



Figure 6-11 Human Body Louse

Control of mites in refugee settings

36. There are over 1,000 species of mites, the most important being biting mites Trombbiculid and scabies mites Sarcoptes Scabeie. Mites are very small 0.5 – 2 mm and have eight legs. Biting mites emerge from their eggs and crawl onto vegetation seeking an animal or human host. They feed once and then drop back to the ground where they enter the soil to develop into adults. Almost the entire life of the scabies mite is spent on and in human skin. Scabies disease results from an allergic reaction to the burrowing mites. Control and prevention strategies for mites include:

- Educating refugees on modes of transmission and protection.
- Increase water quantity and soap availability.
- Encourage personal and domestic hygiene.
- Providing sufficient quantities of hot water and soap for laundering of underwear, clothing.
- Washing clothes with cycles of boiling water and drying will kill mites and eggs but may not be needed for most infestations.
- Encouraging cleaning and residual spraying of shelters.
- Encouraging insecticide treated bednet use.



Figure 6-12 Scabies Mite

Control of rodents in refugee settings

37. Rodents are generally present in most setting where there are humans and there is relatively easy access to food wastes. The risks to human health from rodents include:

- Rats cause disease through their fleas including murine



typhus and plague (see **section 6.30**)

- Rodents can spread diseases such as salmonelloses, leptospirosis, hanta virus and lassa fever through their excreta.
- Rat bites can transmit pathogens that can cause fever and rabies.

38. Rodents can also cause considerable damage to building structures and food stores by chewing through structural materials. Control and prevention strategies for rodents include:

- Controlling populations through proper storage and disposal of food, garbage and refuse.
- Preventing access to dwellings by filling or screening all holes greater than 6mm in diameter.
- Suppressing populations by trapping and poisoning with rodenticides.



Figure 7-13 Rat Infestation

7. Hygiene Promotion

Overcrowding, a lack of access to basic water and sanitation services and a lack of hygiene materials, such as soap, can result in poor hygiene which can rapidly facilitate the transmission of disease. Hygiene promotion is an essential activity in refugee settings to ensure the population has the knowledge, resources, willingness and practice to prevent WASH related disease transmission and live with dignity.

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Introduction

The importance of hygiene promotion in refugee settings

1. During refugee emergencies, overcrowding, a lack of access to basic water and sanitation services, difficult living conditions, and a lack of basic hygiene items (for example soap, or water containers) can cause a rapid increase in water and sanitation related diseases. In some cases there may be a risk of disease outbreaks which can put many lives at risk. Hygiene promotion is an essential activity not only to ensure the population has the knowledge, resources, willingness and practice to prevent WASH related disease transmission but also to create the conditions for life with dignity.



Figure 7-1 Public Health Messages

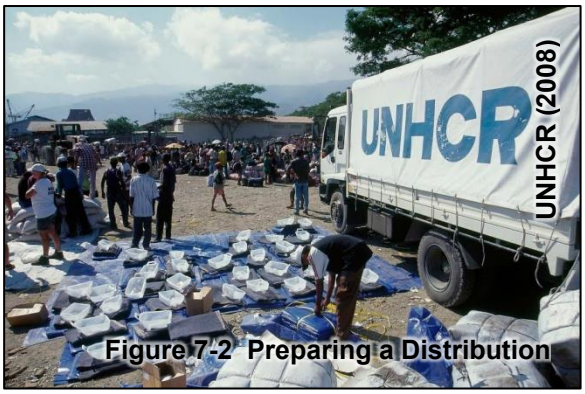


Figure 7-2 Preparing a Distribution

2. Promoting improved hygiene practices in particular handwashing with soap, safe disposal of excreta, safe water management, and safe food handling, can have a significant impact on preventing disease transmission. This includes diarrhoeas and dysenteries such as Amoebic Dysentery, Cholera, Cryptosporidiosis, Giardiasis, Rotavirus Diarrhoea, Salmonellosis and Shigellosis - in addition to enteric fevers such as Typhoid, Paratyphoid, Poliomyelitis, Hepatitis and Leptospirosis. Promoting handwashing with soap and regular bathing and laundering can significantly reduce the transmission of infectious skin and eye diseases such as Scabies and Trachoma. Handwashing with soap has also been shown to reduce the transmission of respiratory infections. Use of insecticide treated bed nets can also prevent the transmission of diseases spread by mosquitoes including Malaria.

"Hygiene promotion is the planned, systematic approach to enable people to take action to prevent and/or mitigate water, sanitation and hygiene-related diseases."

SPHERE Minimum Standards in Humanitarian Response (2011)

3. Enabling the refugee population to regularly launder and dry their clothes and bedding, in addition to the use of insecticide treated bed nets, can reduce the transmission of diseases spread by vectors including human body lice, ticks, fleas and mites including Typhus. A more detailed description of all of the different water, sanitation and hygiene related diseases along with their transmission routes and prevention strategies can be found in **Chapter 2**.





Figure 7-3 Poor Planning for Laundering

Hygiene promotion as part of a comprehensive public health approach

4. The primary objective of hygiene promotion programmes is the reduction of WASH related disease transmission. Therefore, it is absolutely essential that all hygiene promotion related activities are closely coordinated, or run in collaboration, with health programmes. Any disease related information campaigns should provide a balance of messages related to hygiene, messages related to curative health, and messages related to health seeking behaviour. For example, campaigns related to diarrhoeal disease should not only include key messages related to safe water, latrine use, handwashing with soap and food safety - but may also include a diarrhoea case definition, the importance of seeking early medical attention and treatment in the case of small children, and the importance of rapid rehydration using oral rehydration solutions.
5. Hygiene promotion activities are of particular importance for high-risk groups including mothers with small infants, pregnant women, people living with HIV/AIDS are their carers, malnourished children and their carers, and primary school and pre-school children.



Figure 7-4 Child Bathing

6. In all refugee settings it is essential that there is effective coordination and collaboration between the Community Health, Nutrition, HIV/AIDS, Education, Community Services and WASH programmes to avoid overlaps and gaps. At the refugee community, school, and household level, there should be a clear division of responsibilities between the activities of Community Health Workers, Teachers and Hygiene Promoters.

Ensuring the refugee population has the resources and knowledge to carry out key hygienic practices is an essential contribution to the health, dignity and morale of the refugee population. The psychological benefits of being able to live in a clean and hygienic way should not be underestimated.

Hygiene promotion as practical mechanism for community mobilisation

7. Hygiene promotion also provides a practical mechanism for the active mobilisation of the refugee

population to take action related to WASH services and conditions. Hygiene promoters play an essential role in ensuring there is equality of access to WASH services. They also play an important role in ensuring that the community is fully involved in the use and management of WASH facilities and that users have an input into the design of services; in particular that they are safe, secure, comfortable, culturally appropriate and adequately managed. In addition, hygiene promotion ensures there is an effective mechanism for accountability, protection and feedback. Hygiene promoters are also the primary point of community contact for the mobilisation of the population (for example during clean up campaigns).

The importance of seeking expert professional advice

8. Designing and implementing hygiene promotion programmes incorporating elements of hygiene related behaviour change is not easy. Even if the population has access to hygiene resources and facilities, and are provided with key hygiene messages, it does not mean that they will have the willingness to carry out improved behaviours. Factors related to changing hygiene practice can be varied and complex and in all settings UNHCR and WASH actors must take time to fully investigate the main motivations and barriers for certain risk practices. In all settings, it is essential to have expert support from professionals who are familiar with hygiene promotion programmes and the local context. Assistance can be sought locally from sources such as government departments, the UN system, NGOs, or universities. If these cannot meet the need, UNHCR Headquarters assistance should be requested.

The importance of respecting UNHCR's WASH philosophy and principles

9. In addition to the guidance in this chapter, all hygiene promotion programmes must be designed and carried out in full accordance with UNHCR's general WASH principles including (please click the links below or consult the relevant section in Chapter 2 for more information).

- Safety and protection
- A timely and adequate response
- Participation of stakeholders
- Universal access
- Child friendly facilities
- Designs and construction that meet minimum quality standards
- Value for money and cost effectiveness
- Appropriate technology selection
- Durable solutions
- Reinforcing the capacity of stakeholders
- Monitoring the effectiveness of WASH interventions
- Protecting the environment
- Planning for contingencies

Priority actions

Immediate distribution of basic hygiene items

10. UNHCR and WASH actors must ensure that the refugee population

is provided with basic hygiene materials including soap, water containers and women's menstrual materials (see box below) on immediate arrival at the refugee setting and consistently throughout the emergency. It is essential that this distribution is organised as rapidly as possible as the refugee population may arrive without possessions.

11. How the basic hygiene kit is distributed should be carefully coordinated, especially if the hygiene items are included as part of a general distribution with other items such as blankets, or cooking equipment. Whichever way the distribution takes place, the WASH team must take direct responsibility for ensuring the type, quality and timeliness of the hygiene items including any post-distribution monitoring. If hygiene items are distributed by the WASH team, then UNHCR and WASH actors should follow UNHCR best practice for commodity distributions which includes ensuring that the population is well informed of the time, place and type of distribution, and that the distribution is carried out in a secure, orderly, efficient and transparent manner. More guidance can be found in the UNHCR publication *"Commodity Distribution: A Practical Guide for Field Staff" UNHCR (1997).*

12. Additional items to facilitate laundering of clothes and bedding, bathing, management of children's faeces, water treatment, and compound cleanliness may be considered if appropriate, locally available, and the basic hygiene needs have been met (see box below). If these products are readily available on the local market, the use of a cash based approach (i.e. vouchers) is highly recommended in order to prevent undermining of local suppliers and stimulate the local market economy.

Box: Recommended hygiene items for distribution

Basic hygiene items

- ☐ Water containers - 10l per person
- ☐ Hand soap - 250g/person/month (Note this should be doubled during outbreaks)
- ☐ Laundry soap (or powder if appropriate) - 200g/person/month
- ☐ Acceptable material for menstrual hygiene, e.g. washable cotton

Additional optional hygiene items

- ☐ Toothpaste - 75ml/100g
- ☐ Toothbrush - 1 per person
- ☐ Shampoo - 250ml per HH
- ☐ Bathing towel – 1 per HH
- ☐ Disposable razor - 1 per HH
- ☐ Underwear for women and girls of menstrual age - 1 per person
- ☐ Laundry basin – 1 x 40l per HH
- ☐ Washing line – 40m per HH
- ☐ Washing pegs – 80pc per HH
- ☐ Hairbrush / comb - 1 per HH
- ☐ Nail clippers - 1 per HH
- ☐ Hair scissors – 1 per HH
- ☐ Nappies (diapers) and potties (dependent on household need)
- ☐ Nappy rash lotion - 250ml per HH
- ☐ Small yard brush – 1 per HH
- ☐ Small dustbin – 1 x 40l per HH

Notes:
Quantities for approximate guidance only. Alternative items may be considered in consultation with the population.

13. As soon as is possible, the hygiene team should plan to undertake focus group discussions (see **Chapter 9**) to ensure that the


Olyset® Net
Do not eat after touching the Olyset® net. Wash your hands first.
UNHCR

hygiene items being distributed are relevant and appropriate to the culture and context - in particular those related to menstrual hygiene, bathing, hand washing and management of children's excreta.



Figure 7-5 WASH NFI Distribution

14. Additional Care should be taken to avoid distributing products that may be unfamiliar. UNHCR and WASH actors should ensure that beneficiaries receive a visual practical demonstration in the safe use of hygiene items that are unfamiliar to them. This is particularly important if any household water treatment (for example PUR, aquatabs, or household water filters) or disease vector control products (for example bed nets) are being distributed.

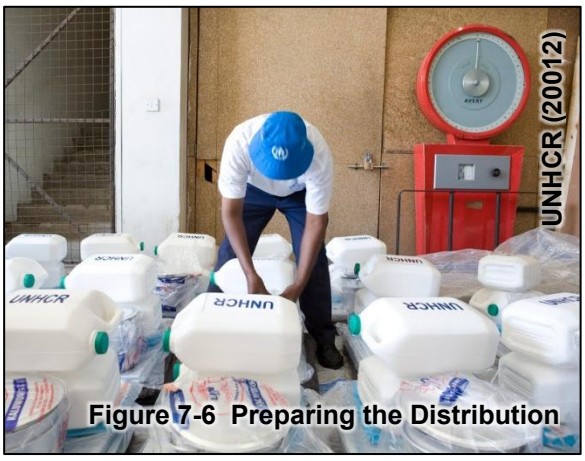


Figure 7-6 Preparing the Distribution

15. Post distribution monitoring is an essential activity after every major distribution to not only ensure that the distribution was carried out correctly and the hygiene items were received by the population, but also to ensure that the distributed items are being used, the population is satisfied with the quality and usefulness of the products, and the population has the opportunity to provide feed-back on the hygiene items and the distribution activity. The post-distribution monitoring activity should take no longer than one day and may include a rapid randomized household survey and several focus group discussions (see **Chapter 9**).

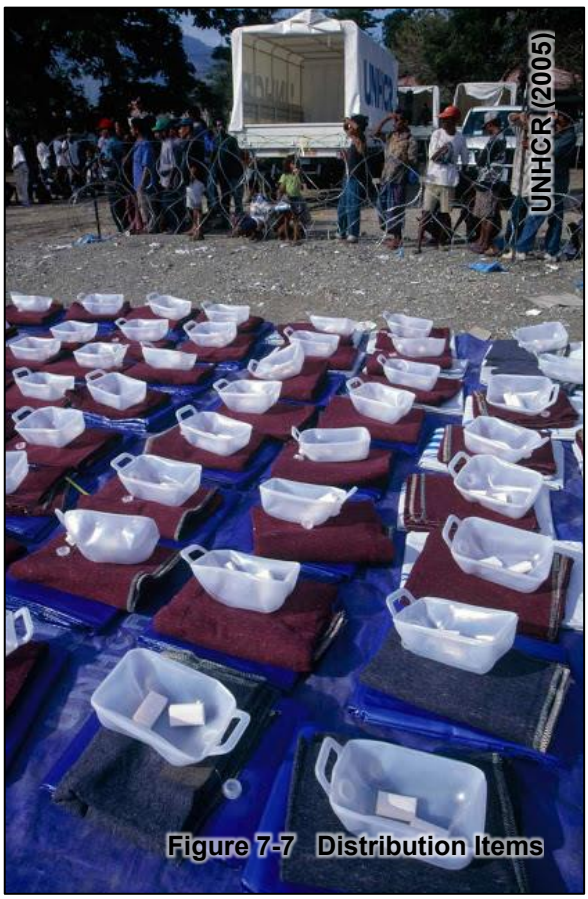


Figure 7-7 Distribution Items

Immediate mobilisation of the community to take action

16. The refugee population should clearly understand that they are not just passive recipients of

humanitarian aid but they have the rights, capacity and means to manage and dictate the direction of their daily affairs, including their sanitary environment. The degree to which the refugee population can be mobilised depends upon the context and the capacity of the refugees. However in all settings, UNHCR and WASH actors should aim to support individuals or organisations to mobilise the larger refugee community to take action concerning WASH related problems in the refugee setting e.g. the safe disposal of excreta, clean up and safe management of wastes, contamination of water resources, or management of disease vector breeding sites.



Figure 7-8 Community Mobilisation

Immediate dissemination of key hygiene promotion messages

17. UNHCR and WASH actors must ensure that the refugee population is provided with clear hygiene messages on immediate arrival at the refugee settings and consistently throughout the refugee emergency. The messages must be in their own native language, and must target the most critical hygiene risk practices for the current displaced context that are responsible for disease transmission, in addition to the key interventions to prevent them. Targeting too many messages can be confusing and can dilute the most important messages. All messages provided to the refugee population should aim to be positive (rather than scare mongering) with a focus on providing key facts.



Figure 7-9 Hygiene Promotion Poster

18. Examples of generic key hygiene messages for hygiene practices can be found in the box on the following page. However, it is essential to review these messages and carefully tailor them to the local culture, customs and context. At all times the emphasis should be on taking as much of an interactive approach as possible and mobilising people to take practical action either themselves or as groups (e.g. clean up campaings). Additional messages may be needed depending upon the context and any critical hygiene risks that are present.

19. In the early stages of a refugee emergency, UNHCR and WASH actors should use a mixture of mass media messaging to ensure that as many people as possible receive important information about reducing health risks. A mixture of approaches is especially important to reinforce messages through different communication channels and to also ensure that all sections of the refugee community are

Key hygiene messages for refugee settings

Handwashing with soap

- ☐ To prevent diarrhoea, always wash hands with water and soap or ash, after defecation, after contact with faeces, before touching or preparing food, before eating and before feeding children.
- ☐ Young children frequently put their hands in their mouths so it is important to keep the household clean and for children to wash their hands regularly, especially after defecating and before eating.

Toilet use

- ☐ To prevent diarrhoea, use a toilet and ensure that all faeces, including those of infants and young children, is disposed of in a toilet or buried. Afterwards, hands should always be washed with water and soap or ash.

Safe water

- ☐ To prevent diarrhoea, always drink water from a safe water source.
- ☐ To prevent re-contamination, store water in a clean, closed water container with a narrow opening.

Food hygiene

- ☐ Prepare and thoroughly cook food just before eating. Food left standing can collect germs that can cause diarrhoea. After two hours, cooked foods are not safe unless they are kept very hot or very cold.
- ☐ Wash fruits or vegetables that are eaten raw thoroughly with safe water.

Diarrhea

- ☐ Diarrhoea kills children by draining liquid from the body, which dehydrates the child. As soon as diarrhoea starts, it is essential to give the child extra fluids along with regular foods and fluids.
- ☐ If the child passes several watery stools in one hour and vomits, there is cause for alarm – these are possible signs of cholera. Cholera can kill children in a matter of hours. Medical help should be sought immediately and the child should continue to receive ORS solution and zinc.
- ☐ Cholera can spread throughout the community quickly through contaminated water or food. Make sure your water and food are safe and follow good hygiene practices.

Vector control

- ☐ Flies that settle on faeces and then on food transmit the germs that cause Diarrhea. To prevent the spread of germs from flies: (1) cover food and drinking water, (2) dispose of faeces in a properly designed latrine or toilet, (3) keep the latrine or toilet clean, (4) reduce fly breeding sites by burying, burning or safely disposing of food refuse at the waste collection point.
- ☐ Malaria, which is transmitted through mosquito bites, can be fatal. Wherever malaria is present, people should sleep under insecticide-treated bed nets; any child with a fever should be examined by a health worker.

Source: Facts for Life (4th Edition, 2010) – WHO, UNICEF, UNDP, WFP

reached, including men, women, children, teenagers, different ethnic groups, different religious groups, and sections of the refugee population that are non-literate or have communication difficulties (deaf, blind, elderly, ill or infirm).

20. Efforts should be made to use any existing mass media communication infrastructure that exists. For example, in urban refugee contexts, there may be an existing network of media outlets, radio stations, television stations and newspaper networks. In many settings the use of popular media (drama, songs, street theatre, dance, etc.) has been shown to be effective - however the provision of basic messages (for example broadcasting messages with loudspeakers or over a public address system) is better than delayed provision spent developing more popular media.

Immediate assessment of hygiene related risks

21. A rapid assessment of hygiene behavioural risks should be carried out within the first few days of any refugee emergency. This is best achieved in collaboration with members of the Health programme and using a combination of observation walks, key informant interviews and focus group discussions (see **Chapter 9**). Following the rapid assessment a prioritised hygiene promotion action plan should be developed that includes short, medium and long term strategies to reduce hygiene behavioural related risks. The risk assessment should be analysed taking into account current prevalence of WASH related diseases in addition to those that have the potential to cause rapid epidemics (see **Chapter 2**). Seasonal diseases should also be taken into account, particularly those linked to seasonal rain, temperature, and harvest seasons and hygiene promotion messages and activities.

Ensuring women's menstrual hygiene management needs are met

22. During a refugee emergency it is possible that the populations may have fled with very few possessions. Therefore, UNHCR and WASH actors must ensure that all women on reproductive age (10-45) have immediate access to sufficient quantities of culturally appropriate Menstrual Hygiene Management (MHM) materials (sanitary cloth, reusable pads, disposable pads, soap, spare underwear) and WASH services (water supplies, bathing, laundering and drying facilities) to practice good menstrual hygiene management. Good MHM reduces risk of infection to girls and women and also gives them the empowerment to engage in daily activities and survival in an emergency refugee context. WASH facilities must allow all women and girls to change, soak, wash and dry MHM cloths with complete security and dignity.

23. UNHCR and WASH actors must ensure that the types and quantities of MHM materials that are distributed are decided in close consultation with women from the refugee population through the use of Focus Group Discussions and Key Informant Interviews. It is essential to understand what

materials were commonly used in the refugee population's place of origins, in addition to any taboos, or specific cultural or religious considerations.

Box: UNHCR sanitary protection standards for women and girls

Indicator: Percentage of needs met for sanitary materials

Standard: 100%

Rationale: To meet the basic and protection needs of refugee women and girls to uphold their dignity and self esteem.

Notes: This group includes girls and women 13-49 years old. The sanitary material kit includes either disposable napkins (12 per person per month) or reusable, absorbent cotton material (two metres long per person per six months), six underpants per person per year, and a 250g bar of soap per person per month (in addition to soap provided to the whole population).

Practical Guide to the Systematic Use of Standards and Indicators (UNHCR, 2006)

Universal access to hygiene promotion messages and activities

24. Hygiene promotion messages, activities and supplies should be accessible to all sections of the populations including older persons, pregnant women, people with disabilities and children. Efforts should be undertaken to ensure that deaf (or hard of hearing), or blind (or partially sighted) persons are able to access hygiene information and participate in activities. Hygiene materials should match the levels of literacy of the displaced population. Particular care should be taken when designing hygiene promotion posters, or materials, for populations that are visually illiterate (cannot recognize pictures or symbols – commonly used in hygiene promotion images).

Approaches to hygiene promotion in refugee settings

25. Hygiene promotion refers to a range of approaches that systematically ensure that children, women and men have the knowledge, resources, willingness and practice to prevent or mitigate water and sanitation related disease transmission. Hygiene promotion seeks to stimulate and facilitate people to practice water and sanitation related hygiene behaviours, by building on what they already know, do and want. The focus of hygiene promotion is to motivate changes in behaviour taking into account that people are not “empty” vessels and are complex individuals with their own customs, perceptions, wants and desires. The emphasis of hygiene promotion interventions is on enabling people to take action to mitigate health risks by adhering to safe hygiene practices in addition to raising awareness about the causes of water and sanitation related disease.

26. UNHCR and WASH actors must ensure that hygiene promotion and water and sanitation hardware interventions are complementary. In order to be able to carry out improved hygiene practices, the displaced population must have access to sufficient numbers of functional latrines, handwashing stations, water collection points, laundry points, soap, water


Natural Feminine Protection
makapads
from sustainable papyrus
UNHCR
German Development Cooperation
UNHCR-BMZ Partnership Program
implemented by
gtz

containers, bathing cubicles, clothes drying facilities, children's potties and mosquito nets. All water and sanitation hardware must be culturally acceptable, comfortable, clean, functional, convenient and accessible to all users including persons with limited mobility. Mechanisms must be in place to ensure that facilities are kept in good working order and are regular maintained and do not deter use.

A phased approach to hygiene promotion

27. The hygiene promotion approach taken to mobilise the refugee community should be adapted to the phase of the emergency. During the emergency phase the priority focus should be saving lives and reducing risks of WASH related disease and should include:

- ☐ Ensuring that refugee populations have the necessary resources (soap, jerry cans etc.) to carry out good hygiene practices.
- ☐ Mobilisation of the community to take action concerning WASH related problems in the refugee setting e.g. the safe disposal of excreta, clean up and safe management of wastes, contamination of water resources, or management of disease vector breeding sites.
- ☐ Mobilisation of the community to take action concerning the design and proper use and management of WASH services.
- ☐ Ensuring that the refugee population has the basic knowledge of preventing disease e.g. basic personal hygiene, environmental hygiene, safe collection, transportation, storage, and treatment of water, and basic food hygiene practices.

28. In the medium and longer-term hygiene promotion programmes should follow a hygiene promotion approach more in-line with development settings based on: continuous assessment, analysis, design, implementation, monitoring and evaluation of hygiene related risks as described in the hygiene promotion cycle below.

- **Step 1:** Obtain an understanding of WASH related problems by carrying out an assessment. The assessment should identify what the specific risks are, how people understand the problem, what might motivate and enable them to do things differently, in addition to the communication channels they trust.
- **Step 2:** Identify potential areas for intervention. This might involve providing or improving access to 'hardware' such as water systems or hygiene items but it will also involve communication to mobilise, educate or advocate for action.
- **Step 3:** Identify the different at-risk target groups (young children, mothers etc.) and the various strategies for improving hygiene practices. It may be helpful to create a list of statements i.e. *In order to help group "A" carry out practice "B", we will concentrate on removing barriers "X1" and "X2" and encouraging motivational factors "Y1" and "Y2" through*



the following interventions "Z1", "Z2" and "Z3".

- **Step 4:** design a hygiene promotion strategy and plan. The strategy should focus on the use of WASH facilities or might also involve information related to controlling WASH related diseases or ensuring that people know when to seek medical help.
- **Step 5:** regularly monitor, evaluate, and redesign the strategies if necessary.

Communication methods in refugee settings

29. In the early stages of a disaster, it may be necessary to rely on mass media to ensure that as many people as possible receive important information about reducing health risks. Communication may use either 'top-down', 'bottom-up', or a combination of both strategies:

- ☐ **'Top-down'** public awareness raising type mass-media campaigns.
- ☐ **'Bottom-up'** type behaviour change activities which work to change individual practices by building on key motivational factors such as convenience, dignity, security, disgust, peer pressure, privacy and livelihood.

30. Using methods such as loud speakers or radio can reach large numbers of people but may not be effective at influencing change. More interactive communication methods (such as street drama) can often be more effective in terms of persuading individuals to take action and should be used in addition to mass communication methods.

Box: Hygiene Communication - Key Principles

1. Target a small number of risk practices
2. Target specific audiences
3. Identify the motives for changed behavior
4. Hygiene messages need to be positive
5. Identify appropriate channels of communication
6. Decide on a cost-effective mix of channels
7. Allocate sufficient resources
8. Hygiene promotion needs to be carefully planned, executed, monitored and evaluated.

Source: Curtis, V. (2005) WELL Hygiene Promotion Fact Sheet

31. Relevant hygiene promotion messages should be targeted at different groups through the most appropriate and relevant communication channels, so that information reaches all members of the population. This is especially important for those who are non-literate, have communication difficulties and/or do not have access to radio or television. Popular media (drama, songs, street theatre, dance, etc.) might also be effective in this instance. Coordination with the education cluster will be important to determine the opportunities for carrying out hygiene activities in schools.



Figure 7-10 Hygiene Reminder at Latrines



32. Communicating good hygiene in refugee settings requires the use of multiple strategies and approaches. It should not be focused only on individual behaviour change but also on mobilising groups of people to take action to address the determinants of poor hygiene. Influencing public policy and legislation can also play an important part in promoting better hygiene and advocacy and lobbying are important aspects of hygiene promotion. For example, motivated refugee households might agree to compost their waste or dig household latrines. Individuals might volunteer to help manage a community water point or visit other refugee households to inform them about ways to prevent and manage diarrhoea. WASH programmes in refugee settings should take a community based approach to improving hygiene by working supportively and respectfully with refugee communities to identify the most appropriate way to meet their needs for water, sanitation and hygiene. The overall aim of WASH interventions is not only to combat infectious diseases but also to maintain people's dignity and ensure that their living conditions contribute to, rather than undermine, their adaptation to a new environment.



Figure 7-11 Mother with Small Child

33. Care should be taken to ensure that those involved in hygiene communication do not convey very judgemental attitudes towards people who struggle to maintain hygiene and this can undermine effectiveness. The first step to successful hygiene communication is to understand the individual and community perspective on the issues that are being addressed.

Working in different refugee contexts

34. UNHCR and WASH actors work in many different contexts but wherever there is a need to provide water and sanitation facilities there will always be a requirement to ensure that they are used in way that will ensure better hygiene and health. In an acute emergency, people may be severely traumatised and bereft of any sense of purpose and simply listening to people's concerns and empathising with them will be a necessary first step to gaining their trust and collaboration later. Enabling people to help make decisions about the response can also give them a sense of purpose and meaning in their lives once again.

35. In urban areas, where refugee communities may be diverse, interventions may need to focus on mobilising smaller neighbourhoods or groups that have shared interests and target host communities and refugee communities at the same time. Hygiene promotion efforts may need to work closely with community services and local authorities to provide common meeting areas.


NAP
SANITARY
CLINIC

Box: Five fallacies about hygiene promotion

1. **Behaviour change is easy.**
   Getting people to change the habits of a lifetime is difficult, takes time and requires resources and skill.
2. **Knowledge = behaviour change.**
   It was thought that education about hygiene would be enough for people to change their behaviour. However, many people already know about germs, but still do not wash their hands at critical times.
3. **Experts know how to change behaviour.**
   Hygiene promotion programmes cannot be designed by experts in an office. They have to de designed around the real needs, wants and contexts of the actors themselves i.e. a consumer-centred approach.
4. **A whole variety of hygiene practices should be encouraged.**
   Only a limited number of key high risk unhygienic practices are responsible for most diarrhoeal episodes. Since behaviour change is difficult, efforts should not be diluted by targeting too many practises or too many target groups.
5. **Hygiene promotion is a cheap add-on to water programmes.**
   Serious efforts to change behaviour require serious investment and professional skill.

Source: Curtis, V. (2005) WELL Hygiene Promotion Fact Sheet

36. Whilst there are numerous approaches and methods used to communicate with people about hygiene, many traditional health promotion methods fail to acknowledge the perceptions of the target groups and try to influence change by providing information alone. Whilst this is important, especially in an emergency, a better understanding of the barriers and motivations for change will usually be required.

Stages of behaviour change

37. All individuals, including refugees, go through different stages in changing our behaviour. These stages include:

- Not being aware
- Becoming aware
- Becoming motivated to try something new
- Adopting a new behaviour
- Sustaining and 'internalizing' a new behaviour so that it becomes part of our normal
- Everyday practice.

38. In order to have an effective hygiene promotion programme it is often first important to understand where there the refugee target groups are along this continuum of behaviour change. For example, moving people from 'not being aware' to 'being aware' can be achieved via IEC (information, education, communication) materials. However moving people to 'becoming motivated to try a new behaviour' or 'adopting a new behaviour' requires a different approach such as understanding the barriers and motivational factors towards behavioural change.

A practice is a regular action that takes place at a certain time and place and can be directly observed or measured. UNHCR field staff and their partners must focus all hygiene promotion activities around the changing of hygiene practices - not just increasing hygiene knowledge or changing attitude.


Practice Good Hygiene In Little Wlebo Camp

39. Sometimes refugees who appear to have adopted a new behaviour reject it and return to their former behaviour. For example, a mother may stop washing her hands with soap before food preparation if her soap stocks are running low, or there has been a long time between distributions.

40. Individuals rarely change all by themselves. Their behaviour often depends on and is influenced by the views and practices of their families, friends and communities. Sometimes these are positive, as when everybody washes their hands with soap and water after using the toilet or latrine. Other times they may be harmful, as when parents refuse to have their children vaccinated. To change social behaviour means changing the everyday views and practices of families and communities. What parents, other caregivers, children and adolescents decide to do is often influenced by what others are doing around them.

41. Resistance can be expected when social norms are challenged. This is because change involves shifting the dynamics of a group on fundamental issues related to gender roles, power relations and many other factors within the family or community. But acceptance can become contagious when society begins to see the economic and social benefits of adopting a new behaviour. An example is when families using mosquito nets no longer have to cope with sickness or death caused by malaria. Their energies can be directed to sustain their children's learning and the family's productivity. People begin to see and hear about the change, and interest spreads, prompting others to adopt the new behaviour that can benefit their lives. Eventually, the behaviour is considered normal practice by everyone.

Participatory learning

42. Participatory methods, on the other hand, encourage the development of problem-solving skills. Participatory approaches are also called learner-centred approaches because they encourage people to express their ideas freely about understanding and solving problems. Some people might resist freely expressing themselves in participatory ways. Some people, particularly women, might not be confident about their ideas particularly if they are not used to freely expressing them. Some people might want to avoid conflict with others and others might feel that their opinion will never make a difference. Despite these obstacles, participatory methods can produce great enthusiasm and involvement the more they are used and the more facilitators allow participants to direct and shape their own learning and exploration.

43. Under some circumstances, didactic approaches are best to use and in other situations, participatory methods or a combination of both might be more suitable. Whether didactic or participatory methods or a combination of the two are used depends on each particular situation. For example, during the acute emergency phase or during an outbreak, it is critical to disseminate basic health information to the entire community



as quickly as possible. Such information might include how disease is spread, early signs of possible infection and danger signs for seeking immediate medical attention particularly for children. During such circumstances, participatory methods might not seem appropriate because of the time investment needed. While time constraints are an important factor, engaging participatory methods can lead to lasting changes and, therefore, efforts should be made to use these methods wherever possible.

Hygiene promotion interventions at the household level

44. UNHCR field staff and their partners must promote hand-washing after toilet use as part of household toilet construction programmes. Budgets and workplans should ensure that hand-washing devices and soap are distributed as part of the ongoing hygiene promotion activities.

Piloting of hygiene promotion materials and interventions

45. UNHCR and WASH actors should ensure that all hygiene materials and activities including street dramas, plays, posters, banners, radio slots, jingles, songs, puppet shows and games introduced into the refugee setting are piloted on a small test group for clarity, comprehension and retention. The piloting programme should observe that the critical hygiene messages are clearly communicated and are readily understood by the target groups.



Figure 7-12 Hygiene Promotion Games

Human resources for hygiene promotion programmes.

46. The day-to-day operation and maintenance of toilets will require a substantial labour force. It is highly likely that the paid and voluntary positions, including managerial positions, can be recruited from among the displaced community. In most cases the community may be willing to help since it gives people something to do, prestige, and possibly a source of income.

47. As a general planning figure, one person per 300 should be recruited from among the displaced population for water, sanitation and hygiene related activities. Take care when selecting hygiene promotion staff to ensure that – respects culture and context. In many cultures it is not appropriate for young girls to be telling old ladies what to do.

Preparing a hygiene promotion strategic plan

Hygiene promotion strategic plan.

48. UNHCR and WASH actors should ensure that every site has a context specific document that clearly describes the hygiene promotion strategy in terms of WHO, WHAT, HOW, WHEN,



WHERE and WHY. The strategy should justify WHY and HOW the key hygiene risk practices have been identified, WHO are the priority at-risk groups and WHY, WHAT are the most effective hygiene promotion approaches and activities and WHY, HOW the target activities for each at-risk group will carried out and HOW the effectiveness of the plan will be monitored. The hygiene promotion plan should be prepared within the first three months of the displacement emergency and should be revised every six months based on monitoring.

Monitoring of the hygiene promotion strategic plan

49. A clear monitoring plan should be developed as part of the hygiene promotion plan that describes WHAT will be monitored, HOW it will be monitored, and HOW OFTEN it will be monitored.

