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Water, Sanitation and Hygiene
Guidelines

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"There is a water crisis today. But the crisis is not about having too little water to satisfy our needs. It is a crisis of managing water so badly that billions of people — and the environment — suffer badly." World Water Council[1]

Mercy Corps Water, Sanitation and Hygiene Guidelines 2008-2009

Preface

Around the world, Mercy Corps country programs implement water, sanitation and hygiene initiatives for the promotion of hygienic and healthy lifestyles as an integral part of programs for poverty alleviation.

These guidelines act to provide context, a toolbox and a how-to manual for Mercy Corps program managers looking to implement water, sanitation and hygiene (WASH) projects or programs, regardless of previous experience. They combine theoretical knowledge with practical information to provide readers with an overview, while also making references to more specific literature for additional information. The contents focus on regular, longer-term programming and, to a lesser extent, needs in emergency or crisis situations. These guidelines combine input from Mercy Corps colleagues at country offices and HQs, as well as information gathered from peer development agencies, universities and research institutions.

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Please note that these guidelines are written with rural areas in mind. Conditions and recommendations may vary for different environments.

[1] World Water Council (2000) *World Water Vision Report*. London: Earthscan Publications Ltd.

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List of Definitions

Term[2]	Definition
Access to (use of) sanitation	*Access to (use of) sanitation* refers to the percentage of population with access to improved excreta disposal facilities. Facilities such as sewers or septic tanks, pour flush latrines, and simple pit or ventilated improved pit latrines are considered to be improved facilities, provided they are not public, according to the JMP definitions.
Access to (use of) water supply	*Access to (use of) water supply* refers to the percentage of population with reasonable access to an adequate supply of safe water in their dwelling or within a convenient distance of their dwelling. The *Global Water Supply and Sanitation Assessment 2000 Report*[3] defines reasonable access as "the availability of at least 20 liters per person per day from a source within one kilometer of the user's dwelling". As per JMP, the indicator is computed as the ratio of the number of people who use improved water supply sources: piped water, public tap, borehole or pump, protected well, protected spring or rainwater to the total population expressed as a percentage.
Activity	An *activity* is an action taken or work performed that converts into specific outputs. Activities, such as providing training or constructing a facility, are designed to deliver outputs.
Advocacy	*Advocacy* is I action of delivering an argument to gain commitment from political and social leaders and to prepare a society for a particular issue. Advocacy involves the selection and organization of information to create a convincing argument, and its delivery through various interpersonal and media channels. Advocacy includes organizing and building alliances across various stakeholders.
Affordability	The *affordability* of water and sanitation services and the related ability to pay of the users may be expressed as: • Cost of water and sanitation services as a percentage of the minimum wage rate for the respective area; or • Cost of water and sanitation services as a percentage of the monthly household expenditure; or • Ratio of the monthly household water consumption expenditure to the monthly household income.[4]
Attitudes	*Attitudes* are personal biases, preferences, and subjective assessments that predispose one to act or respond in a predictable manner. Attitudes lead people to like or dislike something, to consider things good or bad, important or unimportant, or worth caring about or not worth caring about.

[2] Note: For further information on definitions, refer to the OECD-DAC Working Party on Aid Evaluation Glossary of Key Terms in Evaluation and Results Based Management.

[3] WHO/UNICEF Joint Monitoring Program on Water Supply and Sanitation, 2000.

[4] Asian Development Bank, *Handbook of Economic Analysis of Water Supply Projects.*

Term[2]	Definition
Base-line study	A *base-line study* is an analysis describing the situation prior to a development intervention, against which progress can be assessed or comparisons made.
Beneficiaries	The individuals, groups, or organizations, targeted or not, that benefit directly or indirectly from the project or program.
CBO, NGO	Community Based Organization, Non-Governmental Organization
Cost recovery	*Cost recovery* is indicated by annual operating revenue as a percentage of annual operating costs. Annual operating costs exclude depreciation, interest, and debt service.
Gender	*Gender* concerns women and men, how they cooperate and share work, decisions and control in projects and programs. Projects must identify and address these differences and interrelationships to ensure that both men and women have the resources they require for their development.
Goal	*Goals* can be positive and negative, direct and indirect long-term effects produced by one (or more) development intervention, directly or indirectly, intended or unintended. Contributing factors aside from the project activities can also affect goals. Goals are at the top of the project framework; for example, "Improve access to safe drinking water" is a goal. In many but not all cases, it is not feasible to use goals in results frameworks in a manner that is useful as a management tool. This is typically due to reasons of scope or scale (e.g. an intervention is only introduced in a limited geographic area), or because of measurement challenges (e.g. the impact indicator is not being routinely collected at sufficiently disaggregated levels or with sufficient frequency).
Hygiene promotion	*Hygiene promotion* is a planned approach to prevent spread of infections personally, domestically and peri-domestically through the widespread adoption of safe hygiene practices. It begins with and is built upon what local people know, do and want.
Impact evaluation	An *impact evaluation* compares the outcomes of a program against a counterfactual that shows what would have happened to beneficiaries without the program. Unlike other forms of evaluation, impact evaluation allows attribution of observed changes in outcomes to the program being evaluated.
Indicator	An *indicator* is a variable that allows one to confirm whether changes are occurring as a result of a development intervention.
Input	*Inputs* are the financial, human, and other resources mobilized to support activities undertaken by a project. Inputs are converted into activities by the implementing agency. Examples would include loan or credit funds and staff.

Term[2]	Definition
Knowledge	*Knowledge* is a range of information and the understanding thereof.
Life skills	*Life skills* are abilities for adaptive and positive behavior that enable individuals to deal effectively with the demands and challenges of everyday life. In particular, life skills are a group of psychosocial competencies and interpersonal skills that help people make informed decisions, solve problems, think critically and creatively, communicate effectively, build healthy relationships, empathize with others, and cope with and manage their lives in a hygienic, healthy and productive manner.
Monitoring	*Monitoring* is a continuing function that uses systematic collection of data on specific indicators to provide management and the main beneficiaries of an ongoing project or program with indications of the extent of progress and achievement of objectives and progress in the use of allocated funds.
Outcomes	*Outcomes* are expected or actual demand-side behavioral responses by direct beneficiaries and other stakeholders outside the control of the project that demonstrate uptake, adoption and use of the project outputs.
Output	*Outputs* are project or program deliverables (on the supply-side) that are expected to add value to beneficiaries and are designed to stimulate outcomes.
Project Committee	A *project committee* is a working committee for decision-making, finance and implementation. This committee is seen as a bridge between the organizations and the community.
Project cycle	A *project cycle* is a process that provides participants and stakeholders with a view of the project development process, planning, and achievement of outcomes from the identification and concept stage to the post-project completion stage.
Project or program framework	*Project or program frameworks* are management tool mainly used in the design, monitoring, and evaluation of development projects. The framework takes the form of a five by four project table. The five rows are used to describe different types of events that take place as a project is implemented: the project inputs, activities, outputs, outcomes, and goal (from bottom to top on the left-hand side). The four columns provide different types of information about the events in each row. The first column is used to provide a narrative description of the event. The second column lists one or more key performance indicators of the events taking place. The third column describes the data collection strategy where information will be available on the indicators, and the fourth column lists the assumptions. Assumptions are external factors that it is believed could influence (positively or negatively) the events described in the narrative column. The list of assumptions should include those factors that potentially impact the success of the project, but which cannot be directly controlled by the project or program managers. See page 35 for more information.
Social mobilization	*Social mobilization* process of bringing together allies from various sectors to raise awareness of and demand for a particular development program or policy change.

Term[2]	Definition
	The process mobilizes allies at different levels in society to assist in the delivery of resources and services, to strengthen community participation for sustainability and self-reliance, and to bring about transparent and accountable decision-making. Social mobilization is the glue that binds advocacy to planned and researched program communication

CHAPTER 1: Water, Sanitation and Hygiene (WASH): The Challenges Ahead

Water is life! Sanitation and hygiene save lives!

In September 2000, world leaders at the *Millennium Summit* agreed on an ambitious agenda for reducing poverty and improving lives. This agenda was shown through eight *Millennium Development Goals*. Each goal has one or more targets that have been set mostly for 2015, using 1990 as a benchmark. One of the eight main goals is to ensure environmental sustainability, with targets to:

- Reduce by half the proportion of people without sustainable access to drinking water by 2015
- Reduce by half the proportion of people without access to basic sanitation by 2015

Readers of the BMJ (British Medical Journal) recently identified sanitation as "the most important medical advance since 1840." Nevertheless, only 62 per cent of the world's population has access to improved sanitation.

Box 1

Water, sanitation and hygiene are also fundamentally linked to the first goal of reducing hunger and poverty. Access to safe drinking water and proper hygiene are crucial parts of a comprehensive hunger reduction strategy that aims to, among other goals:

- By 2015, reduce by half the proportion of people who suffer from hunger, as measured by both proportion of the population consuming below minimum diet energy standards and the prevalence of underweight children under the age of five.

Annual deaths

- 1.8 million people die every year from diarrheal diseases
- 3900 children die every day from water-borne diseases (WHO 2004)

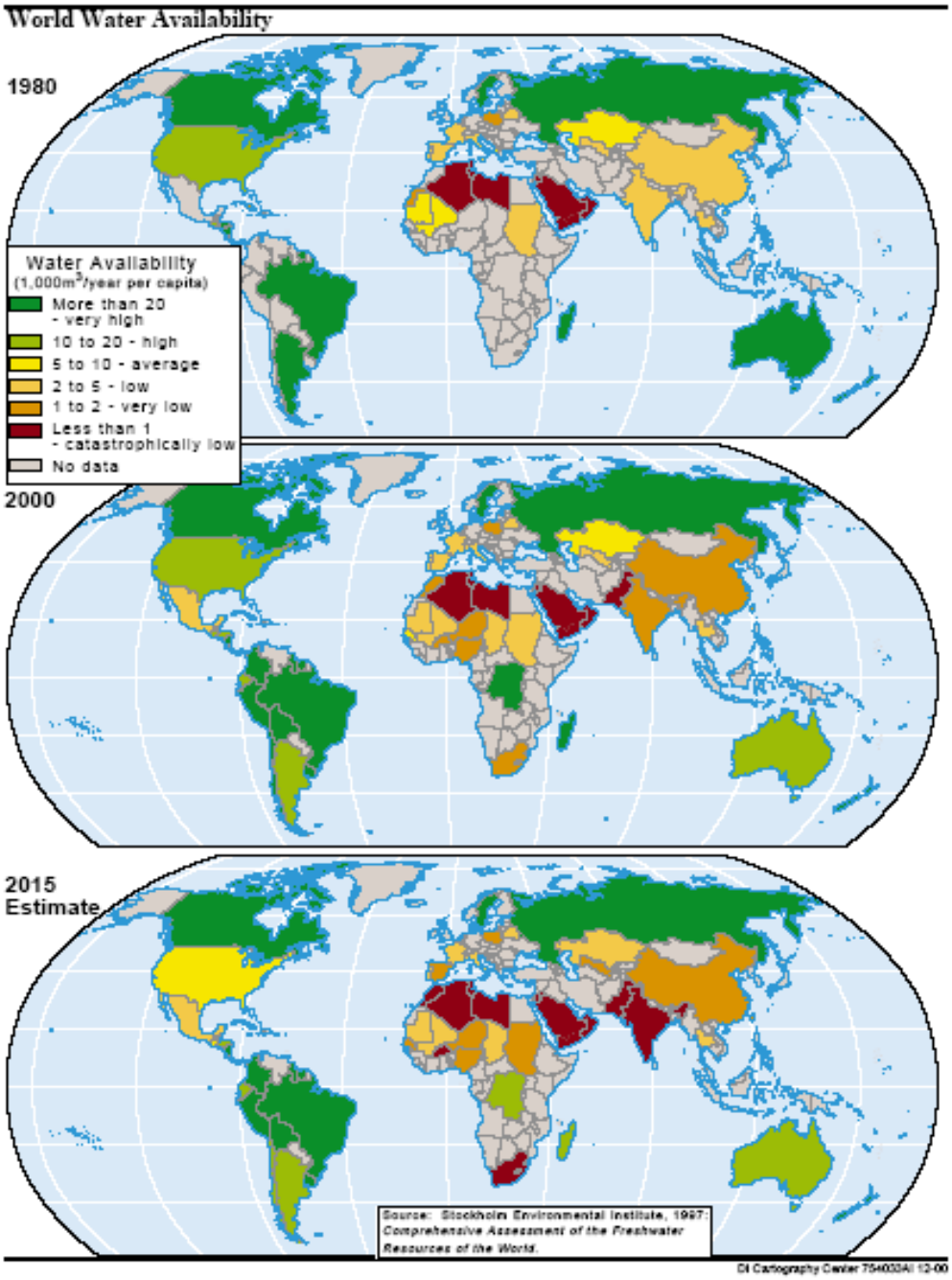
Table 1

1. Water issues are interconnected to other local, national and global issues including the following:

1) Water is a scarce resource

- 97.5% of the water on our planet is saltwater, unfit for human use.
- The majority of freshwater is beyond our reach, locked into polar snow and ice.
- Less than 1% of freshwater is usable, amounting to only 0.01% of the Earth's total water.
- To make things worse, a large number of freshwater sources are now polluted to the point they are no longer safe for human consumption.
- Over 30 nations receive more than one-third of their water from outside their borders and at least 214 rivers flow through two or more countries, but no enforceable law governs the allocation and use of international waters.
- See figure 1 about World Water Availability.

Figure 1: World Water Availability



Source: Global Trends 2015: A Dialogue About the Future With Non-Government Experts

2) Food Security

Water plays a fundamental role in food security at the household, local and national level. There are many competing uses for water connected to agricultural production, hygiene and health. Water is crucial to adequate food production. Infrastructure and access to clean water, combined with appropriate hygiene practices, are essential to ensuring people are healthy; allowing their bodies to

fully utilize nutrients from food. Water borne illnesses and other contamination from poor water quality also contribute dramatically to malnutrition and food insecurity.

3) Demographics
Population growth places increased demand over limited existing water sources. As stated by the World Bank, during the past century while world population tripled, the use of water increased six fold due to urbanization trends, increased population density and additional infrastructure.

4) Overuse
Irrigation accounts for 85 percent of water withdrawals in developing countries. Some agriculture practices, such as rice paddies, require excessive amounts of water. Additionally, underground aquifers are being affected by agriculture practices, industry and other sources that contaminate underground water. Industry accounts for less than 20 percent of water withdrawals and municipal for only 10 percent.

5) Environmental change
Global climate change, deforestation, global warming, and atmospheric pollution are all generating significant changes in the Earth's climate patterns. This has a profound effect on parts of the world where severe droughts make the availability of freshwater even more limited.

6) Political Reform
The privatization of water services previously managed by local governments has had mixed results. While in some cases it has increased access to improved water volume and quality, it has also frequently increased the cost of services which in turn has ultimately limited access for people living in poverty. In other cases, the political process of privatizing water services has been badly handled, resulting in no improvements to availability or access to WHS services.

7) Poverty
Poor people typically live in poor neighborhoods. This creates a vicious cycle where individuals cannot provide for themselves and cannot address the needs of their community. This is also true in the case of WASH systems. It is usually impractical and unaffordable for individuals to think of providing safe drinking water for themselves. Due to an economy of scale, a WASH system is more effective and affordable when the community as a whole can contribute and benefit. However, many poor municipalities in rural areas are too far away to "hook" themselves into existing water systems.

8) Social unrest
Settings with ongoing social unrest due to war or civil disorder are typically characterized by a breakdown of basic services, including water and sanitation. This is always the case during the first stages of a refugee or IDP scenario, and addressed as part of the immediate package of services that NGOs implement. However, WASH programs in refugee or IDP camps are often insufficient to meet the minimum standards.

9) Natural disasters
Earthquakes, floods, and other natural events can disrupt the provision of water and sanitation by destroying existing infrastructure. But natural disasters have the additional complication that they are hard to anticipate and preparedness plans are often not in place to enable quick response..

I. Global Statistics and Standards

During the International Drinking Water Supply and Sanitation Decade in the 1980s, it became clear that better planning and management of interventions demanded better monitoring of statistics. To address this need, the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) decided to combine their experience and resources with the Joint Monitoring Program for Water Supply and Sanitation (JMP)[5]. The first joint monitoring report was published in 1991 with an updated report published every two to four years thereafter. The JMP data is compiled from official government statistics and household surveys and is considered the best available global data on the subject.

According to the 2006 statistics, as published in the 2008 JMP report:

- 87 per cent of the global population, or approximately 5.7 billion people worldwide, are now using drinking water from improved sources. However, 900 million people still do not have access to improved water sources.
- 2.5 billion people or 38 per cent of the world's population, do not have access to improved sanitation facilities. Of this number almost 1.8 billion are in Asia.

The problematic scale of water quality[6] is even larger than that of water supply. The principal cause of concern is microbiological contamination, especially from human and animal feces. While groundwater is generally of much higher microbiological quality than surface water, an increasing number of sources and systems used by people for drinking and cooking are not adequately protected from fecal contamination. This is due to a variety of factors including population pressure, urbanization and the inadequate construction, operation and maintenance of water systems. Water is considered microbiologically safe when one hundred (100) cc of water contain less than 10 fecal coli form bacteria.

Another water quality concern is chemical contamination. Water can be chemically contaminated through natural causes (arsenic, fluoride) or through human activity (nitrate, heavy metals, and pesticides). A third concern is the physical quality of water (e.g. color, taste). Although poor physical water quality is not a direct cause of disease, if the water looks aesthetically displeasing, people may prefer to use different water sour–s--even if those sources are less sanitary. Finally, drinking water can be contaminated with radioactivity, either from natural sources or human-made nuclear materials.

Even fully protected sources and well-managed systems do not guarantee that safe water will be delivered to households. The majority of the world's people must still physically carry water from a water source to their homes and then store it until it is needed. Studies show that water initially collected from safe, sanitary sources is likely to have fecal contamination from transportation and storage.

[5] http://www.wssinfo.org/
[6] From: UNICEF (2008), "*UNICEF Handbook on Water Quality*". UNICEF, New York, USA

The encouraging news is that the world is on track to meet the Millennium Development Goals for water. More than half of the world's households are now using piped[7] water. However the world is not on track to meet sanitation targets. If trends continue, the total population without improved sanitation in 2015 will have decreased only slightly since 1990, to 2.4 billion.

2006 Global WASH Coverage Rates:

Table 2

Region	Drinking Water Coverage (in %)			Sanitation Coverage (in %)		
	Rural	Urban	Total	Rural	Urban	Total
Sub-Saharan Africa	46	81	58	24	42	31
Northern Africa	87	96	92	59	90	76
Eastern Asia	81	98	88	59	74	65
Southern Asia	84	95	87	23	57	33
South-eastern Asia	81	92	86	58	78	67
Western Asia	80	95	90	64	94	84
Oceania	37	91	50	43	80	52
Latin America and the Caribbean	73	97	92	52	86	79
Commonwealth of Independent States	86	99	94	81	94	89
WORLD	78	96	87	45	79	62
Data for 2006 Source: JMP						

Table 3

The MDG definitions for improved Water Sources and Sanitation	
Improved Drinking Water Sources	**Improved Sanitation**
• Piped water into dwelling, plot or yard • Public standpipe/tap • Borehole/tube well • Protected dug well • Protected spring • Rainwater collection	• Flush or pour–flush to: piped sewer system septic tank, pit latrine, ventilated improved pit latrine • Pit latrine with slab • Composting toilet
Unimproved Drinking Water Sources	**Unimproved Sanitation**

II. Basic Water and Sanitation Needs

Of course, the amount of water actually used will be determined by the specific physical conditions and the composition of the user-groups (age, economic activities, climate, availability of kitchen, amount of taps, shower etc.). However, for planning purposes some guidelines have been established:

- The WHO/UNICEF JMP uses 20 liters water/person/day as a minimum for non-emergency situations although other sources use 30-50 liters water/person/day as design criteria.