Hygiene promotion tools for refugee settings

50. A significant amount of work has been carried out by the Hygiene Promotion Technical Working Group within the Global WASH Cluster in 2009 under an initiative to build global capacity for humanitarian response. UNHCR and WASH actors should use these materials in all refugee settings. The following tools can be found in Annex.

Hygiene promotion orientation materials

- Hygiene promotion in emergencies briefing paper and orientation package
- Facilitator's resources for orientation package

Training package for Community Mobilizers

- Training package for community mobilizers

Training package for Hygiene Promoters and Coordinators

- Training package for hygiene promoters and hygiene promotion coordinators

The Global WASH Cluster visual aids library

- Global hygiene promotion visual aids library

Indicators for monitoring hygiene promotion in emergencies

- Indicators for monitoring hygiene promotion in emergencies

List of essential hygiene promotion equipment

- List of essential hygiene promotion equipment and non-food items

List of hygiene promotion job profiles

- Generic job profiles

8. Management of WASH Programmes

WASH programmes in refugee settings often require large numbers of staff, vehicles, equipment and materials – especially in the first few months of an emergency. It is essential that these resources are management efficiently and that WASH staff are able to carry out their tasks with the correct equipment, training, and in safety. Once WASH services are established it is essential that these facilities are kept in good operational condition.

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Introduction

The importance of WASH programme management in refugee settings

1. During refugee emergencies it is essential that water supply, excreta management, solid waste management, hygiene items, and basic disease vector control interventions are well managed and WASH facilities remain in good operational condition. WASH facilities can quickly deteriorate if they are not carefully managed and maintained. Large numbers of WASH staff, vehicles, equipment, resources, materials, and stocks often need to be mobilized in short periods of time. It is essential that these resources are management carefully and efficiently.

The importance of seeking expert professional advice

2. The efficient management of large WASH programmes in refugee settings is not an easy task and can be complicated by additional constraints that include:
    i). A lack of qualified or experienced WASH staff.
    ii). Difficult access.
    iii). A lack of back-up capacity or spare parts.
    iv). Shortage of time to adequately train staff or build capacity.
    v). A lack of willingness from the refugee population to take responsibility for WASH infrastructure.
3. In many refugee emergencies, the initial establishment of WASH services will require significant inputs during the initial few months and it will be essential to engage expert professionals who are familiar with starting large WASH programmes, recruiting and training WASH staff, drafting public works contracts, working with contractors, managing large workforces, and generally managing the scaling up of large WASH programmes in complex environments.

Priority actions

Immediate recruitment and training of WASH personnel

4. The establishment and management of water supply, excreta management, solid waste management, disease vector control and hygiene promotion programmes often requires a substantial labour force in a short period of time. In many scenarios it may be possible to recruit many of the positions, including managerial positions, from among the refugee population. In most cases refugees may be willing to help since it gives people something to do, prestige, and possibly a small source of income.
5. Even if there is limited available time, UNHCR and WASH actors should ensure that all WASH staff, volunteers, or daily labour have received sufficient basic training for the tasks they are performing. Small investments in training WASH staff at the start of a refugee emergency can yield large benefits in productivity, prestige, and motivation over time. It is mandatory that WASH staff, volunteers, or daily labour undertaking WASH tasks with associated public health risks associated receive a basic training in health and safety and the



infection control standard precautions (see **section 8.12**)

Procurement and management of WASH equipment and supplies

6. It is typical that large quantities of WASH supplies (for example soap, jerry cans, household hygiene items, pumps, water reservoirs, pipes, water treatment chemicals, latrine slabs, materials for toilet and shower superstructures, vector control equipment and supplies, and refuse containers, etc.) will need to be procured, warehoused, and managed at the start of any refugee emergency. It is essential that the stock levels and logistical pipelines of these supplies are closely monitored by as ruptures of water treatment chemicals, fuel, or WASH supplies can have large implications on the public health of the refugee population.

Use of public works contracts for construction of WASH infrastructure

7. In most refugee settings there is typically a peak in the workload required to initially establish WASH services at the start of the refugee emergency. Generally, the construction of WASH infrastructure including water points, toilets, showers, laundering points, and solid waste collection systems requires a large amount of resources to establish services in a very short period of time. Options for quickly scaling up the provision of WASH services include:
   i). Working with local WASH service providers to expand existing WASH services to the refugee population.
   ii). Launching a series of small performance based public works contracts to the local private sector to install WASH infrastructure.
   iii). Undertaking WASH construction in-house by engaging directly large amounts of daily labour.
8. Once target levels of WASH infrastructure have been established the level of human resources required to operate and maintain the WASH infrastructure is likely to be much lower. WASH programme staff are likely to be recruited for longer periods of time on a more permanent basis.

Assessment of WASH related health and safety risks

9. WASH staff, contractors, volunteers, or daily labour involved in the establishment or day to day running of WASH programmes - for example the collection and management of excreta, solid waste, or disease vector control activities all have elevated work related health and safety risks. UNHCR and WASH actors should ensure that an assessment of WASH related health and safety risks has been carried out and a plan is in place to mitigate and monitor priority risks. All WASH staff must have adequate personal protective equipment for the tasks they are performing and must have received a basic health and safety training for the tasks they are performing. WASH staff undertaking the following activities should be prioritised:
   - Anyone cleaning toilets or other WASH facilities.
   - Anyone involved in desludging toilets.



- Anyone involved in collection, movement, recycling, reuse or disposal of solid wastes.
- Anyone involved in collection and movement of excreta, infectious or hazardous wastes.
- Anyone involved in disease vector programmes.
- Anyone operating mechanical WASH related equipment.
- Anyone who may potentially come into contact with water treatment chemicals, vector control chemicals, excreta, sewage, wastewater, solid waste, medical waste or any other sources of potential infection.
- Anyone involved in the excavation of latrine pits, wells, or trenches deeper than 80cm.
- Anyone involved in the maintenance of excreta or solid waste related WASH infrastructure or equipment.

10. The best way to undertake a public health and safety risk assessment of WASH activities is to analyse risks at each step of the water, excreta, solid waste, and disease vector chains from source to final use / disposal (see **sections 4.23 and 5.40**). At each step, risks should be analysed in terms of probability (rated from high to low) and likely impact (rated from high to low).

Mitigation of WASH related health and safety risks

11. Once the WASH related health and safety risk assessment has been completed a plan should be established to prioritise these risks and put in place a series of mitigative actions. Any risks that are rated either ‘high’ or ‘medium’ likelihood in addition to either ‘high’ or ‘medium’ health or safety impact must be mitigated immediately.

Provision of personal protective equipment

12. UNHCR and WASH actors must ensure that staff, contractors, volunteers, or daily labour working for the WASH programme have adequate personal protective equipment for the tasks they are performing. A summary of the UNHCR health and safety precautions for WASH related activities can be found in **Annex**. These safety precautions include.

- Assessment of common health and safety risks for each type of WASH activity
- Standards for different types of personal protective equipment depending upon the level of risk
- How personal protective should be worn
- How to remove soiled personal protective equipment
- How to disinfect soiled personal protective equipment
- When and why hand washing should be carried out
- Management, cleanliness, sterilization and storage of excreta management, solid waste and vector control equipment
- Actions in the event of injury or occupational exposure
- Incident reporting and follow up procedures

Provision of health, safety and infection control training

13. UNHCR and WASH actors must ensure that all WASH staff, contractors, volunteers, or daily labour undertaking activities with


RESCUE

potential health and safety risks receive a health and safety briefing related to the tasks they are performing on their first day of employment. All workers who may potentially come into contact with excreta, medical wastes, or solid wastes should receive a briefing on the infection control standard precautions (**see Annex**).

Ensuring water treatment chemical and vector control chemical safety

14. Many chemicals used in water treatment and disease vector control activities are potentially harmful to workers or the environment. Chlorine for example is highly corrosive and can cause burning or a toxic gas and must not come into contact with skin or clothing. Other chemicals used for disease vector control for example insecticides, rodenticides, or larvaecides are toxic and poisonous in concentrated amounts. UNHCR and WASH actors must ensure that all staff working with chemicals have the correct protective clothing for the tasks they are performing (e.g. gloves, goggles, apron, boots). All chemicals used in water treatment or disease vector control activities must be stored under dry, cool dark and ventilated conditions.

15. UNHCR and WASH actors should ensure that any chemicals being used in WASH activities have been approved for under international for the tasks they are being used for and they are applied following internationally approved protocols. Care must be taken during the transportation, storage, application to ensure there are no risks to refugees, staff, or the environment. UNHCR and WASH actors must ensure that all staff involved in handling water treatment and vector control chemicals have adequate personal protective equipment and safety training for the tasks they are carrying out.

Health and safety incident reporting and follow-up

16. Any incident where WASH staff contractors, volunteers, or daily labour have been involved in a work related physical accident, or they have come into direct contact with excreta, solid waste, sewerage, medical waste, hazardous waste, water treatment chemicals, or disease vector control chemicals must be reported to senior management and documented in a health and safety log book so that a review and policy change can take place. Any near misses (a physical, biological, or chemical work-related accident that was narrowly missed) should also be reported and logged.

17. The WASH related health and safety risk assessment, action plan, and the ongoing policy changes resulting from health and safety incident reporting should be fully documented as part of the site WASH strategy/plan.

WASH programme management in refugee settings

Models for WASH service provision in refugee settings

18. The model used to deliver WASH services in a refugee setting depends upon the phase, the context and the capacity of local actors. In settings where there are strong municipal or private sector


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WASH actors the best model is to work with these existing WASH service providers to extend existing WASH services to the refugees. However, in contexts where local service providers or local authorities are weak or non-existent, UNHCR and WASH actors may consider direct implementation of WASH services with a medium-term plan of transitioning WASH service provision to national water, sanitation and public health authorities, or a community based organisation (CBO) made up of members of the refugee community.

The importance of phasing into the construction of household WASH facilities as soon as possible

19. The burden of maintenance and upkeep of WASH facilities in refugee settings can take considerable amounts of time, effort and resources. Therefore, all WASH programmes should start or transition as quickly as possible into the construction of shared and household WASH facilities (in particular toilets and bathing facilities) if it is clear that the time-frame of the humanitarian situation will be longer than six months. While this is a good approach in theory it is not possible for all WASH infrastructure and in every refugee setting it is likely that a significant amount of public infrastructure (for example water collection points, public toilets in institutions and public waste collection services) will need consistent WASH service provision – ideally through the refugees themselves.

Beneficiary participation in cleaning and maintenance activities

20. It may be possible for small communities to be more involved in cleaning and maintaining WASH infrastructure in settings where facilities have been established for their exclusive use (rather than public infrastructure that is open to all – see **section 1.31**). In these settings UNHCR and WASH actors may work with each group of users to prepare a WASH operation and maintenance plan defining the responsibilities of the different stakeholders e.g. cleaning, filling up the hand-washing water containers, keeping the surroundings clean, and providing preventative maintenance. An example agreement can be found in **Annex**.

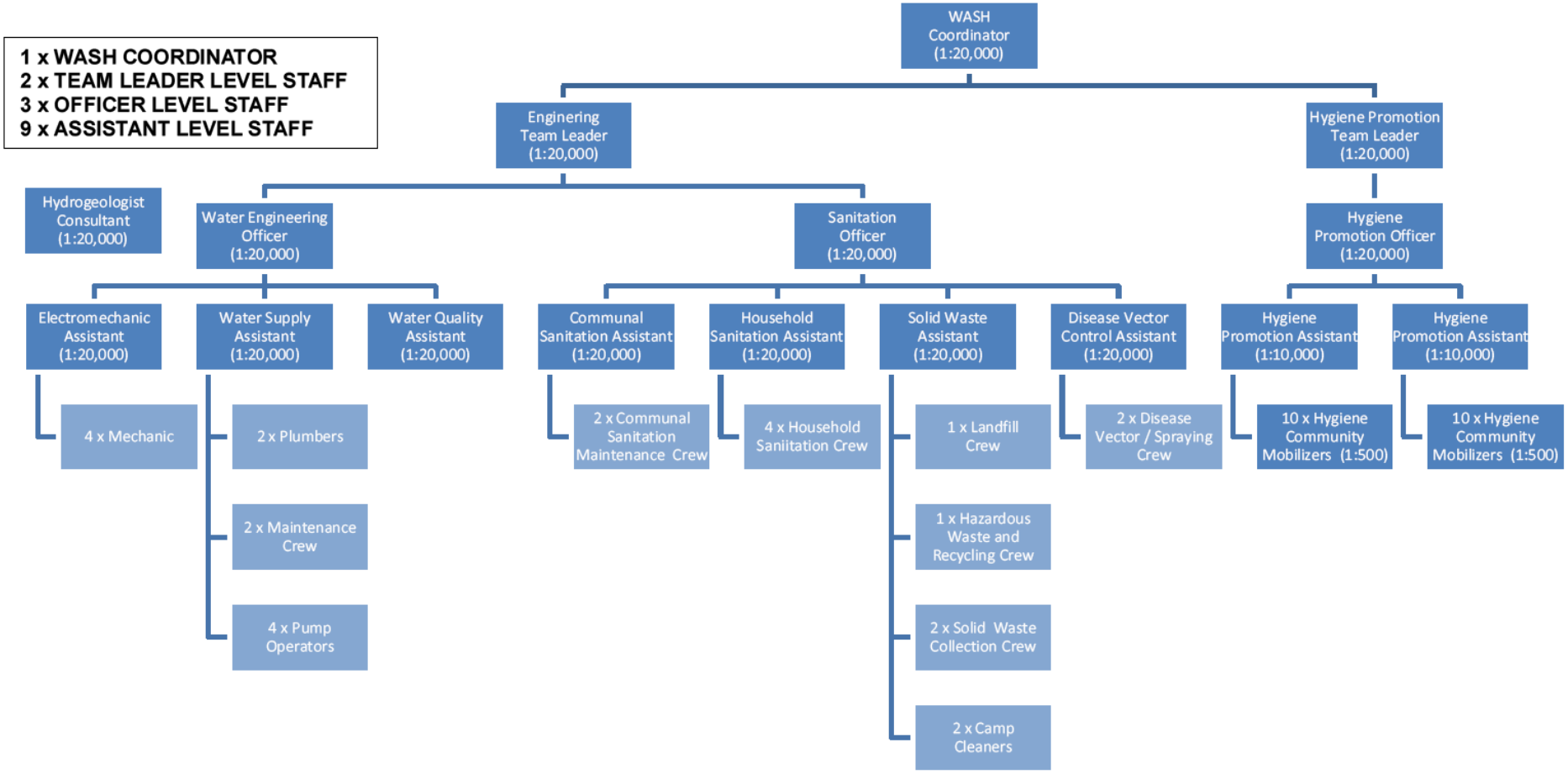
Organisation of WASH teams

21. An example organigram for running a typical refugee WASH programme for 20,000 people in a care and maintenance setting can be found on the following page. The organigram gives an indication of how the WASH Team should be structured in addition to the tentative number of Coordinators, Team Leaders, Officer, and Assistant level staff that should be recruited. It should be noted that staffing levels are for planning purposes only and the actual staffing levels should be adapted to the context. In addition, staffing levels are likely to be significantly higher during the emergency phase due to the need to rapidly establish WASH services, Sample job descriptions for each of the staff positions in the organigram can be found on **wash.unhcr.org**.

UNHCR SAMPLE WASH STAFFING STRUCTURE
CAMP BASED SETTING OF 20,000 PEOPLE – CARE AND MAINTENANCE PHASE

UNHCR The UN Refugee Agency

1 x WASH COORDINATOR
2 x TEAM LEADER LEVEL STAFF
3 x OFFICER LEVEL STAFF
9 x ASSISTANT LEVEL STAFF



Notes

1. Recommended staffing levels (dark blue) have been provided for guidance purposes (e.g. 1:500 Community Hygiene Mobilizer), however the staffing structure should be adapted to the context (e.g. numbers of Pump Operators, Solid Waste Collection Crew, Camp Cleaners).
2. Staffing levels are likely to be significantly higher during the emergency phase (i.e. for the construction and installation of WASH infrastructure).
3. As many positions as possible should be filled with refugees that have sufficient and relevant qualifications and experience.

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(and thanks for your contributions – they are appreciated!)

22. In most cases refugees may be willing to work with the WASH programme since it gives people something to do, prestige, and possibly a small source of income. Salaries for WASH personnel should be in-line with other sectors and should follow the guidance given in the UNHCR Handbook for Emergencies (2007). It should be noted that in most settings, WASH activities such as clean-up campaigns, cleaning toilets, management of solid-waste, digging trenches, or disease vector activities will not be popular jobs and the refugee population cannot be expected to undertake these tasks on a voluntary basis.

Recruitment of WASH personnel

23. Efforts should be made primarily to identify refugee or national staff with pre-existing WASH experience or expertise. In many refugee settings it is surprising to find refugees who have worked in the WASH sector in their place of origin (typically as municipal pump operators, drillers, water officers, handpump repair technicians, municipal sanitary workers, or water quality technicians). Once efforts have been made to identify candidates with prior WASH experience, it is highly likely that additional candidates will be needed who do not necessarily have any prior WASH experiences but are sufficiently educated, motivated, and flexible to learn new skills. Time invested during the recruitment phase identifying the best qualified and most motivated candidates can yield huge savings benefits over the course of the WASH programme.

Making use of locally available human resources

24. UNHCR and WASH actors should try to make full use of locally available human resources. This includes using both skilled and unskilled labour from the refugee population, and national water supply, public health, sanitation, solid waste management, hygiene promotion and disease vector control institutions and regulatory bodies. Programmes should try to avoid relying too much on external expertise. Instead, programmes should aim to train up and build capacity of the refugee population, the surrounding communities, and representatives of national public regulatory bodies from the start.

Capacity building of WASH personnel

25. In many refugee settings, it will be necessary to not only implement a programme of WASH activities but also undertake an extensive programme of on-the–job and off-the-job WASH capacity building training for WASH personnel. All WASH staff should have received sufficient training for the tasks they are performing and should ideally have a good understanding of the importance of their work and their contribution towards ensuring the public health of the refugee population. Staff training initiatives can not only provide an opportunity to increase the skills of the WASH personnel but can provide other additional benefits including team building, a providing an opportunity for motivating staff, recognizing or rewarding their efforts, or providing a change of scene if staff have been working long hours or particularly hard.



Motivating WASH personnel

26. WASH programmes in refugee settings can be particularly hard work, particularly during the emergency phase, and WASH staff are much more likely to be motivated if UNHCR and WASH actors are able to meet the following:

- WASH staff are working in a professional and organised way and have the correct equipment, training, and materials to carry out their jobs.
- WASH staff have clear job descriptions and are working towards clear objectives.
- WASH staff have regular daily or weekly interaction with other WASH staff. There is a sense that everyone is working for the same WASH Team.
- WASH staff feel they are listened to and supported by senior management. There are mechanisms and opportunities to influence and improve the way that they work.
- There is a fair, clear, and transparent system of performance monitoring and rewarding of those staff that work hard.
- There are sufficient WASH staff to carry out the required activities without overworking.
- WASH staff have the opportunities for professional development or career advancement
- WASH staff are able to work in safety and security with the correct personal protective equipment for the tasks they are performing.

Operation and maintenance considerations

The importance of establishing a programme of preventative maintenance

27. It is well documented that money spent on preventative maintenance saves money in the long term on repairs and replacement. Preventative maintenance involves maintaining WASH infrastructure, vehicles, or machinery at planned intervals so that breakdown becomes rare. Preventative maintenance also aims to reduce wear and tear, to cut down oil and fuel consumption, to minimise pollution, and extend the service life of the infrastructure or equipment and promote reliability and safety of operation.

28. Two essential parts of any preventative maintenance programme for WASH machinery are cleaning and lubrication. Cleaning of water intakes, water filters, and sediment from water reservoirs and basins can reduce clogging and the risk of overloading, over-heating or erosion of water pumping equipment. If moving parts on waste collection vehicles, water tankers, water pumps, and electrical generators are not adequately oiled or greased then they wear more rapidly, overheat and may fail.

29. Preventative maintenance is often best organised around a system of daily, weekly and monthly maintenance checks, scheduled typically based around the number of kilometres or hours a piece of WASH equipment or infrastructure has been in operation. Poor planning for operation and



maintenance is one of the most common deteriorating factors for WASH infrastructure. UNHCR and WASH actors should ensure sufficient budgeting for preventative operation and maintenance in addition to back-up capacity for surges in new arrivals, and decommissioning and replacement of ageing infrastructure.

The importance of responsive maintenance

30. In addition to preventative maintenance, refugee settings should also have the capacity to quickly and efficiently respond to WASH related problems as they occur. In a refugee setting, this is likely to consider of a mobile WASH team with the means and resources (spare parts, tools, knowledge) to make immediate repairs before the impacts become critical.

The importance of redundancy and back-up equipment and systems

31. In all refugee settings, WASH programmes should be prepared for potential problems with WASH service provision. All WASH systems should be designed with sufficient redundancy systems to that service coverage is not affected by either preventative or responsive maintenance activities. Every piece of critical water supply, water treatment, excreta disposal, or solid waste management equipment, machinery, or vehicle should have at least one backup system.

The importance of workshop facilities and a pipeline for spare parts

32. A well organised workshop managed by trained staff is vital for the proper maintenance of WASH equipment and vehicles. Separate areas should be established for cleaning, servicing, repairs, tools, storage for essential spare parts, storage for discarded parts, and storage for waste. Staffing of maintenance facilities depends on the size of the programme but typically there are three major functions including administrative (records keeping), storekeeping, and equipment maintenance (mechanics). To avoid delays waiting for spare parts, it is recommended that there is at a two month buffer stock of common spare parts that are re-ordered on use. Standardization is another important aspect of maintenance management. Using only a few types and models of handpump, centrifugal pump, or waste collection vehicle significantly reduces the number and type of spare parts that must be held in the stores and enables the mechanics to be very familiar with the maintenance procedures.

Monitoring of WASH personnel and WASH resources

33. Operation and maintenance activities can present one of the largest costs in WASH programmes and it is essential that budgets are developed with sufficient resources for spare parts, fuel, consumable materials and staff to undertake preventative and responsive maintenance.

34. Labour, vehicle costs and WASH consumables make up a significant part of the expenditure associated with WASH service provision and small optimizations in efficiency of either the workforce, or the resources are used can make big cost saving. For example, the



way that hygiene promoters, waste collectors, public toilet cleaners, or maintenance crews or organised to productively manage their time can significantly improve the productivity of the WASH programme. During the care and maintenance phase it may be helpful to analyse the efficiency of WASH activities to understand how time is allocated during the day and if there are ways of reducing non-productive time (for example time spent moving to or from activities).

35. In addition to looking at efficiencies in time, UNHCR and WASH actors should also consider interventions that bring efficiencies in costs of WASH interventions. The starting point for improving the financial efficiency of WASH interventions is to ensure that the actual costs of each of the WASH interventions (water, excreta management, solid waste, hygiene promotion, disease vector control) is fully documented in the site WASH plan/strategy, including an analysis of any trends over time. This should include at a minimum..

- The cost of water supply (cost per m3 for water abstraction, treatment and distribution up to the end user)
- The cost of excreta management (cost per person per year for excreta management services)
- The cost of solid waste management services (cost per tonne of managing each waste steam)
- The cost of hygiene promotion activities (cost per person per year for hygiene promotion interventions)
- The cost of disease vector control (cost per person per year for each disease vector control intervention)

These metrics WASH actors to track trends in the cost of water supply in addition to comparing the cost of water provision in one setting against another setting. In addition, they allow WASH actors to understand ways in which costs can be economised (i.e. by looking at options to reduce initial capital costs or the annual costs of fuel, electricity, consumables, staffing, logistics, or administration).

Documenting the operation and maintenance plan / strategy

36. A clear description of the operation and maintenance plan should be included in the site WASH plan/strategy. This section should include:

- A description of the short, medium and long-term operation and maintenance arrangements.
- A description of the short, medium and long term WASH staff capacity building arrangements.
- A description of critical WASH backup and spare parts capacity planning.
- A presentation of the actual costs of operation and maintenance for each of the WASH interventions including an analysis of any trends over time and efforts to reduce operation and maintenance expenditure.

9. WASH Assessments

WASH assessments are an essential activity in every refugee setting to identify the locations of the most affected sections of the population, their coping mechanisms, and the most urgent WASH interventions that are required. Timely WASH assessments provide the basis for planning, implementation, and prioritisation of all refugee WASH activities and in many settings are an important factor in saving lives.

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Introduction

The importance of WASH assessments in refugee settings

1. Coordinated WASH assessments are an essential activity in every refugee setting to identify the locations of the most affected sections of the population, their coping mechanisms, and the most urgent WASH interventions that are required. Coordinated WASH assessments can help:

   - Establish a shared vision of WASH needs and priorities;
   - Use limited WASH resources more efficiently;
   - Advocate for increased donor funding;
   - Serve as a foundation for WASH planning and strategy development
   - Reduce duplication of effort;
   - Minimize beneficiary ”assessment fatigue”;
   - Identify gaps with greater precision;
   - Encourage coordination during the response.
   - Understand current levels of WASH coverage in particular what (if any) WASH access, infrastructure, and services exist, what condition they are in, and what needs to be done to meet the UNHCR guidelines.

   UNHCR has the responsibility for ensuring that there are effective and coherent sectoral WASH needs assessments in all refugee emergencies. In all cases, UNHCR and WASH actors must ensure that all WASH assessments are undertaken in a coordinated manner, adhering to the principles and methodologies generally defined in the publications ‘*The UNHCR tool for participatory assessment in operations (UNHCR, 2006)’*, and *‘Operational Guidance for Coordinated Assessments in Humanitarian Crises (IASC, 2012)’*.

> ***Assessments are “the set of activities necessary to understand a given situation”. They include “the collection, up-dating and analysis of data pertaining to the population of concern (needs, capacities, resources, etc.) as well as the state of infrastructure and general socioeconomic conditions in a given location/area.”***
>
> **Master Glossary of Terms (UNHCR, 2006)**

Types of assessment

2. Assessments generally provide the initial basis for planning, implementation, and prioritisation of all refugee WASH activities. They are generally required at the start of any refugee emergency, however the same principles, approaches, and indicators can be used at any time during the course of the refugee emergency to monitor progress and get a sense of the current impact of the WASH programme, and any remaining gaps in WASH service provision (**see Chapter 10**). Assessments types depend upon the context but can generally be classified as:

   i). **Harmonized assessments** that are planned and carried out in partnership with humanitarian actors and where WASH agencies collect, process and analyse data separately, but the


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collected data is sufficiently comparable (because of the use of common operational data sets, common WASH indicators, and geographical and temporal synchronisation) to be compiled into a single database and used in a shared analysis.

ii). **Joint assessments** where data collection, processing and analysis form one single process among humanitarian actors leading to the production of a single common report.

Uncoordinated assessments occur where WASH actors use different indicators and methodologies, and the resulting data sets are not interoperable, and results cannot be used to inform the overall analysis.

General principles for WASH assessments

3. Where possible, all WASH agencies should use common operational datasets for assessments. These are typically available within 48 hours of any refugee emergency and include agreed population statistics, administrative boundaries, and names for settlements (ideally with unique numerical codes). They are essential in both harmonized and joint assessments to ensure that the data collected can be compared, contrasted, and compiled into a single database for shared analysis.
4. Where possible, all WASH agencies should also use common WASH data collection tools and methodologies. In ideal settings, these tools and methodologies would have been developed and finalised as part of ongoing WASH preparedness activities.

Box: IASC Principles for coordinated assessments

1. Ensure assessments identify immediate humanitarian priorities.
2. Whenever possible ensure assessments are led by national governments.
3. Ensure that planning for coordinated assessments is an integral part of inter-agency emergency preparedness.
4. Ensure each assessment builds on existing data.
5. Ensure links between assessment and monitoring are ensured.
6. Ensure assessments collect exactly the data that are required for decision-making.
7. Ensure that assessments are designed/conducted using participatory approaches in a transparent manner.
8. Ensure assessments adequately address priority cross-cutting issues such as gender, age, HIV/AIDS and the environment.
9. Ensure information management considerations are integrated throughout the process.
10. Ensure contextual analysis is undertaken when interpreting assessment findings.

Source: Operational guidance for coordinated assessments in humanitarian crises (IASC, 2012)

5. All WASH assessments should be undertaken in a participatory and transparent manner taking into account local preferences and cultural norms. More guidance on participatory assessment approaches can be found in the UNHCR publication ‘The UNHCR tool for participatory assessment in operations’ (UNHCR, 2006).



6. Whenever possible WASH assessments should be carried out in full collaboration with national refugee and WASH authorities. The results of all WASH assessments should be fully available to national authorities and they should be fully engaged in the process of identifying and prioritising WASH solutions.
7. WASH assessments often end up collecting far more information than is required which can result in overburdening of the affected refugee population. A list of essential questions for WASH assessments can be found in the box on page 345 to help guide agencies. In addition, UNHCR and WASH actors should ensure that every effort has been made to ensure that assessments are well coordinated and affected refugee populations are not visited on multiple occasions by different WASH agencies asking for information.
8. WASH assessments can either be:
    i). Initial assessments or rapid WASH assessments which are typically carried out within the first 72 hours following a refugee emergency. Initial assessments may be carried out either as part of a multi-sectoral assessment with other life-saving sectors (typically shelter, protection, nutrition and health) or as a separate WASH rapid assessment.
    ii). Comprehensive sectoral assessments which are typically carried out within the first month with a similar methodology to the rapid WASH assessment but in greater depth and over a longer period of time (typically several days).

The importance of seeking expert professional advice

9. The planning and implementation of WASH assessments in refugee settings requires a skilled and experienced Coordinator. Every refugee context is different and an assessment approach that has worked well in one setting may not work well in another. The coordination of WASH assessments in emergency settings requires the ability to work with different WASH actors under extreme pressure and prepare and organize assessment activities, logistics, and staff with minimal time and resources – often adapting the approach and methodology in real time. WASH assessments can be complicated by additional constraints that include:
    i). A lack of qualified WASH staff with experience undertaking WASH assessments.
    ii). Difficult or insecure access.
    iii). A lack of logistical resources (vehicles) to undertake the WASH assessment.
    iv). Shortage of time to adequately prepare .
    v). Shortage of time to adequately train WASH assessment staff.
    vi). A lack of willingness from the refugee population to take responsibility for WASH infrastructure.
10. In all settings, it is essential to seek expert advice from professionals who are familiar with preparing and undertaking WASH assessments in difficult conditions. Assistance can be sought locally

from sources such as the UN system, NGOs, or specialized governmental authorities that are used to responding to disasters and emergencies. If these cannot meet the need, UNHCR Headquarters assistance should be requested.



Figure 9-1 Group Discussion

Priority actions

Immediate assessment of WASH needs

11. UNHCR and WASH actors must ensure that a rapid WASH assessment is carried out at the start of any refugee emergency. Regardless of the scale of the emergency or the resources available, UNHCR and WASH actors should aim to complete this exercise in a maximum of one day. In order to obtain the most complete picture possible of the WASH needs, the rapid assessment should aim to collect an equal amount of both qualitative (descriptive) and quantitative (numerical) data (see the **box of essential WASH assessment questions for refugee settings** on the following page). In most settings, it is recommended UNHCR and WASH actors undertake rapid WASH assessments by carrying out all of the following activities:

- Rapid key informant interviews (see **section 9.25**)
- Rapid focus group discussions (see **section 9.26**)
- Rapid observation walk (see **section 9.27**)
- Rapid assessment of existing WASH infrastructure and services (see **section 9.0**)
- Rapid household surveys (see **section 9.32**)
- Rapid assessment of existing WASH management arrangements (see **section 9.35**)

More information concerning how to carry out these assessment activities can be found in the following pages.

Immediate establishment of a WASH action plan

12. The data collected during the rapid WASH assessment should be processed the same day (typically during the afternoon or evening) and the assessment team should meet and prioritise the findings into those needs that that are lifesaving and must be met immediately and those that need a medium term approach. The rapid WASH assessment team does not have to visit the affected communities empty handed and if there is space available in the assessment vehicles it may be possible to bring additional life-saving materials (such as plastic sheeting, soap, jerry cans etc.).

WASH assessment preparation and implementation

13. In most refugee settings it is essential to quickly obtain the most complete picture possible of the needs. This is typically achieved through a needs assessment – which is an information gathering exercise that provides a basis for planning and implementing the refugee programming. It helps in particular to...

- Identify the locations of the most affected sections of the refugee population
- Identify any coping mechanisms
- Identify the most vulnerable groups within the population
- Identify the most urgent WASH interventions that are required.

14. An assessment also gives an opportunity to the refugee population to present what they feel are their greatest WASH needs and what they think are solutions. Assessments are generally based around five key steps..

- Identify resources and compile assessment plan
- Collect data
- Analyse and interpret
- Report conclusions
- Design / modify interventions

15. The first step of preparing the assessment plan generally involves defining the assessment objectives in particular..

- What is to be assessed?
- What geographical area will be visited?
- What secondary WASH data exists?
- What WASH questions need answers?
- How will the WASH data be used?
- What resources exist?
- What resources will be required (vehicles, staff, data collection forms)
- How will secondary data be collected and analysed (e.g. maps, village population data, previous surveys)
- What will be the primary data collection methodologies
- Preparation of an assessment budget



Figure 9-2 Key Informant Interview

Assessment team composition

16. The assessment team size and composition depends upon the assessment objectives and the following..

- Level of WASH expertise required?
- Level of local experience required?
- Level of language proficiency?
- Adequate mix of gender?
- Adequate mix of WASH actors and stakeholders?
- Representation from minority groups (where there are language issues or marginalisation).
- Need for temporary staff for household data collection?

Box: Essential WASH assessment questions for refugee settings

General questions
- ☐ How many displaced women, men, children and families are present?
- ☐ Is the number of refugees increasing, staying the same, or decreasing?

Water availability
- ☐ From where are water supplies currently being collected (Note also the origin i.e. groundwater, surface water, rainwater)?
- ☐ How far are these water sources? Who owns these water sources?
- ☐ What is the average number of refugees per water collection point?
- ☐ How much water is being collected per household per day?
- ☐ How much water storage capacity does each household have?
- ☐ Are the water supplies protected from contamination?
- ☐ Is there sufficient yield / quantity? Are supplies reliable / available all day / year?
- ☐ What is the quality of these water sources? Are they chlorinated?
- ☐ What resources do families have for treating water?
- ☐ What alternative water sources exist nearby?

Excreta management
- ☐ What is the current defecation practice? Is there a designated area?
- ☐ Is the current defecation practice a threat to water supplies or living areas?
- ☐ Are there existing toilet facilities? If so, are they used, are they sufficient and are they operating successfully? Are they segregated by sex? Can they be improved?
- ☐ Would the population be willing to share or are communal toilets preferred?
- ☐ What local materials are available for constructing toilets?
- ☐ Is there sufficient space toilets? What is the slope of the terrain?
- ☐ What is the level of the groundwater table?
- ☐ Are soil conditions suitable for on-site excreta disposal?
- ☐ What do people use for anal cleaning? Are there sufficient materials available?
- ☐ Is there water available for anal cleansing, flushing or hand-washing?
- ☐ How did people manage excreta before the emergency?
- ☐ Do men / women / children feel safe using facilities? Do the toilet doors lock adequately?

Solid waste management
- ☐ How is solid waste currently managed? What sorts of wastes are being created?
- ☐ Are there designated collection points? How frequently is waste collected?
- ☐ Where is waste taken and how is it disposed?
- ☐ Are there any festering wastes or uncontrolled dumping of wastes?
- ☐ Are waste practices a threat to water supplies or living areas?
- ☐ How are hazardous wastes managed? Where are these wastes situated?
- ☐ Are any organisations responsible for waste collection and disposal?
- ☐ What resources (excavators / trucks / staff) do they have?
- ☐ Are there existing landfill sites? Who owns the site? Is the site operating successfully?
- ☐ Is there sufficient space for a landfill? What is the slope of the terrain? What is the level of the groundwater table? Are geological conditions suitable for landfill?

Hygiene
- ☐ Is soap available for hand washing and laundering?
- ☐ How and where are children's faeces disposed?
- ☐ What is the condition of water storage containers? Is water stored safely?
- ☐ Is food stored and prepared safely?
- ☐ Are there facilities for bathing, clothes laundering and airing? Are they segregated?
- ☐ Do current facilities offer sufficient levels of privacy and security?
- ☐ Do women have a place to soak/wash/dry/dispose of MHM materials with dignity?
- ☐ Would people be willing to share bathing facilities?

Vector control
- ☐ Are there problems with flies, lice, fleas, ticks, rodents, bats, birds, or mosquitoes?
- ☐ Is household waste covered daily with at least 20cm soil cover?
- ☐ Are there problems of stagnant water or blocked ditches?

Note: The list of questions is not exhaustive and is merely intended as an *aide memoire*. Additional questions should be formulated based on the replies received and the context.

17. During rapid assessments it is generally easier to organize assessment activities using several small independent multi-sectoral teams each with their own allocated vehicle. A typical team composition is as follows:

Team Leader	- **Key Informant Interviews**
Local Community Representative	- **Guide** - **Key Informant Interviews**
WASH Engineer	- **Engineering Assessment / Sanitary Surveys**
Hygiene Specialist	- **Focus Group Discussions**
Data Collector	- **Rapid Household Survey**

18. If possible, the WASH assessment team should include at least one representative of the relevant local authority (regional/provincial/district, as appropriate) for WASH issues and the national entity responsible for refugees should be fully informed of the planned assessment and its purpose.

19. At all stages the reliability of the information being collected should be assessed according to the following categories:

- **Somewhat Reliable:** Reasonable but questionable source, method or time relevance of data
- **Reliable:** From a reliable source, using scientific method and data reflecting current or projected conditions.
- **Very Reliable:** Effectively unquestioned source, method and time relevance of data.

Box: Principles for rapid assessments

i). Involve all groups, particularly persons with specific needs, in the assessment to identify potential areas or issues needing immediate attention.
ii). Explain the objectives and purpose of the assessment to the respondents to ensure their participation. Explain and ensure that all information will remain confidential.
iii). Try to obtain responses from different sources whenever possible. Do not ask questions if you already know the answer from another source.
iv). Obtain consent from all adult participants in any activity, and inform them that they can refuse to take part in the assessment without negative consequences. Obtain consent from parent or guardian for the children participants.
v). Respect the dignity and self-worth of individuals at all times.
vi). Report incidents immediately to the protection focal point (see Protection incident reporting).

Source: Joint Assessment Missions: A Practical Guide (UNHCR, 2013)

20. To ensure a smooth and productive assessment it may be helpful to create a work plan that includes:

- WASH assessment aims
- Site selection methodology
- Assessment team structure
- Description of the data collection methods
- Copies of data collection templates and tools
- Data analysis plan


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- Reporting formats
- Itinerary/schedule
- Tentative assessment budget
- Debriefing report structure

Identification of assessment locations

21. Typically rapid assessments will be required at locations where refugees are crossing a border and locations where refugees are congregating. This is generally easier if there are fixed border crossing locations. In the case of a porous border with many crossing points, a sample of the congregation points may need to be assessed to gain an appreciation of the general conditions. If the affected area is large and not all areas can be visited, it should be broken down further into sub-units and a selection of sub-units/sites identified for the field visit. In order to obtain a valid picture of the situation, sites should be selected either randomly or purposively. The number of sites that can be visits will depend upon the context and the resources that are available for the assessment (in particularly staff and vehicles).

22. If there is a long distance from the refugee's place of origin to the border crossing it may be possible to also carry out assessments of any way stations provided there is coordination with governmental authorities and WASH actors in the country of origin. The aim of any assessments at refugee points of entry should be to understand the minimum life-saving WASH interventions that are required to stabilise the situation before the population are moved to a more secure and permanent location. It is also helpful at this stage to make an initial estimate of any big ticket items that may be required in the long term as it is often significantly easier to allocate funds for these items during the emergency phase.

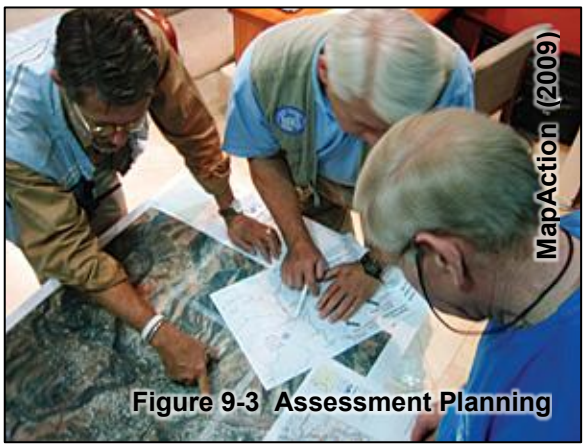


Figure 9-3 Assessment Planning

Field visit security

23. WASH assessments are often conducted in insecure areas and assessment coordinators are generally responsible for ensuring the safety of the field teams. UNHCR and WASH agencies must ensure the availability of telecommunications facilities for the assessment team/s to be able to report back regularly to the field offices. Any required security clearances need to be obtained from relevant authorities before the field visit. In general, all itineraries must be approved by the designated security officer, and all vehicles should comply with minimum operational security standards. In addition, assessment team members should have sufficient level of security training for the context and should have received an adequate security briefing.

Team training and preparation

24. In order to prepare for the WASH assessment, it may be necessary to organise a rapid training and preparation session(s) to ensure

that all field team members understand the WASH assessment objectives, their roles and responsibilities, data collection tools, analysis plan, and debriefing requirements. Before the team training, all questionnaires and interview guidelines should be tested, time recorded, translated and back-translated. Any modifications necessary on the tools as a result of testing and backtranslating should be made prior to the field visit. Other preparatory tasks before undertaking the WASH assessment include:

- Notification of refugees and/or communities about the upcoming assessment.
- Finalising security clearance (if necessary)
- Assembling equipment and materials
- Ensuring logistical arrangements are made e.g. transport, accommodation, food and drinks.

Key informant interviews

25. During the assessment, it is essential to understand what key informants from the refugee population feel are the critical problems and solutions regarding water supplies, excreta management, solid waste, hygiene and disease vector control. Key informants can include community leaders, religious leaders, teachers, or any other knowledgeable individuals. During the needs assessment, the assessor should try to collect information from as many different gender-balanced sources as possible, and should try to triangulate the information to ensure it is correct. The **UNHCR WASH key informant interview primer in annex** can be helpful to guide the conversation.



Figure 9-4 Data Collection

Focus group discussions

26. Discussion of potentially sensitive or embarrassing problems and solutions related to privacy, security, comfort, cultural norms and management of women's menstrual hygiene materials, is usually better achieved on a one-to-one basis or within gender and age specific focus groups. The **UNHCR WASH focus group primer in annex** can be helpful to guide the conversation. When undertaking focus group discussions, UNHCR staff and WASH actors should try to observe the following considerations:

- Try to foster a natural discussion concerning excreta related issues. Use the focus

group primer questions only as a memory aid.

- Try to choose participants of the same age and social standing to reduce the possibility of the discussion being dominated by one or two individuals.
- Try to limit the numbers to a maximum of eight participants.
- Use a note taker so the facilitator can remain engaged.
- Ensure the facilitator, note taker and group are of the same sex.
- Choose a location with privacy.
- Encourage all voices.
- Respect all answers.
- Listen as much as possible and speak as little as possible.
- If time permits, conduct focus groups with as many different sections of the refugee population as possible including:
  i). Older women
  ii). Younger women
  iii). Teenage girls
  iv). Older men
  v). Younger men
  vi). Children
- Try to avoid using technical terms or complicated technical drawings. Consider using scale models of toilet options to explain concepts.
- If appropriate, consider conducting a random walk or participatory mapping exercise to help choose locations for toilets.
- Respect the time of participants and limit the session duration to a maximum of 45 minutes.

Observation walks

27. An observation walk of the refugee site does not have to take long, and can easily be incorporated into the general needs assessment schedule. For safety and security reasons it should generally be undertaken using a member of the refugee population as a guide. This also allows the possibility to pose questions and collect first-hand information about problems and solutions related to excreta management. During the observation walk, try to visit as much as possible of the existing toilet infrastructure in addition to places where open defecation is taking place. Try also to obtain an even balance of places the guide wants to show you and places they may not want you to see. Make sure you have a digital camera and field notebook to record any public health risks related to water supply, water storage, excreta, hygiene, disease vector, solid waste, hazardous waste, or drainage.



Figure 9-5 Observation Walk

Assessment of existing WASH infrastructure conditions

Assessment of the condition and serviceability of existing WASH infrastructure is an essential part of any needs assessment especially in contexts where there is insufficient

or aging infrastructure (for example in urban contexts).

28. When assessing existing WASH infrastructure, it is essential to assess each step of the water supply, excreta disposal, or solid waste, chain from point of origin to point of use/reuse/disposal. At each step, the key characteristics and condition of the infrastructure and resources should be noted, along with risks to public health, and corrective actions to bring the system back into serviceability. Some large scale WASH infrastructure can be complex to assess and may require specialized expertise.

29. During the infrastructure assessment, it is essential to logically record details of what is observed. The following equipment can be useful as part of the infrastructure assessment:

- Field notebook and pens / pencils
- Digital camera
- GPS unit
- Tape measure 5m / 16 feet
- Long measuring tape 30m / 100ft
- Stopwatch
- Calculator
- Chlorine residual and pH tester with consumables
- Conductivity meter
- Sterilized sample bottles for faecal coliform testing.
- Powerful flashlight
- Overalls
- Hard hat
- Waterproof boots
- Rubber gloves
- Well dip meter 50m / 160ft
- Crow bar 1m / 3ft
- Spade
- Bucket 20 litres / 5 gallons
- Turbidity tube
- Photocopies of sanitary survey forms

30. Sanitary surveying templates can be useful in guiding assessment of the condition of WASH infrastructure. More guidance on the use of sanitary surveys in assessing the condition of WASH infrastructure can be found in **sections 3.86 – 3.90**.

Assessment of the availability of water supplies

31. Specialist water prospection expertise is generally essential to identify and evaluate potential water sources for refugee settings. If existing groundwater sources are available the possibility of extending or upgrading these existing sources to supply the refugee population should be given priority. A detailed explanation of the steps in water prospection and evaluation for semi-permanent refugee settings can be found in **sections 3.46 – 3.61**. These assessments are typically carried out in collaboration with UNHCR's site planning section.

Rapid household surveys

32. During the rapid needs assessment it is essential to get a clear picture of the WASH needs not only on a macro-level but also on a household level. Data collected from individual households is invaluable as it allows a snapshot of the current WASH conditions experienced by a representative sample of refugee households to be presented.

33. In order to be able to cover as many households as possible during the emergency site visit the number of questions in the UNHCR rapid household survey tool has been kept to the absolute minimum essential WASH indicators. The aim is that the rapid household survey tool should take no more than 5 minutes to complete at every household. Questions in the rapid household survey tool include...

- How much drinking water was collected during the previous day?
- Where (which sources) was this water collected from?
- How many people shared the water that was collected? (i.e. allows the calculation of per capita water consumption)
- How much water storage capacity does the household have?
- What is the condition of water storage containers? (direct observation - clean? covered?).
- Does the household have access to soap? (directly observe the presence of soap within 1 minute)
- Self-reported occurrence of watery diarrhoea within the household in the last week?

34. Household surveys are invaluable for monitoring the effectiveness of WASH interventions and understanding the needs. However, poorly planned surveys can expend huge amounts of time and resources and often collect information with little practical value. UNHCR and WASH actors must ensure that all WASH related household surveys are carried out with a properly designed survey instrument, a sampling plan, and a sample size calculation for the desired level of confidence and precision. No more data should be collected than necessary. The rapid household survey tool and guidance for sampling and sampling size calculations can be found on the **wash.unhcr.org** website.

Assessment of existing WASH management arrangements

35. Assessment of the existing management arrangements (e.g. who owns, takes care of, and pays for existing WASH infrastructure) is an essential part of any needs assessment especially in contexts where there is aging or inadequate infrastructure. When assessing WASH infrastructure management arrangements, it is essential to describe WHO does WHAT, WHERE, WHEN and HOW for each separate part of the water, excreta management, waste, hygiene, or disease vector control activities. At each step, the key characteristics and condition of the management activities being undertaken (including any transportation, labour, fuel, spare parts and consumable needs) should be noted. Some large scale WASH infrastructure can be complex to assess and may require specialized expertise. Assessment of existing WASH management arrangements has been incorporated into the **UNHCR key informant interview primer question** which can be found in the chapter Annex.

Comprehensive assessments

36. The initial rapid WASH assessment is a preliminary


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estimate and must be succeeded by a more comprehensive WASH baseline assessment as soon as the situation allows, and no later than 1 months after an emergency starts. In order to obtain a more complete picture of the WASH needs, the comprehensive must include the following activities.

- Rapid key informant interviews (see **section 9.25**)
- Rapid focus group discussions (see **section 9.26**)
- Rapid observation walk (see **section 9.27**)
- Assessment of existing WASH infrastructure and services (see **section 9.0**)
- Rapid household surveys (see **section 9.32**)
- Assessment of existing WASH management arrangements (see **section 9.35**)
- Assessment of existing WASH legislation (see **section 9.37**)
- Institutional capacity assessments (see **section 9.38**)

Assessment of existing WASH legislation

37. After the emergency phase, UNHCR and WASH actors should take a moment to ensure that national legislation concerning water supply, excreta management, hygiene, solid waste, disease vector control, and drainage are being fully respected. The best way to rapidly assess and understand existing legislation and practice is to involve local experts and authorities in the assessment process as early as possible. During the emergency and stabilisation phases it may be possible to get exemptions to existing legislation for short term interventions. Assessment of existing WASH legislation has been incorporated into the **UNHCR key informant interview primer questions** which can be found in the chapter Annex.

Institutional capacity assessments

38. During the stabilisation phase, or earlier if possible, it is important to take a moment to assess the capacity and needs of waste service providers and local waste authorities along with what additional priority support they may need to carry out their roles. An institutional capacity assessment is a useful exercise to achieve this. In order to get the best results from the capacity assessment process, it is important that this activity is undertaken with a spirit of collaboration and open reflection with the institution. It is essential to ask the service providers are supported to identify and justify what they feel are their most urgent support needs themselves. In order to achieve this, a review of thefollowing with the service providers is helpful..

- WASH equipment ages, types, capacities and conditions.
- WASH infrastructure ages, types, capacities and conditions.
- Human resources structure (organigram) including technical and managerial capacity and experience
- Fleet maintenance and logistics capacity
- Operational budgets

39. Examples of institutional support that may be considered include..


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- Technical advisory support (e.g. for management of sanitary landfills, hazardous wastes, recycling and reuse operations, maintenance and logistics operations).
- Secondment or direct support for additional staffing.
- Technical training of staff
- Managerial training of staff
- Logistics or fleet management support.
- Provision of additional operational resources (e.g. waste collection vehicles, tools, or infrastructure such as sanitary landfills, or recycling facilities)
- Provision of managerial resources (e.g. computers, expanded office facilities, or office equipment)
- Provision of funds to support budget shortfalls or expansion of waste services.

40. A WASH **organisational assessment tool** has been developed to help UNHCR and WASH actors understand what they can do to help support and build the capacity of WASH organisations that are potential candidates for running WASH operations.

Assessment debriefings

41. Debriefings are a critical step during the WASH assessment process and they should not be skipped. The debriefing should ideally be carried out by the team leader to consolidate thoughts, impressions, and initial findings directly following the assessment. The debriefing should last no more than one hour and should include:

- A discussion on information collected that day by site and thematic area (e.g. water supply, excreta, hygiene, solid waste etc.);
- Triangulation of information sources where possible;
- Discussion of problems encountered or useful practices identified;
- Key findings, issues and recommendations from the day;
- Identification of outstanding information gaps to be filled;
- A review of the methodology and team organisation and adaptation required where necessary;
- Preparation of any outstanding tasks for the following day.

WASH Assessment Analysis

Using an analysis framework

42. One approach to structuring the information collected is to as a group, work through the following questions, consolidating information and organising it around these questions in a framework.

- What is the problem?
- What are the causes?
- Who is affected?
- Are there differences in regards to age, gender or diversity?
- Where? Are there difference related to the location of refugees?
- What is the likely evolution in short, medium and long term?
- What are potential solutions in short and long term?


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Analysis of assessment findings and development of a WASH action plan

43. Analysis is the process whereby information from all the different assessment sources is synthesised. The WASH assessment coordinator should facilitate the overall analysis and are responsible for bringing the analysis together with the team leaders and technical experts. All team members that have taken part in field visits should participate in the analysis process.

44. The analysis process aims to organise, review, synthesise and interpret the information collected throughout the WASH assessment process. An analysis plan should be used to outline how information collected will be utilised. The final output of the analysis process will be key findings and recommendations and a WASH action plan that clearly describes the short and medium term WASH response strategies in terms of WHO, WHAT, WHERE, WHEN and HOW.

45. An analysis of the secondary data should be conducted immediately after the secondary data collection and before the field visit, as the findings inform the primary data collection needs. Preliminary analysis of primary data should starts the same day that it is collected. The overall analysis of both primary and secondary data should be conducted at the end of the field visits, when all data has been collected. The analysis process typically involves:

- Reviewing the key WASH questions to be answered by the assessment.
- Reviewing information collected from the secondary data analysis.
- Reviewing information collected from the field visit.
- Sorting the information so that only reliable and relevant information is used to help answer the key WASH assessment questions.
- Organise the information so that each piece of information relates to a key question to be answered by the assessment.
- Summarise the key findings and information emerging from the discussion into short sentences and bullet points around key themes.
- Turn findings into conclusions and a WASH action plan.

WASH Assessment Reporting

Format of a comprehensive WASH assessment report

46. A comprehensive WASH assessment report should be a maximum of 20 pages (excluding executive summary and annexes) and follow the outline below.

i). **Executive Summary**: 2-3 pages, including key background information, needs identified and recommendations.

ii). **Introduction**: Background to comprehensive WASH assessment, objectives, why the assessment was conducted, overview of current situation, what the assessment aimed to achieve.

iii). **Methodology**: How the assessment was conducted, when, which methods and tools were used.



iv). **Limitations and challenges**: Description of any problems faced in achieving the overall objectives of the WASH assessment.

v). **Findings**:
- Overall picture of the refugee situation: origin, number, sites, surrounding community relations.
- Context: brief overview of the humanitarian context.
- Key findings (organised geographically per site and by WASH thematic area). In particular the key findings should describe:
  - Will the site require a centralized or decentralized water supply solution?
  - Will the water supply solution be integrated into local infrastructure or will it be stand-alone?
  - Are the soil and groundwater conditions suitable for on-site sanitation?
  - What will be the big WASH ticket items?

vi). **Needs and gaps**: how current assistance is addressing the WASH needs in addition to any WASH gaps. This section should also include any likely future scenarios and evolution of needs.

vii). **Conclusions and recommendations**: This section should summarise the main conclusions of the WASH assessment and likely evolution of the situation in the short and medium term.

viii). **Recommended activities**: Description of the WASH short and medium term action plans in terms of WHO, WHAT, WHERE, WHEN and HOW.

ix). **Annexes**:
- ToR.
- Detailed statistics.
- Maps.
- Participants (including names of organisations and individuals).
- List of secondary data sources analysed.
- List of sites visited, people met, FGD held, key informants interviewed.
- Copies of data collection tools used (key informant primer sheets, rapid household survey questionnaires, sanitary survey tools, etc.)

10. WASH Monitoring and Reporting

Regular monitoring of WASH indicators is essential to understand if WASH programmes in refugee settings are on track to meet basic needs and agreed targets. Reporting of WASH progress is essential so that all actors can understand the progress that is being made by WASH activities, including the refugees themselves.

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Introduction

The importance of regular monitoring and reporting in refugee settings

1. The regular monitoring and reporting of core WASH indicators is an essential activity in every refugee setting to ensure that basic WASH needs are being met and that WASH programmes are on track to meet targets. In particular, WASH monitoring and reporting can help:
   - Establish a shared vision of WASH needs and priorities;
   - Prioritise limited WASH resources more efficiently;
   - Advocate for increased donor funding;
   - Serve as a foundation for WASH planning;
   - Reduce duplication of effort;
   - Identify gaps with greater precision;
   - Encourage coordination;
   - Understand current levels of WASH coverage and condition;
2. UNHCR has the responsibility for ensuring that there is effective and coherent coordination of WASH monitoring and reporting in all refugee settings. In all cases, UNHCR and WASH actors must ensure that monitoring and reporting is being undertaken in a harmonized manner using common monitoring tools, methodologies, indicators, collection frequencies, and operational datasets (common refugee population sizes, population names, and administrative boundaries). This is to ensure that the information being collected can be compared and contrasted and used accurately to define strategic sectoral priorities. In addition, monitoring and reporting is an essential transparency and accountability exercise – keeping donors, local authorities and the refugees themselves updated on the progress of WASH activities through the use of camp information boards, WASH monitoring updates and bulletins, and revisions to the site WASH plan/strategy

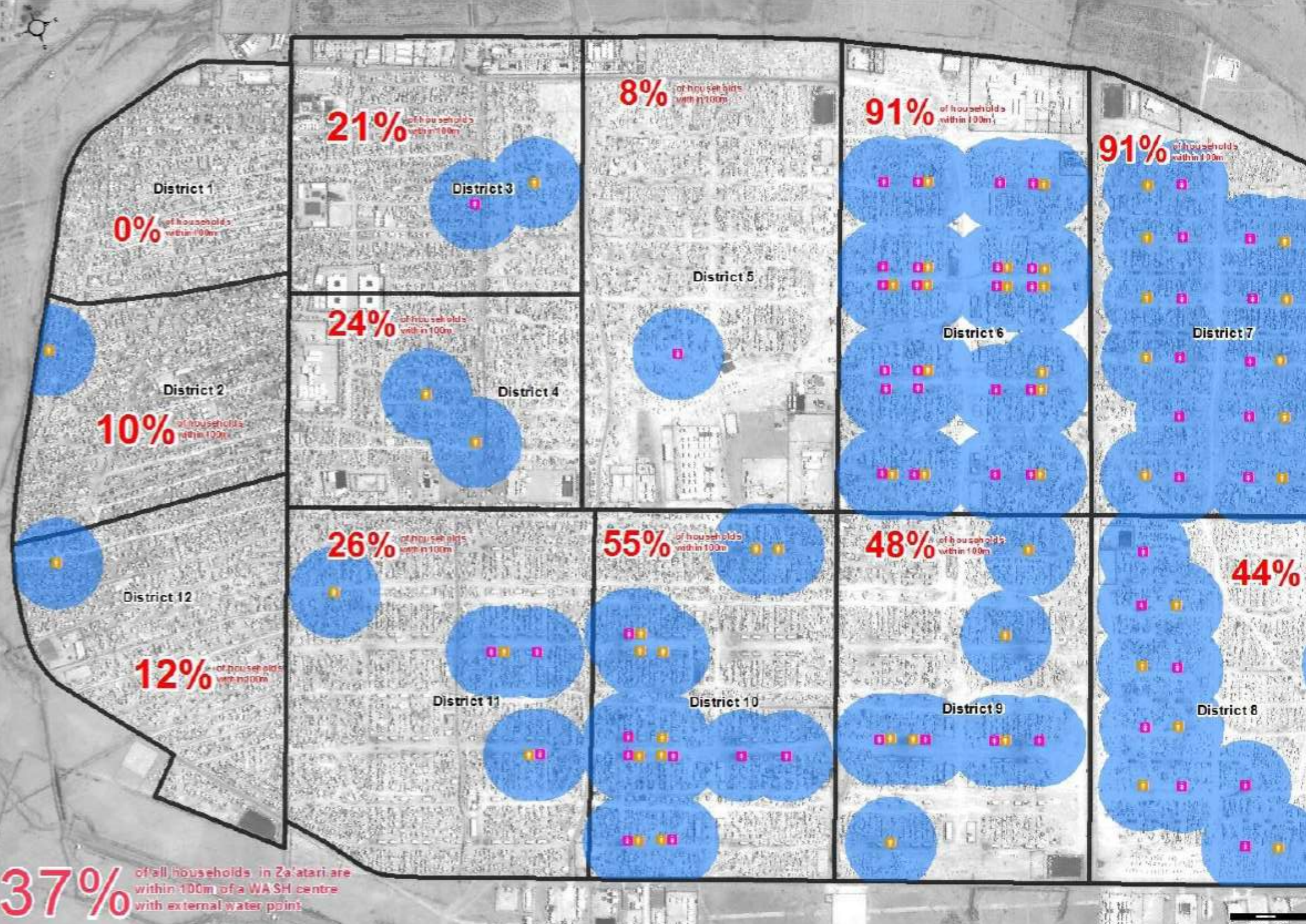
The importance of seeking expert professional advice

3. The planning and implementation of effective WASH monitoring and reporting systems in refugee settings requires a skilled and experienced WASH Coordinator. Every refugee context is different and approaches that have worked well in one setting may not work well in another (e.g. urban vs rural, camp-based vs non-camp based). The routine collection and analysis of WASH data requires the ability to prepare and organize monitoring activities, logistics, and monitoring staff – often with minimal time and resources. In all settings, it is essential to seek expert advice from professionals who are familiar with WASH monitoring and reporting mechanisms in difficult conditions.

Priority actions

Immediate establishment of WASH monitoring and reporting mechanisms

4. Routine monitoring of the UNHCR core WASH indicators needs to be started immediately during the emergency phase and continued through the care and maintenance phase. This is regardless of whether the context is emergency,


District 1
0% of households within 100m
District 2
10% of households within 100m
District 12
12% of households within 100m
21% of households within 100m
District 3
24% of households within 100m
District 4
8% of households within 100m
District 5
91% of households within 100m
District 6
91% of households within 100m
District 7
26% of households within 100m
District 11
55% of households within 100m
District 10
48% of households within 100m
District 9
44%
District 8
37% of all households in Za'atari are within 100m of a WASH centre with external water point

post-emergency, camp-based, non-camp based, urban, or rural. The initial rapid and comprehensive WASH assessment tools (see **Chapter 9**) have been designed to start the initial baseline data collection process and facilitate the initial collection of the core WASH indicators. Many of the field based data collection procedures during the monitoring phase are similar to the initial rapid and comprehensive WASH assessment phases.

The UNHCR core WASH indicators and their monitoring frequency

5. UNHCR and WASH actors should ensure that the UNHCR core WASH indicators are tracked according to the standards and timeframes described in the WASH indicator monitoring frame on the following page - also visible online within the **UNHCR Digital Emergency Handbook**. If WASH activities are not being tracked it is often an indication that no activities are taking place, or WASH interventions are of poor quality.

The importance of tracking the scale-up rate of WASH programmes

6. In addition to tracking the core WASH indicators, UNHCR and WASH actors should also track and report the indicators' rate of change over time (i.e. their scale-up rate) especially as it is a common failure of WASH to scale-up rapidly. During the initial response period, the coverage of water points, toilets, bathing cubicles, water containers, hygiene kits and soap should be closely monitored. If the scale-up rates show that UNHCR target will not be met on-time, additional financial, material, and human resources must be allocated immediately. Changes in WASH implementation strategy may also be required for example: the use of mechanical excavators, imported skilled labour, or mass production of WASH superstructures. Programmes that fail to track implementation rates often fail to realize their scale-up strategies are failing before it is too late. For this reason UNHCR and WASH actors should ensure that tracking is given a priority from the start of any emergency response.

The UNHCR online WASH monitoring system in TWINE

7. UNHCR uses an online platform (**http://twine.unhcr.org/**) called TWINE to manage and analyse public health data collected in refugee operations. TWINE is used to create WASH report cards for refugee sites that monitor trends in key water, sanitation and hygiene indicators at household and community levels. Data is entered into an Excel sheet and submitted directly into TWINE via the internet. The Excel data is automatically analysed and converted into WASH indicators. Currently TWINE is able to record and present data related to the following indicators at the site levels.

   - Average total m3 of water available per day
   - Per capita water availability
   - Number of water collection points
   - Percentage of water points with at least 0.1 mg/l free residual chlorine
   - Percentage of water points with 0 faecal coliforms / 100ml

Box: UNHCR Monitoring Frame for Core WASH Indicators

	Indicator	Emergency Standard	Post Emergency Standard	Means of Verification
Water quantity and safe storage	Per capita water availability.	> 15 l/p/day	> 20 l/p/day	☐ Logging from bulk water meters / tanker records.
	% of HH collecting at least 15 l/person/day.	> 80%	> 80%	☐ Rapid household surveys. ☐ KAP survey report.
	% of HH with at least 10 l/person storage capacity.	> 80%	> 80%	☐ Rapid household surveys. ☐ KAP survey report.
Water quality	% of HH collecting drinking water from protected sources.	> 70%	> 95%	☐ Rapid household surveys.
	% of water collection points with 0 fcu/100ml.	> 95%	> 95%	☐ Water quality records.
	% of water points with > 0.1 mg/l free chlorine residual and turbidity of <5 NTU.	> 95%	> 95%	☐ Water quality records.
Water access	Number of persons per usable water tap.	< 250	< 80 - 100	☐ Target population divided by functional water points.
	Number of persons per usable well/hand pump.	< 400 / Well < 500 / Handpump	< 200 - 300	☐ Target population divided by number of functional wells/handpumps.
	% of HH within walking distance of water collection points.	> 95% within 500m	> 95% within 200m	☐ Overlaying of water point buffer zones on top of satellite imagery.
Excreta	Number of persons per toilet cubicle.	< 50	< 20 1 per HH	☐ Population divided by no. of functional communal and HH toilet cubicles.
	% of communal toilets that meet UNHCR standards (cleanable slabs, privacy, security, absence of faecal matter, safety).	> 60%	> 85%	☐ Sanitary survey records of communal toilet facilities.
	% of communal toilets with functional handwashing stations <10m (soap + water + drainage).	> 95%	> 95%	☐ Sanitary survey records of communal toilet facilities.
	% of households reporting defecating in a toilet.	> 60%	> 80%	☐ KAP survey report.
	% of families with HH toilets.	- - -	> 80%	☐ KAP survey report.
	% of schools and health centres that have toilets in compliance with UNHCR standards.	> 65%	> 90%	☐ Sanitary survey records of school and health centre toilet facilities.
Hygiene Promo - tion	% of HH receiving at least 450g soap / person / month	> 95%	> 95%	☐ Rapid household surveys. ☐ KAP survey report.
	% of HH with soap (any variety) present with 1 minute.	> 90%	> 90%	☐ Rapid household surveys. ☐ KAP survey report.
	% of HH with knowledge of at least 3 out of 5 critical times for handwashing with soap.	> 60%	> 80%	☐ Rapid household surveys. ☐ KAP survey report.
	Ratio of number of persons per hygiene promoter	< 500	< 500	☐ Programme records

More information can be found in '*Practical Guide to the Systematic Use of Standards and Indicators in UNHCR Operations 2nd Edition* (UNHCR, 2006)'

- Total number of functional communal toilet cubicles to UNHCR standards
- Total number of functional household toilet cubicles to UNHCR standards

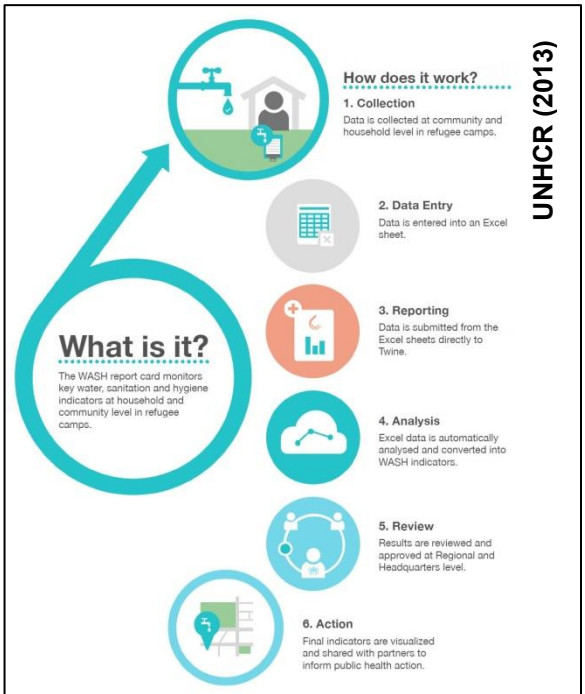


Figure 10-1 TWINE Work Flow

8. Trends of diseases related to hygiene and sanitation conditions (for example the incidence of watery diarrhoea, bloody diarrhoea, and skin disease) are shown in the WASH report card to support the interpretation of WASH indicators. WASH report cards are reviewed and approved at country level by the UNHCR or implementing partner WASH focal point and then at the regional level by the Regional WASH Advisor. The final WASH report cards are made publicly available after they have been approved. Progress against indicators can visualized over time and can be used to inform public health action. UNHCR and WASH actors should ensure that the UNHCR key WASH indicators are reported on a monthly basis and they are uploaded into the UNHCR WASH Monitoring System (TWINE) in all sites where the system has been rolled out.

Practical Guidance for WASH Monitoring

9. A combination of the monitoring approaches may be used to measure the UNHCR core WASH indicators in refugee settings including:

   i) Monitoring of water availability using bulk water meters and water pumping/delivery logs
   ii) Monitoring of water quality through analytical testing
   iii) Monitoring of WASH infrastructure condition through sanitary surveys
   iv) Monitoring of WASH service provision through rapid household surveys
   v) Monitoring of WASH service provision through KAP surveys

   More details concerning each of these approaches can be found in the following sections.