[7] Piped water refers to a network, however this does not automatically mean that it is safe to drink without treatment

The SPHERE[8] standards established for emergency and crisis situations estimate a basic survival water need of 7.5-15 liters water/person/day. This is calculated on the following assumption
Table 4

Basic survival water needs		
Survival needs: water intake (drinking and food)	2.5-3 liters per day	Depends on: the climate and individual physiology
Basic hygiene practices (hands and face washing)	2-6 liters per day	Depends on: social and cultural norms
Basic cooking needs	3-6 liters per day	Depends on: food type, social as well as cultural norms
Total basic water needs	7.5-15 liters per day	

The International WASH community has agreed that "No access" means that a person:

- Has to walk more than 1 km or more than 30 minutes one-way to collect water, or
- Collects less than 5 liters per capita per day

SPHERE indicates that the recommended maximum distance from any household to the nearest water point is 500 meters, queuing time should be less than 15 minutes and it should not take more than three minutes to fill a 20-liter container.

Figure 2

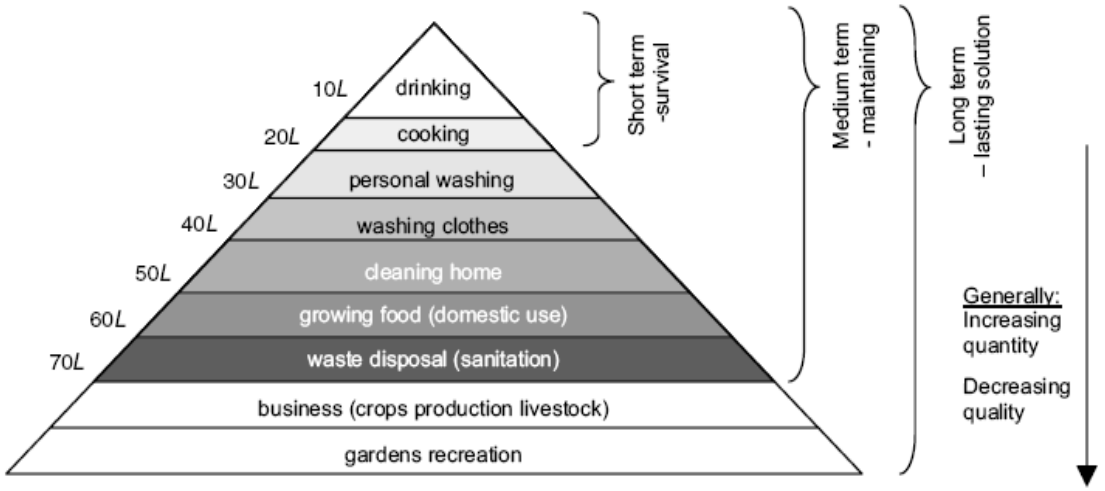


Figure 1. Hierarchy of water requirements
(after Abraham Maslow's (1908-1970) hierarchy of needs)

Determining the number of toilets[9] needed depends on the setting. In a community, one toilet for each household should be the standard. However, in an emergency or crisis setting this will not always be feasible. For those circumstances, SPHERE established a maximum of 20 people for each toilet. Preferably, toilets for communal use will be segregated by sex and have adaptations for

[8] http://www.sphereproject.org/ The Sphere Project was launched in 1997 by a group of humanitarian NGOs and the Red Cross and Red Crescent movement. Sphere is based on two core beliefs: first, that all possible steps should be taken to alleviate human suffering arising out of calamity and conflict, and second, that those affected by disaster have a right to life with dignity and therefore a right to assistance.

[9] Toilet refers to the full range of improved sanitation facilities

women, children and disabled people. Toilets for men can be partly replaced by urinals. The advantage of urinals is that they are cheaper to construct and easier to clean and maintain.

Handwashing

Handwashing is important for good health. Effective washing can be practiced with alternatives to soap and using a variety of different hygienic facilities.

- Washing hands with soap reduces the risk of diarrheal diseases by 42–47%.[10] There are also indications that handwashing is an important preventive measure in the incidence of acute respiratory infections. Overall, interventions to promote handwashing might save a million lives a year. Each person should be able to wash hands with water and soap after toilet use, before food preparation, before eating and after cleaning babies.

- A review of studies has shown that using water only is less effective than when using a rubbing agent, such as soap, mud or ash. The use of mud, ash and soap all achieved the same level of cleanliness and it suggests that the action of rubbing hands is more important than the agent used. However, rinsing with two liters of clean water was also protective, although this much water seems to be difficult to sustain in the absence of on-plot access

- Handwashing facilities can range from simple bowls or containers of water to facilities that have running water. The most important aspect of handwashing is that it can be done in a hygienic setting and that it is part of the overall planning for WASH programming.

[10] Curtis, V., and Cairncross, S. "*Effect of washing hands with soap on diarrhoea risk in the community: a systematic review.*", The Lancet infectious diseases, Vol 3 nr. 5, 1 May 2003

The following tables describe basic water and sanitation needs for a variety of institutional and group settings. They are based on the SPHERE standards.

Table 5. Minimum Water Needs	
Health centers and hospitals	5 liters/out-patient 40-60 liters/in-patient/day Additional quantities may be needed for laundry equipment, flushing toilets, etc.
Cholera centers	60 liters/patient/day 15 liters/carer/day
Therapeutic feeding centers	30 liters/in-patient/day 15 liters/carer/day
Schools	3 liters/pupil/day for drinking and hand washing (use for toilets not included: see below)
Mosques	2-5 liters/person/day for washing and drinking
Public toilets	1-2 liters/user/day for hand washing 2-8 liters/cubicle/day for toilet cleaning
All flushing toilets	20-40 liters/user/day for conventional flushing toilets connected to a sewer 3-5 liters/user/day for pour-flush toilets
Anal washing	1-2 liters/person/day
Livestock	20-30 liters/large or medium animal/day 5 liters/small animal/day
Small-scale irrigation	3-6mm/m^2/day, but can vary considerably

Table 6. Sanitation and handwashing needs for institutions		
Institution	Short Term (in emergencies)	Long Term
Market areas	1 toilet to 50 stalls	1 toilet to 20 stalls
Hospitals/medical centers	1 toilet to 20 beds or 50 out-patients	1 toilet to 10 beds or 20 out-patients
Feeding centers	1 toilet to 50 adults 1 toilet to 20 children	1 toilet to 20 adults 1 toilet to 10 children
Schools	1 toilet to 30 girls 1 toilet to 60 boys 1 urinal to 60 boys	1 toilet to 20 girls 1 toilet to 40 boys 1 urinal to 40 boys
Offices		1 toilet to 20 staff
Handwashing facilities with soap	1 facility to 3 toilets or 3 urinals	1 facility to 3 toilets or 3 urinals

CHAPTER 2: WASH and Poverty Reduction

Lack of water, sanitation and hygiene effects health, education, gender and inclusion, income and consumption as well as the environment, all of which are important dimensions related to poverty. The table below summarizes these impacts[11]:

	Impact
1. Health	• Water and sanitation related diseases • Stunting[12] from diarrhea-caused malnutrition • Reduced life expectancy
2. Education	• Reduced school attendance by children due to health problems, lack of available toilets or water collection duties
3. Gender and Inclusion	• Time, physical and energy burdens born disproportionately by women, limiting their entry into the cash economy and hampering their health • Lack of sanitation hampers dignity and social development
4. Economic (income and consumption)	• High proportion of budget used on water • Reduced income-earning potential because of poor health, time spent to collect water, or lack of business opportunities requiring water inputs
5. Environment	• Unhygienic sanitation pollutes the environment
6. Food Security	• Proper use and management of water impacts supply for agricultural production and food availability • Access to clean water is crucial to proper processing and preservation of foods for optimal nutrition and safety • Time dedicated by the household towards water provisioning can negatively impact overall time for caring practices and other crucial dimensions of food access • Illnesses and conditions in the body caused by poor hygiene and sanitation practices prevent healthy utilization of consumed nutrients, contributing to hunger

[11] Partly aadapted from the World Bank PRSP Source Book
[12] Stunting is a below-average height in relation to age among children and is mainly due to malnutrition

I. The Health Dimension[13]

Diarrhea, worm infections and respiratory infections are widespread health concerns and that can be improved through implementing WASH improvements.

One gram of human feces can be dangerous;[14] containing as much as:
10,000,000 viruses
10,00,000 bacteria
1,000 parasite cysts
100 parasite eggs
Figure 3

- Diarrhea is the *most preventable* cause of death for children under five.
- Worms are spread through unhygienic environments (such as contaminated soil or water) and unhygienic behavior. Annually, more than 2 billion people worldwide suffer from worm infections, 300 million people become severely sick and 155,000 people die[15]. Worm infection is ranked as the main cause of disease in children aged 5-14.
- The global estimated figures can be seen in the following table:

Table 7

Disease type	Morbidity Worldwide/year	Mortality worldwide (deaths/year)
Roundworm	250 million	60,000
Hookworm	151 million	65,000
Whipworm	42.5 million	10,000
Trachoma	146 million and 6 million blind	None
Bilharzias	200,000	20,000
Adapted from Fresh Framework and World Health Report, 1998 – WHO website, 2004		

- The table on the next page summarizes the main health concerns for different parts of the body that are related to inadequate water and sanitation services as well as personal hygiene. It also lists possible prevention strategies:

[13] Adapted from Mooijman, A, (2004) *WELL Fact Sheet on Evaluation of Hygiene Promotion activities"* and contribution to "*Policy Brief on MDG on Education"*, WELL resource centre for water, sanitation and environmental health, UK

[14] Curtis, V. (1998). Hygiene, happy and health. A UNICEF series of practical manuals designed to help you set up a hygiene promotion program. Part 1. Planning a hygiene promotion program. UNICEF, New York and London School of Hygiene and Tropical Medicine, London.

[15] Montresor, A., Crompton, D.W.T., Gyorkos, T.W. and L. Savioli (2002). *Helminth control in school-age children: A guide for managers of control programs*. Geneva, World Health Organization

Table 8	Health concerns[16]	Prevention
Head	**Respiratory tract infections:** Virus or acute bacterial infections that affect nose, throat, ears, sinuses, and lungs and are the most common diseases among children. They are the leading cause of death among infectious diseases, accounting for 3.9 million deaths worldwide and 6.9% of all deaths annually. **Lice**: Tiny, wingless parasitic insects that live among human hairs and feed on extremely small amounts of blood drawn from the scalp. They can cause itching and sometimes skin infections.	Washing face and hair with water and soap as well as avoiding use of the same towel and clothing of others. Washing hands with soap/ash/mud.
Eye	**Conjunctivitis:** Or Pink Eye is a very contagious eye infection which spreads from person-to-person by flies or touching. It develops slowly starting with redness, puss and mild "burning" and gets progressively worse, and can eventually even cause blindness. **River blindness:** An infection caused by tiny worms that are carried from person to person by small, hump-backed flies or gnats. The worms enter a person's body through a bite from an infected fly. If left untreated it will eventually lead to blindness. **Trachoma:** Is a chronic infection that slowly gets worse. It is spread by touch or by flies. If left untreated it will eventually lead to blindness.	Good personal hygiene.
Mouth	**Tooth decay and tooth loss:** Cavities or holes in teeth are made by an infection (or tooth decay) as the result of acid touching the teeth and gums. The acid is made when sweet and soft foods mix with germs. Tooth decay can eventually lead to tooth loss. **Gum infections:** Red, swollen and painful gums that bleed easily caused by malnutrition or lack of dental hygiene.	All teeth and gums should be cleaned twice a day. Use a brush, stick or finger wrapped with a piece of rough cloth. If no toothpaste is available, salt, charcoal or just plain water will also work.
Body	**Impetigo:** A bacterial infection that spreads rapidly from sores or contaminated fingers. It often occurs on children's faces especially around the mouth. **Scabies:** Caused by tiny animals which make tunnels under the skin creating little and itchy bumps that can appear all over the body. It is spread by touching the affected skin or by clothes and bedding. Scratching can cause infection, producing scores with pus, and sometimes swollen lymph nodes or fever.	These skin problems are closely tied to personal hygiene and cleanliness. Bathing daily and body washing with soap as well as changing clothes daily can greatly reduce transmission.

[16] Details on the characteristics of the different health concerns have been derived from the Hesperian Foundation publications "Where there is no doctor", " Where women have no doctor" and "Where there is no dentist" more on: http://www.hesperian.org/

Table 8	Health concerns[16]	Prevention
Body	**Ring worm:** A fungus infection which grows in the form of a ring. It often itches and is very contagious. **Yaws:** Is an infection of the skin, bones and joints caused by a certain bacteria. It is transmitted by skin contact between infected individuals or flies. **Lice:** (see above)	Good personal hygiene.
Internal Diseases	**Diarrhea, food poisoning, colds:** Very common signs of several diseases which are mainly caused by viruses or bacteria spread from person to person (colds can also be spread in the air). **Intestinal worm infections:** There are many types of worms and parasites that live in the intestine and cause disease. Generally they are spread from a person's stools to another person's mouth. A person may not feel sick right away. **Dysentery:** Leads to severe diarrhea caused by parasites. The stools of infected people contain millions of parasites. Because of poor sanitation, the parasites get into food or drinking water and infect other people. **Typhoid, paratyphoid fever:** A bacterial infection that is spread feces-to-mouth. It causes high fever and severe diarrhea. **Cholera:** Caused by a bacterial infection. Transmission occurs through food or water which is contaminated with cholera. In its most severe forms, cholera can be one of the most rapidly fatal illnesses and a healthy person may become sick within an hour of the onset of signs. The disease progresses from the first liquid stool to shock in 4 to 12 hours, and if left untreated will lead to death after anywhere from 18 hours to several days. **Hepatitis A, polio:** Severe viral infections which can make people very sick. Polio mainly affects children and can lead to paralysis.	Washing both hands, rubbing with plenty of water with soap/ash/mud after toilet use, before eating, before preparing food, after cleaning babies, after handling domestic pets and animals, after working in the field. Also: • Washing hands reduces the risk of diarrheal diseases by 42–47%[17]. • Washing hands with soap also significantly reduces the cases of acute respiratory diseases among school children. • Cutting nails and washing under nails with soap
Feminine Hygiene	**Vaginal, bladder and kidney infections:** Infections are caused by bacteria which enter the body from outside (mainly due to lack of cleaning of the urinary opening and genitals). They cause painful urination and create a sensation of needing to urinate often. In case of a kidney infection, it can also cause a fever and pain.	• Cleaning of genitals and surrounding skin and wiping from front to back after using toilet. • Frequent drinking and urinating. • Urinating after intercourse.

[17] Curtis and Cairncross (2003), *Effect of washing hands with soap on diarrhea risk in the community: a systematic review,* The Lancet infectious diseases, Vol 3 nr. 5, 1 May 2003

One of the first studies that focused on the direct links between water supply, sanitation provision and hygiene habits was undertaken in the 1990s[18]. This study showed that improved hygiene habits and provision of appropriate sanitation have a greater impact (≈35% reduction) than water supply provision (19%) or improving the water quality (15%).

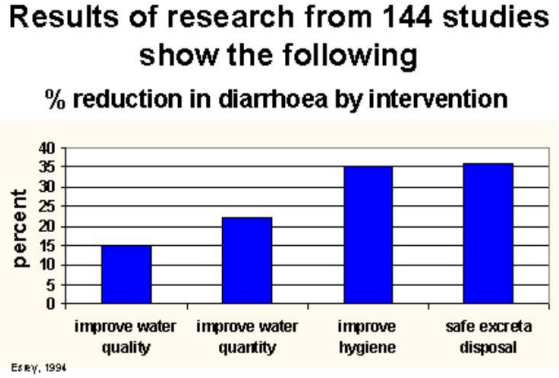


Figure 4

In 2005, a review[19] of existing studies confirmed the above findings but also discovered that multi-focused interventions (simultaneous water, sanitation and hygiene measures) were *not* more effective than single-focused interventions. This review disputed the traditional view that programs focused solely on water, sanitation or a hygiene intervention have little impact. The studies showed the importance of promoting handwashing with soap amongst children and their caregivers, balancing between technical solutions towards water and sanitation provision and the promotion of appropriate hygiene behavior.

Stunting and reduced life expectancy from diarrhea-caused malnutrition

In developing countries, cases of diarrhea range from 5-12 episodes/child/year, with the highest rates in the most crucial first two years of life[20]. Repeated episodes of diarrhea, often associated with family practices to reduce food intake as well as mal-absorption of nutrients, are an important risk factor for chronic under-nutrition which affects up to 50% of children in some of the areas where Mercy Corps works. Some 3900 children die each day from diarrhea from water-related diseases

II. The Educational Dimension

Due to health problems and the lack of available toilets or water collection duties, children are more likely to miss school

- Although diarrhea seldom kills children above the age of five, it remains an important issue for school-age children: it is the major source of morbidity[21] and therefore factors into why children are absent from school.
- Chronic early childhood diarrhea can result in decreased blood flow to the brain or failure to absorb sufficient dietary nutrients. Repeated episodes may have permanent effects on brain development. This may have an impact on a child's learning ability and their health during school years.

[18] Esrey, S. et al. (1990), "*Health benefits from improvements in water supply and sanitation: survey and analysis of the literature on selected diseases",* WASH technical report no. 66
[19] Fewtrell, L. et al. (2005), "*Water, sanitation, and hygiene interventions to reduce diarrhea in less developed countries: a systematic review and meta-analysis",* The Lancet infectious diseases, Vol 5, pages 42-52, 2005
[20] Guerrant, Hughes, Lima and Crane (1990), "*Diarrhea in developed and developing countries: magnitude, special settings, and etiologies",* Rev Infect Dis. 1990 Jan-Feb 12 Suppl 1: S 41-50
[21] World Health Report, 1998

- Children from a Brazilian shantytown community who suffered serious and ongoing episodes of diarrhea during their first two years of life performed worse than other children on intelligence tests.
- A study[22] in Bangladeshi children aged 5-11 years suggested that the link between diarrhea and impaired growth is still present in school-age children and that efforts to reduce the frequency of diarrhea in older children could have a significant effect on their catch-up growth.
- Diseases spread quickly at schools because they are gathering places for large numbers of children for many hours a day. A study in Colombia showed a direct link between diarrhea and hygiene[23] in schools. In this study, more than 40% of the cases of diarrhea in schoolchildren were attributed to school infections rather than transmission in homes.
- Children, as well as teachers, frequently miss school due to domestic and water-carrying duties. There was a 12% increase in Tanzanian school attendance when water was 15 minutes away rather than one hour.
- School attendance among girls has risen since the introduction of water points in four communities in Arappalipatti and Panjapatti India. There was also a recorded increase in women's literacy levels.
- Children caring for relatives suffering from water-related illnesses or replacing the role of a deceased parent also miss school.
- Children are often excluded from school activities if they wear dirty school uniforms or shoes, are dirty or show signs of infections.
- Teacher retention and recruitment is difficult in schools which lack adequate water and sanitation facilities.
- Teachers also miss school due to WASH related illnesses and domestic chores such as water-carrying.
- The impact of worm reduction programs in schools has been remarkable. A study in Jamaica found that children who were treated against a worm infection performed much better in school than children who did not receive treatment.
- A school Environmental Health Club was established in the Nigerian village of Bashibo, promoting hygienic behaviour in the home. By 2001, handwashing increased by 95%, and regular bathing and teeth brushing increased by 90%. School attendance, especially amongst girls, has also increased, as has the general health and nutritional status of the community.