Monitoring of water availability

10. Per capita water availability can be estimated though the use of bulk water meters or water pumping or tanker delivery logs. Practically a per-capita figure is calculated by dividing the total amount of water supplied per day by the number of refugees. It should be noted that this approach generally only provides an approximation of water availability as the results do not take into account leakage, wastage, misappropriation and geographic variations. In all settings UNHCR and WASH actors must also monitor the actual availability of

Al Za'atari Camp: DISTRICT 4



Number of active WASH centres: 22
Number of WASH centres assessed: 22*
#Female: 12 #Male: 10
Population coverage: 4605
of households: 954
of children: 2586

*All active centres were assessed, except those that were locked and could not be accessed

MINIMUM STANDARDS INDEX**

	This week	2 weeks
STRUCTURAL INTEGRITY	1.86 / 4	2.05
HYGIENE	1.39 / 3	2.34
ACCESS & PROTECTION	2.18 / 3	2.23
OVERALL	5.43 / 10	6.61

(MS) = minimum standard

STRUCTURAL INTEGRITY

TOILETS & SHOWERS

	This week	2 weeks ago
(MS) At least min standard of functional toilets are present[1]	6 (27%)	8 (36%)
(MS) There are at least 2 functional shower stalls[2]	9 (41%)	9 (41%)
There are doors on 100% of all toilet and shower stalls	7 (32%)	7 (32%)
There are locks on 100% on all toilet and shower doors	0 (0%)	1 (5%)
Female centres contain at least 1 lockable toilet and shower stall	8 (67%)	6 (50%)

TAPS

	This week	2 weeks ago
(MS) There are at least two internal taps	4 (18%)	6 (27%)
There is at least one external tap	4 (18%)	1 (5%)
There are no leaking internal taps (only centres with running water)	4 (67%)	13 (93%)

SEWAGE

(MS) If there is a septic tank, there are no signs of overflow	11 (58%)	19 (100%)

LIGHT

	This week	2 weeks ago
(MS) WASH centres with internal or external lighting	4 (18%)	5 (23%)
Female WASH centres with internal or external lighting	3 (25%)	3 (25%)

TOTAL ITEMS

	This week	2 weeks ago
Total number of functioning toilets	85	101
Total number of functioning showers	27	27
Total number of doors on toilet and shower stalls	142	152
Total number of locks on toilet and shower doors	52	55
Total number of internal taps	15	22

ACCESS

PUBLIC ACCESS

	This week	2 weeks ago
(MS) Centre is not locked	22 (100%)	22 (100%)
There are no locked toilet and shower stalls	11 (50%)	13 (59%)
There is an unlocked stall for disabled persons	2 (9%)	2 (9%)

PRIVATE CONNECTIONS

	This week	2 weeks ago
There are no private connections to water tanks	18 (82%)	20 (91%)
There are no private connections to the taps	19 (86%)	19 (86%)
There are no visible private connections to WASH centre septics tanks	14 (74%)	16 (84%)

HYGIENE

CLEANLINESS

	This week	2 weeks ago
(MS) There is no faeces inside the facility	11 (50%)	15 (68%)
(MS) No faeces outside the centre within a 2m radius	N/A (-)	N/A (-)
(MS) No stagnant water inside and outside the facility	7 (32%)	20 (91%)

SANITARY WASTE DISPOSAL

	This week	2 weeks ago
(MS) Female centres with disposal arrangements for menstrual hygiene materials and diapers[3]	8 (67%)	8 (67%)

A) See below for min. standard calculation. B) Functioning toilet means one that is intact, and not blocked, overflowing, or destroyed
A functioning shower means one that has a door and an internal lock
This disposal arrangement may include a bin or bag inside the hallway of the WASH centre

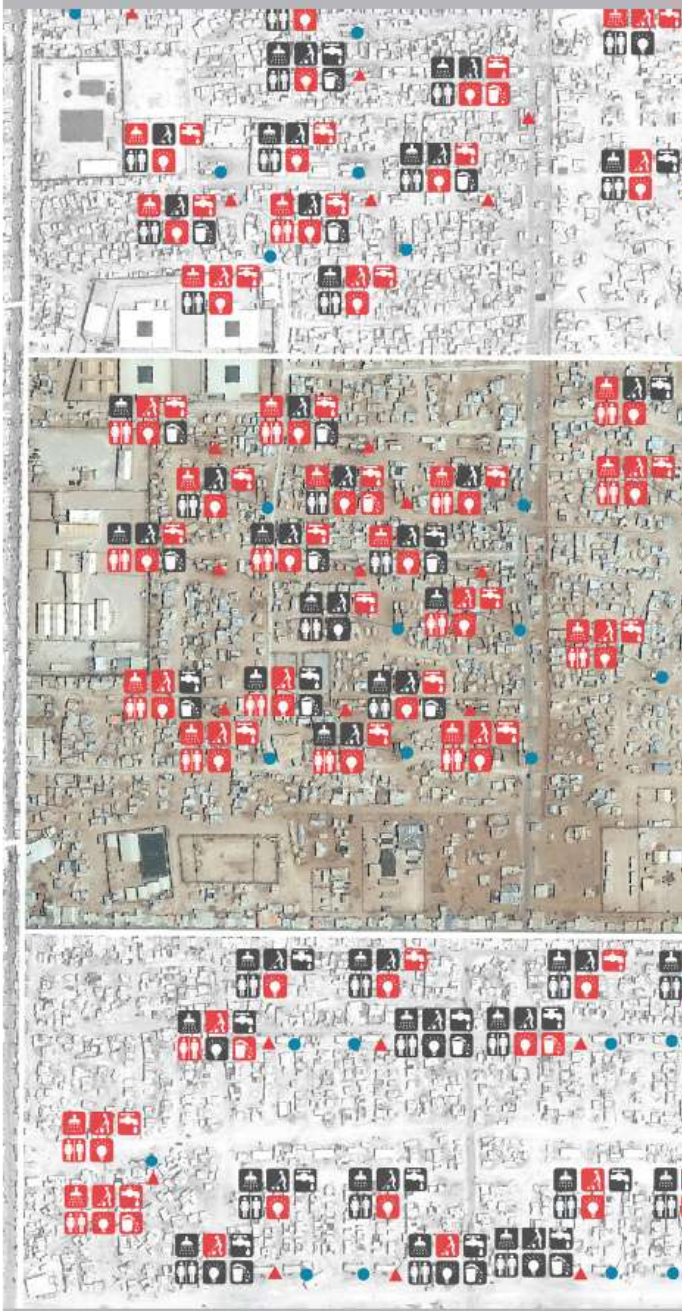
Index Indicators

A. STRUCTURAL INTEGRITY INDEX
1.In Districts 4-11, there is at least 1 toilet per 50 individuals that is functional; i.e. intact and not blocked/overflowing. In Districts 1/2/3/12 there are at least 2 functioning toilets per centre.
2.There are at least 2 functioning shower stalls; including an intact basin and door with lock.
3.There are at least 2 functioning taps inside the centre
4.There are no signs of sewage tank overflow

B. HYGIENE INDEX
1.The centre does not contain faeces inside the WASH facility
2.There is no stagnant water inside or outside the facility
3.There is an arrangement for the disposal of diapers or menstrual hygiene materials (bag or bin in the hallway)

C.ACCESS & PROTECTION INDEX
1.The centre is open and free of charge
2.The centre is sex-segregated
3.There is internal or external lighting

DISTRICT 4: KEY MINIMUM STANDARDS PER WASH CE



DISTRICT 4: Compliance with key minimum standards

- At least 2 functioning showers
- Less than 2 functioning showers
- No faeces present inside centre
- Faeces present inside centre
- At least two taps present
- Less than two taps present
- At least m.standard of functioning toilets
- Less functioning toilets than minimum standard
- Light present inside or outside centre
- No light inside or outside centre
- Disposal arrangement for female hygiene items
- No disposal arrangement for female hygiene items

unicef

REACH Informing more effective

water at the household level through the use of rapid household surveys.

Monitoring of water quality

11. In all refugee settings, UNHCR and WASH actors must ensure that the water supplied is fit for human consumption. A full explanation of guidance for water quality monitoring, surveillance and water safety plans in refugee settings can be found in the **Water Supply Chapter** in **sections 3.86 – 3.113**. At a minimum all refugee settings must have in place an up-to-date water safety plan and should be routinely undertaking water quality testing of the following:

- Percentage of water points with 0 fcu/100ml
- Percentage of water points with at least 0.1mg/litre free chlorine residual and <5 NTU
- Any medium to high risk relevant chemical water quality parameters

Monitoring WASH programmes using the rapid household survey tool

12. The most important monitoring tool for refugee settings is the rapid WASH household survey (**see Annex**). It is recommended that UNHCR and WASH actors use this monitoring tool on a weekly basis during the acute emergency phase, transitioning to every month during the care and maintenance phase. Guidance for use of the rapid WASH household surveys tool including sampling methodologies (systematic random sampling) and sampling size calculation (60 households to give a 95% confidence interval of +/- 12.5%) are being developed by CDC and can be found on the **wash.unhcr.org** website. At a minimum the following indicators will be monitored using this tool:

- Per capita water consumption
- Household water storage capacity
- Percentage of households collecting water from protected sources
- Percentage of households reporting defecating in a toilet
- Percentage of families with household toilet
- Percentage of households that can produce soap within 1 minute
- Percentage of households with knowledge of at least 3 out of 5 of the critical times for handwashing with soap

Monitoring WASH infrastructure condition using sanitary surveys

13. In all refugee settings, UNHCR and WASH actors should ensure that the condition and coverage of WASH infrastructure is closely monitored and meets UNHCR standards. More detailed guidance for the use of sanitary surveys in monitoring water, excreta management and solid waste infrastructure can be found in **sections 3.86 – 3.90, 4.23, and 5.40**. In all refugee settings, these tools should be used routinely to monitor the following:

- Number of person per functioning tap
- Number of person per functioning well / handpump
- Number of persons per functioning toilet cubicle
- Number of persons per functioning bathing cubicle

- Percentage of communal toilets that meet UNHCR standards
- Percentage of schools and health centres with WASH structures in compliance with UNHCR standards
- Percentage of communal waste collection points that are overflowing

KAP (knowledge, attitudes and practice) surveys

14. In all refugee settings, UNHCR and WASH actors should aim to carry out an initial KAP baseline survey within the first 6 months of the emergency and then at least once a year (ideally twice if there are distinct rainy and dry seasons). Results from the KAP survey should be used to assist in the modification of the WASH activities in particular the hygiene promotion aspects. The KAP Survey Manual, developed in collaboration with CDC can be found on the **wash.unhcr.org** website and includes core WASH questions and a description of several scientifically robust representative sampling methodologies.

15. UNHCR and WASH actors must ensure that every KAP survey is carried out with a properly designed KAP survey instrument, sampling plan, sample size calculation and data analysis plan. In all cases a sampling size calculation must be provided as it is very easy for inexperienced WASH staff to heavily oversample the population wasting huge amounts of time and resources. UNHCR and WASH actors should also ensure that KAP surveys do not overburden the population and do not collect any more information than is required. It is very easy for KAP surveys to quickly become 'bloated' with questions that are either unimportant or irrelevant, again leading to a waste in time and resources.

Mapping the condition of WASH infrastructure

16. Simple mapping of WASH facilities (for example water point, toilets, bathing cubicles, solid waste collection points) using satellite images (Google Earth) in addition to any simple image editing software (for example Microsoft Paint) can help a WASH programme manager have a clear snapshot of coverage and condition. For example, a WASH monitoring map might plot WASH facilities in green if they are functional, yellow if they have minor issues, and red if there is an issue for immediate attention. An example can be found in the figures on the following pages. These simple geographical information systems can also be used by the health programme to investigate the linkages between disease, where patients reside, and poor access to WASH services.

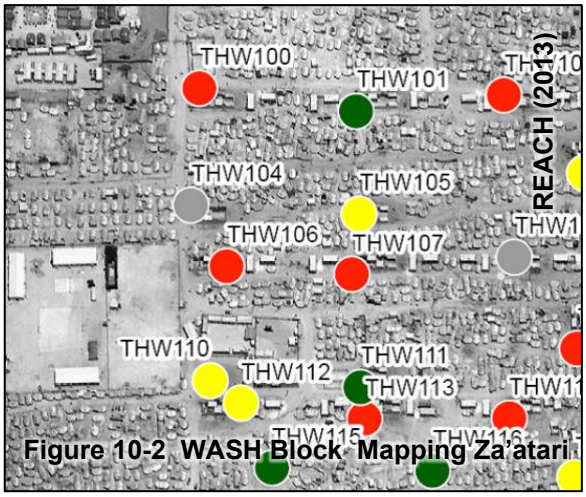


Figure 10-2 WASH Block Mapping Za'atari

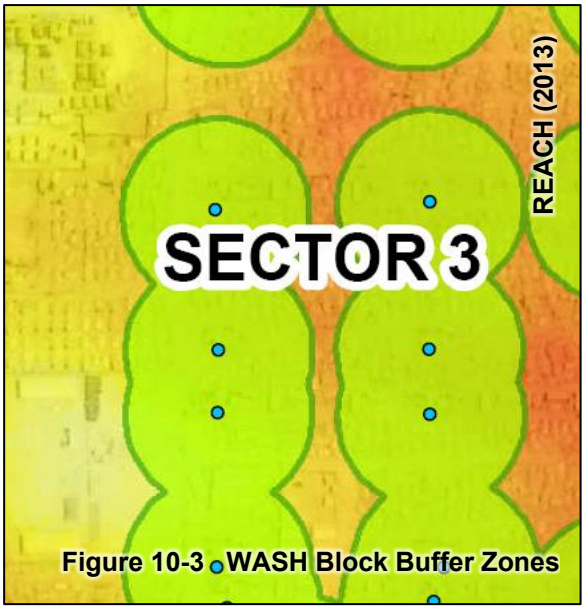


Figure 10-3 WASH Block Buffer Zones

Monitoring the cost effectiveness and efficiency of WASH interventions

17. During the care and maintenance phase, UNHCR and WASH actors should monitor the cost and efficiency of all WASH interventions over time. Core value-for-money indicators include:

- The cost of water supply (cost per m^3 for water abstraction, treatment and distribution up to the end user)
- The cost of excreta management (cost per person per year for excreta management services)
- The cost of solid waste management services (cost per tonne of managing each waste steam)
- The cost of hygiene promotion activities (cost per person per year for hygiene promotion interventions)
- The cost of disease vector control (cost per person per year for each disease vector control intervention)

18. The monitoring of WASH expenditure per refugee allows different refugee settings to be compared and can also be used to explain why indicators are not achieved in some settings due to a lack of funding. The monitoring of WASH expenditure can also highlight locations that are not making efficient use of resources.

19. In addition to monitoring costs, UNHCR and WASH actors should also monitor the productivity of WASH programmes in an effort to maximize efficiency and reduce costs. WASH programmes typically employ a large number of staff (e.g. construction teams, operation and maintenance teams, hygiene promoters, cleaners, waste collection team), vehicles (e.g. waste collection vehicles, water tankers, maintenance pick-ups), and machines (e.g. water pumps, water treatment machines, sludge pumps). Small changes in how these assets operate can result in large increases in efficiency. Basic log sheets should be used to monitor how vehicles, machines and staff are working. For example water tankers, or waste vehicles may be be logged to measure how many return trips are being carried out per shift, how much time is spent waiting, loading, collecting, transporting etc..

20. UNHCR and WASH actors should ensure that break-down rates (in particularly programmes that use handpumps for water supply), and spare-parts replacement rates are closely tracked to ensure that strategies to reduce breakdown frequency and replacement are functioning (and to identify irregularities and increasing frequency in breakdown rates and spare-part replacement). Core

indicators for WASH infrastructure includes..

- Water System Reliability = [Number of Days Water System is Operational (Days) / Total Elapsed Time (Days)] * 100%
- Percentage of Functioning Water Points = [Number of Functioning Water Points / Total Number of Water Points] * 100%
- Percentage of Functioning Toilets = [Number of Functioning Toilets / Total Number of Toilets] * 100%
- Percentage of Functioning Bathing Cubicles = [Number of Functioning Bathing Cubicles / Total Number of Bathing Cubicles] * 100%

21. All data collected by the WASH programme should be collected with a purpose to inform decisions and improve the performance and cost-efficiency of the programme. This is not just to save the donors money but to move to a cost efficient model that may be handed over to the refugee population or local authorities. More information on monitoring the cost and efficiency of WASH interventions in refugee settings can be found in the UNHCR "Cost for water" project which is accessible on the **wash.unhcr.org** website.

Practical Guidance for WASH Reporting

22. UNHCR and WASH actors should ensure that there are functional systems in place to report back to donors, beneficiaries and local authorities the progress of the WASH programme. Different communication strategies (for example WASH monitoring updates and bulletins, camp information boards, updated site WASH plans/strategies) should be used to meet the information needs of different groups.

23. Within UNHCR it is compulsory that all WASH data collection and reporting must be harmonized with the UNHCR Information Management (IM) Team. In addition, during emergencies the WASH section is directly responsible for compiling WASH related information for the UNHCR Basic Indicators Report (BIR).

Use of WASH monitoring updates and bulletins

24. WASH updates and monitoring bulletins can be used to keep key actors informed of the progress of the WASH programme towards targets and objectives. The WASH updates / bulletins are typically in a much easier to digest format (one or two pages of maps/infographics) that the site WASH plans / strategies and are typically circulated more frequently (fortnightly, monthly). An example prepared by the organisation REACH can be found on **page 367**.

WASH monitoring integration into site WASH plans and strategies

25. UNHCR and WASH actors should ensure that every refugee setting has a site WASH strategy document that contains up to date and relevant data and information concerning the WASH situation in the site. The document should describe the short, medium and long-term strategies for water

supply, excreta management, solid waste management, hygiene promotion and disease vector control, in addition to the fourteen (14) core UNHCR WASH philosophies and principles. In addition to the general strategies, an operational plan should be included that clearly describes the ongoing WASH activities in terms of WHO, WHAT, WHERE, WHEN and HOW.

26. The site WASH strategy/plan for each site should be seen as a living document that should be kept up to date with the latest information concerning the conditions within the refugee setting. All of the latest monitoring information from water quality testing, sanitary surveys, waste surveys, baseline surveys, focus group discussions, rapid household surveys, and KAP surveys should be included in the site WASH plan annex. The WASH sectoral strategies developed for the site should be based on a solid interpretation of the WASH data that is collected. The site WASH plan should include maps showing geo-spatial data (coverage and condition of WASH infrastructure) and graphs showing historical trends.

Conveying progress to beneficiaries through the use of information boards

27. Camp information boards can be displayed in public areas to inform the refugee population of the progress of the WASH programme towards targets and objectives. Care must be taken to display information in a format that is clear and legible to all.

11. WASH Sector Coordination

WASH sector coordination is an essential activity in all refugee settings to ensure there is a united and common approach to providing WASH services to the refugee population. Refugee WASH sector coordination includes ensuring that there is a common WASH strategy; harmonized assessment of WASH needs; avoidance of gaps and duplication; definition and application of appropriate technical standards; joint mobilisation and allocation of resources; building of capacity; monitoring of performance; combined advocacy efforts; joint information sharing; joint preparedness and contingency planning; and to ensure there is capture and application of lessons learned and sector best practice.

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Introduction

The importance of effective WASH sector coordination in refugee settings

1. WASH sector coordination is an essential activity in all refugee settings to ensure there is a united and common approach to providing WASH services to the refugee population including a common WASH strategy, a coordinated and harmonized assessment of WASH needs, avoidance of gaps and duplication, definition and application of appropriate technical standards, common mobilisation and prioritisation of resources, building of capacity, monitoring of sector performance, joint advocacy, sharing of information, and a common long term vision. In addition, the refugee WASH Sector lead is responsible for ensuring there are clear common inter-sectoral strategies and information sharing between WASH and the Health, Shelter, Education, Livelihoods, Protection, Nutrition, Site Planning and Community Services Sectors.
2. UNHCR is ultimately responsible for ensuring there is effective WASH sector coordination in all refugee settings. In 2013, UNHCR has defined the Refugee Coordination Model (RCM) which outlines UNHCR's role and responsibilities in refugee operations and mixed displacement situations and has been built on UNHCR's best practices from the field in particular interaction with the Cluster system. A clear explanation of UNHCR's refugee response coordination model in mixed settings and the interface with broader humanitarian coordination structures and the IASC cluster system can be found in the briefing document in the **references** section. In the context of a complex emergency where the cluster mechanism has been activated and refugees are a part of a much larger response then UNHCR will undertake coordination of the WASH activities in the refugee settings and will ensure that the refugee situation is represented at the wider coordination meetings.

WASH sector coordination implementation arrangements

3. Appropriate refugee WASH Sector coordination arrangements will depend on the scale, phasing, and anticipated duration of the refugee situation. Other factors to consider include government, UN and NGO response capacity and the presence and effectiveness of existing coordination mechanisms, including committees or temporary ministries run by the refugees themselves. Whatever the structure adopted, it must be flexible enough to suit all stages of the response e.g. expanding during intensive relief activities and scaling back during post emergency and protracted phases.
4. A key element of the UNHCR Refugee Coordination Model is that sector coordination, whenever possible, should be led by Government line ministries and/or (co)chaired by UNHCR and/or (co)chaired by one of UNHCR partners through a standby-arrangement. Under International Human Rights, Humanitarian, and Refugee law, it is the primary responsibility of the state to provide

assistance to refugees affected by disaster or armed conflict. In all cases, efforts must be undertaken to ensure that refugee WASH sector coordination is set up and chaired by the national government with strong support from UNHCR. If this is not possible UNHCR should co-chair with the government and(or) a partner organisation, or in some cases may need to chair alone. If refugee WASH coordination mechanisms already exist then the UNHCR must ensure that coordination is supported, reinforced and functioning effectively - avoiding creating parallel coordination structures.

5. During large emergencies a decision may be taken by UNHCR Senior Management to mobilize arrangements for rapid refugee WASH sector coordination which includes a dedicated refugee WASH sector coordination focal point, Information Manager, and resources for coordination either within UNHCR or a partner organisation. If standby arrangements are not activated, UNHCR Senior Management must ensure that effective coordination of the refugee WASH response is taking place at the national, sub-national and site levels. Depending on the coordination arrangements, the refugee WASH sector coordination focal point may be hosted at either UNHCR, or within national government authorities (if a co-leadership arrangement of sector coordination is established).

6. In large refugee responses WASH sector coordination is likely to be required at three levels:

   i) **National Level** i.e. primarily high-level strategic decision making, technical working groups and liaison.
   ii) **Sub-National Level** i.e. if a host country has several borders it is typical to have coordination at the sub-national level for coordination of planning and response activities within the regions.
   iii) **Site Level** e.g. at refugee camp level – sector coordination is generally undertaken at site level in collaboration with other service sectors and refugee committees.

   During smaller responses, coordination may only be required at the site level.



Figure 12-1 Sector Coordination Meeting

The importance of seeking expert professional advice

7. Effective WASH coordination, in complex refugee settings requires a skilled and experienced refugee WASH sector coordination focal point. Every refugee context is

different and approaches that have worked well in one setting may not work well in another (e.g. complex emergencies vs. classical refugee emergencies, urban vs rural, camp-based vs non-camp based). The success of WASH Coordination and Information Management roles typically not only depend upon the skills and experience of the individuals but also upon their personality types in particular their leadership, communication and negotiation skills, in addition to being accessible and bringing out the best in diverse groups of individuals and organisations. In all settings, it is essential to seek professionals who are familiar with coordination and information management mechanisms in difficult conditions.

Priority actions

An immediate response

8. Refugee WASH sector coordination is an essential activity that must be mobilised and reinforced at the immediate onset of any refugee emergency. The provision of basic coordination activities (for example establishing a regular time and place for WASH organisations to meet and share information) is better than delayed provision of improved systems. Costly mistakes that are hard to rectify can be made if attention and resources are not given to coordination from the start. A harmonized assessment of the WASH needs and gaps at the start of the refugee emergency is often a big test of the efficiency and effectiveness of the WASH coordination arrangements.

Common analysis of needs and gaps

9. Harmonized WASH assessments are an essential activity in every refugee setting to identify the locations of the most affected sections of the population, their coping mechanisms, and the most urgent WASH interventions that are required. Coordination is essential to ensure that where possible WASH agencies use harmonized WASH data collection tools, indicators and common operational datasets (common population names, population sizes, administrative boundaries). Use of harmonized tools and approaches means that a common analysis of WASH needs and gaps can be developed through sharing of assessment information and analysis resources (see **chapter 9** for more information on WASH assessments).

Establishment of a common sector response plan/strategy

10. Common refugee WASH sector response plans and strategies at the national, sub-national and site level are essential so that WASH actors are able to implement WASH activities with a common approach up to the same levels of service provision. The refugee WASH plan/strategy should not only consider defining the common approach to WASH service provision (water, sanitation, hygiene, solid waste, disease vector control) but also common approaches to ensuring value for money, appropriate technology selection, cost-effectiveness, sustainability, safety and security, consultation and participation, equability of service, universal

access, working with national service providers and regulatory authorities.

Establishment of agreed common indicators, standards and approaches

11. Where possible, refugee WASH actors should agree and use common WASH indicators and standards for the refugee WASH response. At a minimum the UNHCR core WASH standards should be used to routinely monitor WASH needs and WASH sector progress in all refugee settings. If the UNHCR WASH Monitoring System has been rolled out ensure that data is uploaded monthly to the TWINE website (**http://twine.unhcr.org/**) see **section 10.7**.

12. Where possible, refugee WASH coordination structures should also take time to review existing WASH standards (national WASH standards and UNHCR WASH standards) and adopt, or if necessary adapt, existing standards for the refugee emergency response.

13. Harmonizing of agreed indicators, standards amongst refugee WASH actors means that needs assessment or monitoring data can be compared, contrasted, and compiled into a single database for shared analysis. Use of common indicators and operational datasets (common population sizes, population names, administrative boundaries) allows WASH data to be readily compared, contrasted and combined to get an overview of the whole sector's response.

Establishment of a programme of refugee WASH coordination meetings

14. Coordination meetings at the national, sub-national and site levels are essential for communicating information, but they frequently produce limited outcomes. It is essential that the refugee WASH sector lead ensures effective and efficient coordination meetings are taking place that are productive and do not waste the time of the participants. The quality of these meetings will significantly affect engagement and attendance of WASH actors in future meetings and possible the overall effectiveness of the refugee WASH sector response. The box on the following page contains a list of recommendations to ensure that refugee WASH sector coordination meetings are productive.

Creation of Technical Working Groups (TWGs)

15. Technical, working, or sub-groups are useful in producing technical guidelines, analysing problems, resolving concerns, and formalising principles and responsibilities. Consensus is more easily achieved within a smaller group. To establish a TWG, a focal point should be elected with responsibility for establishing the group, defining the terms of reference, and feeding back on their activities and recommendations, either to the Advisory Group, or the refugee WASH sector as a whole.

16. A TWG's life-span should be determined by its purpose and deliverables. Once the purpose and deliverables have been achieved it is better to dissolve the group rather

Box: Guidance for WASH coordination meetings

Before the meeting

1. If appropriate, ensure (or advocate strongly) for government chairing or co-chairing of refugee WASH sector coordination meetings, particularly in the early response.
2. Ensure that there is a clear agenda that is circulated well in advance. Ensure the agenda is approved by the Advisory Committee.
3. Ensure there is sufficient information for participants to know what they need to do to prepare in advance (especially those that are making presentations).
4. Ensure WASH actors have been contacted to facilitate different parts of the meeting in order to change presentation style and demonstrate open collaboration.
5. Ensure that there is a suitable venue for meeting that is comfortable and facilitates productivity and sharing of information. Consider whether venues are appropriate e.g. many iNGOs are uncomfortable or have security restrictions imposed on attending meetings within UN compounds or in expensive hotels used mainly by expatriates. Consider rotating the meeting among WASH Sector members' offices.
6. Ensure that all the required resources (projectors, extension cables, whiteboards, maps, reports, refreshments) are prepared.
7. Ensure attendance of key decision makers – encourage their involvement in meetings through maintaining regular, personal contact. The better the relationships with WASH actors the better the coordination.
8. Only call a coordination meeting when it is absolutely necessary and review the meeting frequency frequently with the Advisory Committee.

During the meeting

1. Ensure that the meeting starts promptly and finishes on-time. Try to keep the timings to those in the published agenda without limiting time for discussion.
2. Allow time for all members to introduce themselves and provide a short (two minute) agency update. Allow actors enough time to feel engaged in the meeting (break the ice) – but do not allow actors to talk endlessly. Detailed agency updates should be shared via other means (e.g. written updates and 3W, 4W).
3. Ensure that the objective of the meeting is understood and achieved. As the meeting progresses, compile a clear summary of short, medium and long term action points (WHO, WHAT, WHERE, WHEN, HOW). At the end of the meeting summarize the action points focusing on what needs to be done before the following meeting.
4. Share and discuss the latest 4W Matrix. Update the 4W matrix based on WASH agency resources. Allocate additional resources is available.
5. Share and discuss the short, medium and long-term thematic strategies.
6. If lengthy topics for discussion arise, consider the option of tackling them within a separate Technical Working Group or the Advisory Group.

After the meeting

1. Ensure that all presentation materials from the meeting are uploaded onto the WASH sector coordination website (where available).
2. Ensure that the meeting minutes of meetings are circulated within three days and invite comments and corrections.
3. Follow up with key decision makers that couldn't attend the meeting. Ensure they have a written or verbal update of the meeting's outcomes.
4. Follow up with key action points and ensure prompt feedback on decisions taken.
5. Update the revised contact information on the WASH sector coordination website.

For more guidance refer to the WASH Cluster Coordinator Handbook (2009)

than have many smaller groups that continue to meet without clear objectives. Membership of TWG's should be through voluntary self-selection, although special expertise may be required. They may be drawn from within or outside the WASH Sector, e.g. government, academic, professional institutions, civil society organisations, or private sector organisations.

Establishment of common reporting

17. Reporting on the refugee WASH sector's needs, progress and gaps is essential so that stakeholders inside and outside of the sector are aware of WASH service coverage, resource availability, and implementation progress towards defined targets. In many cases, common reporting is vital to mobilize additional resources and raise awareness of key problems (particularly lack of funding). In every refugee setting the WASH Sector lead must ensure that they have the capacity to collate, analyse and report on collective progress and outcomes. Regardless of whether they are bilaterally funded or funded by UNHCR, all WASH agencies working in refugee settings must report their activities to the refugee WASH sector coordination focal point. The principle sector communication tools are.

i) 4W matrices and maps.
ii) WASH updates, sitreps and bulletins.
iii) WASH plans/strategies.
iv) Internet based coordination platform.
v) WASH monitoring system (**http://twine.unhcr.org/**)

Use of 4W (Who, What, Where, When) matrices and maps

18. 4W matrices clearly show who is working where in the refugee WASH sector, what they are doing, how many beneficiaries they are targeting and when certain WASH activities are planned to start and finish. Often the clearest way to present the data contained in 4W matrices is graphically in the form of a thematic map (also known as chloropleth or heat maps). In general, it is recommended that a single map is produced for each of the core WASH activities (i.e. distribution of hygiene kits, water access, toilet coverage). Maps can be produced to show a snapshot in time e.g. what has been completed in the last reporting period and what is planned for the next reporting period. These 4W maps allow refugee WASH actors to obtain a very clear picture of where WASH interventions have recently been carried out in addition to gaps and duplications.

19. The ability to produce maps is an essential coordination activity in large refugee emergencies. Information Management staff with skills in using mapping software should be considered as core function within the sector.

Preparation of WASH sector updates / sitreps / bulletins

20. Refugee WASH sector updates, sitreps and bulletins provide a snapshot of the current WASH situation faced by the refugee population including an overview of WASH implementation priorities, collective progress, results, gaps and constraints. These may be

prepared as a stand alone documents or may feed into multi-sectorial sitreps. The 4W database should be used to provide an update of the total impact of the refugee WASH response to date (e.g. the total number of hygiene kits distributed, the total litres of water supplied, the total number of toilets constructed etc.) in addition to the current gaps (e.g. the total number of families who have not received hygiene kits, the total refugee population without water supply or excreta management assistance). Refugee WASH sector updates, sitreps and bulletins are useful in that they allow anyone to quickly access information concerning the current quantitative status of WASH needs, progress and gaps. However they often fail to provide a detailed qualitative analysis of the situation or the short, medium and long term refugee WASH strategies.

Common WASH plans and strategies

21. UNHCR and WASH actors should ensure that coordination efforts lead to the creation of common refugee WASH strategy documents and operational plans at the national, sub-national and site levels. The strategies and action plans should contains up-to-date and relevant data concerning the refugee WASH situation in addition to short, medium and long-term strategies for water supply, excreta management, solid waste management, hygiene promotion and disease vector control, in addition to the fourteen (14) core UNHCR WASH philosophies and principles. The operational plans should clearly describes the ongoing WASH activities in terms of WHO, WHAT, WHERE, WHEN and HOW. They should also include an overview of the resources available and the additional resources that are required (including a tentative budget – particularly for large ticket items).

22. The refugee WASH strategies/plans should be shared among the WASH actors and should be seen as living documents that are kept up to date with the latest information concerning the conditions within the refugee settings. All of the latest monitoring information from water quality testing, sanitary surveys, waste surveys, baseline surveys, focus group discussions, rapid household surveys and KAP surveys should be included in the annexes and the WASH sectoral strategies developed should be based on a solid interpretation of the WASH data that is collected.

Establishment of a common internet platform and sharing of information

23. An important aspect of Information Management is the ability to rapidly share different types of information with the refugee WASH community. It is essential that the refugee WASH sector not only has an active physical presence but also continues to interact through a virtual presence. In every refugee setting WASH information should be closely integrated with UNHCR's Inter-agency Information Sharing Portal (**http://data.unhcr.org/**). In addition, refugee WASH coordination structures should consider establishing additional web based coordination mechanisms for

social communication, information updates, news, contact lists, and WASH tools and reports. In the first few weeks of a refugee emergency this can be as simple as a DropBox account but within the first month this should be a fully functioning coordination platform (e.g. customized Wordpress or Drupal 7 Distro).

Practical Guidance for WASH Sector Coordination

Establishment of an Advisory Group

24. In large refugee emergencies a Refugee WASH Advisory Group should be established to ensure that there is an element of democratic and transparent decision making on behalf WASH actors. The Advisory Group is able to share some of the coordination workload in particular the responsibility for decision making. An Advisory Group is essential to be able to demonstrate that critical or influential decisions have been made by a group of persons rather than a single individual. The steering or Advisory Group size should generally be managed to ensure the balance between the need for rapid decision making and effective management, and the need for broad participation. The group should aim to represent all major stakeholders including national WASH actors and sub-national WASH sector leads.

The importance of dedicated WASH coordination personnel and resources

25. In large refugee emergencies WASH sector coordination may be required at the national, sub-national and site level. It must be clearly understood that WASH Sector Coordination is not free and UNHCR senior management must ensure that resources are immediately available to make sector coordination work from the start of the refugee emergency through the allocation of resources for dedicated WASH coordination staff and Information Managers, coordination website hosting, tools, computers and mapping facilities. In most settings it is virtually impossible for a UNHCR WASH Officer to manage both sector coordination and their UNHCR responsibilities.

26. The role of the refugee WASH sector coordination focal point is to facilitate a well-coordinated and effective humanitarian response to a refugee situation. At all times the refugee WASH sector coordination focal point should act in the best interest of the refugees and the WASH sector as a whole rather than his or her own organisation.

Coordinated sector preparedness and contingency planning

27. Refugee WASH sector coordination arrangements should not only be active in ensuring collaboration in the short and medium term but should also ensure that proper arrangements are in place for sector contingency planning. UNHCR and WASH actors should ensure that country level and site level refugee WASH contingency plans are prepared in conjunction with multi-sectorial plans that include an analysis of historical and probable WASH needs, probable scenarios, likely impacts, WASH stockpiling and stand-by arrangements,

coordination arrangements, and links to early warning systems.

28. Part of the preparedness activities include ensuring that there is consensus over common interagency WASH rapid and comprehensive assessment tools and approaches in addition to common emergency response implementation methods, approaches and standards. Efforts undertaken during the preparedness phase can dramatically improve the quality and effectiveness of any future WASH responses.

Capture and application of lessons learned and sector best practice

29. Refugee WASH sector coordination mechanisms should strive to continuously evaluate their performance in terms of:

i) **Response speed**. The extent to which WASH activities were able to scale up within agreed timeframes.
ii) **Relevance**. The extent to which WASH activities are meeting the priority needs of the target groups.
iii) **Effectiveness**. The extent to which WASH activities achieved the desired overall objectives.
iv) **Efficiency**. An analysis of whether it was possible to achieve the same outputs using less resources.
v) **Impact**. An analysis of positive and negative changes directly or indirectly produced by the WASH activities.
vi) **Sustainability**. An analysis of whether WASH activities are likely to continue to function with reduced funding or technical support.

In all refugee settings, lessons learned should be used to not only inform local refugee WASH sector policy change but also to feed into learning at a global level.

Monitoring of the quality of WASH sector coordination

30. UNHCR Senior Management has the overall responsibility for monitoring the quality of WASH sector coordination that is taking place. In all refugee settings, the UNHCR Country Programme and refugee WASH sector members must undertake a transparent and participative self-review of the quality of the WASH sector's performance in particularly the WASH coordination every six months based on feedback from local WASH actors. UNHCR should change the WASH sector coordination structure if more than 50% of WASH actors find the performance to be below average.

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UNHCR WASH SAFETY AND SECURITY CHECKLIST

- UNHCR and WASH actors must ensure that all WASH programmes in refugee settings have been designed to protect users from physical safety related risks.
- While undertaking the assessment it is important for the assessor to assess each piece of WASH infrastructure for potential risks from the individual perspective of each type of vulnerable user in particular women, children, infants, the elderly, and refugees with disabilities.
- Please note that the list of questions is not exhaustive and is merely intended to focus attention on potential safety and security issues related to trip, crush, pinch, pierce, cut, splinter, burn, drowning, and gender based violence. Common sense should be used at all times and if there is a safety or security issue that is not included on the sheet it should be noted in the additional comments section for corrective action.
- Following the assessment, it is essential to prioritise risks into high, medium and low – and establish a clear plan of action to immediately address the most critical risks.
- This safety and security checklist and action plan should be referenced in the annex of the site's WASH strategy/plan.

UNHCR WASH SAFETY AND SECURITY CHECKLIST

A. General Information

Location: Camp _____ Sector _____ Block _____ Community _____

GPS Long: ____°_____'_____" GPS Lat: ____°_____'_____" Site Population : _____

Contact Person: _____ Position: _____ Organisation: _____

Telephone: _____ Email: _____ Date of Assessment: ____/_____/_____

B. Risk of SGBV	**Risk Factor**
1. Lack of consultation of women with regards to	
• The design and siting of toilets?	Y ☐ / N ☐
• The design and siting of bathing areas?	Y ☐ / N ☐
• The design and siting of laundering areas?	Y ☐ / N ☐
• The design and siting of water collection points?	Y ☐ / N ☐
• The design and siting of waste collection points?	Y ☐ / N ☐
2. Lack of household or shared (one per 4 families) toilet or bathing facilities?	Y ☐ / N ☐
3. Public toilet or bathing cubicle coverage greater than one cubicle per 20 persons?	Y ☐ / N ☐
4. Public toilet or bathing blocks are used by more than 80 persons (16 families)?	Y ☐ / N ☐
5. Public toilet or bathing facilities further than 50m from users?	Y ☐ / N ☐
6. Lack of at least two layers of privacy at public, shared or household bathing and toilet facilities? (inadequate = lack of privacy wall at least 1.8m around facility in addition to a lack of individual cubicle privacy).	Y ☐ / N ☐
7. Inadequate privacy of individual toilet or shower cubicles? (for example – privacy exists but material is inadequate or ripped)?	Y ☐ / N ☐
8. Inadequate or non-functional door on any of the cubicles? (inadequate door = lacking a solid frame, poorly fitting with gaps)	Y ☐ / N ☐
9. Inadequate, missing, or non-functional cubicle locking mechanism in any of the cubicles? (inadequate = less than 100kgs static holding force)	Y ☐ / N ☐
10. Lack of adequate night-time security lighting at WASH facilities? (inadequate lighting = less than 100 lumens / m^2 up to 3m around block)	Y ☐ / N ☐
Total score of risks	**/ 10**

UNHCR WASH SAFETY AND SECURITY CHECKLIST

C.	**Risk of trip, slip, or fall when using WASH infrastructure**	
1.	Risk of wet or slippery surfaces at water collection, laundering, bathing, toilet, or waste disposal areas?	Y ☐ / N ☐
2.	Risk of tripping over steps, kurbs, or raised objects when accessing WASH services or infrastructure?	Y ☐ / N ☐
3.	Risk of falling from elevated structures? (raised toilets, open well etc.)	Y ☐ / N ☐
4.	Lack of hand-rails to provide additional support when climbing steps or stairs to WASH infrastructure? (raised toilets, open well etc.)	Y ☐ / N ☐
5.	Lack of hand-rails to provide additional support in potentially wet or slippery areas?	Y ☐ / N ☐
6.	Lack of anti-slip floor surfaces in potentially wet or slippery areas?	Y ☐ / N ☐
7.	Solid waste pits (or latrine pits under construction) without adequate fencing or clear and visible warning tape and signs?	Y ☐ / N ☐
8.	Any other risks of trip, slip, or fall at the site?	Y ☐ / N ☐
	Total score of risks	**/ 8**
D.	**Risk of cut, pinch, pierce, crush, or splinter when using WASH infrastructure**	
1.	Risk of cut, pinch, pierce, crush, or splinter when using handpump or any other water collection or lifting equipment?	Y ☐ / N ☐
2.	Risk of cut, pinch, pierce, crush, or splinter when using solid waste containers?	Y ☐ / N ☐
3.	Risk of cut, pinch, pierce, crush, or splinter when using toilet or bathing cubicles?	Y ☐ / N ☐
4.	Any other risks of cut, pinch, pierce, crush, or splinter at the site?	Y ☐ / N ☐
	Total score of risks	**/ 4**
E.	**Risk of drowning when using WASH infrastructure**	
1.	Surface water collection (river, stream, lake, pond) taking place at the site?	Y ☐ / N ☐
2.	Open wells are not equipped with locked covers / metallic grills?	Y ☐ / N ☐
3.	Open well headwalls are lower than 70cm?	Y ☐ / N ☐
4.	Septic tanks are not equipped with locked covers?	Y ☐ / N ☐
5.	Toilet slab or support structure at risk of collapse?	Y ☐ / N ☐
6.	Blocked drainage canals or risk of poorly managed drainage?	Y ☐ / N ☐
7.	Any other risks of drowning at the site?	Y ☐ / N ☐
	Total score of risks	**/ 7**
F.	**Risk of burning when using WASH infrastructure**	
1.	Hot water provided for bathing or laundering is greater than 50 °C?	Y ☐ / N ☐
2.	Burning of solid wastes taking place at the site?	Y ☐ / N ☐
3.	Any other risks of burning at the site?	Y ☐ / N ☐
	Total score of risks	**/ 3**

Signature of Inspector …….. **Community representative ……..**

Notes

WASH ORGANISATIONAL CAPACITY ASSESSMENT

- Capacity building of national public, private, or refugee-based WASH service providers is an essential element in ensuring there is a long-term durable strategy for WASH service provision in refugee settings. It should be carried out in parallel with activities to switch to appropriate and affordable low-cost WASH technologies for the setting, making WASH service provision as cost-effective as possible to facilitate handover.
- Capacity building activities should focus on reinforcing technical skills, ensuring the organisation has the financial and material resources (e.g. office furniture, computers, printers, waste collection trucks, containers, water pumps etc.) to carry out effective WASH programming, in addition to reinforcing administrative systems (finance, admin, logistics). Any interventions to hand over WASH service provision should be carried out slowly and carefully with continued support and capacity building. Once WASH services are handed over, UNHCR and WASH actors should continue to work with national regulatory authorities to ensure that the quality of services is being carried out to defined standards.
- This tool has been designed to help obtain a snapshot capacity of national public, private, or refugee-based WASH service providers and understand the type of interventions that can be carried out to build capacity. Please note that the list of questions is not exhaustive and is merely intended to focus attention on areas of potential organisational capacity support. Common sense should be used at all times and if there is a clear capacity building need that is not included on the sheet it should be noted in the additional comments section for support.
- The tool should be used to guide a conversation (approximately an hour long) with the most senior representatives of the organisation. It should be made clear that the aim of the tool is not to identify weaknesses within the organisation but to understand where the organisation can most benefit from additional support and strengthening.
- At the end of the tool, the results may be plotted on a radar plot (or simple bar chart) as follows..



A. TECHNICAL SERVICE DELIVERY	
1. WASH sectoral expertise	
a. Relevant WASH sectoral expertise and experience (water supply, excreta management, hygiene promotion, solid waste management, disease vector control) exists within the organization.	⓪①②③④⑤⑥
b. The organization is able to carry out WASH related technical design, build, operate, train, transfer, and regulate related activities to national WASH quality standards.	⓪①②③④⑤⑥
c. WASH expertise is distributed throughout the organisation and does not rest with one or two individuals.	⓪①②③④⑤⑥

2. Geographical coverage	
a. The WASH organisation has a programmatic presence in areas affected by displaced population or has the ability to expand WASH programming into these areas.	⓪①②③④⑤⑥
3. WASH assets and resources	
a. The WASH organisation currently has the required staffing, assets, and resources (e.g. pumps, tankers, reservoirs, surveying equipment, water quality testing equipment, tankers, drilling equipment, waste collection equipment, vector control equipment etc.) to carry out WASH program delivery to relevant standards, or has a demonstrated ability to procure these assets?	⓪①②③④⑤⑥
4. Stakeholder consultation	
a. WASH programs currently undertaken by the organization are based on real prioritized needs and are designed and implemented in association with stakeholders. Accountability mechanisms are in place and functional.	⓪①②③④⑤⑥
5. Value for money	
a. WASH programs currently undertaken by the organization are efficient, adequate, cost effective, timely, and responsive.	⓪①②③④⑤⑥
6. Programmatic sustainability	
a. The WASH programs carried out by the organization have clear exit strategies and systems of sustainable operation, maintenance and cost-recovery in the medium and long-term.	⓪①②③④⑤⑥
B. GOVERNANCE	
1. Board / advisors	
a. The WASH organisation has a board or list of advisors composed of elected and capable members who carry out key roles such as policy formulation, fund raising, public relations, or financial oversight.	⓪①②③④⑤⑥
2. Clearly defined mission and goals	
a. The WASH organisation has clearly articulated mission/goals and clearly defined objective statements aligned with a mission statement.	⓪①②③④⑤⑥
3. Legal status	
a. The WASH organisation is registered according to relevant legislation.	⓪①②③④⑤⑥
4. Leadership	
a. Board / advisors, and senior management have a clear understanding of their respective roles and responsibilities.	⓪①②③④⑤⑥
b. Leadership style of senior management is participatory.	⓪①②③④⑤⑥
C. MANAGEMENT PRACTICES	
1. Organizational structure and culture	
a. The WASH organisation has an organizational structure with clearly defined lines of authority and responsibility.	⓪①②③④⑤⑥
b. Systems are in place to ensure appropriate involvement of all levels of staff in decision making.	⓪①②③④⑤⑥

2. Planning	
a. The WASH organisation has short, medium and long-term plans that are used and are updated regularly.	⓪①②③④⑤⑥
3. Administrative procedures	
a. Administrative procedures and manual exist.	⓪①②③④⑤⑥
4. Monitoring, evaluation and reporting	
a. The WASH program carried out by the organisation incorporates monitoring, evaluation and reporting activities	⓪①②③④⑤⑥
b. Systems exist to collect, analyse and report data and information.	⓪①②③④⑤⑥
c. The organisation has the ability to produce a range of appropriate reports.	⓪①②③④⑤⑥
D. HUMAN RESOURCES	
1. Human resources management	
a. Recruitment processes are transparent and competitive.	⓪①②③④⑤⑥
b. Job descriptions are documented and updated.	⓪①②③④⑤⑥
c. Salaries are clearly structured and competitive.	⓪①②③④⑤⑥
2. Human resources development	
a. Job appraisals are performance based and equitable.	⓪①②③④⑤⑥
b. Staff training is based on capacity, needs and strategic objectives.	⓪①②③④⑤⑥
3. Human resources management	
a. The WASH organisation has short, medium and long-term plans that are used and are updated regularly.	⓪①②③④⑤⑥
4. Work organisation	
a. Staff meetings are held regularly and team work is encouraged.	⓪①②③④⑤⑥
E. FINANCIAL AND PROCUREMENT	
1. Accounting	
a. Appropriate financial procedures and reporting systems are in place. Account categories exist for separating project funds.	⓪①②③④⑤⑥
2. Budgeting	
a. Budgeting process is integrated into annual implementation plans.	⓪①②③④⑤⑥
b. A financial unit responsible for the preparation, management and implementation of the annual budget exists and budgetary control is carried out on an ongoing basis.	⓪①②③④⑤⑥
3. Procurement	
a. Appropriate stock control systems exist.	⓪①②③④⑤⑥
b. Appropriate procurement systems are in place.	⓪①②③④⑤⑥
c. Internal and external audits are conducted on a regular basis.	⓪①②③④⑤⑥
d. The organization has the ability to prepare, launch, analyse and award competitive tenders	⓪①②③④⑤⑥
4. Financial reporting	
a. Annual financial report is prepared by a registered firm of auditors.	⓪①②③④⑤⑥

5. Diversification of income base	
a. The organization has multiple funding sources.	⓪①②③④⑤⑥
b. The organization has the ability to tender for contracts.	⓪①②③④⑤⑥
F. EXTERNAL RELATIONS	
1. Stakeholder relations	
a. The organization is seen as credible by stakeholders and funders.	⓪①②③④⑤⑥
2. Inter-organisation collaboration	
a. The organisation networks and shares resources with other national WASH organisations.	⓪①②③④⑤⑥
3. Government collaboration	
a. The organisation has contacts with government policy and decision makers.	⓪①②③④⑤⑥
4. Funder collaboration	
a. The organisation has diversified contacts within the funding community.	⓪①②③④⑤⑥
5. Public relations	
a. The organisation engages in public relations. Activity information disseminated.	⓪①②③④⑤⑥
6. Local resources	
a. The organisation has relations with the private sector for technical expertise, material and/or human resources.	⓪①②③④⑤⑥
7. Media	
a. The organisation has media strategy and has attracted positive media attention.	⓪①②③④⑤⑥
G. SUSTAINABILITY	
1. Program/benefit sustainability	
a. Programs are supported by those being served.	⓪①②③④⑤⑥
b. The organisation has developed systems for continuation of its program in the medium and long-term.	⓪①②③④⑤⑥
c. The organisation has developed programmatic phasing-out strategies.	⓪①②③④⑤⑥
2. Organizational sustainability	
a. The organisation has linkages with international NGOs, education institutions, government entities, research institutes, and the private sector.	⓪①②③④⑤⑥
3. Financial sustainability	
a. The organisation has the ability to access diversified resources.	⓪①②③④⑤⑥
b. The organisation has a fee for services and/or other cost recovery mechanisms built into service delivery where appropriate.	⓪①②③④⑤⑥
c. The organisation has a fund raising strategy.	⓪①②③④⑤⑥
d. The organisation has capacity to develop proposals and respond to tenders and calls for proposals.	⓪①②③④⑤⑥

UNHCR BOREHOLE LOG

UNHCR field staff and their partners must ensure that a drilling log, development log, constant discharge pump test, and step drawdown pump test are completed for every borehole. Copies must be kept by the drilling agency, the WASH partner, national regulatory authorities, and UNHCR.

A) Agency information	
Drilling Agency:	Drilling rig make and model:
Drilling Officer:	Drilling fluid used:
Contact details:	Drilling bit sizes:
Name of Geologist:	Date started:
Drilling method:	Date completed:
B) Borehole location	
District:	Coordinates:
Sub-district:	Latitude:
Village / Camp:	Longitude:
Location:	Elevation:

Depth (m)	Time (hh: mm)	Description (geology, colour, density, hardness, gradations, angularity, odour, fragments, lamination etc.)	Acid test (reaction to 5% HCl acid)	Conductivity (µS/cm)	Water struck (est. of yield)	Observations (bit diameter, use of mud additives, foam etc.)	Casing plan
0m							
2m							
4m							
6m							
8m							
10m							
12m							
14m							
16m							
18m							
20m							
22m							
24m							
26m							
28m							
30m							
32m							
34m							
36m							
38m							
40m							
42m							
44m							
46m							
48m							
50m							

UNHCR BOREHOLE LOG

UNHCR field staff and their partners must ensure that a drilling log, development log, constant discharge pump test, and step drawdown pump test are completed for every borehole. Copies must be kept by the drilling agency, the WASH partner, national regulatory authorities, and UNHCR.

C) Borehole construction details

Borehole diameter:		mm
Casing / screen diameter:		mm
Screen / slot size:		mm

Sediment formation

Head casing length:		m
Casing length:		m
Screen length:		m
Gravel pack length:		m
Gravel pack volume		litres
Gravel pack size:		mm
Gravel pack type:		
Grout seal length:		m
Total borehole depth:		m

Hard rock formation

Head casing length:		m
Casing length:		m
Screen length:		m
Grout seal length:		m
Total borehole depth:		m

Yield

Static water level:		m
Dynamic water level:		m
Production yield		m^3/hr
Conductivity		µS/cm

Equipping

Pump type:		
Pump setting depth:		m
Centralizers		Y/N
Rising main material		
Rising main diameter		mm

UNHCR BOREHOLE LOG

UNHCR field staff and their partners must ensure that a drilling log, development log, constant discharge pump test, and step drawdown pump test are completed for every borehole. Copies must be kept by the drilling agency, the WASH partner, national regulatory authorities, and UNHCR.

D) Remarks

E) Sketch plan of borehole location (show any nearby buildings/features and the north direction)

UNHCR BOREHOLE LOG

UNHCR field staff and their partners must ensure that a drilling log, development log, constant discharge pump test, and step drawdown pump test are completed for every borehole. Copies must be kept by the drilling agency, the WASH partner, national regulatory authorities, and UNHCR.

F) Borehole construction sketch (show dimensions)

UNHCR BOREHOLE LOG

UNHCR field staff and their partners must ensure that a drilling log, development log, constant discharge pump test, and step drawdown pump test are completed for every borehole. Copies must be kept by the drilling agency, the WASH partner, national regulatory authorities, and UNHCR.

G) Borehole development

	Depth (m)		Time (min.)	Measured yield (l/s)	Dynamic water level (m)	Observations (presence of sand, clay etc.	Conductivity (µS/cm)
	Pipe	Hose					
Pumping							
Flushing							
Pumping							
Pumping							
Flushing							
Pumping							
Pumping							
Flushing							
Pumping							
Pumping							
Flushing							
Pumping							
Pumping							
Flushing							
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Flushing							
Pumping							
Pumping							
Flushing							
Pumping							
Pumping							
Flushing							
Pumping							
Pumping							
Flushing							
Pumping							

Compressor size: Compressor make: Compressor model:	Remarks:

H) Constant duration pumping test

Boreholes that will be equipped with handpumps need only be subjected to a constant discharge pump test for 12 hours. Production boreholes that will be motorized must be tested for 48 hours.

PUMPING					RECOVERY			
Time	Pumping time (minutes)	Water level (m)	Drawdown (m)	Discharge (l/s)	Time	Recovery time (minutes)	Water level (m)	Residual drawdown (m)
	0							
	3							
	5							
	10							
	15							
	20							
	30							
	40							
	50							
	(1H) 60							
	80							
	100							
	(2H) 120							
	140							
	160							
	(3H) 180							
	210							
	(4H) 240							
	270							
	(5H) 300							
	330							
	(6H) 360							
	(7H) 420							
	(8H) 480							
	(9H) 540							
	(10H) 600							
	(11H) 660							
	(12H) 720							
	(13H) 780							
	(14H) 840							
	(16H) 960							
	(18H) 1080							
	(20H) 1200							
	(22H) 1320							
	(24H) 1440							
	(32H) 1920							
	(40H) 2400							
	(48H) 2880							
Discharge rate (l/s): Duration (hours):					Observations:			

I) Step drawdown pumping test

Three constant discharge steps must be selected with the third step being 20% greater than the design yield. The duration of each step is 2 hours.

STEP n° :	**1**	**Discharge rate (l/s) :**		**Pumping duration :**			**2 hours**
PUMPING				**RECOVERY**			
Time	Pumping time (minutes)	Water level (m)	Drawdown (m)	Discharge (l/s)	Time	Recovery time (minutes)	Water level (m)	Residual drawdown (m)
	0							
	1							
	2							
	3							
	5							
	10							
	15							
	20							
	30							
	40							
	50							
	(1H) 60							
	80							
	100							
	(2H) 120							

STEP n° :	**2**	**Discharge rate (l/s) :**		**Pumping duration :**			**2 hours**
PUMPING				**RECOVERY**			
Time	Pumping time (minutes)	Water level (m)	Drawdown (m)	Discharge (l/s)	Time	Recovery time (minutes)	Water level (m)	Residual drawdown (m)
	0							
	1							
	2							
	3							
	5							
	10							
	15							
	20							
	30							
	40							
	50							
	(1H) 60							
	80							
	100							
	(2H) 120							

STEP n° :	3	Discharge rate (l/s) :		Pumping duration :	2 hours

PUMPING					RECOVERY			
Time	Pumping time (minutes)	Water level (m)	Drawdown (m)	Discharge (l/s)	Time	Recovery time (minutes)	Water level (m)	Residual drawdown (m)
	0							
	1							
	2							
	3							
	5							
	10							
	15							
	20							
	30							
	40							
	50							
	(1H) 60							
	80							
	100							
	(2H) 120							

Observations:

UNHCR BOREHOLE LOG

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J) Hydrogeologist's report (include graphs of constant discharge and step drawdown tests)

TOILET INFRASTRUCTURE ASSESSMENT FORM

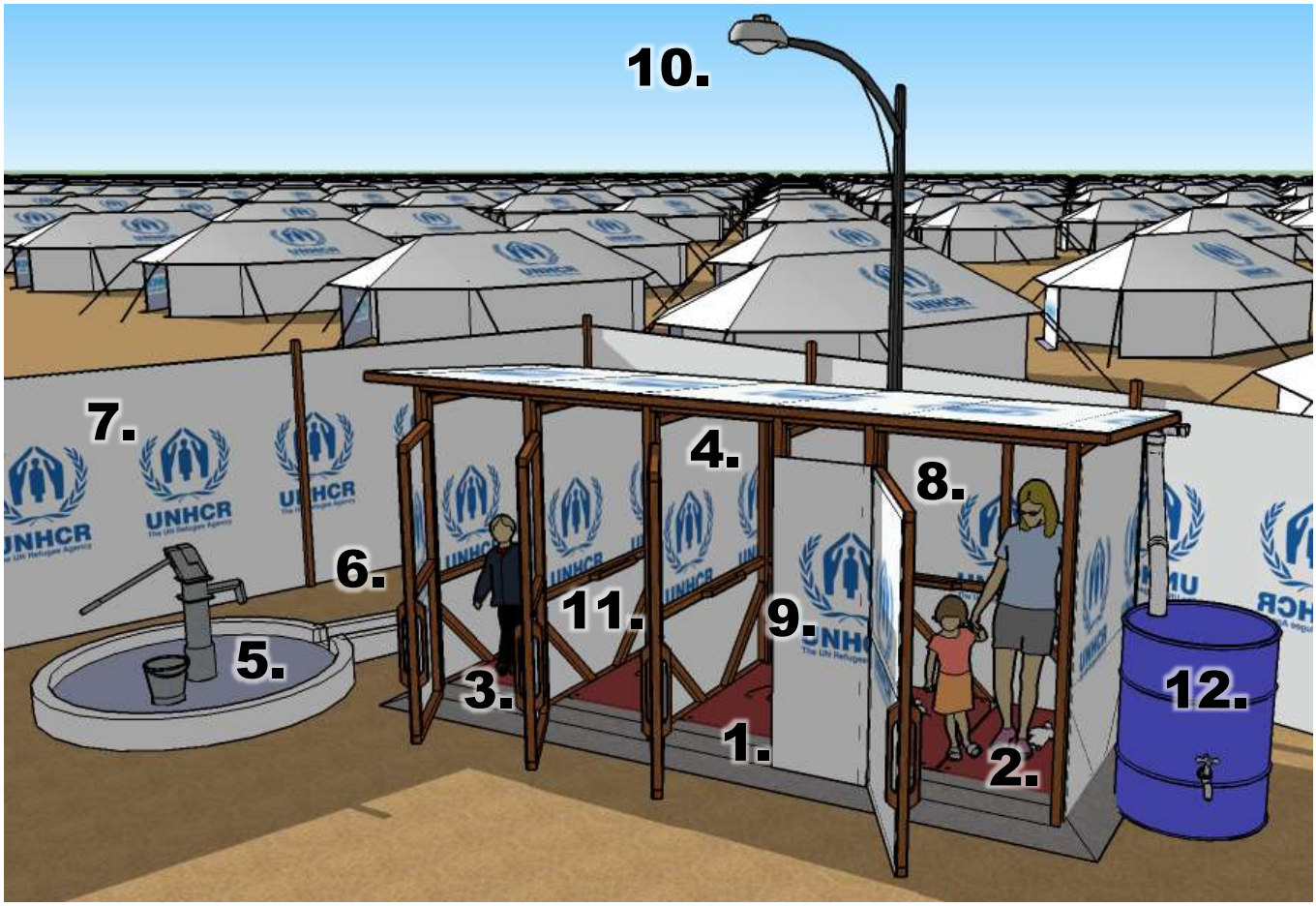
COMMUNAL TRENCH LATRINE

A. General Information

Location: Camp _____ Sector _____ Block _____ Community _____

GPS Long: _____°_____'_____" GPS Lat: _____°_____'_____" Number of toilet cubicles: _____

Contact person: _____ Position: _____ Date of visit: ____/_____/_____



B. Identification of risk factors	**Risk**
1. Are the pit walls visibly cracked / broken / leaking / flooded?	Y ☐ / N ☐
2. Is the toilet pit full? (less than 0.5m remaining space in the pit)?	Y ☐ / N ☐
3. Is the toilet block unsanitary? (traces of faeces anywhere inside the toilet facilities)?	Y ☐ / N ☐
4. Is there any evidence of fly infestation? (presence of one or more flies in the cubicle during the assessment period)?	Y ☐ / N ☐
5. Are there any drinking water sources within 10m of the toilet facility?	Y ☐ / N ☐
6. Is there evidence of open defecation anywhere around the toilet block?	Y ☐ / N ☐
7. Is there a lack of a privacy screen around the toilet block?	Y ☐ / N ☐
8. Is there a lack of privacy inside any of the toilet cubicles? (for example - is any of the plastic sheeting missing or ripped)?	Y ☐ / N ☐
9. Are any of the toilet cubicles missing a functional security lock?	Y ☐ / N ☐
10. Is there a lack of adequate night-time security lighting within 3m of the toilet block? (adequate lighting = at least 100 lumens / m^2)	Y ☐ / N ☐
11. Is there a lack of a functional hand-washing station within 10m of the toilet? (functional = soap + handwashing water + drainage)	Y ☐ / N ☐
12. Is there a lack of handrails for vulnerable groups (elderly / infirm / disabled / children)?	Y ☐ / N ☐
Total score of risks	**/ 12**

Signature of Inspector …….. **Community representative** ……..

Note: Risk score: 9-12 = very high, 6-8 = high, 3-5 = intermediate, 0-2 = low

EXCRETA MANAGEMENT INFRASTRUCTURE ASSESSMENT TOOL

- This assessment tool has been designed to assist UNHCR field staff and their partners collect data on excreta management during a needs assessment. The main purpose of this tool is to identify problems related to excreta management and identify actions to bring conditions to UNHCR standards.
- This tool attempts to capture most of the common problems encountered with excreta management, however the user should apply common sense and document any additional problems that may not be covered.
- It is good practice to discuss the results of this assessment with members of the displaced community before departing. Matters of extreme urgency should be addressed immediately.

EXCRETA MANAGEMENT INFRASTRUCTURE ASSESSMENT TOOL

Assessor(s): _____
_____

Contact details: _____

Date of assessment : _____/_____/_____

Site information

Site location (District, Town, Village etc.): _____

GPS Long: _____°_____'_____" GPS Lat: _____°_____'_____"

☐ Planned camp ☐ Unplanned camp ☐ Urban collective centre ☐ Host families

☐ Rented accommodation ☐ Public buildings ☐ Other _____

Contact person: _____ Position: _____

Number of men: _____
Number of women: _____
Number of children: _____

Phone number: _____

Toilet coverage information

☐ Number of cubicles _____ ☐ Total daily users _____ ☐ Coverage rate _____(persons/toilet)

☐ Estimated % of population defecating in the open _____

Privacy structure type

☐ Wood frame / plastic sheeting ☐ Wood frame / corrugated iron sheeting ☐ Wood frame / grass covering

☐ Concrete Block ☐ Brick ☐ Cement ☐ Wood ☐ Other _____ *(tick all that apply)*

Toilet type

☐ Plastic squatting slab ☐ Wooden squatting slab ☐ Concrete sanplat ☐ Ceramic pour flush slab

☐ Non-reinforced dome concrete slab ☐ Urine diverting toilet ☐ Ceramic cistern flush toilet

☐ Bucket latrine ☐ Non-flush pedestal type toilet ☐ Oil drum latrine ☐ Storage tank latrine

☐ Plastic bag latrine ☐ Portable toilet ☐ Trench latrine ☐ Defecation field ☐ Other _____

Privacy structure / toilet problems

☐ Broken privacy structure?
☐ Toilet block unsanitary (faeces visible on toilet surface, or inside facilities)?
☐ Toilet block flooded?
☐ Insufficient number of toilets?
☐ Lack of privacy screen around toilet block?
☐ Lack of privacy inside toilet cubicle?
☐ Lack of security (lack of functional lock or lighting)?
☐ Lack of dedicated cleaning equipment (buckets / mops, brushes, detergent etc.)?
☐ Lack of dedicated cleaning attendant?
☐ Insufficient water for adequate operation or anal-cleansing?
☐ Evidence of open defecation?
☐ Inadequate cleaning (< four times a day or strong smell of excreta or urine)?
☐ Inappropriate design?
☐ Fly infestation (flies observed during assessment period)?
☐ Difficult access / usage for vulnerable groups (elderly / infirm / disabled / children)?
☐ Lack of personal protective equipment for cleaners (gloves, aprons, overalls, boots)?
☐ Lack of functional hand-washing station within 5m / 15ft of toilet?
☐ _____
☐ _____

Collection / storage system

☐ Offset pit ☐ Direct pit ☐ Double pit ☐ Raised pit ☐ Dehydrating vault ☐ Composting vault

☐ Septic tank ☐ Sewage holding tank ☐ Transfer station ☐ Biogas vault ☐ Other _____

Toilet capacity information

☐ Vault / pit capacity _____(m^3) ☐ Used volume ____(%)

Excreta collection / storage problems

☐ Excreta containment structure inadequately covered or sealed?
☐ Containment structure < 1.5m / 5ft of groundwater table?
☐ Containment structure <30m from water source?
☐ Fly infestation (flies observed during the assessment period)?
☐ Excreta containment structure visibly cracked / broken / leaking / flooded?
☐ Excreta containment structure full or overflowing?
☐ Presence of vermin or other vectors?
☐ _____
☐ _____

Excreta handling / desludging operations
☐ Human emptying ☐ Motorized emptying ☐ Buckets ☐ Vacuum pumps ☐ Diaphragm pumps
☐ Centrifugal pumps ☐ Other _____ *(tick all that apply)*

Excreta desludging device specifications
☐ Device make _____ ☐ Device model _____ ☐ Power_____(kW)

Excreta handling / desludging problems
☐ Excreta leakage?
☐ Direct contact between excreta and personnel?
☐ Visible traces of excreta on equipment during transportation or storage?
☐ Desludging equipment or vehicles inadequately cleaned or disinfected (0.2% chlorine), between desludging?
☐ Inadequate disposal of desludging cleaning water?
☐ Lack of personal protective equipment for desludging staff?
☐ Lack of on-site showers for desludging staff?
☐ _____
☐ _____

Excreta transportation information
☐ Sludge tankers ☐ Sludge carts ☐ Sealed drums ☐ Other _____ *(tick all that apply)*
☐ Volume _____(m^3) ☐ Type _____ ☐ Emptying Frequency _____ ☐ Condition _____

Excreta transportation problems
☐ Excreta transportation tank overflowing, leaking, or poorly sealed / covered?
☐ Unauthorized dumping?
☐ Visible traces of excreta on transportation system?
☐ Visible traces of excreta along transportation route?
☐ Fly infestation (flies observed during assessment period)?
☐ Insufficient fuel / capacity?
☐ _____

Presence and use of sewers
☐ Conventional sewer ☐ Simplified sewer ☐ Interceptor sewer ☐ Vacuum sewer ☐ Other _____
☐ Sewer pipe material _____ ☐ Sewer lengths _____(m) ☐ Sewer diameters _____(mm)

Sewer related problems
☐ Sewer pipes or inspection chambers overflowing, blocked or leaking?
☐ Insufficient retention times?
☐ Sewer pipes exposed or buried less than 0.5m / 2ft?
☐ Inspection chambers or rodding eyes inadequately sealed?
☐ Fly infestation (one or more flies observed on inspection)?
☐ _____
☐ _____

Excreta treatment practice
☐ Off site sewage treatment works ☐ Waste stabilization ponds ☐ Anaerobic digester
☐ Constructed wetlands / reed beds ☐ Septic tank ☐ Trickling filter ☐ Activated sludge
☐ Thickening ponds ☐ Drying beds ☐ Composting ☐ Other _____ *(tick all that apply)*
☐ Width ____(m) Height ____(m) Length ____(m) ☐ Volume ____(m^3) ☐ Flow rate ____(l/s)

Excreta treatment related problems
☐ Excreta containment structures cracked, broken, overflowing, leaking, flooded, inadequately covered or sealed?
☐ Insufficient retention times?
☐ Inadequate protection from surface water?
☐ Poor maintenance schedule / lack of cleaning / replacement?
Inadequate fencing?
☐ Lack of personal protective equipment for workers?
☐ _____
☐ _____