III. The Gender Equity and Inclusion Dimension

Women spend a disproportionately large amount of time on water-centered activities and bear significant physical burdens. This harms their health and limits their entry into the cash economy.

- In many societies[24] water is at the core of women's traditional responsibilities: collecting and storing water, caring for children, cooking, cleaning, and maintaining sanitation within the home or community. These tasks often represent an entire day's worth of work as women can spend

[22] Torres, Orav, Willet and Chen (1994), *Association between protein intake and 1-y weight and height gains in Bangladeshi children aged 3-11 years.* American Journal of Clinical Nutrition, Vol. 60, 448-454
[23] Koopman, J. S. (1978) Diarrhea and school toilet hygiene In Call, Colombia. Am J Epiderniol107:412-420.
[24] Partly adapted from http://www.wateryear2003.org

as much as five hours a day collecting wood for fuel and getting water, and up to four hours preparing food. Providing access to clean water close to the home can dramatically reduce women's workloads and free up time for other economic activities.

- In Africa, 90% of the work of gathering water and wood for household needs, such as food preparation, is done by women.
- Improved water supply allows women entrepreneurs in Gujarat to earn anywhere from US$ 15-110 a year working jobs such as dairying, crafts and tree nurseries.
- In the Noakhali district of Bangladesh the provision of water and sanitation facilities increased girls' attendance at school by 15% in 1998.
- A community-based project in Punjab, Pakistan, has provided safe drinking water and drainage facilities to about 800,000 people. The main impact of the project has been to stop women and children from having to carry water 2–6 hours every day. This has increased people's income because 45% of the time saved can be spent on income-generating activities. A survey found that, after the project was carried out, there was more than a 90% reduction in water-related diseases, a 24% average increase in household income, and as much as 80% increase in the enrolment of schoolchildren.

Lack of sanitation hampers dignity and social development

- A study in Sri Lanka and Malaysia found that reductions in maternal mortality ratios and communicable disease were linked strongly to general improvements in sanitation.
- Women play a key role in educating children about water. It is important to grab their interest about water awareness, since they look after the household, and it is due to contaminated water or lack of good hygiene practices that lead to children contracting diseases and getting sick.
- If adolescent girls[25] attend schools during menstruation the availability of girls' toilets and water supply is essential to comfortably change and dispose of sanitary pads. When not available, adolescent girls may have discomfort during class. Although it has not been proven through scientific research, the lack of sanitary protection during menstruation is often mentioned by adolescent girls as a barrier to their regular attendance in school. Especially in rural areas there is very limited availability of commercial sanitary products (or if they are available they are financially out of reach for most women and girls) which leads women to make home made sanitary pads. An assessment done in 20 schools in rural Tajikistan revealed that all girls chose not to attend school when they have their periods, because there are no girls' facilities.
- Regular absence from school for several days a month can, even in the short term, have a negative impact on girls' learning and their academic performance in school. Eventually this can even lead to dropping out completely.
- School curricula typically do not cover the topic of menstruation and puberty in a girl-friendly way, and therefore often do not help girls to understand the changes in their maturing bodies. Girls (and boys) should have access to sexual and reproductive health education within formal education programs. However, many biology text books instead contain sexless bodies and make no reference to menstruation or reproductive health, leaving girls (and boys) ignorant about the topic.

[25] The text has adapted from: Kirk, J. and Sommer, M (2006), *"Menstruation and body awareness: linking girls 'health with girls' education"* Gender and Health Special. Royal Tropical Institute (KIT), Amsterdam, Netherlands

- Access to WASH facilities for women, does not only mean focusing on economic improvements but may also involve modifying long-established religious or cultural practices.

IV. The Economic Dimension

Dublin Statement on Water and Sustainable Development (1992)'

'Principle No. 4: Water has an economic value in all its competing uses and should be recognized as an economic good. Within this principle, it is vital to recognize first the basic right of all human beings to have access to clean water and sanitation at an affordable price. Past failure to recognize the economic value of water has led to wasteful and environmentally damaging uses of the resource. Managing water as an economic good is an important way of achieving efficient and equitable use, and of encouraging conservation and protection of water resources.

Box 2

High proportion of budget used on water

There are very few studies on the comparison of price for water between low-income groups living in informal settlements and households who receive water through government-initiated house connections. The table below compares the cost of water bought from informal vendors to the cost of water supplied through house connections (examples from Asia):

Table 9

City	Cost of Water for Domestic Use (House Connection–s - 10 m³/month) in $US/m³	Price charged by informal vendors in $US/m³	Ratio B/A
Delhi*	0.01	4.89	489
Vientiane	0.11	14.68	136
Faisalabad	0.11	7.38	68
Bandung	0.12	6.05	50
Manila	0.11	4.74	42
Mumbai*	0.03	1.12	40
Ulaanbaatar	0.04	1.51	35
Davao*	0.19	3.79	20
Phnom Penh	0.09	1.64	18
Mandalay	0.81	11.33	14
Cebu	0.33	4.17	13
Hanoi	0.11	1.44	13
Bangkok*	0.16	1.62	10
Chonburi*	0.25	2.43	10
Ho Chi Minh	0.12	1.08	9

Chiangmai*	0.15	1.01	7
Chittagong*	0.09	0.50	6
Karachi	0.14	0.81	6
Dhaka	0.08	0.42	5
Colombo*	0.02	0.10	4
Male*	5.70	14.44	3
Jakarta	0.16	0.31	2
Lae*	0.29	0.54	2
* Some water vending but not common.			
Source: Second Water Utilities Data Book Asian and Pacific Region, Asian Development Bank, October 1997. (tables 11 and 18). Compiled by C. Ertuna, Chief, Population and Rural and Urban Development Division, ESCAP)			

Reduced income-earning potential because of poor health, time spent collecting water, or lack of business opportunities requiring water inputs[26]

- The costs and benefits of improvements to water supply and sanitation are difficult to calculate because many benefits are not direct in terms of material changes to economic costs and outputs. In an attempt to calculate the cost benefits, a recent WHO study found that every dollar spent on improving sanitation generates an economic benefit of $3 to $60[27]. Other benefits include increases in ecosystem goods, services and other non-use values resulting from improvements in ecosystem health and options from increased water access, such as the productive use of domestic water in income-generating activities and the cost savings from buying water from more expensive sources.

A 2003 WaterAid household-approach study assessed a small number of projects in two countries, Tanzania (4 projects) and India (3 projects). They were chosen due to extensive data already collected for a poverty study and because NGO partners had maintained comprehensive records on water collection and associated time costs. The study focused on time savings and calorie energy savings, and also on agricultural output (in the case of the Tanzania projects). The cost-benefit analysis performed under these parameters found returns ranging from $2 to $52 for every $1 invested. It must be noted that the study did not calculate savings from improved health and benefits derived from improved ecosystem health (due to lack of available local-level data) or options from increased water access. Therefore, actual returns, though difficult to measure, may be even higher than the figures obtained.

[26] Detailed information can be found in: Evaluation of the Costs and Benefits of Water and Sanitation Improvements at the Global Level http://www.who.int/water_sanitation_health/wsh0404.pdf

[27] G. Hutton and L. Haller (2004). Evaluation of the costs and benefits of water and sanitation improvements at the global level.WHO,

V. The Environmental Dimension

Unhygienic sanitation pollutes the environment

- Improved disposal of human waste protects the quality of drinking water sources. At present, more than 200 million tons of human excreta, as well as big quantities of waste water and solid waste, go uncollected and untreated each year. This waste pollutes the environment and exposes millions of people to disease and dirt.
- Most prevalent diseases, such as diarrhea or worm infections, are spread by germs. Germs pollute the environment and cause sickness. The path in which germs can spread from person to person is summarised in the **F-diagram**[28]:

  - **Fingers**: Human feces stick to hands, fingers and under nails
  - **Flies:** Flies and other insects sit on feces, moving from the feces to food for human consumption
  - **Fields:** (Human) feces are being used or disposed on food production fields, causing consumption of feces through food that might not be fully cooked
  - **Fluids** (water): Feces mixes with drinking water

Following the F-diagram, stopping the paths of contamination can be defined at the fecal contamination point on the left side of the diagram and at the fecal-oral transmission point on the right side.

- **Fecal contamination** can be stopped through the provision of safe toilets and the protection of water sources.
- **Fecal-oral transmission** can be stopped through hygienic storage and preparation of food, protection of water between source and consumption and washing your hands with soap after toilet use, before eating, before preparing food and after cleaning babies.

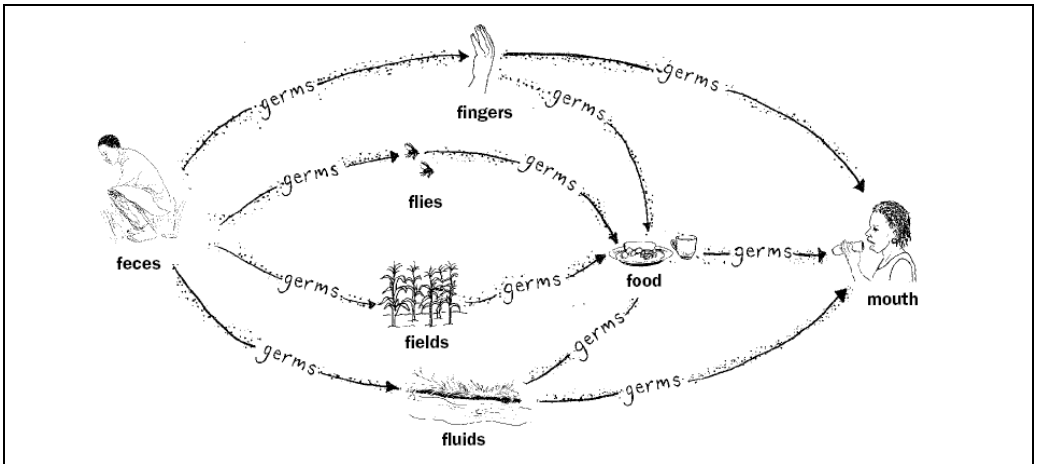


Figure 5 F-diagram (drawing from a Manual developed for CCF/UNICEF in Sri Lanka, 2006)

[28] It is called F-diagram because all paths start with F.

VI. The Food Security Dimension

The most commonly referenced and agreed upon definition comes from the 1996 World Food Summit:

> **Food security, at the individual, household, national, regional and global levels [is achieved] when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.**

It is also often referred to using the USAID 1992 definition and recent 2008 framework:

> **When all people at all times have both physical and economic access to sufficient food to meet their dietary needs for a productive and healthy life.**

Food security initiatives therefore incorporate elements of enhanced *food availability* (e. g. agriculture production, imports, aid), *access to food* (e.g. elements of increased income, physical access, distribution of food within the household), *utilization of food* (e.g. behavior change, health, water and sanitation programs to reduce disease and malnutrition) and *reduction in vulnerability and risk to future insecurity*. Water, sanitation, and hygiene initiatives that address issues of health, education, gender, and economic development all are connected to a comprehensive approach for reducing food insecurity. The figure on the next page details some of these relationships.

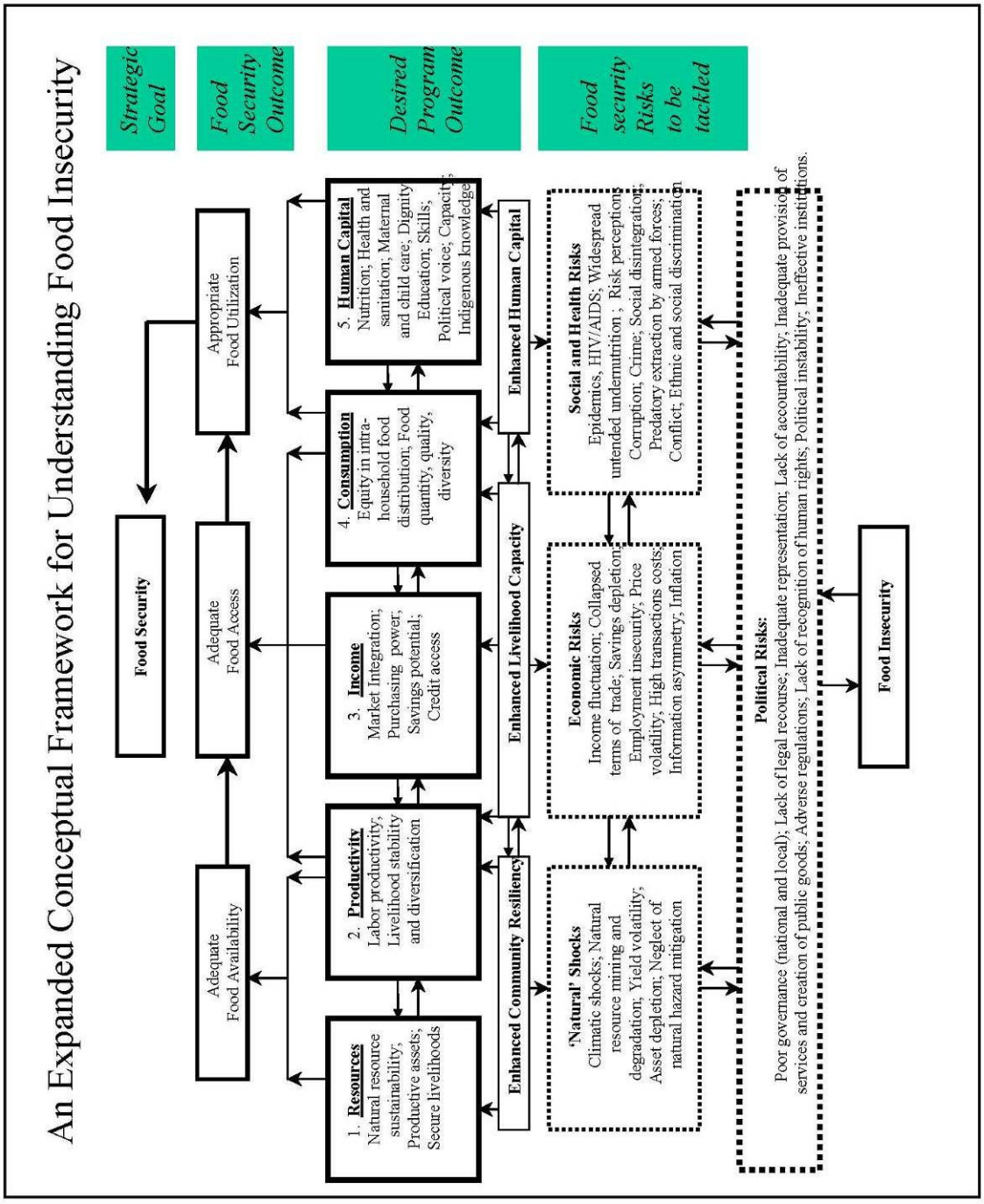

An Expanded Conceptual Framework for Understanding Food Insecurity
Strategic Goal
Food Security Outcome
Desired Program Outcome
Food security Risks to be tackled
Food Security
Adequate Food Availability
Adequate Food Access
Appropriate Food Utilization
1. Resources
Natural resource sustainability; Productive assets; Secure livelihoods
2. Productivity
Labor productivity; Livelihood stability and diversification
3. Income
Market integration; Purchasing power; Savings potential; Credit access
4. Consumption
Equity in intra-household food distribution; Food quantity, quality, diversity
5. Human Capital
Nutrition; Health and sanitation; Maternal and child care; Dignity Education; Skills; Political voice; Capacity; Indigenous knowledge
Enhanced Community Resiliency
Enhanced Livelihood Capacity
Enhanced Human Capital
'Natural' Shocks
Climatic shocks; Natural resource mining and degradation; Yield volatility; Asset depletion; Neglect of natural hazard mitigation
Economic Risks
Income fluctuation; Collapsed terms of trade; Savings depletion; Employment insecurity; Price volatility; High transactions costs; Information asymmetry; Inflation
Social and Health Risks
Epidemics, HIV/AIDS; Widespread untended undernutrition ; Risk perception; Corruption; Crime; Social disintegration; Predatory extraction by armed forces; Conflict; Ethnic and social discrimination
Political Risks:
Poor governance (national and local); Lack of legal recourse; Inadequate representation; Lack of accountability; Inadequate provision of services and creation of public goods; Adverse regulations; Lack of recognition of human rights; Political instability; Ineffective institutions.
Food Insecurity

Figure 6

CHAPTER 3: WASH Program Goals, Objectives, Activities and Indicators

Mercy Corps WASH interventions focus on solving issues of *availability* of water and sanitation, *access* to these services and correct *utilization* of those services. Overall, a well planned program addresses the **real needs and demands** of the beneficiaries. In order to fully understand those needs and demands, an accurate analysis of the existing situation is needed as well as a vision of a desired future situation. Such analysis demands four components:

1. **Stakeholder analysis:** This involves the identification of all stakeholder groups likely to be affected (either positively or negatively) by the proposed intervention, the identification and analysis of their interests, problems, potentials, etc. The conclusions of this analysis are then integrated into the program design.
2. **Problem analysis:** Sometimes this analysis is presented in a problem tree.
3. **Objective analysis:** This involves making an analysis of the proposed improvements and future desired benefits to which the beneficiaries and target groups attach priority. Sometimes this analysis is presented in an objective tree.
4. **Analysis of the strategies** to achieve those improvements (analysis of proposed inputs, major activities and key outputs).

The findings from such an analysis generally lead to the beginning of a full planning process.

The **objectives** are the center of any program planning and should be defined and agreed upon first. Objectives illustrate the change for the direct beneficiaries and have to be discussed and agreed upon before the different program components can be determined. Well formulated objectives should be concise and measurable, as well as incorporate the following questions:[29]

- Who are the direct beneficiaries?
- What problem or which problems have been solved for the direct beneficiaries after finalisation of the program?
- What will the direct beneficiaries do differently after the program.

Commonly used goals for development projects:

- Poverty reduction
- Environmental sustainability
- Improved health
- Human development
- Equitable income growth

Box 3

[29] Rajalahti, R. et al (2005), "*Monitoring and evaluation for World Bank Agricultural research and extension projects: a good practice note*", Agriculture and Rural Development I. Discussion Paper 20, The International Bank for Reconstruction and Development & The World Bank, Washington DC, USA

I. Program Framework

The results of the planning process are then translated into a **program framework** (also known as a **log frame**). Developing a program framework that is comprehensive and representative should preferably be done in a joint planning process with all partners involved**.** To strengthen sense of ownership, preferably the future WASH managers[30] (e.g. central or local government partners, water boards) should play a central, lead role in the process, keeping in mind all other partners that may influence objectives. The main groups that should be involved are: the direct beneficiaries or clients, community WASH boards, Government partners, NGOs and CSOs and private sector. Going through a joint planning process will:

- help the program team and beneficiaries to understand the different inter-linkages and help to clearly align the different program components:
  - ✓ provide the link with the strategic context in which the program operates
  - ✓ provide a definition of the risks and assumptions that directly links to the program objectives and program implementation.
- help the program implementation team understand the linkages between monitoring for implementation and for results.

The development of a program framework or log frame has been standardized within Mercy Corps. Detailed information, explanation and instructions can be found in the *Mercy Corps Design, Monitoring and Evaluation Guidebook*. This chapter gives an overview of the most relevant information pertaining to the WASH field manual.