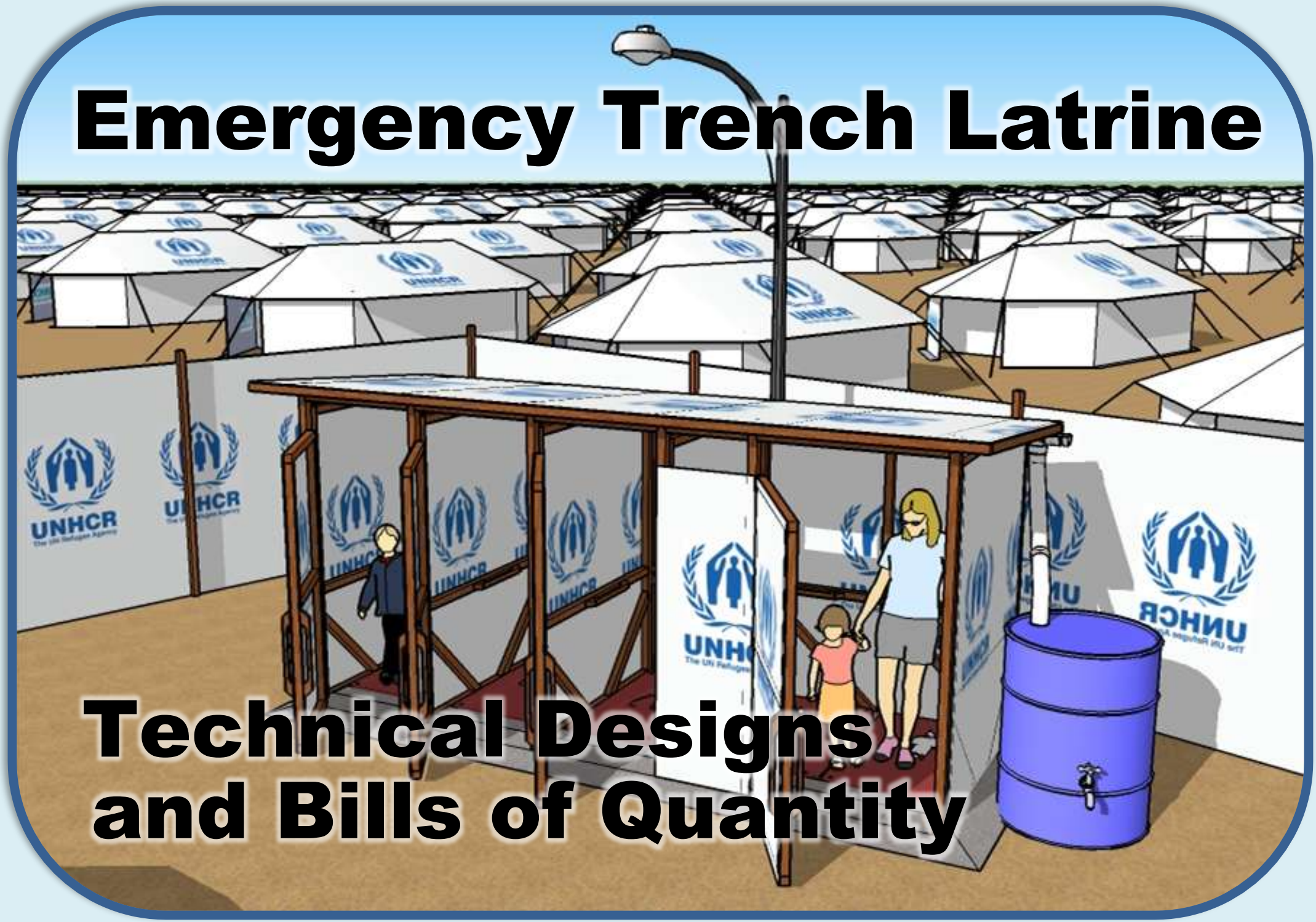
Excreta final disposal practice
☐ Fill And Cover ☐ Leach Field ☐ Other _____ *(tick all that apply)*

Excreta final disposal problems
☐ Untreated disposal of excreta into water bodies?
☐ Excreta disposal location less than 1.5m / 5ft above groundwater level?
☐ Fly infestation (flies observed during the assessment period)?
☐ Application of untreated excreta to directly to land, or inadequate soil cover depth?
☐ Lack of personal protective equipment?
☐ _____
☐ _____
☐ _____

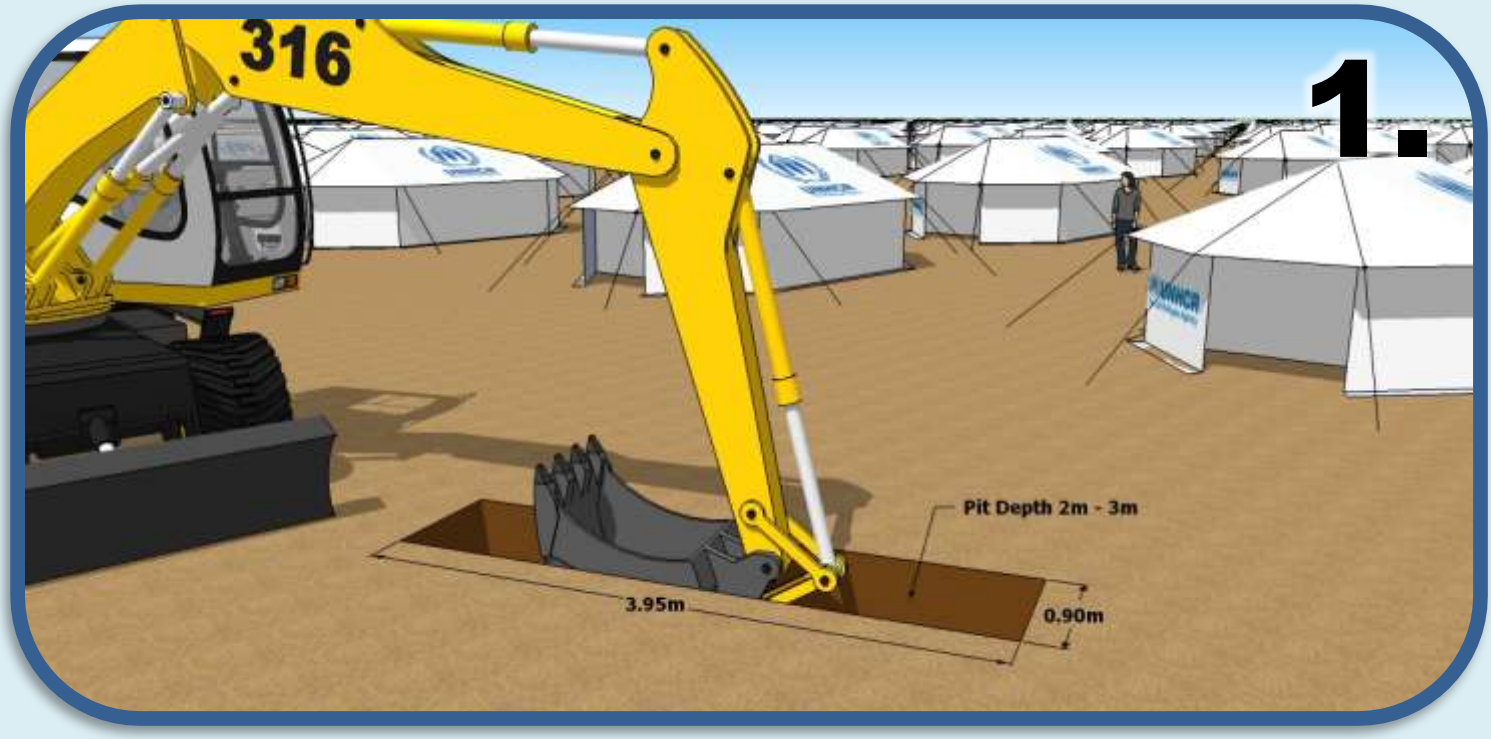
Toilet programme operation and maintenance information
☐ No. of toilet attendants _____ ☐ No. of maintenance crew _____ ☐ Cleaning stocks _____(weeks)
☐ # Shovels _____ ☐ # Wheelbarrows ____ ☐ # Buckets _____ ☐ # Brushes _____ ☐ # Mops _____
☐ # Backpack sprayers ____ ☐ # Overalls ____ ☐ # Thick soled boots _____ ☐ # Thick gloves ____
☐ # Aprons ___ ☐ # Eye protection ____ ☐ # Masks ____ ☐ # Chlorine ____(kg) ☐ Detergent ____(l)

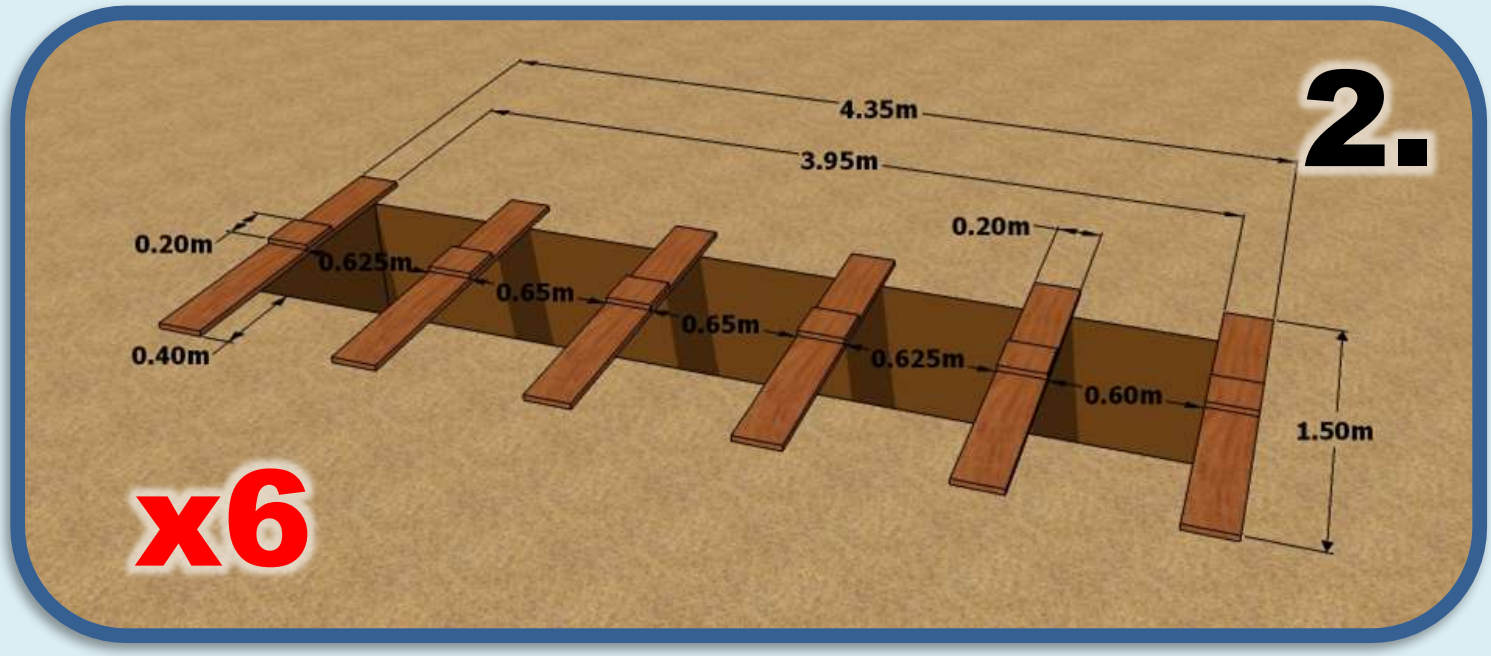
Operation and maintenance related problems
☐ Insufficient cleaning and maintenance staff?
☐ Staff insufficiently trained?
☐ Lack of maintenance equipment?
☐ Poor routine cleaning and maintenance schedule?
☐ Lack of personal protective equipment?
☐ Lack of consumables?
☐ Lack of on-site showers for sanitation workers?
☐ _____

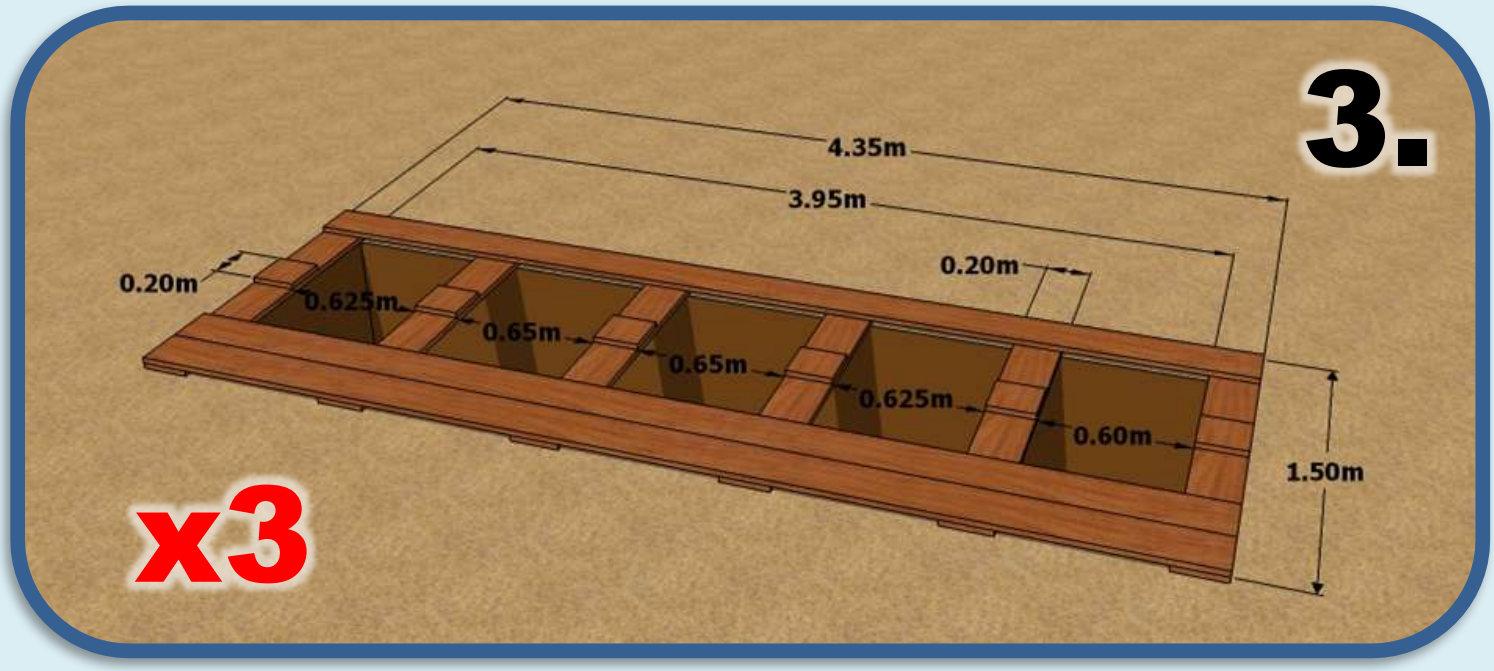
Emergency Trench Latrine

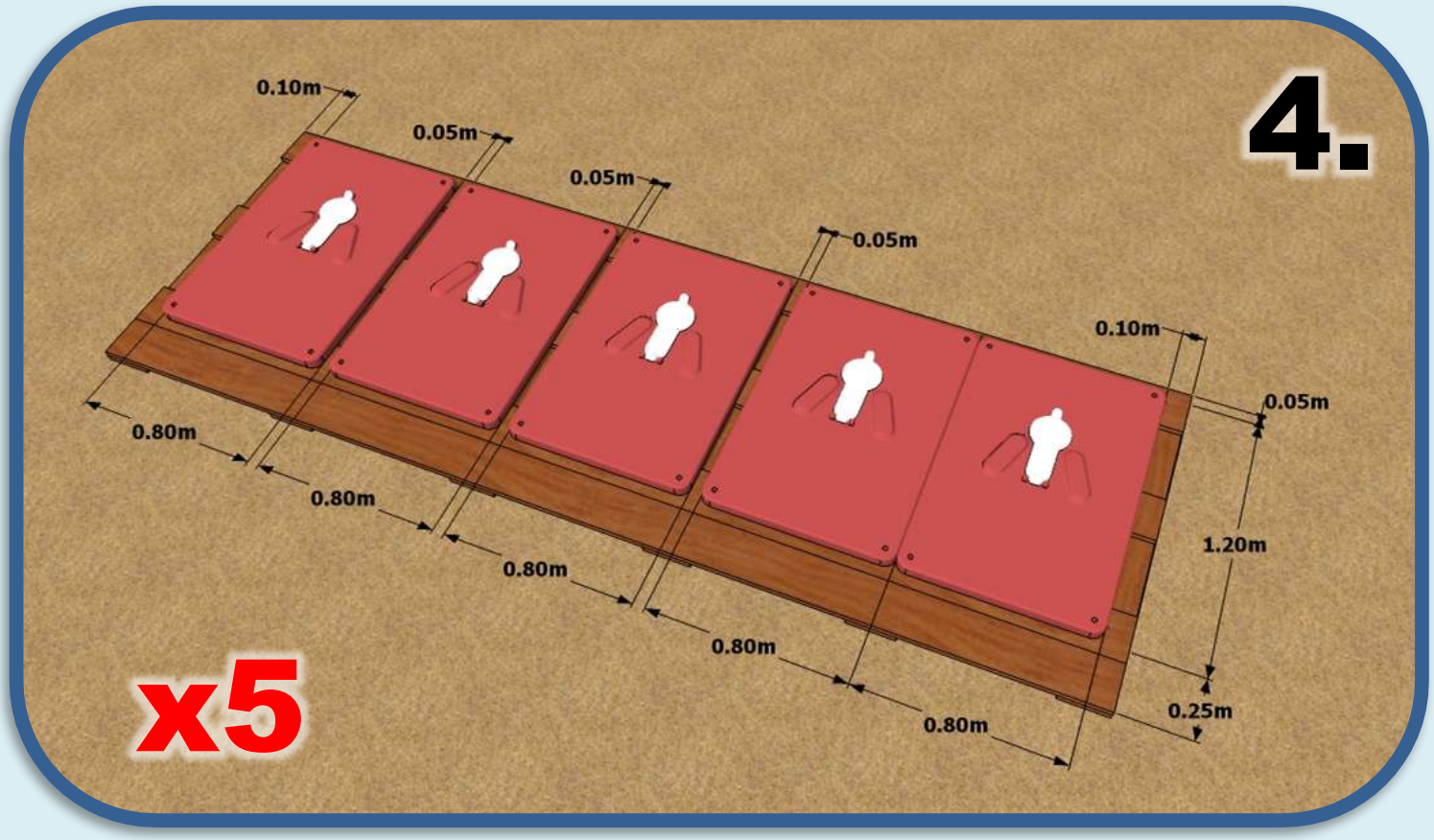


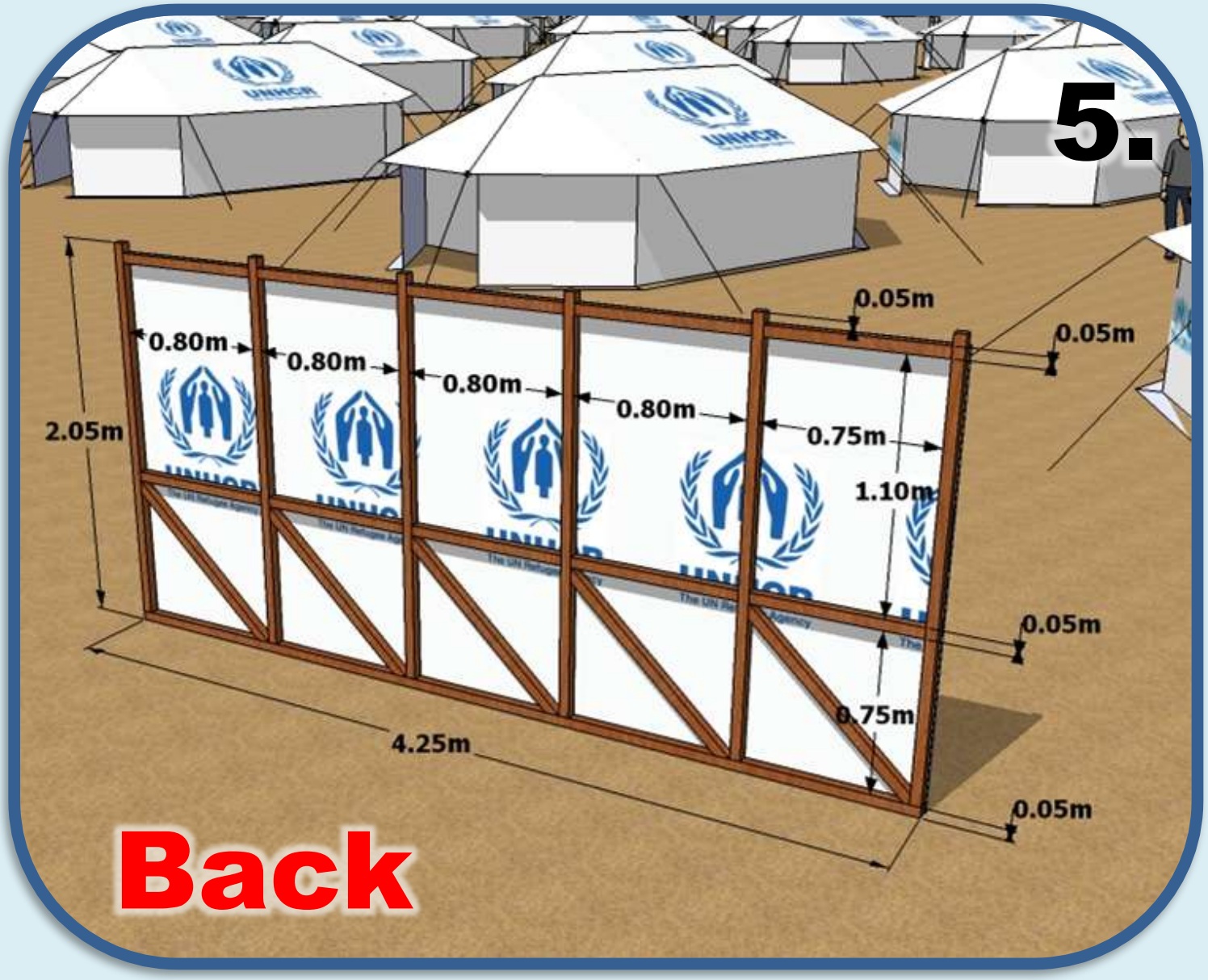
Technical Designs and Bills of Quantity


316
1.
Pit Depth 2m - 3m
3.95m
0.90m


2.
4.35m
3.95m
0.20m
0.20m
0.625m
0.65m
0.65m
0.625m
0.60m
0.40m
1.50m
x6

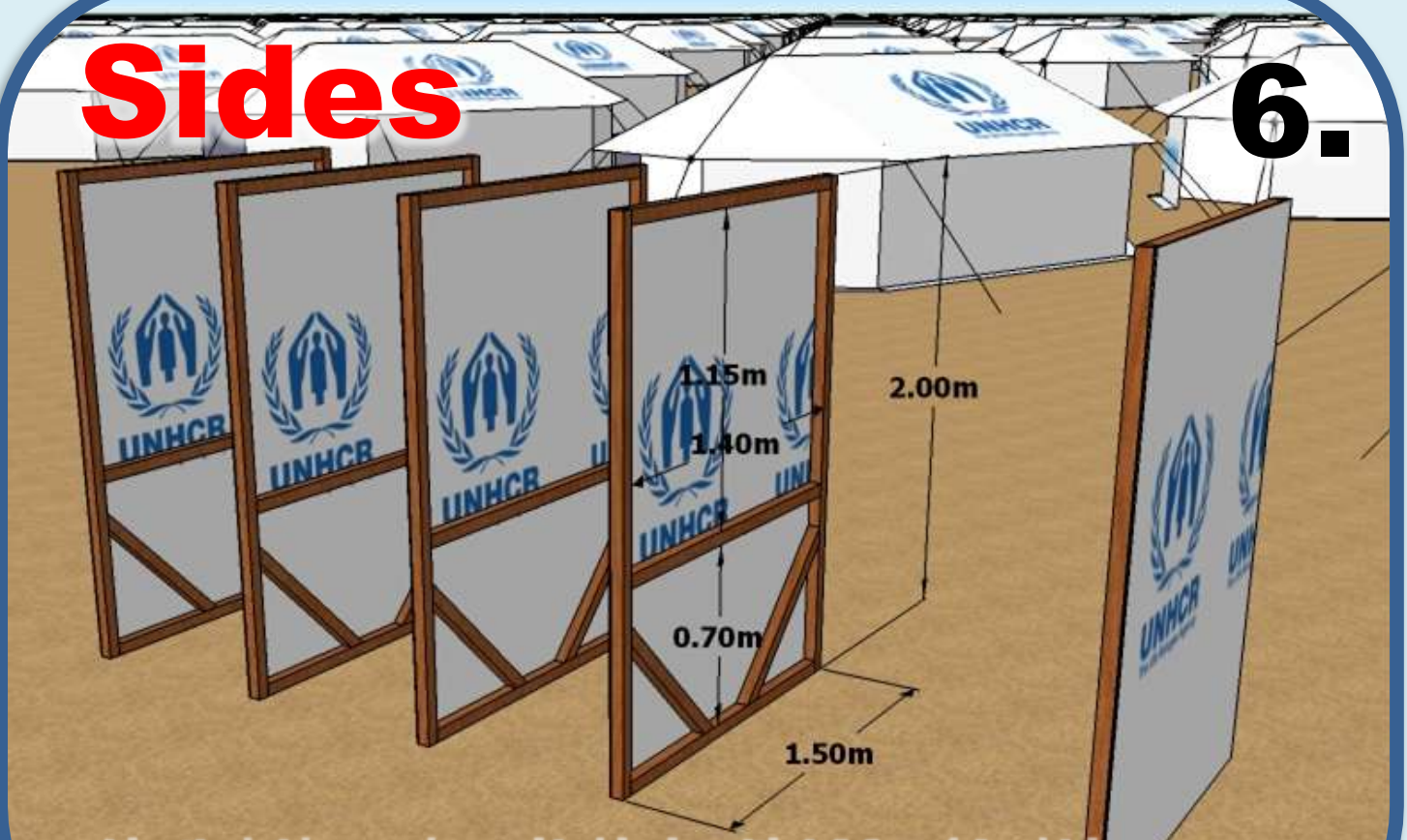

3.
4.35m
3.95m
0.20m
0.20m
0.625m
0.65m
0.65m
0.625m
0.60m
1.50m
x3


4.
0.10m
0.05m
0.05m
0.05m
0.10m
0.05m
0.80m
0.80m
0.80m
0.80m
0.80m
1.20m
0.25m
x5


5.
0.05m
0.05m
0.80m
0.80m
0.80m
0.80m
0.75m
2.05m
1.10m
0.05m
0.75m
4.25m
0.05m
Back

Sides

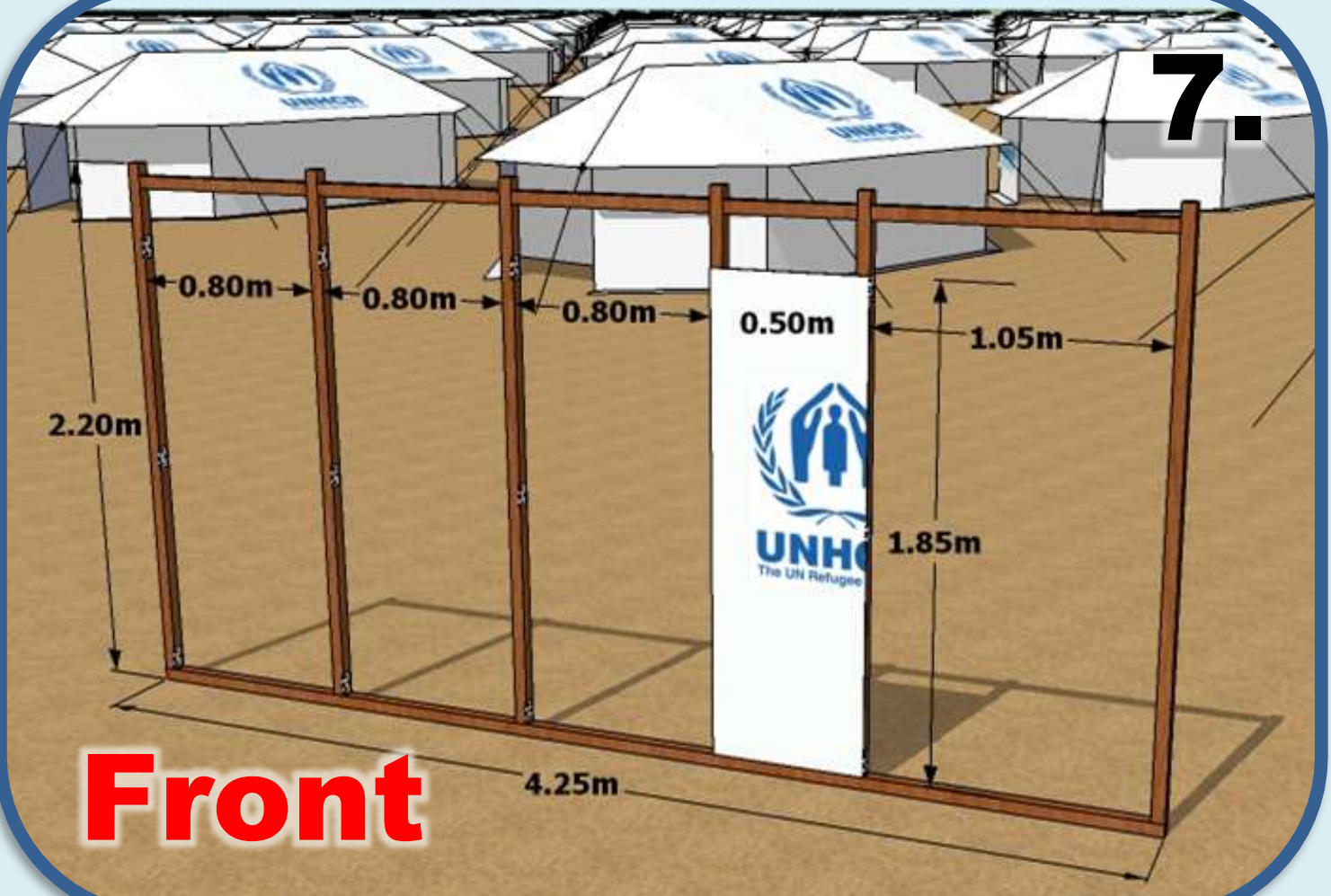
6.



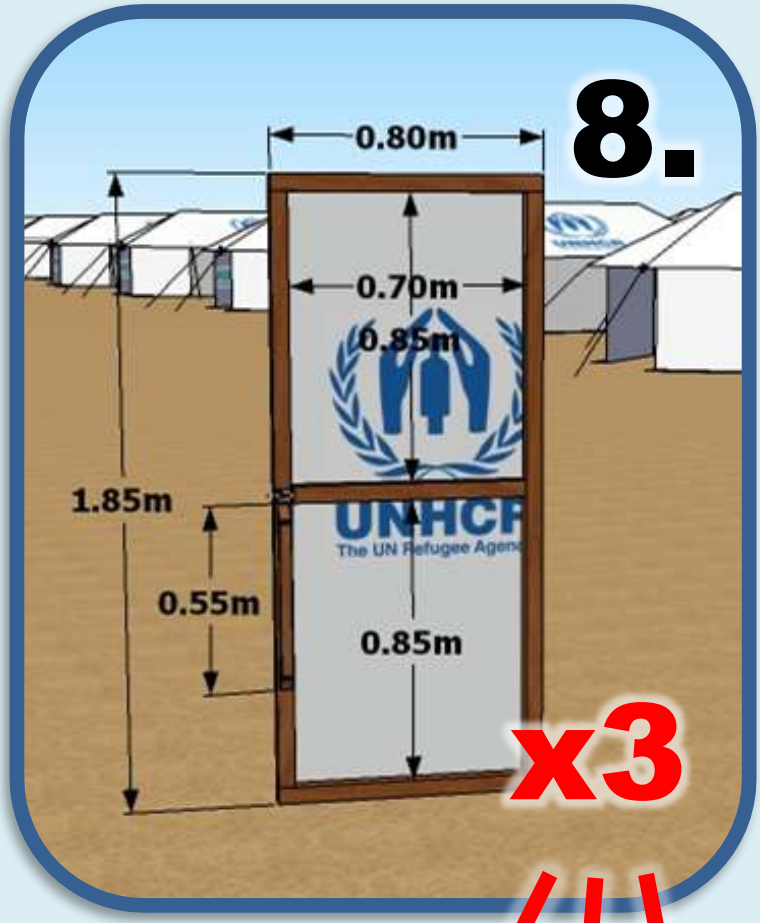
Identical side panels used in blocks with 1,2,3,and 4 cubicles.

Panels can be stockpiled with emergency contingency supplies.

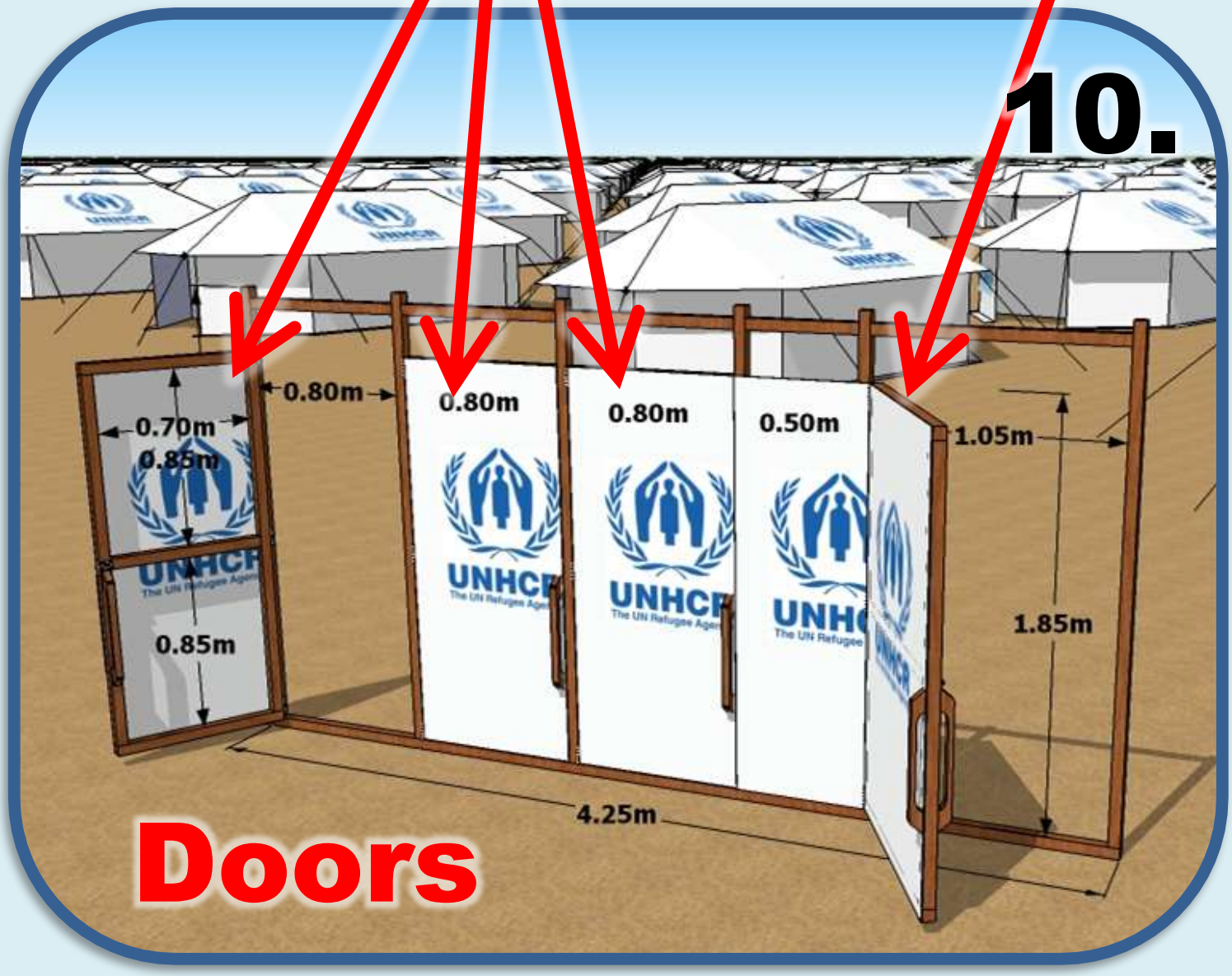
7.