A full program framework formulates (1) Goals, (2) Objectives, (3) Key Outputs, (4) Major Activities and (5) Indicators. The following questions should be answered before preparing the framework:

2. Where will the data for the objective and goal indicators come from?
3. Where will the capacity and responsibility for collection of indicator data and analysis of results reside? Do capacities have to be strengthened? If so, how?
4. What mechanisms exist or are needed to permit the use of measured indicators by implementers, managers and policy-makers in order to assess the program's effectiveness during and after implementation?

The table below gives the format, including an explanation and example of each component as well as the relevance it has within the program framework.

[30] Sometimes future managers will not be the managers on the short-term, but will act as managers once the program has phased-out. E.g. Mercy Corps managers are in charge during construction and implementation, but the program is handed over to Government or Water Board upon completion.

Table 10 PROGRAM FRAMEWORK or LOG FRAME set-up			
Goals (impact): Positive and negative, direct and indirect long-term effects produced by one (or more) development interventions, directly or indirectly, intended or unintended. Goals can also be affected by contributing factors other than the program major activities. *Examples of goals:* Improved well or water supply, increased private sector productivity, increased family incomes, an upward trend of health indicators.			
Objectives (effects): Expected or actual demand-side behavioral responses by the direct beneficiaries and other stakeholders outside the control of the program that demonstrate uptake, adoption and use of the program key outputs. Objectives are measured before the end of program implementation in participating areas. *Examples:* 75% of households adopt new hygiene behaviors in participating areas; improved effectiveness of service delivery as shown by improved user satisfaction among 80% of community members; 70% of community members access/use safe water supply and/or sanitation services.	**Key Outputs:** Program deliverables, on the supply-side, that are expected to add value to beneficiaries and are designed to stimulate objectives. Key outputs are designed to stimulate objectives. *Examples:* Water supply system, latrines, wastewater systems; strengthened capacity of implementing agency; improved efficiency of service providers.	**Major Activities:** Action taken or work performed by which inputs are converted into specific key outputs. Major activities are designed to deliver key outputs. *Examples:* Capacity building activities; training activities; construction activities; technical assistance.	**Indicators:** Variables that confirm whether changes are occurring as a result of a development intervention.

Objectives are outside the control of the program. Success in the transformation of key outputs to objectives is about *effectiveness*. Major activities and key outputs are within the control of Mercy Corps; success in the transformation of major activities to key outputs is about *efficiency*.

II. Indicator Plan

In addition to Mercy Corps' program framework, an *indicator plan* should be developed. This plan is typically created during the project start-up phase and serves to organize the process for baseline data collection. It helps to define what indicators mean in relation to what they are supposed to measure and their relevance to the program. It also describes where to get information, from which sources and on

what schedule. It is especially useful for identifying indicators that may be hard to measure. For example, how to measure intangible things like increased capacity or reduced rates.

Overall the Indicator Plan is *a long-term time saver* that allows for:
- ✓ better definition of indicators
- ✓ narrowing of indicators to a manageable number
- ✓ a thoughtful schedule for data collection
- ✓ the selection of appropriate data collection methods

Table 11 Format of an indicator plan[31]					
Objective					
Indicator	Definition of Indicator and Management Utility	Baseline Data and Targets	Data Collection Sources & Methods	Frequency of Data Collection	Person Responsible

III. Practical Tips for Developing WASH Indicators

1. **Limit the total number of indicators**
   It is ideal to have the minimum amount of indicators necessary that will show whether the expected key outputs or objectives have been achieved. Avoiding collecting **too much information** will limit the **risk** of:
   - Too detailed information may create *difficulties in identifying important trends.*
   - *Incorrect measuring or misreporting* due to large amounts of information
   - *Running out of time* because there is too much data to analyze and use
   - People might *resent cooperation* if they are repeatedly asked for information.
2. **Link indicators to objectives**
   Too often indicators are largely output-focused. Therefore be sure to always formulate at least one indicator that measures achievement of the objectives.

[31] Sometimes a somewhat different format is being used where all objectives are given in the first column instead of on top of the table.

3. **Indicators must relate to the appropriate level of key outputs, objectives or goals**
   Be sure that indicators at the objective level are not made too ambitious or unspecific. For example, "Improving the overall health and well-being of population in area X" is far too ambitious. A better indicator would be "Decrease in the incidence of cases of diarrhea by x%".

4. **Indicators can be quantitative and qualitative**
   Simple quantitative indicators can be expressed in a number or percentage, e.g. *X* water systems constructed or *Y*% of the population have a functioning latrine. Qualitative indicators should be used with caution to avoid measurement of perceptions instead of actual facts. However, they can provide insight on changes in institutional processes, attitudes, beliefs, motives and behaviors of individuals such as "quality of", "level of", "extent of", "compliance with," etc.

5. **Define the indictors following the SMART principle**
   This implies that indicators should be:
   - Specific
   - Measurable
   - Achievable
   - Relevant
   - Time-bound (meaning they have a clear beginning and end).

6. **The use of proxy indicators**[32]
   When it is difficult to measure the objective indicator directly, indirect or *proxy indicators* can be used. Normally, proxy indicators will be used only when data for direct indicators is not available, when data collection is too costly or time consuming, or when it is not feasible to collect data at regular intervals (e.g. the selling of ORS instead of measuring the incidence of diarrhea).

7. **The use of existing indicators**
   Existing indicators established independently by an individual country, organization, program, or sector context can often be applied. Some well-known examples of such indicators are:
   - MDGs: the UN Millennium Development Goals contain eight goals, with underlying targets and indicators assigned to each. http://www.un.org/millenniumgoals/index.html

[32] Adapted from Kusek, J. and Rist, R. (2004), "*Ten steps to a Result-Based Monitoring and Evaluation System*", World Bank, Washington, DC, USA

- The UNDP's Sustainable Human Development Goals measure achievements in development from a human perspective, expressed in terms of numerical indicators that permit comparisons within countries and between countries over time. http://hdr.undp.org/
- MICS: the Multiple Indicator Cluster Surveys developed by UNICEF are household surveys developed to obtain specific data on monitoring the situation of children. http://www.childinfo.org/index2.htm
- DHS: Demographic and Health Surveys (USAID) collected, analyzed and disseminated data on population, health, HIV, and nutrition in over 75 countries. http://www.measuredhs.com/

Normally, existing indicators are used in addition to specific program indicators which are program driven and can be collected with active stakeholder participation.

8. **Disaggregate indicators to measure impacts on specific beneficiary groups**
   Separate indicator data, if needed, by age, gender, ethnic or socio-economic group to be able to investigate the overall impact for the different groups of beneficiaries. In this way, a lack of impact on specific groups can be detected during an early stage of project implementation.

9. **Take time to develop a set of indicators.**
   Consultation and participation of experts, stakeholders and future beneficiaries will allow different perspectives to be taken into account when developing indicators. In this process, issues such as feasibility, financial implications and political relevance of certain indicators can be considered.

ADDITIONAL INFORMATION:

- Mercy Corps (2005), "**Design, Monitoring and Evaluation Guidebook**"
- Shordt, K., (2000) "**Action Monitoring for effectiveness. Improving water, hygiene and environmental programs**", Part I and II, IRC International Water and Sanitation Centre, Delft, the Netherlands and Danida, Ministry of Foreign Affairs, Denmark.

IV Mercy Corps Examples of LogFrames, Indicator and Data Collection Plans[33]

Example: RURAL WASH PROJECT

Objectives	Indicators	Data Collection Strategy
• Improved percentage of population with sustainable access to (use of) WASH services in rural areas	• Percentage of population that is supplied with water through water boards that cover at least the Operation & Maintenance cost of the water supply service and have a billing efficiency of more than 80 percent • Percentage of population that is supplied through water boards that cover at least the O&M cost of the sewerage service and have a billing efficiency of more than 80 percent • Number of beneficiaries using sustainable water systems[34] in year 5 of the program in communities that were provided with services in year 1 of the project • Number of beneficiaries using basic sanitation systems in year 5 of the program in communities that were provided with services in year 1 of the project • Reduction in working days lost due to water borne related diseases • Time saved by water users per year, by gender and social group (in hours per year) • Percentage of target audience that have adopted good hygiene behavior at key times	• Annual Monitoring and Evaluation – Track progress towards meeting national targets on rural access to potable water supply • Assess prospects for sustainability of the RWASH investments or whether changes in strategy and implementation are needed • Reports on Health and Environmental improvement • Planning for future investment needs in the rural WASH sector • Verify impact of personal hygiene promotion

[33] Derived from A. Mooijman (2008) Toolkit on Monitoring and Evaluation for Water Supply and Sanitation, World Bank, Washington DC, USA

[34] Systems are considered to be "sustainable" if (i) the systems are functioning as intended and deliver the service either continuous or regularly depending on the service level selected; (ii) the water committees meet on a regular basis; and (iii) tariffs are set at a level that guarantees operation and routine maintenance of the system, and collected; (iv) the systems are designed to ensure long-term supply (designed appropriately for yield of source).

Objectives	Indicators	Data Collection Strategy
Key outputs **<u>Component A:</u>** **Set up arrangements that promote sustainable WASH service delivery in rural areas**	**Output Indicators** **Improve WASH Performance** • Percentage of water boards where communities contribute the minimum required capital cost contribution by type of service (water/sanitation) • Percentage of water boards that collect a tariff that covers at least the operation and maintenance cost of water supply delivery • Percentage of water boards that record water quality tests at least *x* times per year • Percentage of municipalities that monitor annual progress for WASH targets • Percentage of municipalities that provide TA to water boards • Percentage of water boards that receive support services from regional associations	**Use of Output Monitoring** **Component A:** • Monitoring and Evaluation • Measure boards' ability to achieve financial sustainability • Identify key areas within the board that need strengthening and capacity building • Assess participation of local communities in capital investment • Inform areas where capacity building of involved enterprises and institutions needs to be targeted or capacity building approaches improved • Ascertain adequacy of regional government involvement in monitoring district's WASH programs • Evaluate effectiveness of efforts to build the capacity at the directorate of water and ascertain where additional efforts are needed • Assess the viability and effectiveness of present arrangements for water supply
<u>Component B:</u> **Construction (expansion) of WASH facilities in rural areas**	**Improve access to (use of) WASH services** • Percentage of population with access to (use of) improved water services • Percentage of population with access to (use of) improved sanitation services • Percentage of poor population with access (use of) to improved water services • Percentage of poor population with access to (use of) improved sanitation services	**Component B:** • Monitoring and Evaluation • Identify gaps in access to acceptable WASH quality levels; and initiate timely operational improvements to improve service levels • Assess options for further scaling up of village piped water supply

Objectives	Indicators	Data Collection Strategy
	• Average per capita consumption of water in residential households	
Component C: **Rehabilitation of WASH facilities in rural areas**	**Improve quality of access to WASH services** • Increase in average per capita consumption of water in residential households • Decline in percentage of water boards that fail to comply with water quality standards • Reduction of system breakdowns as measured in downtime in days per year	**Component C:** • Monitoring and Evaluation • Planning of future water demand and investment needs • Identify gaps in access to WASH services and initiate timely operational interventions to meet targets
Component D: **Promote certain hygiene behaviors to target audiences at key times**	• Percentage of target audience that has been exposed to message • Percentage of target audience recalling messages correctly	**Component D:** • Assess progress of hygiene education and reorient as required; find improved ways of communicating potential health benefits and translating this into behavioral change

Example: URBAN ENVIRONMENTAL POLLUTION PROJECT

Objectives	Indicators	Data Collection Strategy
To reduce urban environmental pollution by reducing pollution loads into rivers/seas	• Reduction in pollution levels from *x* to *y* (as measured at selected points downstream (e.g., all monitoring stations) Percentage of target audience that has reduced the annual pollution load from *X* tons in year *x* to *Y* tons in year • *y*	• Annual Monitoring and Evaluation – Track progress in achieving MDGs for access to WASH • Reports on health and environmental improvement • Assess environment mitigation measures • Planning for future investment needs for reducing urban environmental pollution • Building upon experience of environmental impacts to prepare more environmentally friendly water supply projects

Objectives	Indicators	Data Collection Strategy
Key outputs • Increase in treated wastewater • Reduction in pollution levels at selected points downstream	• Percentage of wastewater volume treated in relation to total wastewater volume collected increases from X percent in year x to Y percent in year y • Increase in efficiency of sewage treatment plants • Percentage of water samples passing water quality tests • Reduction of pollution loads at the treatment plants outlets from X tons in year x to Y tons in year y • Percentage of target audience that has been exposed to environmental awareness raising messages • Percentage of target audience that can recall environmental awareness raising messages correctly • Adoption of environmental standards that are cost effective	**Use of Output Monitoring** • Monitoring and Evaluation • Preparation of plan for sustainable reduction of pollution • Assure sustainability of investment, recommended adjustments in planning and/or operations and dissemination of the objective for public awareness surrounding the environmental conditions • Better enforcement of actions, public disclosure of compliance, or lack of, from major polluting enterprises, and continuous improvement of industrial wastewater pollution control programs • Flag capacity constraints that should be addressed

CHAPTER 4: WASH Program Cycle

Using the Program Cycle Approach makes sure that:

- **You think systematically BEFORE undertaking action and AFTER you have implemented and**
- **You can REFLECT on what you have done and learned from it.**

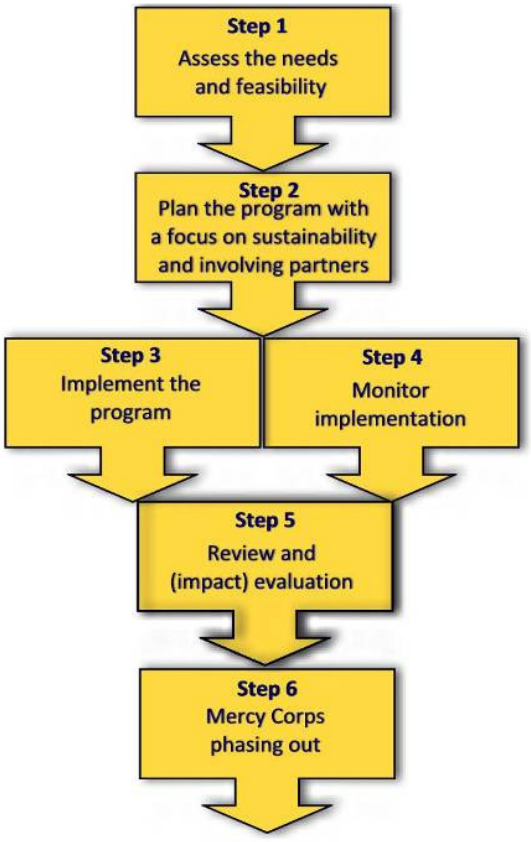
The common program cycle outlined below contains six key steps and describes how assessment, stakeholder involvement, program implementation, monitoring, evaluation and phasing out are part of a continuous process to plan a program. The different steps should be seen as elements of a cycle, rather than separate exercises.

Following ALL steps should ensure that program planners and implementers:

- Think properly over what they are trying to achieve before actually starting
- Develop the most effective plan of action to achieve their objectives and monitor their progress during implementation
- Take action when things do not work as planned during implementation, and,
- Learn from the program and use this for future policy and practice.

Figure 7

Program Cycle Diagram



Step 1: Assess the needs and feasibility

Conducting a needs assessment and investigating feasibility starts with a proper understanding of the problem. Except for the obvious coverage and needs statistics on current WASH conditions in the program of project area, there are a many additional questions to be addressed:

- What do you need to know?
- Whose views, priorities and experiences are relevant to get this information?
- What will be the potential impact on health, education, gender and inclusion, income and consumption, and the environment?
- Whose needs and rights are affected by the program or project?
- Who has an interest in analyzing problems and working on appropriate solutions? Also consider those with a less obvious or outspoken interest.
- Who is likely to feel threatened by the possibilities of changes to the program or project?
- Whose active support is essential for the success of the program or project?
- Who takes decision about the program or project?
- Who will be expected to act on the decisions?

Normally, the process of collecting above information is being done by project officers or managers and is a rather quick process which results in a note describing broadly what can be expected from a project or program. It does not provide many details and is mainly used to search potential financers and find initial commitment from potential partners, such as communities, water boards, local government partners and health officials.

Questions Commonly used in Assessing Needs

If you can only ask a few questions to asses need, you should ask:

1. What percentage of the population has access to water?
2. How far do people have to walk to access water?
3. How much water they fetch a day?
4. Is diarrhea frequent among children?
5. Other water borne diseases?

However, a detailed set of questions will allow for a more accurate needs assessment as well as contribute in designing the appropriate solution/ intervention:

General:
How many people live in this village?
- ✓ Are people moving in?
- ✓ Are children under 5 dying?
- ✓ How many households have access to water and toilets?
- ✓ Does everyone have equitable access to water?
- ✓ Does the local school or health post have running water and toilets?
- ✓ What are the current or likely water and sanitation related diseases?

Quantity:
1. How much water do people fetch each day per household?
2. How many members in the household?

3. Does everyone have equitable access to water?
4. What is the source of water?
    - Piped water into dwelling
    - Piped water to a public tap or standpipe
    - Tube well/ borehole
    - Protected Dug Hole
    - Unprotected Dug Hole
    - Protected spring
    - Unprotected spring
    - Rain water collection
    - Cart with small tank/ drum
    - Tanker truck
    - Bottled water
    - Surface water (river, pond, lake, dam, irrigation canal)
5. Oth5. Is there enough water at this source year round?
    - 100% of the time
    - 75% of the time
    - 50% of the time
    - 25% of the time or less
6. Is livestock population considerable?
7. If yes, what is the provision for drinking water for the livestock?

Quality:
1. Is the water source contaminated or at risk of contamination (microbiological and chemical/radiological)?
2. If so, what is the contaminate?
3. Is treatment required? Is treatment possible? What type of treatment is necessary?
4. Is disinfection necessary, even if supply is not contaminated? Is water contaminated while storage and transportation? If so, why?
5. What are the key hygiene issues related to water supply?
6. What means do people have to use water hygienically in this situation?

Accessibility:
1. How far are water collection points from where people live? (Minimum Standard, Shelter to water point 500m.
2. Are there any problems of accessibility for vulnerable segments of the population like elderly, disabled, women etc?
3. What and where are possible alternative sources?
4. Are there any legal or other obstacles to using available supplies, If yes, list and describe briefly.
5. Is it possible for the population to move if water sources are inadequate? Who makes this decision?
6. Is it possible to tanker if water sources are inadequate? From where?

Storage:
1. What are people using to transport water?
2. Do people have enough water containers of the right size and type?
3. Is there a possibility of contamination during storage and transport due to the containers currently in use?

Sanitation:
Excreta disposal
General Description:
1. What are the current facilities and practices (include anal cleansing)? Include how facilities were constructed, operated and maintained with general comment on quantities, qualities and current factors.
2. What is the estimated population and how are people distributed across the area (minimum standard to maximum standard is 20 people per toilet).

Facilities:
1. Are there any existing facilities? If so are they used, are they sufficient and are they operating successfully? they be extended or adapted? Do all groups have equitable access to these facilities? (minimum standard – toilets no more than 50m from dwellings or no more than 1 minutes work).
2. Do vulnerable groups such as the elderly, disabled, women, and children have easy access to the facilities?
3. Are the current defecation practices a threat to health? If so, how?
4. What is the current level of awareness of public health risks? Are there handwashing facilities?
5. Is there sufficient space for defecation fields, pit toilets etc?

Practices:
1. What are the current beliefs and traditions concerning excreta disposal especially regarding women's habits and attitude towards child excreta? What material/water is used for anal cleansing? Is it available?
2. Are both men and women prepared to use defecation fields, communal toilets or family toilets?
3. Are there any people familiar with the construction of toilets?
4. How do women deal with menstruation? Are there materials or facilities they need for this?

Solid waste disposal:
1. Is solid waste a problem?
2. How do people dispose of their waste?
3. What type and quantity of solid waste is produced?
4. Can solid waste be disposed of on site, or does it need to be collected and disposed of off-site (minimum standard–d - 1 100L refuse container is available per 10 families 5m from dwelling where refuse must be taken off-site).
5. Are there medical facilities and activities producing waste? How is this being disposed of? Who is responsible?

Public Health Promotion:
1. What health related behaviors are contributing to the public health risks faced by the affected population?
2. What are the common health related practices among the affected population and how have these been affected by the emergency?
3. What are the current practices on the key hygiene behaviors like
    a. Washing hands after defecation.
    b. Method of disposal of children's feces.
    c. Practices for storage and handling of water.
    d. Practices of storage and handling of food.
4. How the community dispose their solid waste?
5. What are the breast feeding practices?
6. Is there an understanding of the relationship between water/sanitation/shelter/vectors and disease?
7. Dose the community have access to lidded water containers/cooking utensils/mosquito nets/

soap/sanitary protection/blankets/bathing facilities?
8. Are they linked with water and sanitation and/or health services?
9. Are the users involved in the management and maintenance of water sources and toilets?
10. What health promotion media are available/accessible to the affected population (radio, posters/leaflets, local folk media and other)

Technical questions
Accessibility:
1. How far are water collection points from where people live (minimum standard: shelter to water point 500m).
2. Is it possible to tanker if water sources are inadequate? If so, from where?

Quality:
1. Is the water source contaminated or at risk of contamination (microbiological and chemical/radiological)?
2. If so, what is the contaminate?
3. Is treatment required? Is treatment possible? What type of treatment is necessary?
4. Is disinfection necessary, even if supply is not contaminated? Is water contaminated while storage and transportation? If so, why?

Technical Aspects:
1. How does the land slope and what are the drainage patterns?
2. What is the depth and permeability of the soil, and can it be dug easily by hand
3. What is the level of the groundwater table (minimum Standard – bottom of any toilet pit is > 1.5m above water table).
4. What local materials are available for constructing toilets?
5. When does the seasonal rainfall occur?

Wastewater disposal
Drainage:
1. Is there a drainage problem (flooding shelters and toilets, vector breeding sites, polluted water contaminating living areas or water supplies)?
2. Note the current waste water disposal of water from – water points, domestic waste water from washing utensils, bathrooms, laundry etc, livestock.
3. Are there any stagnant pools of standing water?
4. Do people have the means to protect their shelters and toilets from local flooding?
5. Is there enough slope/drainage for disposal of storm water?

Step 2: Plan the program with a focus on sustainability and involving partners

As described in chapter 3, the result of the planning process should be a **Program Framework or Log Frame.** This should be developed in a joint planning process with representatives of all project or program partners and potential beneficiaries**.** Preferably the government partners should play a central, lead role in the process with all other partners that may influence objectives. The main groups to be invited are: the direct beneficiaries or clients, community WASH boards, Government partners, NGOs and CSOs and private sector.

If not yet agreed upon, the partners have to decide on the following:

- The type of the WASH interventions and locations,
- How to promote the project or program in potential beneficiary communities,
- Define approaches and make a strength-weaknesses analysis, as much as possible based on lessons in the past and objective information,
- The objectives, key outputs and major activities for the project or program.

PROJECT/PROGRAM FRAMEWORK or LOG FRAME set-up			
Goals			
Objectives	**Key Outputs**	**Major Activities**	**Indicators**

Baseline

In addition, to a project or program framework, a baseline study should be undertaken. The baseline describes the current situation against which progress can be assessed and comparisons can be made. Further:

- Baselines are established to identify after implementation whether there were any benefits of the program or project investments made. Have the objectives been achieved? To show the communities served, government partners, project staff and financers what effect has been achieved by implementing the program or project.
- By setting a benchmark and measuring objectives of a program or project, future projects can benefit from the experience
- When testing a new program or project approach, baselines help to monitor the success of these new approaches

The indicators measured in the baseline should follow directly from Program Framework which are often related to a mix of the following (as appropriate):

- National and local WASH context
- Health, education, gender and inclusion, income and consumption, hydro-geological, geophysical and environment aspects
- Socio-economic conditions and willingness-to-pay of beneficiaries, segregated by age, gender, people with disabilities, ethnic groups etc.
- Services that exist or are being planned and other agencies and projects in the area.

- Existing policies and resources, such as professionals, skilled labor, training possibilities, infrastructure and money
- Past experiences with WASH project or programs in the communities considered.

The framework or Indicator Plan (see chapter 3) may also indicates WHERE and HOW to collect the information. The figure below shows different methods .The method choice will depend on the available project resources, time available, access to sources, degree of data accuracy needed etc.

In general, several data collection methods will be used within the same project or program, because (i) often not one single method will deliver all data required for all indicators; and (ii) they will help to double check or triangulate the most critical data.

The two below tables give an overview of the most common data collection methods.

Figure 8

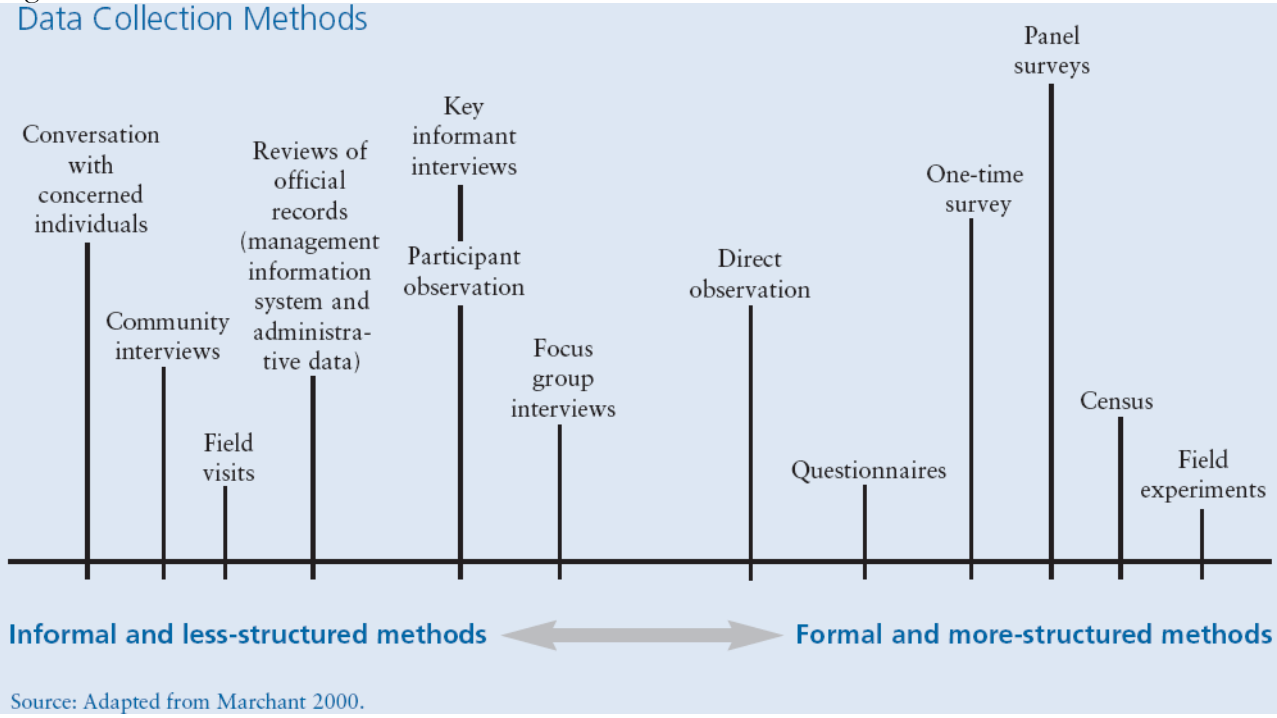


Figure 10 Some of the Tools for Measuring Results

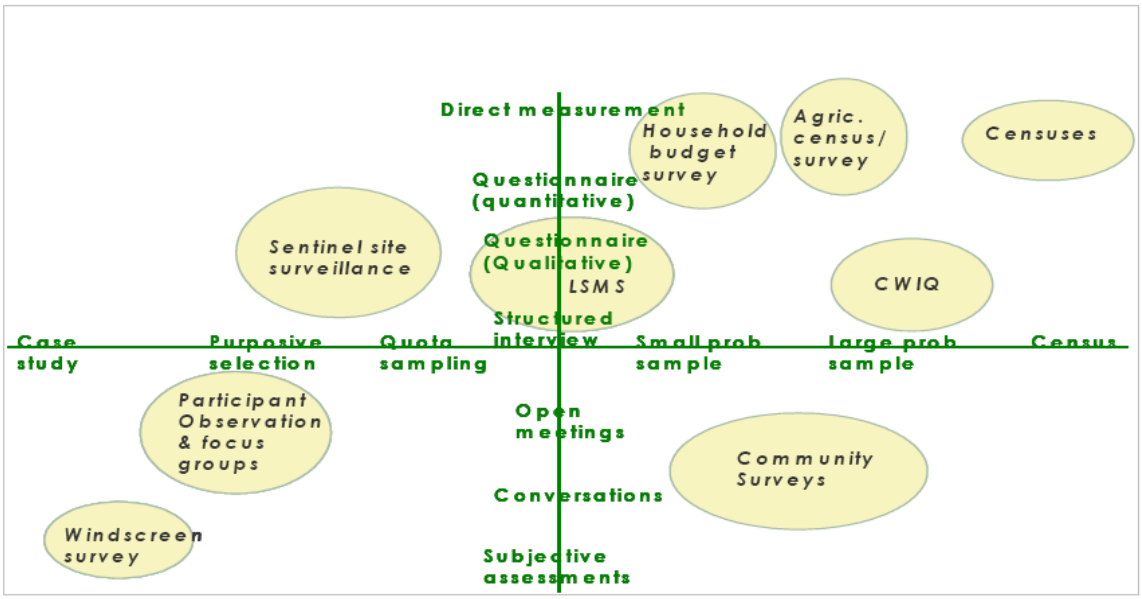


Figure 9

Explanation of the main methods[35]:

- **Community member interviews**: These are, often unstructured (without pre-described questions), interviews with community members or smaller groups of community members in which questions are being asked on existing habits and conditions and potential solutions to overcome the existing problems. The people interviewed can be selected or randomly picked from groups of trespassers.
- **Reviews of official records**: Asking for the review of official data collected for other purposes by (semi-) government institutions and others at national, regional and local levels.
- **Key informant interviews/semi-structured interviews**: Interviews are being conducted with informed people within a community, such as local health workers, community leaders or water board members on the basis of a pre-prepared written interview schedule. The interviewers have been trained beforehand on interview techniques and question lines.
- **Participant observation**: Observation is a relatively simple and highly effective method which is often combined with other methods, such as, focus groups or interviews. Observations can be done in a structured way, using pre-established check lists, or in an unstructured way by noting down all relevant issues observed and than classifying those issues by theme. Often structured observations are preferred for WASH projects because they will provide information that can be compared among different communities, groups, locations, etc. *Examples of an observation checklist can be found in the appendixes chapter.*
- **Focus group interviews**: In a focus group discussion, people from similar backgrounds or experiences are brought together to discuss a specific topic of interest to the investigator(s). Homogeneous samples are preferred because mixing age/gender/ethnic groups may inhibit some people from expressing their views and may not allow for information correction mechanisms within the group. Focus groups are a *qualitative* tool, meaning that they are useful in obtaining descriptive information such as opinions and perspectives. *Examples of a focus group guide can be found in the appendixes chapter.*

[35] Text partly adapted from Mercy Corps DM&E Tip Sheets

- **Community mapping**: Participants are asked to create a map, a representation of their territory, showing places that are important to them (marketplaces, churches, mosques etc) including points that are of interest for the project, such as water sources and locations of toilets.
- **Survey**: A data collection method to find out key information about a target population. It poses a standard list of questions to individuals or households, and can be oral or written. The most effective surveys are focused on gathering very specific (quantitative) information in the most concise way possible. It addresses key information gaps, is tailored to the audience and uses close-ended questions in a written questionnaire.

Step 3: Implement the program

Assuming that the planning process has been undertaken under step 2 and that an implementation team has been brought together, this part of the Field Manual focuses on the different components which can be part of a WASH program.

A. Design Considerations
B. Water Supply
C. Common Water Technology
D. Water Quality and Treatment
E. Sanitation
F. Environmental Aspects
G. Handwashing
H. Hygiene promotion
I. Methodology for Implementation
J. Hygiene Promotion for Children
K. Finance and Cost Recovery
L. Community Ownership
M. Cooperation with Government partners
N. Partnerships with others involved

Step 3 also describes design considerations and technical option available. In practice those issues will come up during the planning phase. However, since design details are part of the implementation process it has been decided to give this information under step 3.

A. Design considerations[36]

Except for technical design choices which are often based on the financial resources, physical condition and socio/economic circumstances, there are several design considerations that go beyond those technical considerations. Those are e.g. special attention for the needs of children, women or people with a disability, participatory planning processes as well as factors related to environmental conservation or operation and maintenance make sure that facilities are designed, constructed and maintained, are hygienic and safe to use and can be sustained and maintained by the households themselves.

[36] The text of this chapter has been inspired by: Zomerplaag, J. and Mooijman, A. (2005), *"Child-friendly hygiene and sanitation facilities in schools: indispensable to effective hygiene promotion",* Technical paper series; no. 47. IRC International Water and Sanitation Centre and UNICEF New York.

Facilities[37] should encourage hygienic behavior

Hygienic behavior or collecting water often comprises of several small activities, each with its own range of necessary preparations. If it is difficult, complex or time consuming to undertake these "activities" and children, as well as adults, will skip some of those activities taking potential health risks. Therefore facilities must be close to the houses, have sufficient capacity, simple to use, provide for handwashing and anal cleansing, and water and soap should be available at all times.

Going to a toilet in low-income areas in developing countries demands a couple of subsequent activities:

1. *Collecting materials for anal cleansing* (such as paper, sticks, stones and leaves)**:** If materials or water are not readily available, people will have to collect the materials in the surrounding of the toilet or opt to not use any material at all. Not cleaning after defecation can lead to irritation of the surrounding skin, cystitis (mainly for girls and women), and embarrassment because the child might smell bad, as well as, be a source for future transmission of diseases.
2. *Defecating and anal cleansing:* Human feces are the primary source of diseases, particularly for diarrheal diseases and worm infections. It is at this point that the people's fingers get exposed to feces (to which level depends on the method/materials being used) and they can be the source of disease transmission directly to somebody else or through the handling of food.
3. *Safe disposal of anal cleansing materials*: If other methods than water are used, there will be anal cleansing materials that have to be safely disposed off. Because pits will fill up too quickly if they are thrown in and pipes can get blocked if no or insufficient water is available, a *container with lid* should collect those materials and be placed preferably inside the toilet. The lid is very important to avoid that flies get in touch with human feces and be potential transmitters of diseases. If adolescent girls and women in use disposable pads or materials during menstruation, the containers should also be appropriate for the collection of those.
4. *Collecting water and soap for handwashing with soap* (preferably be done before toilet visit to avoid contamination while getting water) and *handwashing with soap and drying hands*
5. *Safe waste treatment of anal cleansing materials:* Once the anal cleansing materials are safely collected in a container with lid, those containers have to be regularly emptied and cleaned. The materials can be (1) buried in a hole that has to be covered by enough soil to avoid that animals can excavate it or they should be (2) burned in a safe place. After emptying the containers they have

[37] Facility refers to facilities for water provision, handwashing as well as toilets and urinals

to be washed with soap. Because the task is not a very attractive one to do, the Operation & Maintenance plan should clearly spell out this responsibility.

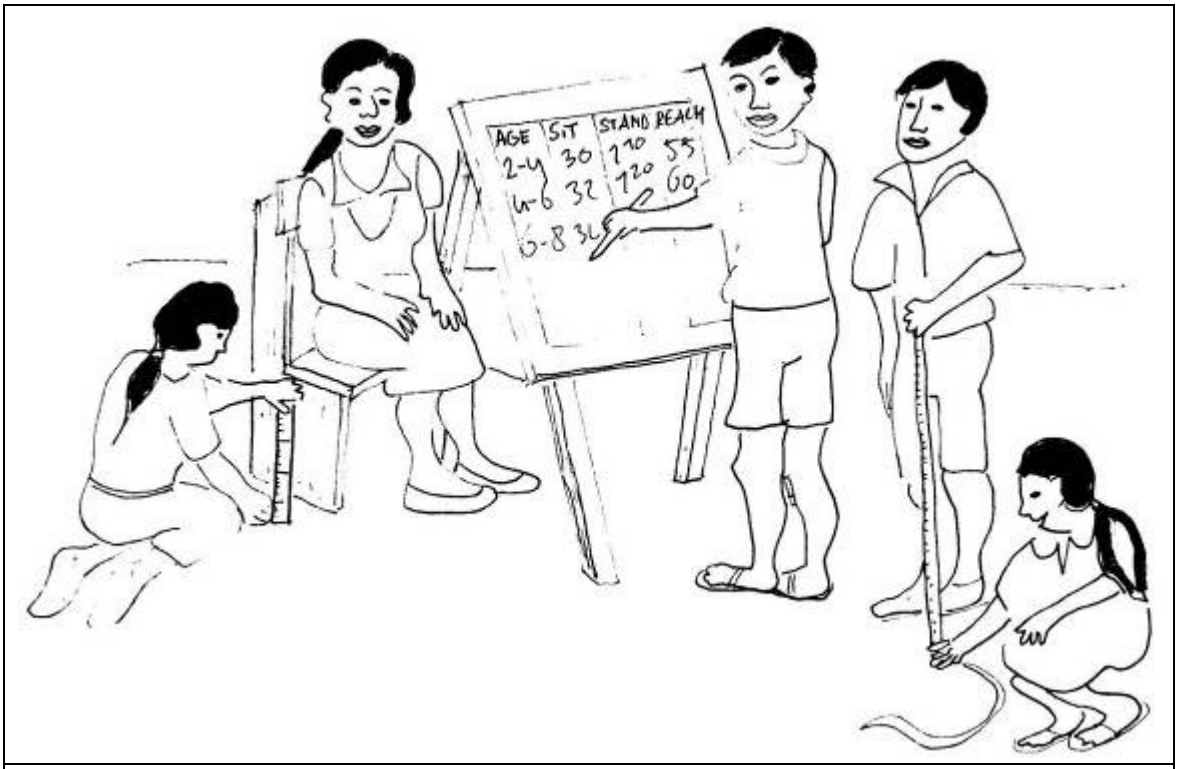
It is obvious that the complexity of these activities does not always encourage hygienic behavior. To make it even more complex….when it is dark, it is rainy season, unsafe because of animals or school rules are such that the children might have to visit the toilet during their free playing time.

Appropriate dimensions and adjustments for children

Adapting designs for children is about making facilities accessible and comfortable for children. Children are smaller and have less physical strength than adults and therefore facilities should be adapted to this.