Front


8.
0.80m
0.70m
0.85m
1.85m
0.55m
0.85m
x3


9.
1.05m
0.95m
0.85m
1.85m
0.55m
0.85m
x1


10.
0.80m
0.80m
0.80m
0.50m
0.70m
0.85m
0.85m
1.05m
1.85m
4.25m
Doors

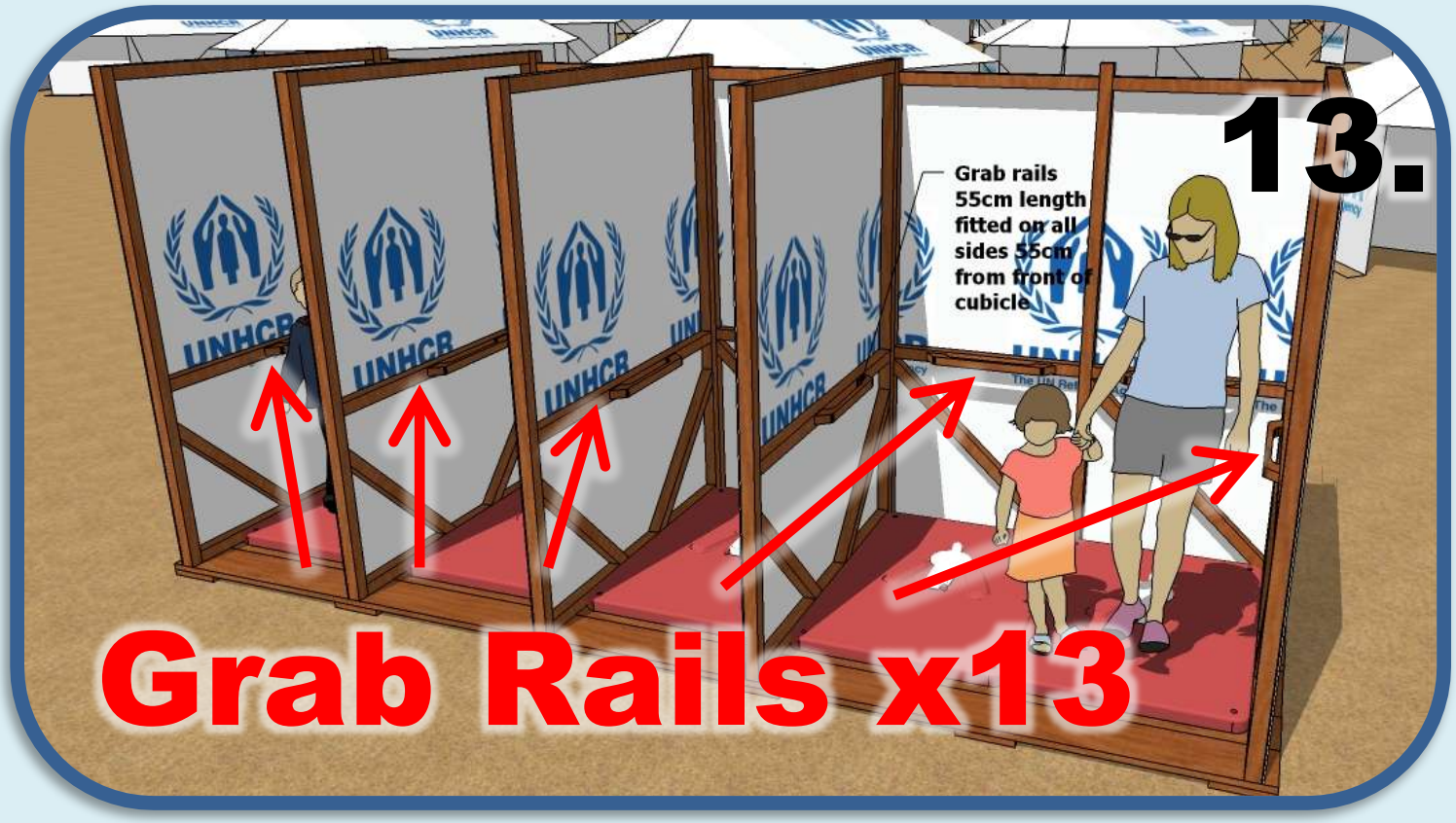




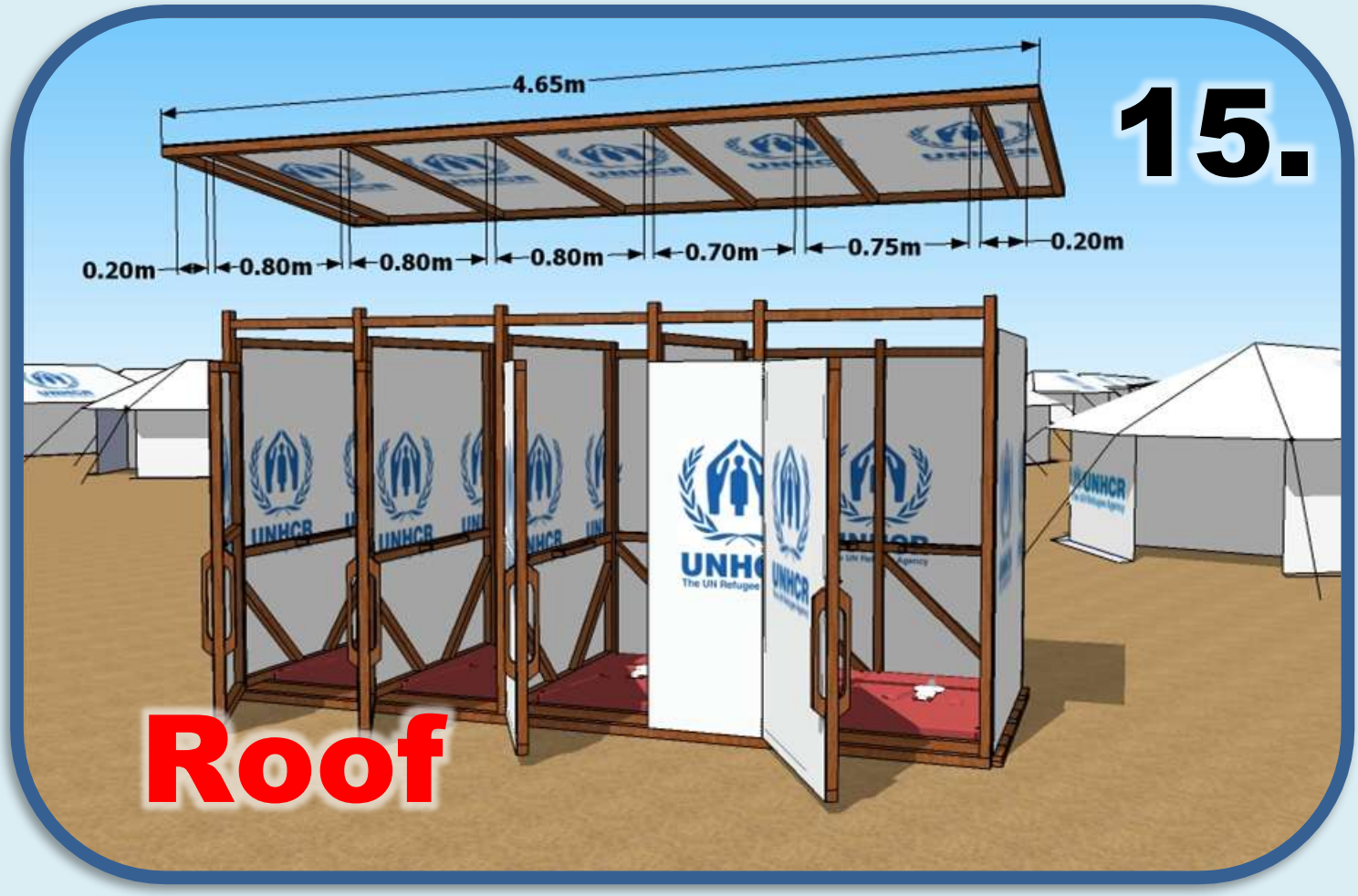
Assembly 12.



Panels to be **BOLTED** together for ease of storage, assembly, disassembly, moving and reuse in new locations


13.
Grab rails 55cm length fitted on all sides 55cm from front of cubicle
Grab Rails x13


14.
Assembly


15.
4.65m
0.20m
0.80m
0.80m
0.80m
0.70m
0.75m
0.20m
Roof


16.
Assembly

17.



Sanitary Seal

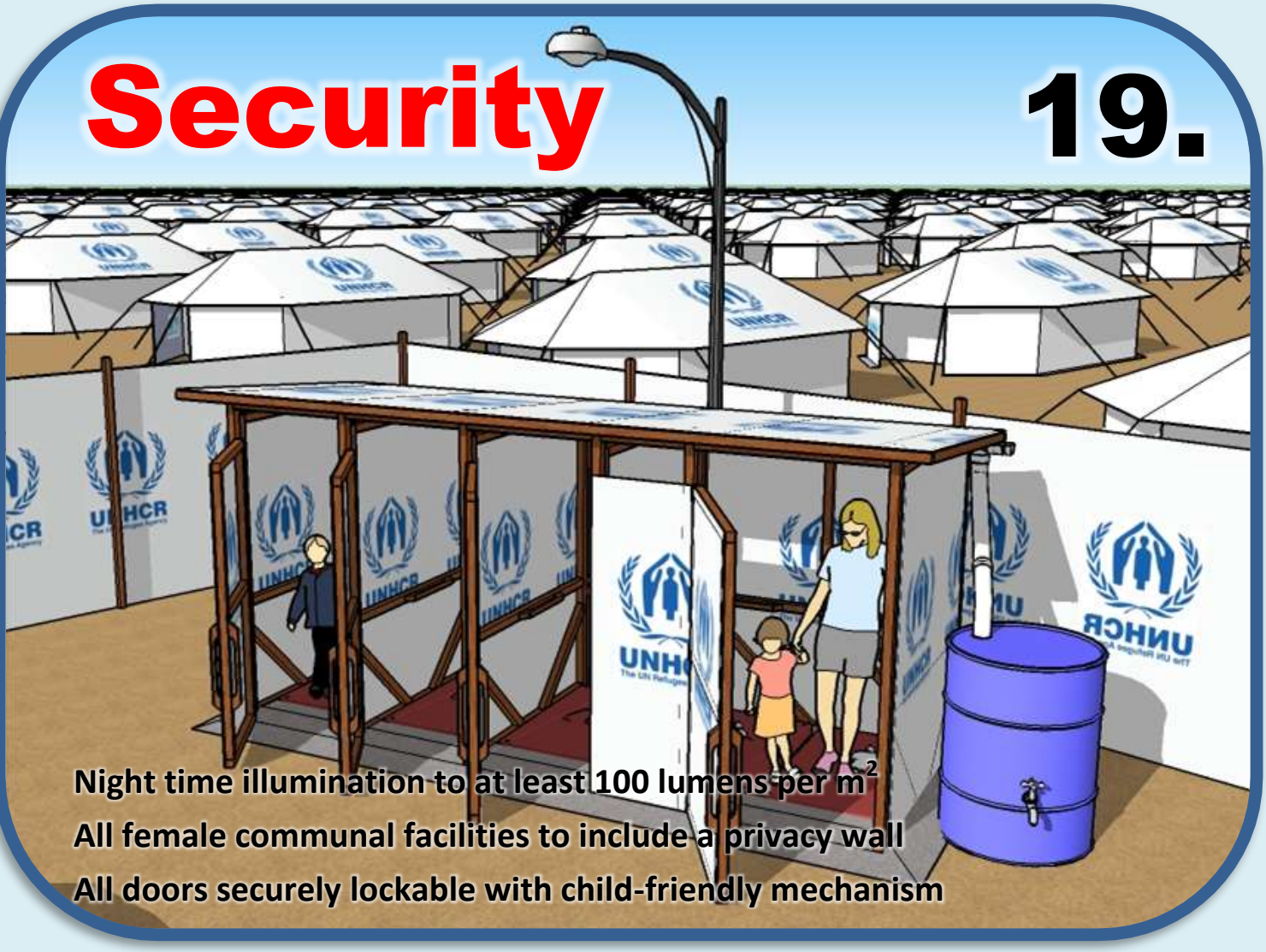
18.



Handwashing

Security

19.



Night time illumination to at least 100 lumens per m^2

All female communal facilities to include a privacy wall

All doors securely lockable with child-friendly mechanism

All plastic sheeting to be upgraded within 6 months

Upgrade walls, doors, slabs, vent-pipes

20.



Upgrades

Bill of Quantities

1. *Wooden Post (pc)*
   5cm x 5cm x 4m



x39

2. *Wooden Plank (pc)*
   2.5cm x 20cm x 4m



x7

3. *Nails 10cm (kg)*



x4

4. *Nails 5cm (kg)*



x3

5. *Latrine Slab (pc)*
   80cm x 120cm



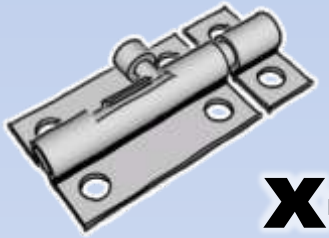
x5

6. *Plastic Sheeting*
   50m x 4m (roll)



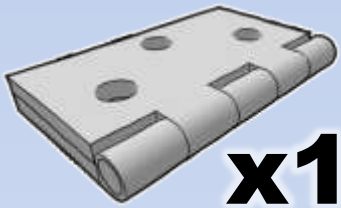
x¼

7. *Door Bolt 4cm (pc)*



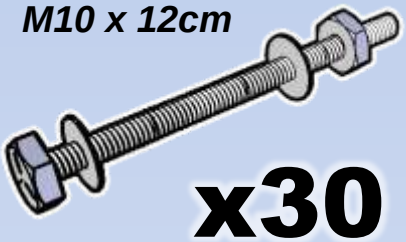
x4

8. *Door Hinge (pc)*
   4cm x 8cm



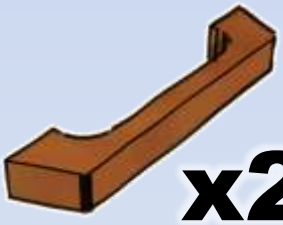
x12

9. *Metal Bolt + Washers*
   M10 x 12cm



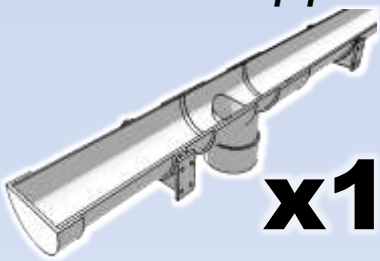
x30

10. *Grab Rails and Door Handles 50cm (pc)*



x21

11. *Gutter Assembly*
    430m + Downpipe



x1

12. *Handwashing Reservoir 200l (pc)*



x1

13. *Sand (m3)*



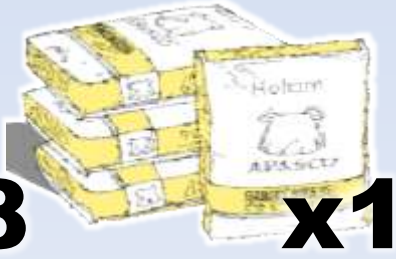
x0.4

14. *Gravel (m3)*



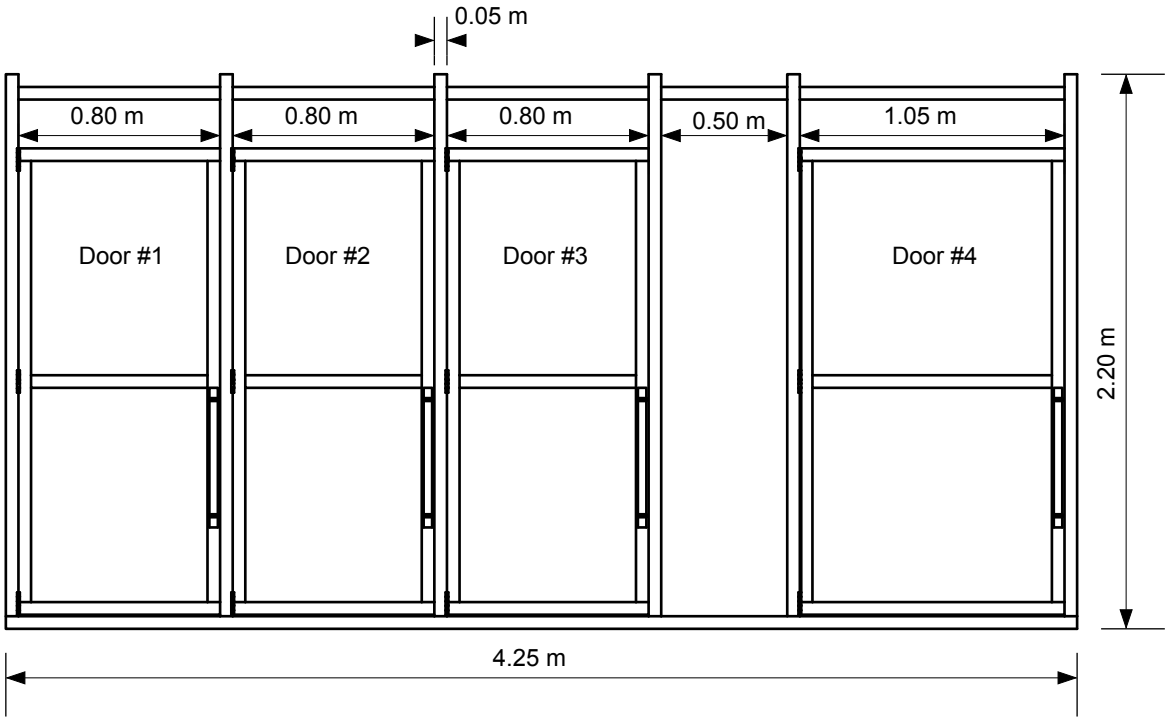
x0.8

15. *Cement 50kg (sacks)*

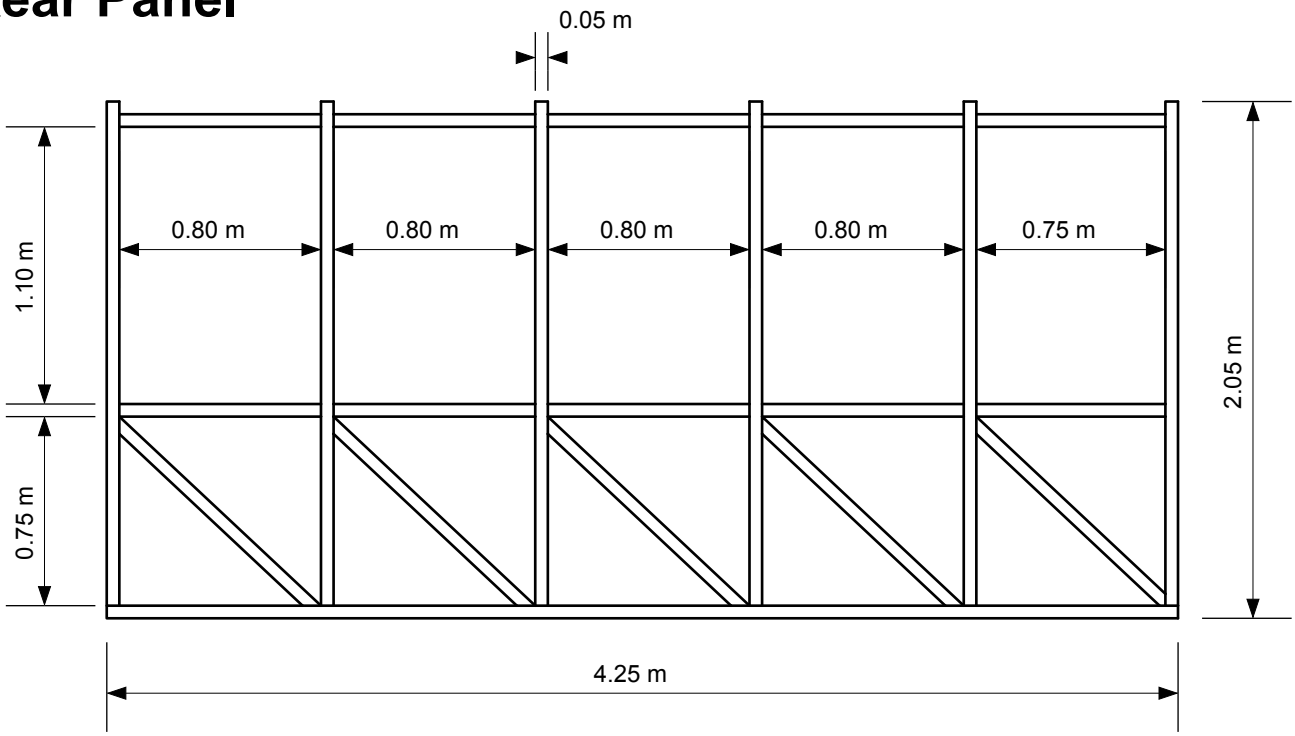


x1

Front Panel



Rear Panel



A.01

TITLE
Communal Trench Latrine
General Layout

PROJECT
Project Name, Country

DRAWN BY
B. Harvey - 11/12/13

APPROVED BY
D. Porteaud - 15/01/14

SCALE
1:30

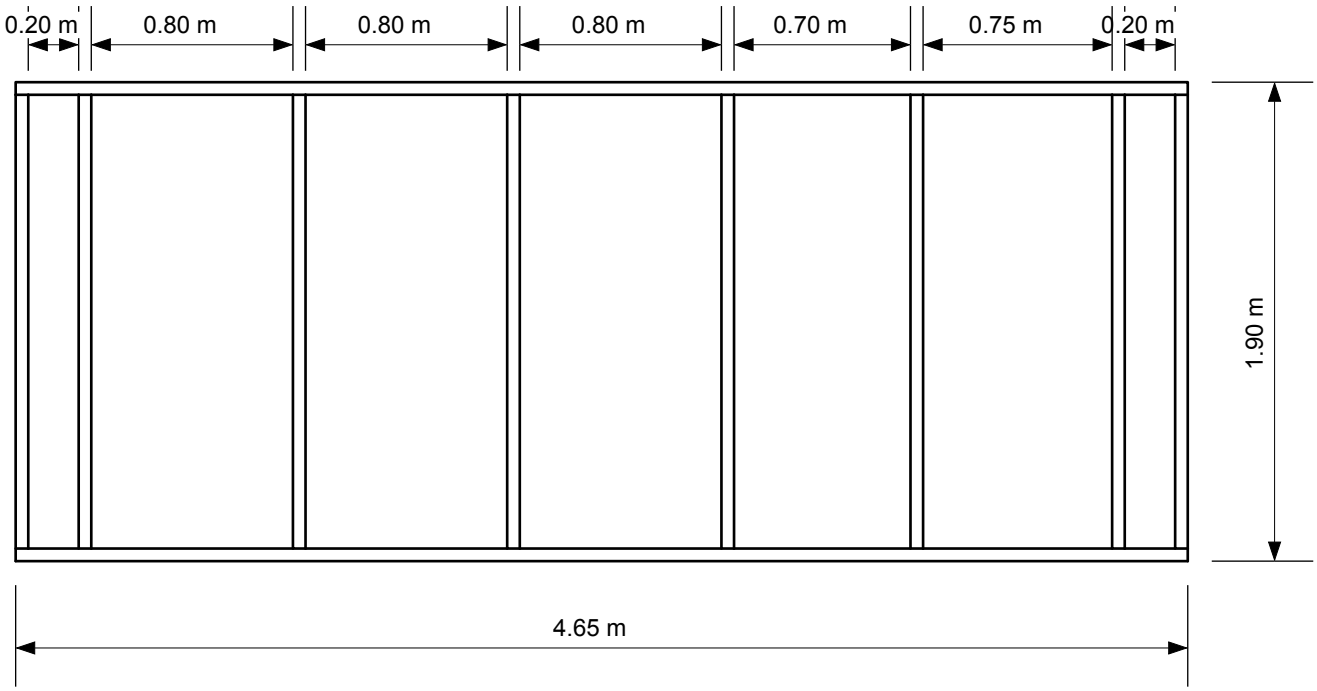
UNITS
metres

SHEET
1 of 5

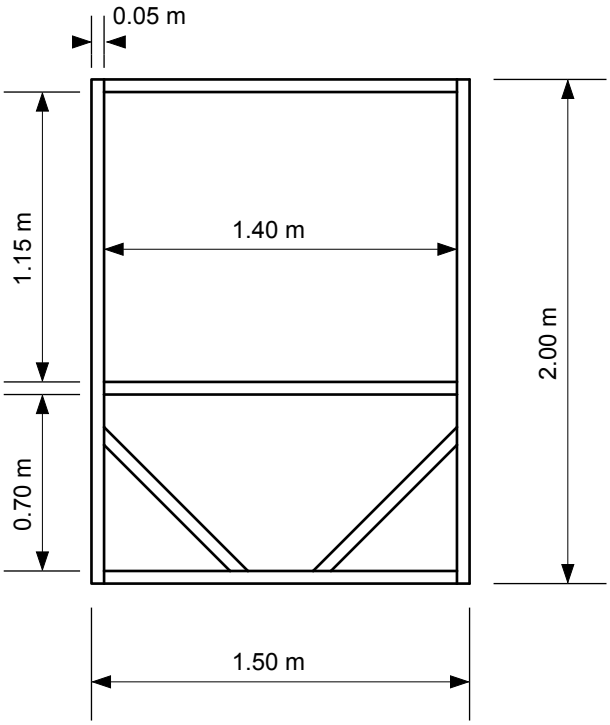
DATE PUBLISHED
02/02/14

UNHCR
The UN Refugee Agency

Roof Panel



Side Panels



x5

A.02

TITLE
Communal Trench Latrine
General Layout

PROJECT
Project Name, Country

DRAWN BY
B. Harvey - 11/12/13

APPROVED BY
D. Porteaud - 15/01/14

SCALE
1:30

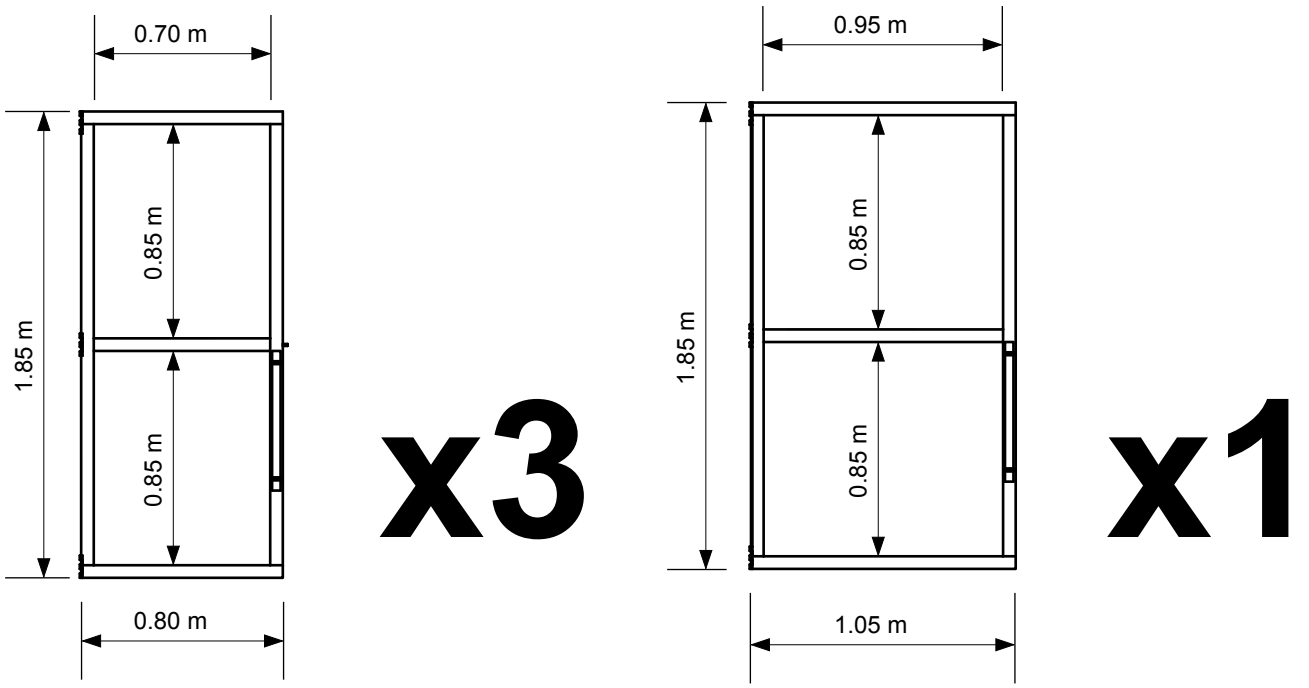
UNITS
metres

SHEET
2 of 4

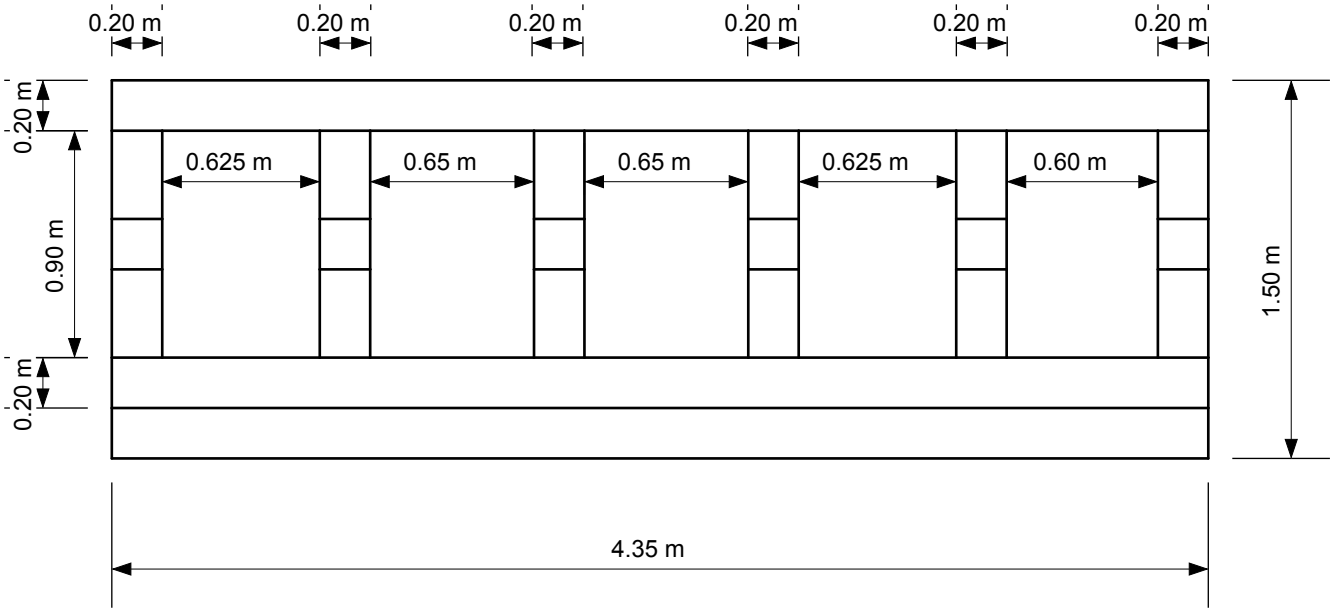
DATE PUBLISHED
02/02/14

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Doors Detail



Latrine Slab Support Planks



A.03

TITLE
Communal Trench Latrine
General Layout

PROJECT
Project Name, Country

DRAWN BY
B. Harvey - 11/12/13

APPROVED BY
D. Porteaud - 15/01/14

SCALE
1:30

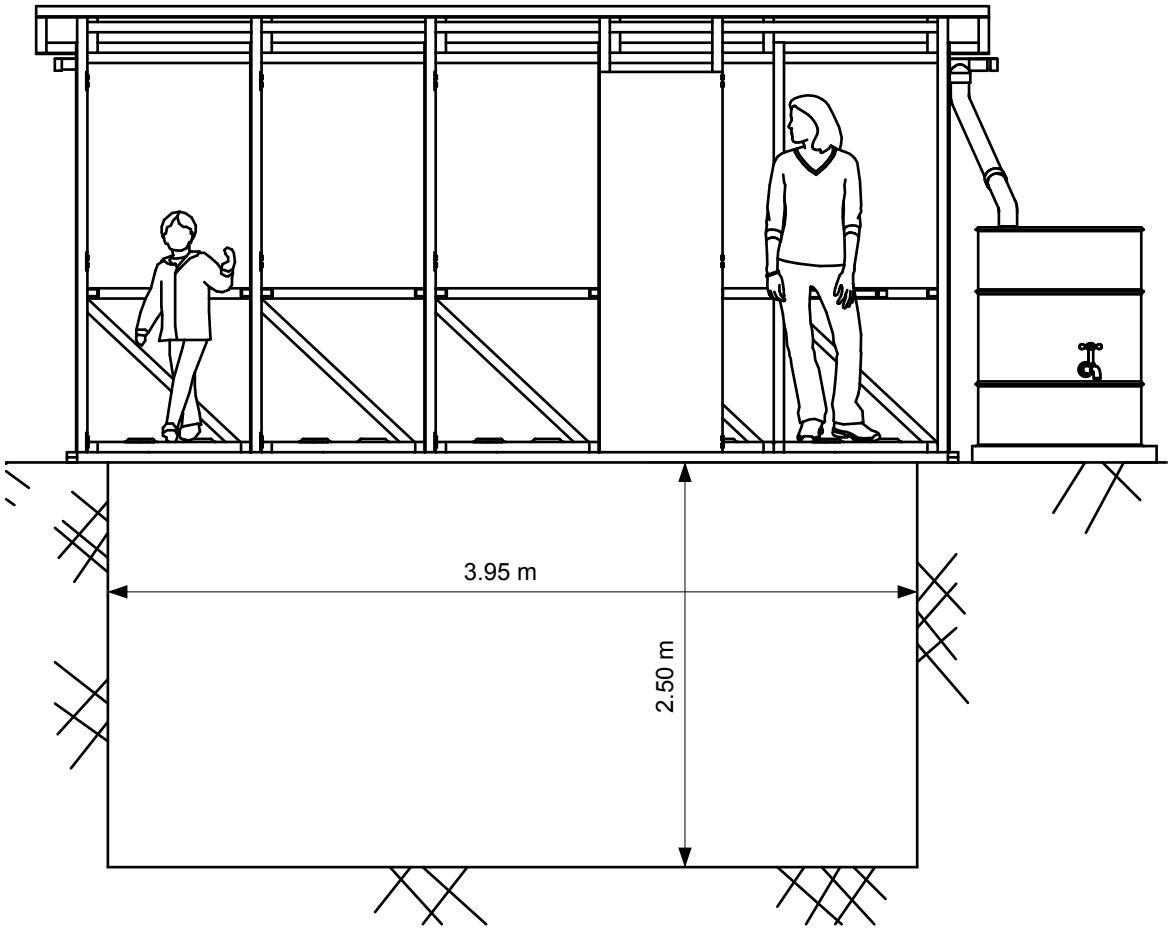
UNITS
metres

SHEET
3 of 5

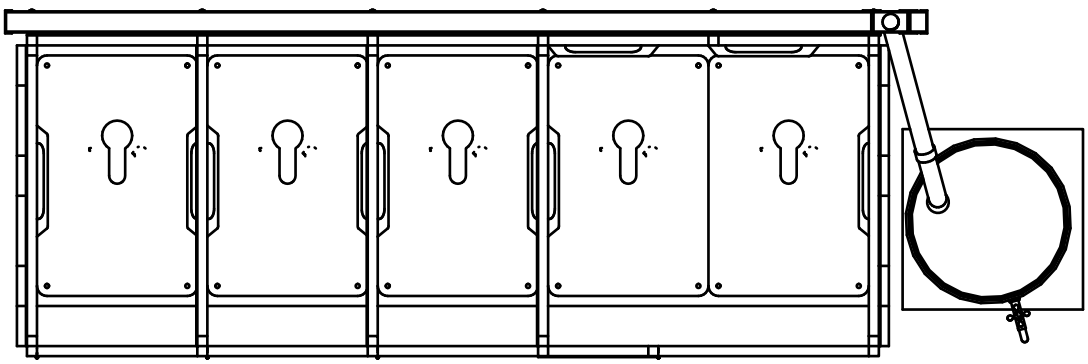
DATE PUBLISHED
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Assembly Front