The following child-size *dimensions* should be accounted for in the design:

- Height of taps and handwash facilities.
- Height of doorknobs and locks
- Height of steps and handrails of stairs in toilets and for water and handwash facilities
- Height of toilets seats (if seats are being used)
- In urinals, distance from the squatting platform in to the wall (girls need more space to squat comfortably, while boys will stand up when urinating)
- If elevated urinals are being used: height of urinals
- Diameter of the squatting hole (also consider children's fear of falling in)



Math exercise to determine dimensions of facilities (drawing by Jaap Zomerplaag)

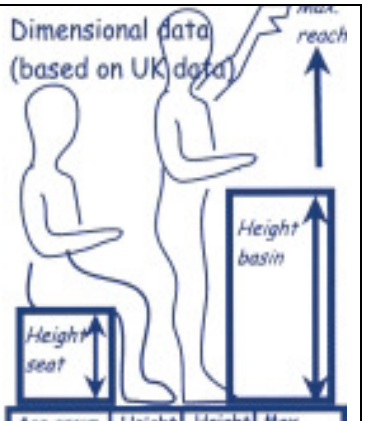
Because children also have different levels of *physical strength and motor skills* than adults the following aspects have to be considered and measured:

- Force needed to open toilet doors
- Strength needed to open taps, fetch water, etc.

For the youngest children, up to age 8, facilities and adaptations should be made to allow for adults to supervise and/or help when children use the facilities.

It is impossible to set international standards for dimensions of facilities because the length and size of children may vary per region. A good way of determining dimensions is by making a participatory math exercise in which children will measure their height while standing, sitting etc.

Box 4



Age group	Height seat	Height basin	Max. reach
3-5 year	26 cm	58 cm	105 cm
5-9 year	30 cm	70 cm	120 cm
9-11 year	34 cm	76 cm	140 cm
11-13 year	38 cm	76 cm	156 cm
13-16 year	42 cm	82 cm	167 cm

Source: [38]

Example of toilets for young children, allowing adults to supervise and support while children use the toilet (source: Mercy Corps Indonesia)

[38] Zomerplaag, J. and Mooijman, A. (2005), *"Child-friendly hygiene and sanitation facilities in schools: indispensable to effective hygiene promotion"*, Technical paper series; no. 47. IRC

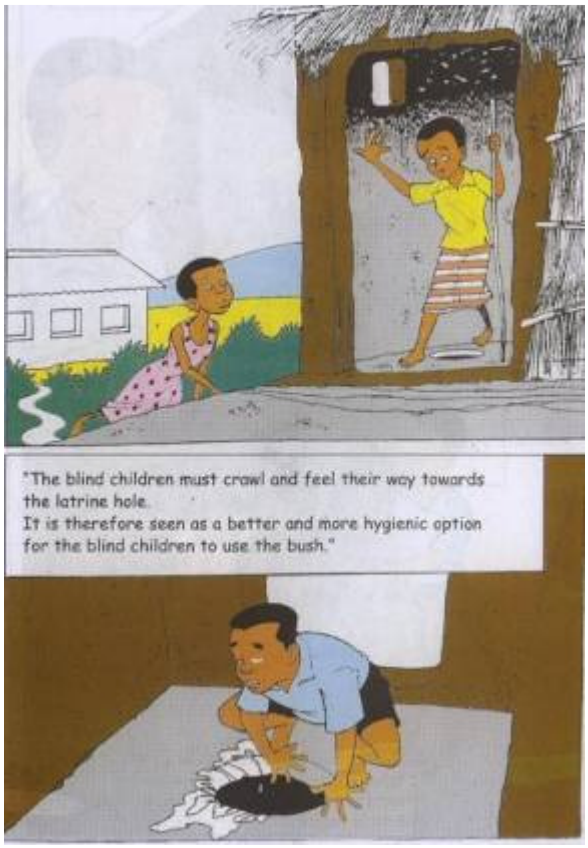
Needs and roles of women

Some WASH needs are gender specific. Girls and women have different physical needs and socio-culturally determined roles than boys and men. Therefore special consideration should be given to each group. Ideally, girls and boys, women and men will be involved in meetings on design, construction and operation and maintenance of facilities. It is recommended to conduct some participatory sessions with girls and women separately from the boys and men so that they can speak freely. Important topics for girls and women are:

- **Location of facilities** Girls and women will not use toilets or collect water from locations that are situated in an "unsafe" location because of the risk of harassment or even rape (by people of the opposite and same sex) or because of cultural believes or restrictions because people should not be seen when visiting a toilet.
- A proper environment for **menstrual hygiene and management** has to be provided for adolescent girls and women in the fertile age. They need adequate toilets and water supplies for girls and women to comfortably change and dispose of sanitary pads and wash themselves in privacy when they menstruate. The needs and requirements are culturally determined and could even differ between ethnic groups or social classes within the same community.
- **Dialogue** on sensitive issues like feminine and menstrual hygiene, managing diarrhea should be part of the design process to determine the obstacles and needs. In most countries talking about defecation, menstruation or reproductive health is surrounded by taboos. The implementation of a WASH program or project might be an incentive to start this dialogue.

Special needs for people with physical disabilities or suffering from chronic diseases

About one in five of the worlds' poorest is disabled and chronic diseases, such as HIV/AIDS, heart disease, stroke, cancer, chronic respiratory diseases and diabetes, can lead to disabilities. Exclusion from basic facilities can result in isolation, poorer health, and even poverty. The lack of proper school toilets can deter disabled children from even entering school. Only rarely, adaptations for disabled people are incorporated into the design of WASH facilities. While if incorporated in the original design, these adaptations can be made at little or no additional expense.



From: booklet" Sara and her friends talk about sanitation and hygi promotion in school, UNICEF, Malawi

Adaptations in WASH facilities should be made for the three main categories of disabled persons:

- Blind people and people with poor vision: special grips and guiding systems as well as proper lighting for the poor-sighted people.

- People in wheelchairs or with crutches: no entrance steps or the provision of ramps in addition to steps, wider doors, and special grips or foldable seats.
- People with missing or paralyzed arm(s): lids, taps, and knobs that can be opened with one hand or operated with the feet and are not too heavy.

Appropriate locations for toilets and water supply

Even a well-designed facility faces the risk of not being used if is located in a poorly considered place. Finding the right location for facilities requires looking at different practical, environmental and cultural aspects. This can become difficult when these aspects give conflicting solutions and user-groups have different preferences. Therefore it demands for a process of setting priorities and participatory decision-making.

The following criteria should be considered when choosing a location for toilets and water supply:

- People have to **feel secure** when visiting WASH facilities without risking and fearing harassment by people or attacks by animals such as snakes, scorpions or spiders. Access routes have to be open and clear and the facilities must be in hearing/visual distance of the community so that assistance can be called for if necessary.
- Privacy: Particularly for people above the age of approximately 8 years toilet facilities and urinals should guarantee privacy. In some cultures it is important not to be seen entering or leaving the toilet. Access routes can therefore better be located away from the busy part of the community and roads, while still being open and clear for security reasons.
- It must be possible to reach facilities during all weather conditions, also after heavy rains or flooding.
- Facilities only contribute to health and hygiene improvements if properly used. Especially for the younger children, supervision of behavior and skills by adults is essential. Some locations will facilitate supervision of proper use, e.g. for younger children a handwashing facility near the house allows for better monitoring than when it is placed near the exit of the toilet.
- The location of the facilities should **allow for proper supervision and reduce the risk of vandalism**, particularly when communal WASH facilities are being installed. Somebody or a group of supervisors has to be responsible for this task.
- There is a tendency to locate toilets and urinals close to other "odor and fly producers", such as garbage dumps and places where animals defecate. This will not **motivate people to use** them. It is better to locate facilities elsewhere and/or design solutions that minimize the nuisance and environmental degradation.
- To avoid **pollution of scarce water sources**, toilets with pits and other pollutants have to be located at least 20 meter away from wells and water sources because the further the horizontal distance the pathogen has to travel from the point of entry into the water table to the water point, the longer it is retained and the more likely the pathogen is to die.

Facilities are designed with involvement of all

Active involvement of the users is essential in all phases of any design process. Sometimes, in bigger programs or projects standard designs are used for WASH facilities to reduce costs for design and implementation. This can be a good solution, but applying a standard design too rigidly can lead to ignoring specific local pre-conditions and needs. In general, when properly coached and guided, potential users are perfectly able to assess their existing practices and find solutions for their own needs. Their involvement during the design stage of WASH facilities will lead to better solutions and increased acceptance of these solutions.

Low-cost solutions without compromising quality

Best are those WASH facilities that are affordable, durable, encourage proper use, and are easy to maintain and keep clean. For example: properly drain excess water at wells, surfaces that come into contact with faces or urine must be impermeable and easy to clean, moulds can be used to make a serial production of smooth-shaped surfaces and corners for slabs, seats, etc. To facilitate cleaning of slabs, provisions can be made in the slabs to drain water used for cleaning.

Investing in good quality and sustainable facilities means investing in overall public health. Moreover, despite higher initial investment costs, money will be saved in the long run because the facilities have a longer lifespan and require less maintenance. On the other hand, this does not mean that the most expensive options are best. It is always a matter of finding the right balance between costs and quality.

Reduce harm to the environment

It is important to reduce the negative environmental effects and hazards to public health at the same time. Some facilities may pose risks of soil and groundwater contamination, while others may produce wastewater flows that must be managed. Environmental sustainability should be an integral part of the design, implementation, operation, and maintenance of facilities, as well as of the accompanying hygiene promotion component. The challenge is to promote awareness on environmental issues while providing incentives and tools to address them.

Operation and maintenance plans

A well-designed facility will lose its effect if it is not properly looked after. A good operation and maintenance plan will not only indicate who is responsible for cleaning, maintenance and the costs involved. It will also ensure that:

- It involves community members (men and women, young and old), community groups and public health staff in the continuous process of monitoring and improving hygiene practices in the community.
- It is appropriate to the community's ability and willingness to pay for operations and maintenance (e.g. do they want to pay for a care taker and/or technician).
- It is developed and agreed upon before the facilities are constructed.

- It is non-discriminatory and protects basic human rights: women should not automatically be assigned "female" task, child participation should never be child labor etc.
- If training is needed on O&M skills this should be provided on a regular basis (annual or bi-annual).

Sample Operation and Maintenance Plan and Set-Up:

Table 12

Activity	How often (e.g. twice daily, daily, weekly, occasionally)	Who is responsible	Materials, parts, tools, and equipment needed (soap, brushes, spare parts, etc.)	Who finances the materials, parts, tools, and equipment
Supply of soap, filling of water reservoirs, provision of clean towels				
Cleaning of toilets, hygiene water supply facilities,				
Supervision: inspection for maintenance needs and repairs as well as checking if the latrine pits are full or septic tanks need to be cleaned				
Maintenance: minor repairs, major repairs, emptying of pits				
Monitoring and evaluation of use				

B. Water Supply

Why do households need water?

The main applications of water in families are:

- Drinking water
- Food Preparation
- Handwashing
- Personal hygiene (body washing)
- Cleaning of the house and toilets
- Sometimes, for flushing toilets
- Anal cleansing after using the toilet (in certain cultures)
- Laundry
- Watering of garden
- Drinking water for animals

Assessing the water needs

Water is essential for survival and therefore every family already has access to some kind of water source. A water program might be planned because existing water sources provide unsafe water, or may need repair, may not provide sufficient water (during some seasons) or may be situated at an inappropriate location (unsafe or too far).

Although provision of water will often be limited by financial or physical restrictions, it is also always necessary to make a (rapid) assessment on the community and household water needs through, e.g.:

- *Observation of current water use in the community by either*: (1)the use of a previously prepared observation guide indicating the issues to be observed or (2) in an unstructured manner by noting down everything observed and then classifying the information according to relevant themes.
- *Physical examination of conditions of existing water supply facilities by either:* (1) the use of a previously prepared observation guide indicating the issues to be observed or (2) in an unstructured manner by noting down everything observed and then classifying the information according to relevant themes.
- *Interviewing* community members, children, health staff, local water boards and government officials on current use and desired water use. Preferably this should be done in (semi-) structured interviews where the interviewer has beforehand prepared a schedule with relevant questions.

Choosing and designing the most appropriate technical solution

Normally, the existing situation (as documented through a needs assessment) should be the starting point. If it is possible to bring the existing facilities up to standards through some upgrade/improvement works, this might be a low-cost solution that in some cases even can be undertaken with the use of the existing care-takers with few outside interventions. If new technical solutions are preferred, it might be useful to present it as a package of options to the community taking into consideration: costs, operation and maintenance, sustainability, and hygienic improvement. The probability that community members will fully use the new water system is higher when they understand the importance of the improvements and are allowed to define and choose their own solutions. The process of upgrading or designing water supply facilities can be seen as a participatory learning experience: facilitating a group of people in the

analysis of their existing situation and guiding them to develop skills and obtain knowledge that enables them to set their own priorities and design appropriate solutions as well as plan for maintenance and replacement. Project staff involved in the development of water supply, at this point in the project implementation, should see themselves as trainers and facilitators who guide people through the design process and bring in background support with technical expertise and organizational and planning skills.

Selecting a water supply technology

In most circumstances the choice of technology will depend on the existing situation, the financing available, the willingness to contribute (by the future users) and the hydro-geological conditions. Water sources can be divided in:

- *Groundwater* occurs under most of the world's land surface, but there are great variations in the depths at which it is found, its mineral quality, the quantities present and the rates of infiltration (thus yield potential) and the nature of the ground above it (thus accessibility). In hilly areas it emerges from the ground in places as natural springs, otherwise wells have to be constructed and pumps or other lift mechanisms installed.
- *Surface Water*, in streams, lakes and ponds is readily available in many populated areas, but it is almost always polluted. It should only be used if there are no other safe sources of water available or a safe water treatment system can be set up.
- *Rainwater* collection, from roofs or larger catchment areas, can be utilized as a source of drinking water, particularly where there are no other safe water sources available
- *Condensation water* In extreme situations, small quantities of water can be condensed from the atmosphere (as dew) on screens or similar devices.

C. Common Water Technologies

Ground Water Systems.[39]

Spring protection

A spring is a water source where groundwater comes to the surface (without the use of pump or wells). Springs are often the traditional source of water, especially for communities living in hilly areas. Only under certain circumstances, springs can be considered a safe water source:

- the spring should provide a minimum yield of water throughout the year
- there should be no major sources of contamination (such as a town, factory, cattle yard, etc.) upstream of the spring, and the water quality should be tested beforehand and found acceptable
- the distance between the spring and the beneficiary community should be within 500 meters

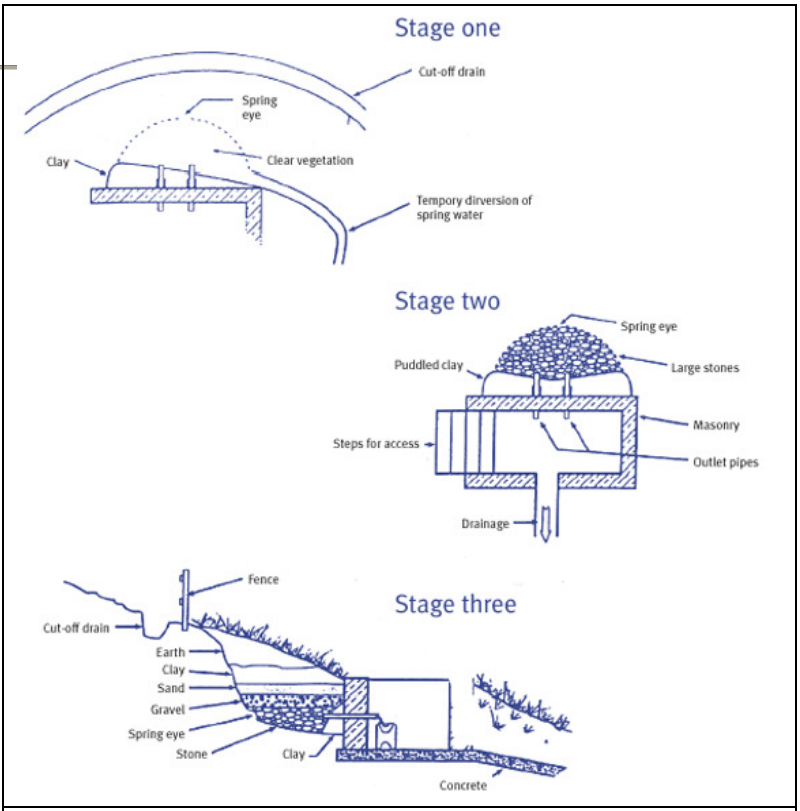


Figure 10 Drawing copied from WaterAid website

The protection of the spring usually involves the construction of a sealed "spring box" (see drawing) which traps the water, provides for some basic filtration and sedimentation through the use of a gravel filter and a collector, and, in some cases, provides water storage space to satisfy peak demand. It can be constructed using locally available resources and expertise.

The yield of some springs can be improved through the construction of a "filtration gallery," the insertion of filter pipe around the spring, leading to the spring box. In all cases, the area immediately upstream of the spring should be protected from the defecation of animals through the use of a fence or hedge.

Erosion can also be a problem in spring areas: the area upstream from the spring should be protected with vegetation if necessary, while the excess flow from the stream should be channeled into an existing stream or drain, or directed back into the ground using a soakage pit. A protected spring can also be used as a source for a gravity-flow piped water system leading to a village below. Since no pumping is required, spring-fed piped systems are generally less costly and simpler than pumped piped systems.

[39] This sections had been adapted from UNICEF (1999), "*Towards better programming: A Water Handbook",* Water, Environment and Sanitation Technical Guidelines, UNICEF, New York, USA – a practical guide for implementation of water programs.

Hand-Dug Wells

Hand-dug wells are widely used in developing countries. There are many *advantages* to this technology:

- it does not require highly skilled labor
- the level of community involvement and ownership can be enhanced through
- the appropriate participation of beneficiaries in the actual construction of the water point
- an efficiently managed hand-dug well construction program can be the most inexpensive water supply option
- the improvement in an existing hand-dug well is often the first step towards a
- safe water source for the community;
- water can continue to be drawn from a hand-dug well even if the pump is broken or where a pump has never been installed
- much of the well can be constructed using locally available material
- since hand-dug wells are of a larger diameter than borewells, a certain amount of water storage space is available which can help to provide sufficient water for peak use times.

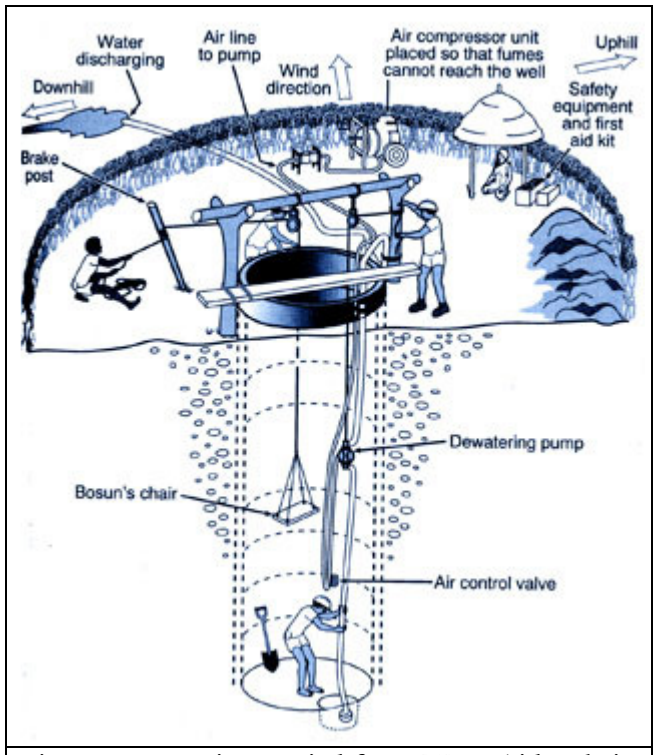


Figure 11 Drawing copied from WaterAid website

The *disadvantages* of hand-dug wells are:

- If no appropriate safety measures and equipment are in place, the construction of wells can be dangerous
- although there are many cases of very deep hand-dug wells, most are relatively shallow (less than 15 to 20m) and tend to tap water from the uppermost (unconfined) aquifer, and are thus more susceptible to bacteriological contamination and the effects of falling water tables;
- unsealed hand-dug wells are especially susceptible to contamination from people and animals

Although there are a wide range of construction methods and materials that can be used to construct hand-dug wells, most larger well programs make use of circular concrete well "rings" that are pre-cast (on site or in a local production centre) and sunk into the ground. In very soft formations, the rings are sunk starting from the surface: digging from the inside of the ring, removing the material with a bucket (usually with the help of a tripod and pulley), and adding new rings as required. In harder, semi-consolidated formations, an unlined hole can be excavated down to the water table and only then are the ring liners inserted. In any case, the concrete rings are usually 1 to 1.3 meters in diameter and 0.5 to 1 meters high (large enough to allow a person to work inside it, but small enough to be economical and easily transported).

In most cases a motorized pump is required to de-water the well to allow excavation below

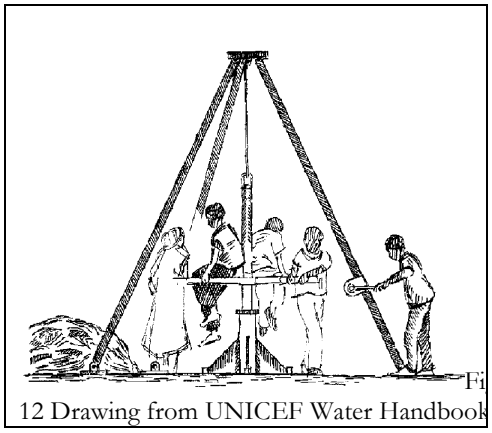
the water table. A filter at the bottom of the finished well is often necessary, especially in formations with fine sand or silt particles. The filter can be a layer of gravel and coarse sand or a porous concrete plug (some of the lower well rings can also have porous areas to allow greater flow in poorer aquifers).

The well is finished with a headwall, a sealing slab and a surrounding apron with a drain. Care must be taken that the drain ultimately directs water to a natural or artificial drainage system and that the apron drain does not create a pool of water three meters away from the well. Although some new wells are still constructed without the installation of a handpump (instead relying on a windlass or bucket and pulley system), a handpump is preferable to avoid contamination but only in areas where handpumps are already prevalent.

It is sometimes appropriate, and economical, to concentrate on the improvement or rehabilitation of existing wells rather than the construction of new wells. This usually involves the deepening and disinfection of the existing well, the repair or replacement of the well lining, and the installation of a sealing slab, an apron and a handpump.

Hand-Drilled Borewells

The drilling of borewells using simple, inexpensive hand-operated equipment is a very appropriate technique when a hydrological and geophysical survey has confirmed that the aquifer is relatively shallow (usually less than 25 to 30 meters), and the formation soft. Under these conditions, hand-drilled borewells can be completed much faster than hand-dug wells, and can reach slightly greater depths.



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12 Drawing from UNICEF Water Handbook

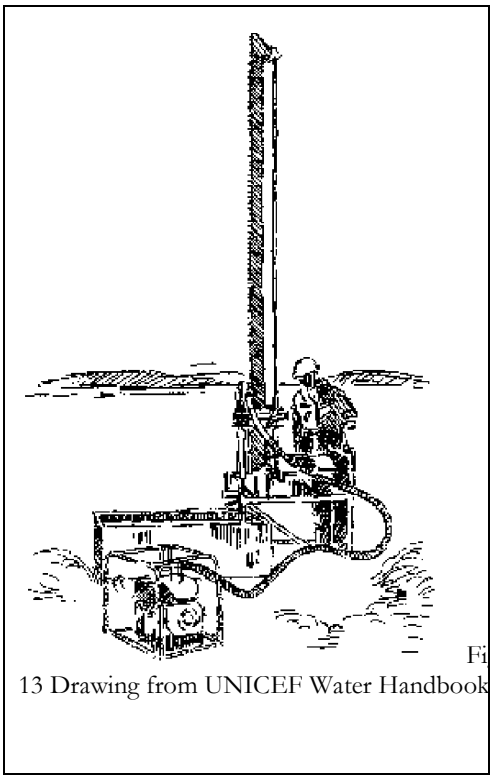
The most common type of hand-drilling equipment consists of a tripod and winch with drill rods and bits. The rods are manually turned (usually by four people) and extra downward force is applied by people sitting on the cross bars.

As in all borewells, the design and completion of the hand-drilled well is vitally. Ideally this should be done in collaboration with government actors to minimize unsuccessful drilling or environmental impacts. The appropriate type and length of well screen (slotted well-casing pipes) must be placed at the correct depth, and, in most cases, a gravel pack must also be applied. An improperly designed or finished well is sometimes a cause for failure when drilling is carried out by less killed labor. As such, the hand-drilled well is less "forgiving" and more dependent on skilled labor than is the hand-dug well. However, the hand-drilled well does share with the hand-dug well, to a large extent, the advantage of being very suitable for a high degree of community participation as people can assist in the actual construction of the well.

Machine-Drilled Borewells

The majority of water points constructed under development programs or projects are machine-drilled borewells. Mechanized drilling is chosen over hand-digging or hand-drilling for three principal reasons:

1. Borewells can be drilled much faster
2. Much greater depths can be achieved
3. It is possible to drill in semi-consolidated and consolidated and in (hard) formations



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13 Drawing from UNICEF Water Handbook

In fact, in many regions, mechanized drilling rigs are the only choice for groundwater-based water supply programs. The main disadvantage is that it is much more expansive than hand-drilling or digging. Two types of mechanized drilling rigs are most commonly: cable-tool rigs and small rotary rigs

Cable-tool rigs, or percussion rigs, are of very simple design and have been used for many years. The machine drills a hole by repeatedly driving a heavy drill string and bit into the ground, removing the cuttings with a bailer, and repeating the process until the desired depth is reached. The drill string is not rotated (some natural rotation takes place which assists in the cutting operation) - the rigs engine is used for repeatedly raising the heavy drill string through a winch and cable system. Since the rigs, although mechanized, are of very simple design, capital and operating costs are reasonable low. High drilling speeds can be achieved in unconsolidated and semi-consolidated formations, but this drilling method is not suitable for hard formations.

Unlike cable-tool rigs, *rotary rigs or* drill by boring - the engine turns the drilling stem and bit at high torques to produce a hole. There are many types and designs of rotary rigs. A common subdivision of type is into rigs which use mud (water mixed with clay) for the removal of cuttings ("flushing") and those which use air (usually mixed with a foaming agent to increase efficiency). In all cases the air or mud is forced down the drilling stem and then returns back up the stem carrying the cuttings to the surface. In addition to flushing, the drilling fluid (mud or air) also serves to cool and lubricate the drilling bit and stabilize the hole and prevent it from collapsing (in unconsolidated and semi-consolidated formations) until the drilling operation is finished and the casing installed.

Pumping

With a few exceptions (springs and artesian wells), all groundwater systems must make use of pumps to draw the water to the surface (non-pumping solutions such as lowering buckets into dug wells, or large open step-wells where people walk down inside the well to collect water are highly prone to contamination and thus should not be considered as safe options).

Handpumps

Handpumps are the most common and, in most cases, the only economically feasible water lifting device for community needs. Yield depends on the depth and design, normally in the range of 600 to 1,500 liters per hour during constant use. Thus the maximum number of users for any one pump should, ideally, be not more than 150 persons.

The in-country production of handpumps, while desirable in principle, is only potentially feasible in medium and larger countries with an established manufacturing base and a market large enough to support it. Experience has shown that it is more efficient for smaller countries to procure handpumps from abroad, especially from other developing nations with long experience in the production of public domain handpumps (India is the notable example here, producing - and exporting - thousands of Mark II/III, Afridev and Tara handpumps at prices significantly lower than anywhere else in the world).

Other ways of pumping

Most other ways of pumping than handpumps, including those based on alternative energy sources as solar and wind power, have greater capital and operating costs associated with them and in most cases, greater maintenance costs as well. However there are specific situations where power pumps can be more appropriate than handpumps, such as:

- areas where a storage and distribution system is necessary (e.g. rural hospitals), economically feasible (e.g. high density poor urban neighborhoods), or desired by a community willing and able to pay the higher capital, operation and maintenance costs associated with such a system;
- areas with a relatively inexpensive and reliable source of energy (usually electricity);
- situations where greater yields than that available from a handpump is required (e.g. communities with only one borewell which require water for additional needs such as cattle and irrigation);
- areas where the only available water is groundwater which is deeper than 90 m;
- some emergency situations (e.g. rapidly expanding refugee camps);
- in some areas where the only source is surface water.

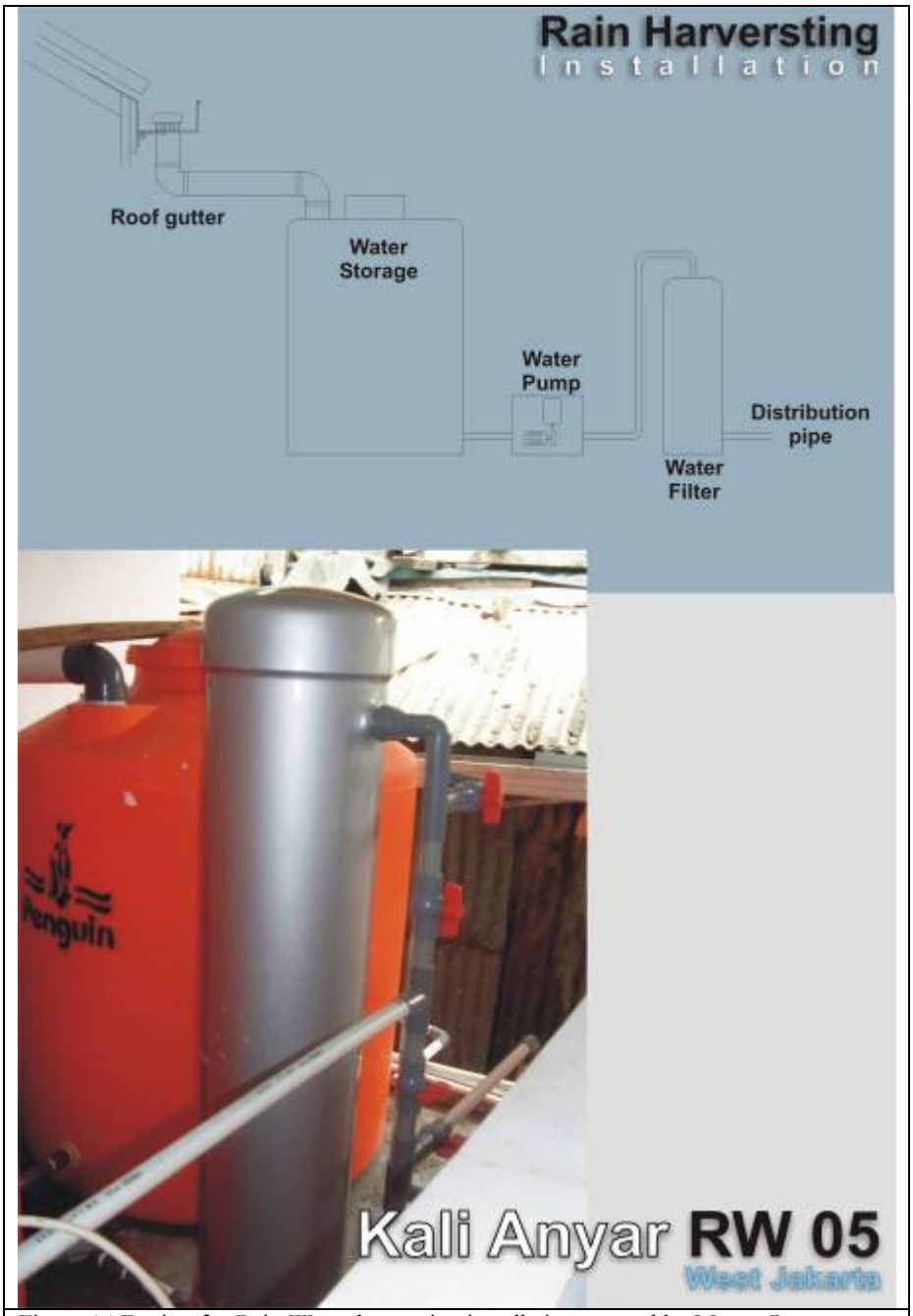


Figure 14 Design for Rain Water harvesting installation as used by Mercy Corps Indonesia

Rain water harvesting

This is a water source which is quite commonly used in developing countries, especially in island states and countries with long and intensive rainy seasons. The number of annual rainy days determines the feasibility of the use of rainwater as the main source for water supply. If the dry period is too long, big storage tanks would be needed to store rainwater or alternative back-up sources have to be provided. After collection the water has to drain through a filter or screen, the water and led to a storage tank. More on rain water collection and its technical designs can be found at http://www.rainwaterharvesting.org/Urban/ThePotential.htm

Surface water

Where no other sources are readily available, surface water can be collected and used after some form of treatment. In most rural areas, it will not be feasible to construct a water treatment plant to treat surface water into drinkable water. In addition, storage tanks and a pipeline for distribution might be needed.

Water trucks or bottled water

If all of the above options cannot be implemented, trucking safe drinking water can be an alternative. The water truck stores water in an on-site tank or reservoir. The high costs associated with water trucks is often a financial burden for the community. Therefore, although people in developing countries frequently use this source of water supply, it is generally looked upon as either an intermediate solution until a better alternative has been found or a seasonal solution in areas that collect rain water or use rain-dependent ground or surface water.

ADDITIONAL INFORMATION:

Several good handbooks on the technical details and designs of different water supply techniques have been written. One of those books is:

- Smet, J. & C. van Wijk editors (2002) *"Small Community Water Supplies: Technology, people and partnership"*, IRC International Water and Sanitation Centre, Delft, the Netherlands
  Available at: http://www.irc.nl/page/1917
  Chapter 24 of this book focuses on **Water supply in disasters and emergencies**

D. Water Quality and Treatment

The principal cause of concern of water pollution is *microbiological* contamination, especially from human and animal feces. While groundwater is generally of much higher microbiological quality than surface water, an increasing number of sources and systems used by people for drinking and cooking water are not adequately protected from fecal contamination.

Box 5 Sources and Pathways for the Fecal Contamination of Water Sources

Point Sources: tubewells, dug wells and springs

- Latrines close to the source*
- Latrines uphill of the source*
- Other potential sources of fecal contamination close to or uphill from the source (e.g., open defecation,
  septic tanks, corrals, intensive grazing, abandoned dug wells, garbage pits)
- Standing water at or near the source due to poor drainage*
- Poorly constructed or maintained headworks (concrete apron and drain, headwall, pump seal) and below-
  ground sanitary sealing
- Irregular maintenance and cleaning of apron and source surrounding
- Bucket used in windlass system allowed to touch the ground, buckets from homes dipped in well or in spring
  reservoir
- Animals with access to source (fencing missing or broken) Erosion around protected spring, dug well or tubewell
- Abandoned contaminated dug well

* The minimum safe distance (MSD) between contamination sources and water sources varies, depending on local hydrogeology and other factors. In some countries rule-of-thumb figures (e.g., 10 m minimum distance between a dug well and a latrine)

Rainwater Harvesting Tanks

- Bird and small animal feces from rooftops and gutters
- Cracked tanks, poorly sealed access holes allow entry of animal and insect vectors
- Inadequate or poorly maintained filters and/or 'first flush' system

Piped Systems

- Groundwater source inadequately protected from contamination (see above)
- Surface water intake inadequately protected from local sources of contamination (e.g., no fencing, broken
  fencing, poorly constructed or damaged intake structures, inadequate screening)
- Treatment plant non-operational, operates intermittently (e.g., broken equipment, no treatment chemicals)
  or inadequately maintained and supervised (e.g., process control tests not carried out regularly, record
  keeping inadequate, poorly trained operators, incorrect storage of treatment chemicals)
- Cracked storage tanks and reservoirs
- Tank access covers or vents improperly sealed

- Infrequent cleaning of storage tanks and reservoirs
- Broken or leaking pipes, exposed pipes due to erosion or poor construction
- Service interruptions causing pressure loss and thus potentially allowing the entry of contaminated surface
  and groundwater into system via pipes and fittings
- Standing water around tapstands (standpipes) due to poor drainage
- Open defecation near tapstands

Source: UNICEF (2008), "*UNICEF Handbook on Water Quality*". UNICEF, New York, USA

Box 6 Pathways for the Fecal Contamination of Water during Collection, Transport and Storage

Water collection and transport

- Use of wide-mouth containers that allow hands to come into contact with water
- Use of leaves or other material in buckets to prevent water spillage during transport
- Containers used not clean
- Containers 'washed' with contaminated hands or cloths
- Contaminated cups, bowls, ladles or buckets used to draw water
- Dirty source surroundings and pump/tap spouts

Water Storage

- Use of wide-mouth containers for storage that allow hands, cups/ladles and insect and animal vectors to come into contact with water
- Uncovered containers
- No spigot or spout on containers – water drawn with cups or ladles
- Containers stored on floor, allowing more easy access to water by children and animals
- Infrequent cleaning of storage containers

Source: UNICEF (2008), "*UNICEF Handbook on Water Quality*". UNICEF, New York, USA

Also *chemical* contamination can be a major health concern. Water can be chemically contaminated through natural causes (arsenic, fluoride) or through human activity (nitrate, heavy metals, pesticides). The *physical quality* of water (e.g., color, taste) must also be considered. Water of poor physical quality does not directly cause disease, but it may be aesthetically unacceptable to consumers, and may make them to use less safe sources. Finally, drinking water can be contaminated with radioactivity, either from natural sources or human-made nuclear materials.

Because of the negative health impacts[40] of unsafe water, national government agencies have established drinking-water quality standards that public sources must meet or exceed. In most cases, private water supplies are not subject to national drinking-water standards and also rural water supply programs do not always follow those standards. When setting national drinking-water standards, most countries consider the standards set in other countries and the *Guidelines for Drinking-Water Quality* available electronically on

[40] From: UNICEF (2008), "*UNICEF Handbook on Water Quality*". UNICEF, New York, USA

the World Health Organization water quality web pages:
www.who.int/water_sanitation_health/dwq/guidelines/en

Box 7 National Drinking Water Standards

A number of countries make their national drinking-water standards freely available online. These can serve as points of reference, when developing national drinking-water standards.

Australia www.nhmrc.gov.au/publications/synopses/eh19syn.htm
Canada www.hc-sc.gc.ca/ewh-semt/water-eau/drink-potab/guide/index_e.html
European Union www.emwis.org/IFP/Eur-lex/l_330199812O5en00320054.pdf
Japan www.env.go.jp/en/standards/
New Zealand www.moh.govt.nz/water
United Kingdom www.dwi.gov.uk
United States www.epa.gov/safewater/mcl.html

Source: UNICEF (2008), "*UNICEF Handbook on Water Quality*". UNICEF, New York, USA

Water Treatment

Preferably safe water (ground water or rainwater) is abstracted at the source or treated in a large scale treatment plant. However, particularly in rural settings this might not always be possible and some kind of **treatment at household level** is necessary. In general, only the **microbiological** treatment of water that will be used for drinking and food preparation is needed. For the other uses lightly contaminated water can be used (but be sure that children know the risk of drinking this water and that there is no health threatening chemical contamination of the water).