Plan View



A.04

TITLE
Communal Trench Latrine
General Layout

PROJECT
Project Name, Country

DRAWN BY
B. Harvey - 11/12/13

APPROVED BY
D. Porteaud - 15/01/14

SCALE
1:30

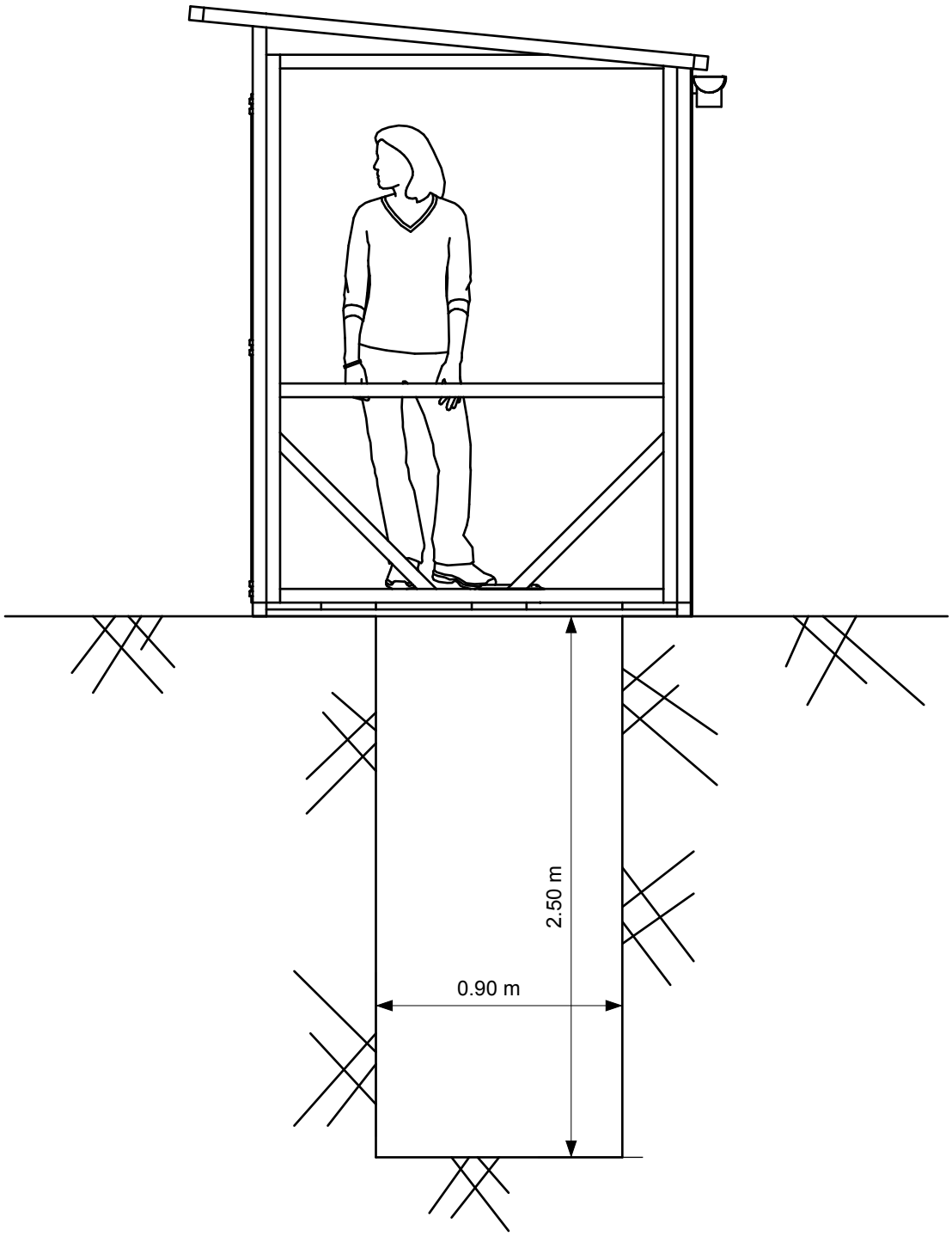
UNITS
metres

SHEET
4 of 5

DATE PUBLISHED
02/02/14

UNHCR
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Assembly Side



A.05

TITLE
Communal Trench Latrine
General Layout

PROJECT
Project Name, Country

DRAWN BY
B. Harvey - 11/12/13

APPROVED BY
D. Porteaud - 15/01/14

SCALE
1:30

UNITS
metres

SHEET
5 of 5

DATE PUBLISHED
02/02/14

UNHCR
The UN Refugee Agency

HOUSEHOLD LATRINE DIGGING PROGRAMME KIT

Description:

This kit is intended to provide tools to support a household pit latrine programme at the block level (1 block = 16 communities = 256 households = 1,250 persons).

Dimensions:

- ☐ Gross weight: 632 kg
- ☐ Volume: 2.9 m^3
- ☐ Length, width, height: 367 × 76 × 74 cm
- ☐ Approximate unit cost: USD$ 1,982

Photo:



Item:	*Qty:*	*Specification:*
1.	32	Pointed trenching shovels with handles, pressed from high steel, fitted with graded wooden shaft. Stock polished for comfort in use. Weatherproofed handle. Size no. 2. Round mouth with T-type hilt, shovel size. 28" shaft × 12 × 9.1/2" blade.
2.	32	Flat trenching spades with handles, pressed from high quality steel, fitted with 28" graded wooden shaft and PY-type hilt. Socket polished for comfort in use. Weatherproofed handle. Blade type: square mouth. Blade size: 12" × 10", size no. 2
3.	32	Pickaxes (chisel and point) with handles. 3.2 kg pick axe head. Eye size 70 × 50 mm. Will accept standard pick axe shafts. Weight 3.2 kg. Hardwood pick/mattock shaft, 900 mm, sanded and waxed. For pick axes and mattocks with eye size 78 × 54 mm.
4.	32	13.5 litre buckets (galvanised)
5.	16	Roll of site marking tape, red/white (100m)
6.	16	Contractors' rakes with handles, 12-tooth head with epoxy-coated finish. Head securely fixed to tubular steel handle. With black plastic hand grip with hang hole. Blade width 280 mm.
7.	16	Miners' bars, one end chisel, one end point, 3 cm dia., length 1.5 m
8.	16	Cold chisels, length 225 mm, blade width 75 mm
9.	16	4 lb lump hammers, forged head from fine high carbon, correctly hardened and tempered. Shaft from first-quality straight-grained hickory. Weight 1.8 kg (4 lb).
10.	16	Measuring tape, length 30 m, width 13 mm
11.	16	8 mm polypropylene rope, 30 m coils

Technical Considerations:

- ☐ If this kit is used to set up a household pit latrine programme it is recommended that it is procured in conjunction with the household concrete latrine slab mould kit.
- ☐ Pits should be as deep as possible (up to 2.5 m) but never so deep as to risk pit collapse and injury to personnel. Round pits are more stable than square or oblong pits, so round pit digging should be encouraged.
- ☐ This kit can also be used to provide tools to set up defecation zones, trench latrines, or VIP latrines in which case it is recommended that the kit is procured in conjunction with the self-supporting plastic squatting plate kit.

EXCRETA MANAGEMENT KEY INFORMANT / FOCUS GROUP PRIMER QUESTIONS

- This assessment tool has been designed to assist UNHCR field staff and their partners collect data on excreta management. The aim of the tool is to help collect background information on excreta management issues that may not be obvious from direct observation, in particular any underlying non-technical causes.
- If the questions are used during key informant interviews, try to interview a number of key different individuals (community leaders, teachers, religious leaders, medical staff, women, men and any other knowledgeable individuals) and triangulate responses.
- If the questions are used during focus groups, try to keep the group as small as possible (max 8 persons) of the same sex, age and social standing. Try to triangulate response between different focus groups.
- The list of questions is not exhaustive and is merely intended as a conversation primer.
- The questions have been designed as an aide memoire so try not to simply read the questions directly off the list. Instead use the themes as conversation starters.
- Additional questions should be formulated based on the replies received and the emergency context.
- Try to keep questions as open-ended as possible. Ask staff for their opinions. Keep asking 'why?'.
- Try to avoid overburdening respondents - concentrate on factors that pose the greatest health risk first.
- It is often better to carry out interviews after any infrastructure assessments and observation walks have been completed so the questions can be directly related to what has been observed.

UNHCR PRIMER QUESTIONS - EXCRETA MANAGEMENT IN DISPLACED SETTINGS

General background information and population numbers.

- ☐ *How many displaced women, men, children and families are present?*
- ☐ *Have you seen the number increase as a result of the emergency or do you expect it to increase?*

General perceptions of excreta management in the displaced population

- ☐ *Are there any existing toilet facilities?*
- ☐ *If so are they used? Are they sufficient? Is there sufficient space for toilets?*
- ☐ *Are they being operated successfully? Can they be adapted, improved or extended?*
- ☐ *Do you like the design of the toilets? Is it culturally acceptable? Comfortable? Safe to use?*
- ☐ *What designs are the displaced population familiar with back home?*
- ☐ *Are people familiar with the design and construction of toilets?*
- ☐ *What local materials are available for constructing toilets?*
- ☐ *Is there any existing toilet infrastructure nearby (e.g. sewer networks or treatment facilities)?*
- ☐ *How many communal toilet facilities exist and how many households have their own toilets?*
- ☐ *If open defecation is practiced, is there a designated area?*
- ☐ *Are there any threats from defecation to water supplies or living areas?*
- ☐ *Would the community be willing to move directly to shared toilets or are communal facilities preferred?*
- ☐ *Is there permission from the land owner to construct toilets?*
- ☐ *Where in the displaced community are the biggest sanitation related hazards in the community?*
- ☐ *What do you feel are the solutions?*

Discussion concerning protection of users at toilet facilities.

- ☐ *Do users feel safe using the toilet facilities during the day? How about at night time?*
- ☐ *Have there been any security problems related to use of the toilet facilities?*
- ☐ *Is there sufficient privacy? Do the locks on the doors function adequately?*
- ☐ *Is there sufficient night time lighting? Would the use of night-time community patrols be beneficial?*
- ☐ *What do you think can be done to improve the security of toilet facility users?*

Perceptions concerning water availability for toilet facilities.

- ☐ *What is the practice for anal cleansing? Is water preferred?*
- ☐ *How much water is needed for toilet flushing, handwashing and cleaning of toilet facilities?*
- ☐ *How much water is available for toilet flushing, handwashing and cleaning of toilet facilities?*
- ☐ *What do you feel could be done to increase the availability of water?*
- ☐ *What are the main sources of water for toilet facilities?*
- ☐ *How far are these water sources? What recommendations do you have to improve the situation?*

Discussion concerning geographical conditions

- ☐ *What is the level of the groundwater table?*
- ☐ *What is the soil like? Is the ground hard and difficult to dig?*
- ☐ *Is there sufficient soil infiltration capacity? Is there sufficient soil bearing capacity?*
- ☐ *Does the soil have a high sand content? Is there a risk of pit collapse?*
- ☐ *When does the winter season start and end? Are temperatures below zero?*
- ☐ *What excreta management difficulties are encountered during the winter season?*
- ☐ *What solutions do you propose for the winter season?*

Discussion concerning operation and maintenance.

- ☐ *Are there any toilet facilities with problems (e.g. full, leaking, fly infestation, cleanliness)?*
- ☐ *Who is responsible for cleaning the toilets and how often are they cleaned?*
- ☐ *Whose responsibility is it to get the system working when it breaks down?*
- ☐ *Do you feel there are enough staff to operate and maintain the toilet systems?*
- ☐ *Do you feel they have sufficient tools, materials, and training?*

Discussion concerning public health hazards from toilet facilities.

- ☐ *Where along the sanitation chain do you feel are the biggest public health hazards?*
- ☐ *Is any part of the system leaking or open to the exterior?*
- ☐ *Are there any high risk activities such as excreta conveyance, handling, tankering, lagooning?*
- ☐ *Where is the excreta finally disposed?*

Discussion concerning universal access, disabled users, and child friendly designs

- ☐ *Do you think the toilet design is generally acceptable to children, the elderly, the infirm, disabled users?*
- ☐ *Do you have any suggestions for improving the design?*

Discussion concerning handwashing.

- ☐ *How is water stored for handwashing and cleaning of toilet facilities?*
- ☐ *Do you feel there is enough water storage? Does water ever run out?*
- ☐ *Are there handwashing points in every toilet block?*
- ☐ *Do you feel that generally there are enough handwashing points?*
- ☐ *Do any of the handwashing points have problems (e.g. low flowrates, blockages, lack of soap)?*
- ☐ *Can you suggest any ways that handwashing operation and maintenance can be improved?*

Discussion concerning the management of children's faeces.

- ☐ *How and where are children's faeces disposed?*
- ☐ *Does the population require potty, trowels or chamber pots?*

Discussion concerning surface water management.

- ☐ *When it rains, are there any problems with surface water intrusion around toilet facilities?*
- ☐ *Do you have any suggestions for improving surface water management?*

Discussion concerning disease vectors.

- ☐ *Do you have any problems with the presence of disease vectors in and around the toilets (such as vermin, bats, birds, mosquitoes, ants, cats, dogs)?*

Use this section for any notes or recommendations

SAMPLE COMMUNITY AGREEMENT

UNHCR COMMUNITY AGREEMENT – COMMUNAL TOILET FACILITIES

- COMMUNITY AGREEMENT -

BETWEEN

COMMUNITY _____, BLOCK _____, SECTOR _____, CAMP _____

AND

_____

(Implementing partner of the United Nations Refugee Agency)

INTRODUCTION

The community _____ residing in block _____, and sector _____ within camp _____, hereinafter referred to as "the community" – and the non-governmental organisation implementing partner of the United Nations Refugee Agency (UNHCR) _____ _____, hereinafter referred to as "the organisation" - have agreed on the following articles..

1. Whereas both the community and the organisation recognises the public health importance of well managed toilet facilities with accompanying hygiene promotion interventions.
2. Whereas the organisation is a non-political, non-religious and non-profit humanitarian non-governmental organisation (NGO), which endeavours to bring humanitarian assistance.
3. Whereas the organisation has previously obtained all the necessary agreements from the land owners and relevant national authorities to carry out the activities described below;

CONTRIBUTIONS AND RESPONSIBILITIES

The contribution and responsibilities of the organisation and the community are as follows:

Contributions and responsibilities of the community:

1. To hold a meeting with all members of the community to discuss the acceptability of household vs. shared vs. communal facilities in addition to any cultural design requirements.
2. If the community decides that household and shared toilets are unacceptable, the community must reach a decision on the following:
   A) Identification for suitable locations for communal facilities that poses the minimum security risk for all users in particular women and girls.
   B) Identification of a focal person living within 50m of the communal toilet facilities with the following responsibilities:
      a. Cleaning of the toilet facilities with detergent and 0.2% chlorine solution (during times of risk of epidemics) at least four times a day.
      b. Ensuring that handwashing facilities are continuously topped up with soap and water and that waste water is safely removed.
      c. Ensuring toilet flushing or anal cleansing water is available (if required).
      d. Undertaking small-scale minor repairs as required.
      e. Informing the organisation at least seven (7) days in advance of the need for major repairs or desludging activities.

Contributions and responsibilities of the organisation:

1. To ensure the community is empowered to make their own decisions concerning the toilet facilities to ensure that designs are to the greatest degree possible, culturally appropriate, comfortable, transparently managed, and safe to use.

2. To provide materials for the construction of _____ household toilet cubicles, _____ shared toilet cubicles, and _____ communal toilet cubicles, fabricated from _____ materials, equipped with _____ hand washing units, and _____ accessories.
3. To provide routine maintenance and desludging services for communal toilet facilities as required.
4. To provide ____ mops, ____ buckets, ____ brushes, ___ wheelbarrows, _____ jerry cans, ____ shovels, ___ handwashing dispensers with drainage, _____ pairs of gloves, ____ backpack sprayers, _____ pairs of boots and _____ overalls to support the daily cleaning and maintenance of the communal toilet facilities.
5. To provide a monthly provision of _____ bars of soap, _____ litres of chlorine, ____ litres of detergent, and _____ rolls of toilet paper to support the daily use of the communal toilet facilities.
6. To provide a system of security lighting, door locks, and privacy screen for the communal toilet facilities and _____ padlocks for shared and household toilets.
7. To support and train a communal toilet attendant identified by the community.
8. To support the community through a programme of hygiene promotion in particular the linkages between excreta and disease.
9. To keep the community and national authorities informed about the implementation progress of the programme.

MISCELLANEOUS

1. This Community Agreement is the unique basis of collaboration between the community and the organisation. All amendments, alterations and termination need to be elaborated in writing and duly signed and agreed by both parties. The community agreement is made in the following languages _____and _____.
2. In case a dispute related to operational or administrative issues for the activities envisaged under terms of this Community Agreement arises between the community and the organisation, the resolution of such kind of difficulties shall be negotiated through open discussion and in good faith in order to find mutually agreeable solutions before having an impact on the programme beneficiaries.

This Community Agreement is entered into effect on the following date: _____/_____/_____

Signed on behalf of the community…

Representative 1: _____

Representative 2: _____

Representative 3: _____

Signed on behalf of the organisation …

Name: _____ Title: _____

The sample should be used as a guide only. It can and should be adapted to meet locally specific conditions.

SOLID WASTE KEY INFORMANT INTERVIEW PRIMER

- ☐ These key informant primer questions have been compiled as an aide memoire to help collect information related to solid waste management practices in particular:
  - *i). What key informants from the displaced population feel are the key problems related to solid waste management including their underlying causes?*
  - *ii). What key informants from the displaced population feel are the solutions?*
- ☐ In order to obtain a complete picture, interview a number of key informants (e.g. Community Leaders, Teachers, Medical Staff, and Religious Leaders) and triangulate responses.
- ☐ Note that the questions are intended merely as a conversation primer and are not exhaustive.
- ☐ Additional questions should be formulated based on the replies received and the context.
- ☐ Try not to simply read the questions directly, instead use the questions as reminders.
- ☐ There is no need to ask all questions, choose only the themes that are relevant to the context.
- ☐ Try to keep questions as open as possible. Ask the key informants for their personal opinions?
- ☐ Try not to overburden respondents - concentrate on the factors that pose the greatest risk first.

A. General Information

Name of displaced setting: _____ Population Size: _____

Key informant undertaken by: _____ Organisation: _____

Date: ___/___/_____ Email: _____ Contact Phone: _____

B. Key Informant Information

Name of key informant: _____

Title of key informant: _____

Address of key informant: _____

Email: _____ Contact Phone: _____

C. Key Informant Primer Questions

Current practice related to solid waste management

- ☐ *How is solid waste currently managed?*
- ☐ *Are there designated waste collection points? How frequently is waste collected?*
- ☐ *Are wastes handled or transferred manually in any way during collection and disposal?*
- ☐ *Where is waste taken and how is it disposed?*
- ☐ *Are there any locations with uncontrolled dumping of wastes?*
- ☐ *Are there any problems of festering wastes? How can this be prevented?*
- ☐ *Is the waste service accessible to children, the elderly, the infirm, or disabled users?*
- ☐ *What are current solid waste management related beliefs and practices? How did people manage solid waste in their place of origin?*
- ☐ *Is there evidence of any open burning of wastes? How can this be prevented?*

General perceptions of solid waste management related public health risks

- ☐ *What do you feel are the biggest challenges in ensuring that the community is free from waste?*
- ☐ *What do you feel are the biggest hazards related to solid waste?*
- ☐ *Are current waste management practices a threat to water supplies or living areas?*
- ☐ *Where in the displaced setting are the biggest hazards located?*
- ☐ *What do you feel are the solutions?*

Estimation of waste types and volumes

- ☐ *What types and volumes of wastes are being produced each day?*
  - *Paper and cardboard*
  - *Plastics and rubber*
  - *Metals and Glass*
  - *Organic wastes*
  - *Market, slaughter and animal wastes*
- ☐ *What are the most optimal systems for collection, and management of each of the waste streams?*

Capacity assessment of local solid waste service providers

- ☐ *Who is responsible for waste collection and disposal within the displaced or host population?*
- ☐ *Can the organizations responsible for waste management cope?*
- ☐ *What resources (excavators / trucks / staff) do they have?*
- ☐ *Do you have any suggestions for improving the waste management services provided?*

Existing resources for waste management

- ☐ *What resources are available locally for waste management (excavators / trucks / staff)?*
- ☐ *Are there existing landfill sites? Who owns the site? Is there a tipping fee? Is the site operating successfully? Can they be improved, extended or adapted?*
- ☐ *Is there sufficient space for a new landfill? What is the slope of the terrain? What is the level of the groundwater table? Are geological conditions suitable for landfill?*

Reduction, recycling, reuse and composting

- ☐ *What activities are being undertaken to reduce, recycle or reuse solid wastes? Are there any recycling companies? Is composting of organic wastes being undertaken?*

Waste collection from public spaces

- ☐ *Who is responsible for cleaning public spaces and how often are they cleaned?*
- ☐ *Do you feel there are enough street cleaners considering the size of the displaced setting?*
- ☐ *Do you feel the waste collection staff have the correct tools, cleaning equipment, and personal protective equipment?*

Hazardous wastes

- ☐ *How are the following hazardous wastes managed? Where are these wastes created or situated?*
  - *Used batteries*
  - *Used engine oils*
  - *Paints, solvents, and varnishes*
  - *Broken electrical equipment*
  - *Medical waste – sharps*
  - *Medical waste – infectious*
  - *Medical waste – non-sharp, non-infectious*

Market waste management

- ☐ *What sorts of wastes are created in market areas?*
- ☐ *Who is responsible for wastes from market areas and how often are they managed?*
- ☐ *How can waste management in market places be improved?*

Medical waste management

- ☐ *How are sharps, infectious waste, and non-sharp non-infectious waste managed?*
- ☐ *Do you feel there are enough appropriate waste collection containers?*
- ☐ *Do you feel health-care wastes are adequately separated and managed?*
- ☐ *Do you have any suggestions for improving current practices?*
- ☐ *How is the health-care waste transported within the facility?*
- ☐ *Is health-care waste stored anywhere while it waits for treatment, collection or final disposal?*
- ☐ *What do you feel could be done to improve the transport or storage of wastes?*
- ☐ *Do you have any suggestions for improving how health-care waste is treated or disposed?*

Disease vector control

- ☐ *Is solid waste creating problems with disease vectors (such as vermin, bats, birds, mosquitoes, flies, ants, cats, or dogs)?*
- ☐ *Are landfills covered daily with at least 20cm soil cover?*
- ☐ *Is solid waste creating problems of stagnant water, or, blocked ditches?*
- ☐ *Do you have any suggestions how vector populations can be reduced?*

Leachate management

- ☐ *Are there any problems of leachates from waste dumps or landfills contaminating local water supplies or the local environment?*
- ☐ *Are groundwater supplies effectively protected from waste dumps*
- ☐ *When it rains, are landfills protected from surface waters with diversion canals?*

Solid waste legislative environment

- ☐ *What national or local legislation exists for waste management and environmental protection?*

SOLID WASTE ASSESSMENT TEMPLATE

UNHCR field staff and their partners must conduct a waste survey within the first three months and then at least once a year. Activities must be revaluated and reorganised according to the findings of the survey (see Section 7.26).

A. General Information

Name of displaced setting: _____ Population: _____

Waste survey undertaken by: _____ Organisation: _____

Email: _____ Contact Phone: _____

B. Displaced setting waste creation rates **Waste survey date ___/___/___**

Waste constituent	(tons/week)	(kg/pers/week)	%	(kg/m^3)
1. Paper / cardboard				
2. Glass				
3. Metals				
4. Plastic				
5. Rubber				
6. Misc. combustible				
7. Misc. incombustible				
8. Organic matter > 50mm				
9. Organic matter 10–50mm				
10. Organic matter <10mm				
11. Lead-acid batteries				
12. Household batteries				
13. Used engine oils				
14. Paints, solvents, & varnishes				
15. Broken electrical apparatus				
16. Other toxic wastes				
17.				
18.				
TOTALS			**100%**	

TYPE OF WASTE:	Kgs per week _____

a) Description of current practice for this waste type

☐ Reduce ☐ Reuse ☐ Recycle ☐ Recover ☐ Uncontrolled dumping
☐ Controlled dumping ☐ Sanitary landfill ☐ Other _____

b) Description of medium term strategy (< 6 months)

☐ Reduce ☐ Reuse ☐ Recycle ☐ Recover ☐ Uncontrolled dumping
☐ Controlled dumping ☐ Sanitary landfill ☐ Other _____

c) Description of longer term strategy (> 6 months)

☐ Reduce ☐ Reuse ☐ Recycle ☐ Recover ☐ Uncontrolled dumping
☐ Controlled dumping ☐ Sanitary landfill ☐ Other _____

PUBLIC HEALTH AND ENVIONMENTAL HAZARD ASSESSMENT

Summarize the waste management chain from point of creation to point of final disposal or reuse. Note the top three hazards for each step. Do not include hazards that are unlikely or that have minor or insignificant consequences.

Waste Management Chain	Current / Potential Hazards	Level	Control Measures
	1. _____ 2. _____ 3. _____	☐ High ☐ Med ☐ High ☐ Med ☐ High ☐ Med	1. _____ 2. _____ 3. _____
⇩			
	1. _____ 2. _____ 3. _____	☐ High ☐ Med ☐ High ☐ Med ☐ High ☐ Med	1. _____ 2. _____ 3. _____
⇩			
	1. _____ 2. _____ 3. _____	☐ High ☐ Med ☐ High ☐ Med ☐ High ☐ Med	1. _____ 2. _____ 3. _____
⇩			
	1. _____ 2. _____ 3. _____	☐ High ☐ Med ☐ High ☐ Med ☐ High ☐ Med	1. _____ 2. _____ 3. _____

SOLID WASTE INFRASTRUCTURE ASSESSMENT FORMS

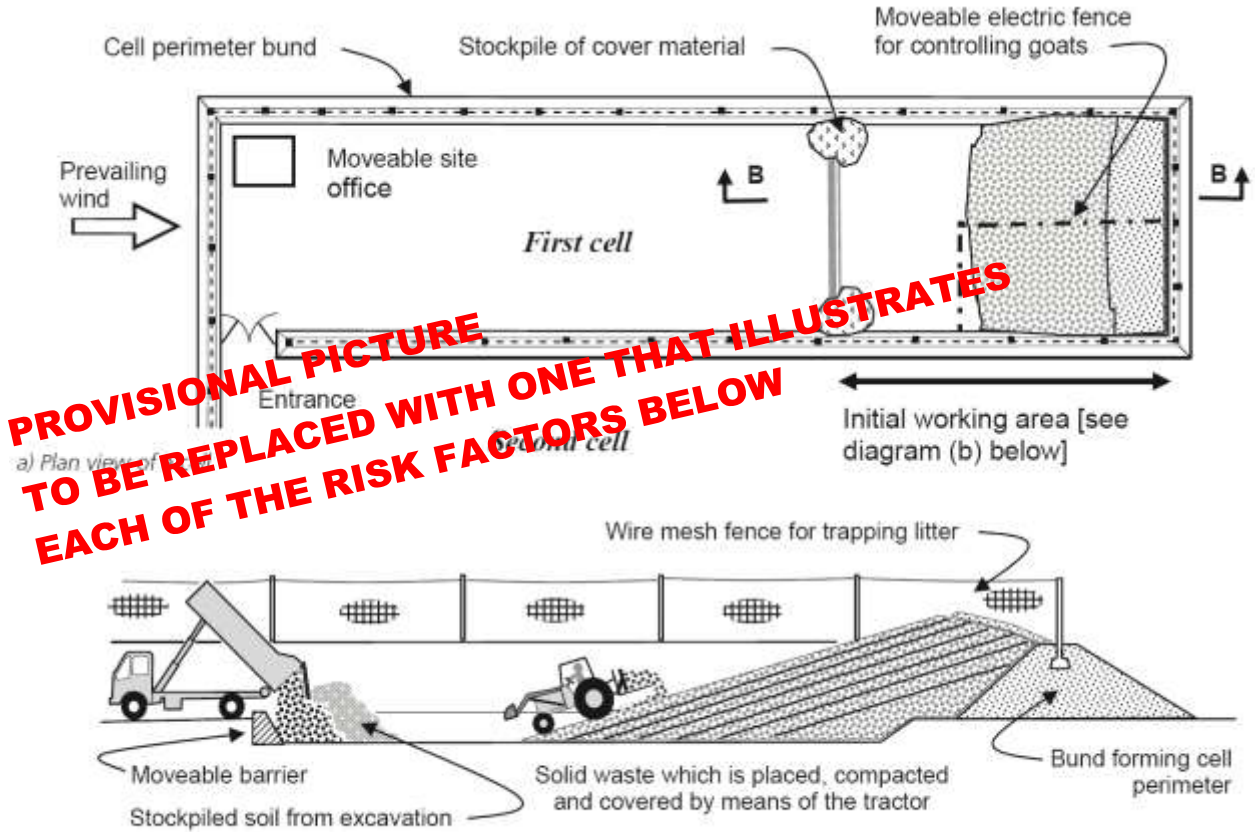
LANDFILL SANITARY SURVEY FORM

A. General Information

Location: Camp _____ Sector _____ Block _____ Community _____

GPS Long: _____°_____'_____" GPS Lat: _____°_____'_____" Number of toilet cubicles: _____

Contact person: _____ Position: _____ Date of visit: ____/_____/_____



B. Identification of risk factors	**Risk**
1. Is there evidence of uncontrolled dumping of wastes outside of the landfill area?	Y ☐ / N ☐
2. Are there any natural water bodies or drinking water supplies within 50m of the landfill?	Y ☐ / N ☐
3. Are there any residential houses or shelters within 50m of the landfill?	Y ☐ / N ☐
4. Is there a lack of fencing around the landfill area?	Y ☐ / N ☐
5. Is there a lack of a surface water diversion canal around the landfill area?	Y ☐ / N ☐
6. Is the landfill missing an impermeable rock or clay base layer preventing leaching of wastes into groundwater supplies?	Y ☐ / N ☐
7. Is the landfill cell visibly cracked / broken / leaking / flooded in any way?	Y ☐ / N ☐
8. Is there a lack of daily 20cm landfill soil cover to reduce disease vectors?	
9. Is there any evidence of fly infestation at the landfill site? (presence of one or more flies)?	Y ☐ / N ☐
10. Are hazardous wastes allowed to enter the landfill (e.g. batteries, solvents, paints, varnishes, broken electrical equipment, medical wastes)?	Y ☐ / N ☐
11. Is there evidence of any open burning of wastes in the displaced setting?	Y ☐ / N ☐
12. Are wastes handled or transferred manually in any way during collection and disposal?	Y ☐ / N ☐
13. Do waste collection staff lack basic personal protective equipment (gloves, boots, overalls)	Y ☐ / N ☐
14. Is the landfill full? (less than 0.5m remaining space in the pit)?	Y ☐ / N ☐
15. Is there a lack of a functional hand-washing station and shower at the landfill site? (functional = soap + water + drainage)	Y ☐ / N ☐
Total score of risks	**/ 15**

Signature of Inspector …….. **Community representative** ……..

Note: Risk score: 10-15 = very high, 6-9 = high, 3-5 = intermediate, 0-2 = low

SOLID WASTE ACTION PLAN

WHAT? (List of priority activities)	BY WHOM?	BY WHEN?	TOOLS / EQUIPMENT REQUIRED? (e.g. spades, wheelbarrows)	MATERIALS / CONSUMMABLES REQUIRED? (e.g. cement, pipes, soap, chlorine)	SKILLED LABOR REQUIRED? (man-days)	UNSKILLED LABOR REQUIRED? (man-days)	APPROX. COST? (USD$)	WHO PAYS?	WHO MONITORS?
e.g. Establishment of 5 hazardous domestic waste collection points	Camp Committee	End of week	Spade, pick, wheelbarrow, hammer, spirit level, measuring tape	Metallic containers, information boards, fence posts, gates, nails, hinges, barbed wire	1 man-day	7 man-days	300 USD$	NGO	NGO / Camp Committee
1.									
2.									
3.									
4.									
5.									
6.									
7.									
8.									
9.									
10.									

UNHCR The UN Refugee Agency


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WASH
EARLY RECOVERY PROJECT