- **Boiling of water:** very safe and reliable form of treatment but because of the costs for fuel or firewood often too expensive for people in poor areas. There are some discussions on the desired length of boiling. In general, somewhere between 1-3 minutes is enough.
- **Filtering of water through a sand filter:** very safe if properly operated. This form of treatment requires maintenance through regular replacement or cleaning of sand and trained staff.
- **Solar disinfection:** This is a simple water treatment method using solar radiation and temperature to inactivate pathogens causing diarrhea. It can treat small quantities of water at a time. Contaminated water is filled into transparent plastic bottles and exposed to full sunlight for six hours. It is a cheap option, but it is hard to detect if the water is safe for drinking (more at www.sodis.ch) creating a risk of use of unsafe water.
- **Chemical disinfection:** ongoing research is taking place for reliable chemical disinfection of water. Traditionally, chloride is being used for disinfection. When properly dosed this is a very reliable way of treating water at a low cost. The disadvantage of the use of chloride is the changed taste of water (normally considered 'bad taste' and therefore unattractive for human consumption) and the fact that it is hard to detect whether the water has been safely treated.

If the water contains **chemical** contamination, such as arsenic, fluorosis or salt, specialized treatment measures are required.

Box 8 Water Treatment in Crisis and Emergency Situations

Straining

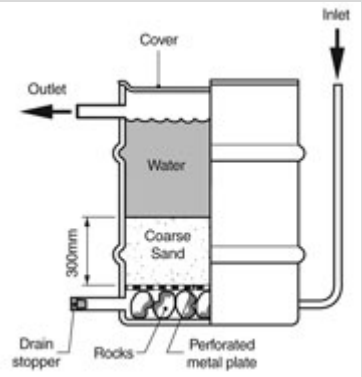
Pouring water through a clean piece of cotton cloth will remove a certain amount of the suspended silt and solids. It is important that the cloth used is clean, as dirty cloth may introduce additional pollutants. Specifically made monofilament filter cloths may be used in areas where guinea-worm disease is prevalent. Such cloths remove organisms known as copepods, which act as intermediate hosts for the guinea-worm larvae. The cloth must always be used with the same surface uppermost. The cloth may be cleaned using soap and clean water.

Storage and settlement

When water is stored for a day in safe conditions, more than 50% of most bacteria die. Furthermore, during storage, the suspended solids and some of the pathogens will settle to the bottom of the container. The container used for storage and settlement should have a lid to avoid recontamination, but should have a neck wide enough to facilitate periodic cleaning. For example a bucket with a lid could be used for this purpose. Water should be drawn from the top of the container where it will be cleanest and contain fewer pathogens. Storage and settlement for at least 48 hours also eliminates organisms called the cercariae, which act as intermediate host in the life cycle of bilharziasis (schistosomoasis). Longer periods of storage will leader
to better water quality.

Simple up-flow sand filter

Simple household filters may be put together inside clay, metal or plastic containers. The vessels are filled with layers of sand and gravel and pipe work arranged to force the water to flow either upwards or downwards through the filter.



A filter such as this could be built from a 200 liter drum. It has a filter bed made up coarse sand (of about 0.3m depth) of grain size between 3 and 4mm diameter, and supported by gravel covered by a perforated metal tray. The effective filtration rate of this filter can be as high as 230 liters per hour. Such filters must be dismantled regularly to clean the sand and gravel and remove any settled silt. The frequency of cleaning is dependent on the level of turbidity of the raw water. Furthermore, such filters are not effective at removing the pathogens. Therefore the water must be disinfected or stored for 48 hours in order to make it safe.

Charcoal filters

Charcoal can be quite effective at removing some tastes, odors, and color. Ordinary charcoal available locally could be used, but activated carbon is more effective, though rather expensive. An example of such a filter is the UNICEF upflow sand filter. However, if the charcoal is not regularly renewed or if the filter is left unused for some time, there is evidence that it can become the breeding ground for harmful bacteria.

Ceramic filters

Water may be purified by allowing it to pass through a ceramic filter element. These are sometimes called candles. In this process, suspended particles are mechanically filtered from the water. The filtered water must be boiled or otherwise disinfected. Some filters are impregnated with silver which acts as a disinfectant and kills bacteria, removing the need for boiling the water after filtration. Ceramic filters can be manufactured locally, but are also mass-produced. They can be costly but have a long storage life and so can be purchased and stored in preparation for future emergencies. The impurities held back by the candle surface need to be brushed off under running water, at regular intervals. In order to reduce frequent clogging, the inlet water should have a low turbidity.

Disinfection

It is essential that drinking water be free of harmful organisms. Storage, sedimentation and filtration of water reduce the contents of harmful bacteria but none of them can guarantee complete removal of germs. Disinfection is a treatment process that ensures drinking water is free from harmful organisms or pathogens. It is recommended that this be the final treatment stage as many of the disinfection processes will be hampered by suspended solids and organic matter in the water. There are various methods of achieving disinfection at household level:

Disinfection by boiling

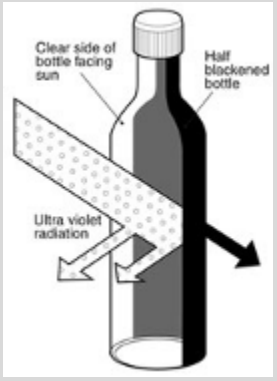
Boiling is a very effective though energy consuming method to destroy various pathogens such as viruses, cysts and worm eggs. The water should be brought to a rolling boil for at least three minutes and preferably up to a period of twenty minutes. Apart from the high energy costs involved in boiling, the other disadvantage is the change in taste of water due to the release of air from the water. The taste can be improved by vigorously stirring the water, or shaking the water in a sealed container after it has cooled.

Disinfection using chlorine

Chlorine is a chemical most widely used for the disinfection of drinking water because of its ease of use, ability to measure its effectiveness, availability and relatively lower cost. When used correctly, chlorine will kill all viruses and bacteria, but some species of worms are resistant. There are several different sources of chlorine for home use; in liquid, powder and tablet form. Chlorine is commonly available to households as liquid bleach (sodium hypo chlorite), usually with a chlorine concentration of 1%. Liquid bleach is sold in bottles or sachets, available on a commercial basis.

Solar disinfection

Ultra-violet rays from the sun are used to inactivate and destroy pathogens present in water. Fill transparent plastic containers with water and expose them to full sunlight for about five hours (or two consecutive days under 100% cloudy sky). Disinfection occurs by a combination of radiation and thermal treatment. If a water temperature of least 50oC is achieved, an exposure period of one hour is sufficient. Solar disinfection requires clear water to be effective. An enhanced example is the SODIS system, whereby half-blackened bottles are used to increase the heat gain, with the clear side of the bottle facing the sun.



Other water treatment chemicals

A number of commercially produced chemicals have been developed to holistically treat water at household level in emergency situations. Studies have shown that some of these powders significantly remove pathogenic bacteria, viruses and parasites from water. They also enable the particles to flocculate together, so they then to sink to the bottom of the container. Commercially available sachets typically treat 10 liters of water. The water should be allowed to stand for at least 5 minutes before it is strained. It should be allowed to stand for a further 30 minutes before it is used for human consumption.

Source: WHO website and contributions from Shaw, Rod (ed.) (1999) Running Water: More technical briefs on health, water and sanitation, ITDG, UK and Information prepared by WEDC for Technical Notes: Author and Series Editor: Bob Reed

Testing water quality[41]*****

A number of field kits, or portable laboratories, are used for field microbiological analysis. All allow measurement of essential physical and chemical parameters (pH, turbidity, chlorine residual), and some have modules for colorimetric measurement of various inorganic chemicals (e.g., ammonia, arsenic, fluoride, nitrate). All kits are able to run from mains electricity or on built-in batteries, which can be charged with solar panels. Some of the more commonly used kits are;

- ELE Paqualab www.ele.com/env/int/
- Hach MEL portable laboratory series2 www.hach.com
- Oxfam/DelAgua kit www.rcpeh.com
- Wagtech Potakit www.wagtech.co.uk

* This list does not constitute an endorsement of the companies or products.

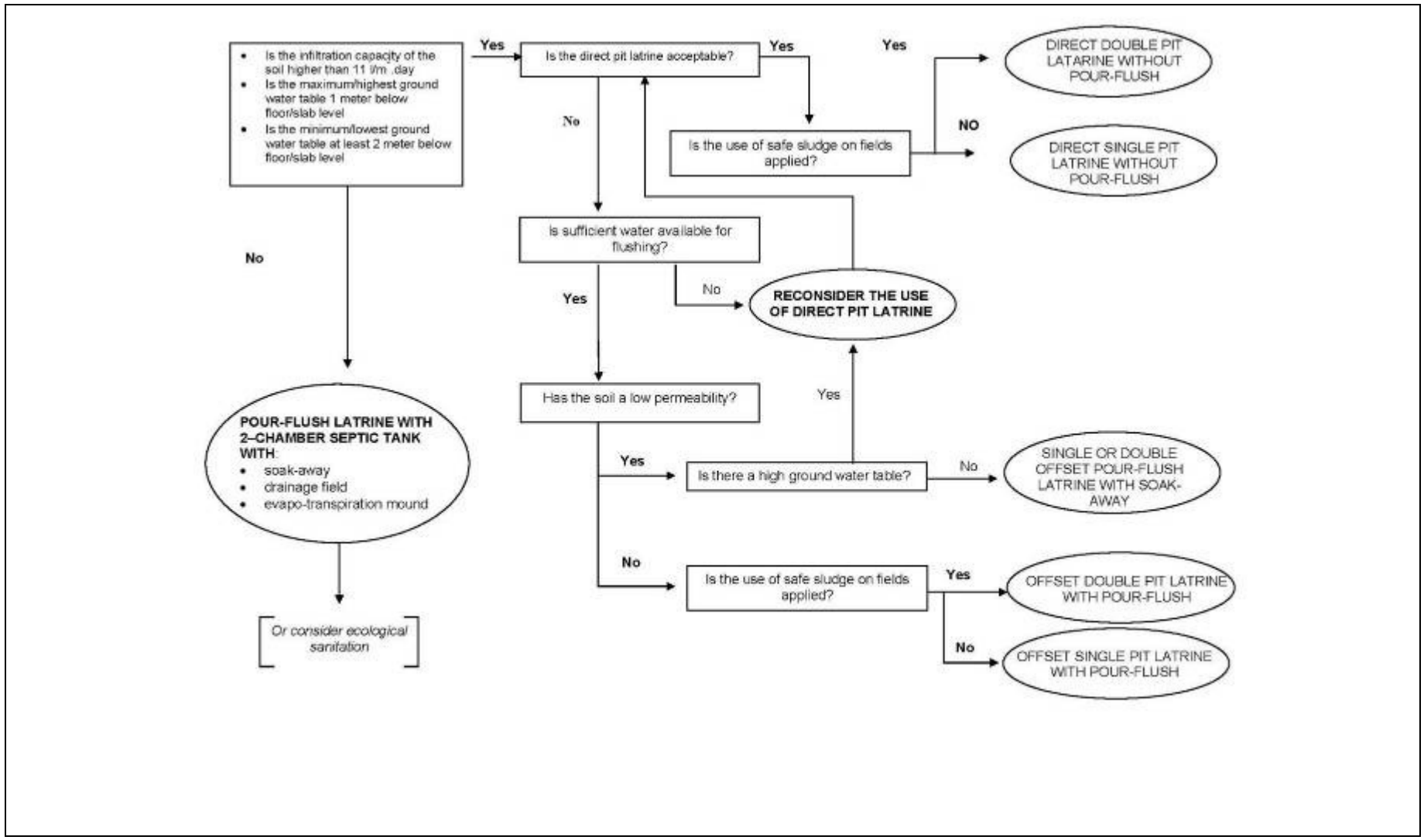
E. Sanitation

ADDITIONAL INFORMATION:
Please note that the information on technical designs of toilets has been derived from Smet, J, et al., (2001), "*guidelines for the improvement of school sanitation*", IRC and ITN Bangladesh, June 2001 (final draft). It gives and overall impression on technologies that can be used. For detailed information, reference should be made to technical designer handbooks. such as:
Cotton, A. and Saywell, D. (1998), "*On-plot sanitation for low income Urban Communities*" and
Franceys, R., Pickford, J. and Reed, R. (1992), "*A guide to the development of on-site sanitation*" http://www.who.int/water_sanitation_health/hygiene/envsan/onsitesan.pdf

In general, poor areas in developing countries are not connected to functioning central sewerage systems. In those conditions alternatives for 'traditional' flush toilets have to be found. Before taking the decision to construct completely new facilities, an **assessment** of the conditions of possible existing facilities should show the need for new construction. Such assessment should consist of a physical examination, study on options for rehabilitation as well as an economic analysis showing that renovating is more cost-effective on the longer term than newly constructed facilities.

[41] Source: UNICEF (2008), "*UNICEF Handbook on Water Quality*". UNICEF, New York

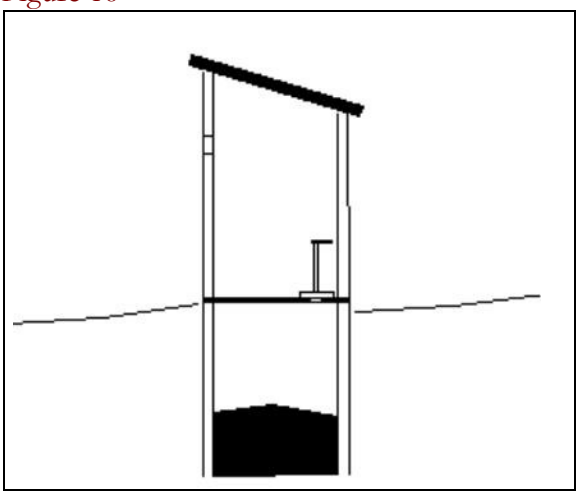
This **flow chart** has been developed on the choice of toilet technology. However, note that it is a simplified decision making chart that should only be used for preliminary guidance. The main toilet technologies can be split in two concepts (1) dry toilets and (2) flush toilets. Flush toilets, that use water to drain the feces, can only be used when enough water is available.
Figure 15



Dry toilets

Direct single pit toilet without pour-flush

Figure 16



This toilet consists of a single pit covered with a slab with a drop hole, a vent pipe covered with a fly screen and a sealed slab at the rear of the toilet. This slab can be removed at the end of the dry season, to dig out part of the sludge under the removable slab.

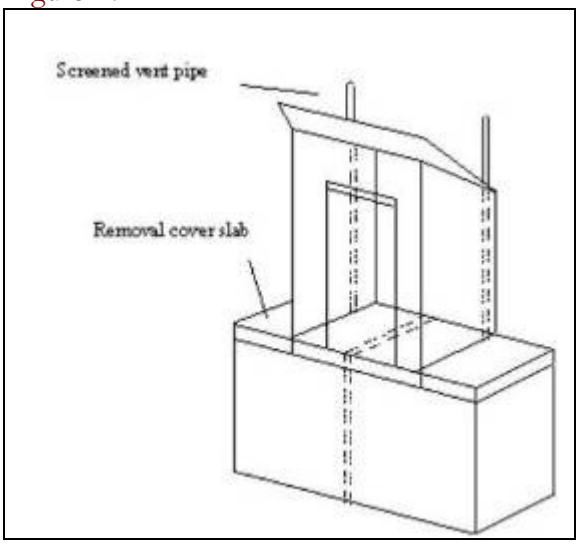
Wind blowing across the top of the vent pipe creates a flow of air that sucks out the foul smelling gasses from the pit. The vent pipe plays also an important role in the vector control. Insects are attracted to light and if the toilet is suitable dark inside they will fly up the vent pipe to the daylight. Because they cannot escape because of the fly screen, they are trapped in fly screen until they dehydrate and die.

Considerations:

- Odor problems may occur during the night and early morning in toilets relying more on solar radiation for the air flow in the vent pipe than on wind speed.
- In areas with soils with a low infiltration capacity (around 11 l/m^2.day or lower) the use of water for cleansing should be limited or even better be avoided.
- Pit sludge is not safe when pit is emptied.

Direct double pit toilet without pour-flush

Figure 17



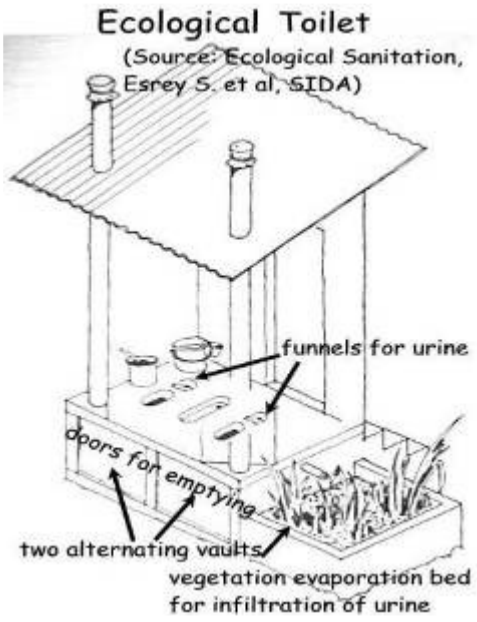
This toilet consists of two pits, which are covered with two slabs with each a drop hole and a vent pipe covered with fly screens but only one superstructure. Only one pit is used at the time. When the contents of the pit reach the level of 0.5 meter below the slab, its drop hole is covered and the second pit is being used. After a period of at least one-year, the contents of the first pit can be removed safely and used as soil conditioner. The first pit can be used again after it has been emptied or when the second pit has filled up. This alternating cycle can be repeated indefinitely. Wind blowing across the top of the vent pipe creates a flow of air that sucks out the foul smelling gasses from the pit. The vent pipe plays also an important role in the vector control. Insects are attracted to light and if the toilet is suitable dark inside (when not in use) they will fly up the vent pipe to the daylight. Because they cannot escape because of the fly screen, they are trapped in fly screen until they dehydrate and die.

Considerations:

- Odor problems may occur during the night and early morning in toilets relying more on solar radiation for the air flow in the vent pipe than on wind speed.
- Pits can be emptied manually if their contents have been left to decompose at least for a year.
- In areas with soils with a low infiltration capacity (around 11 l/m^2.day or lower) the use of water for cleansing should be limited or even better be avoided.
- An extra concern for the double pit toilet system could be that the content of the pit may not decompose safely because the double pits are too close to each other without an effective seal between them, allowing liquids to percolate from one pit to another.

Double-vault ecological toilet with urine separation, Figure 18

Ecological sanitation is part of a broader vision of bringing society in balance with nature to ensure a more sustainable future.
Ecological sanitation consists of the following principles:



- **Protection and conservation of water:** Keeping excreta dry and dehydrating them eliminates the need to use scarce water. Moreover, dry disposal will further enhance the elimination of pathogens.
- **Recovering and recycling of nutrients and organic matter:** Urine can be diluted and applied directly to the soil, or stored underground in storage tanks prior to applying it to the soil. After being sanitized, feces can be recycled and used as fertilizer. The taboos surrounding sanitation could make it difficult to convince stakeholders to utilize urine and feces as fertilizer. In those cases burying the fecal compost and draining the urine to a soak pit are good alternatives. Often when the initial resistance has been overcome, stakeholders will be prepared to use the residues.
- **Prevent diseases:** The harmful pathogens in feces can be treated and converted to a harmless state directly inside the facility. After this 'sanitation' process (making them harmless for health and environment), the feces can be disposed of or recycled without environmental or health risks.

Figure 19

The process of ecological sanitation can be divided into two steps.

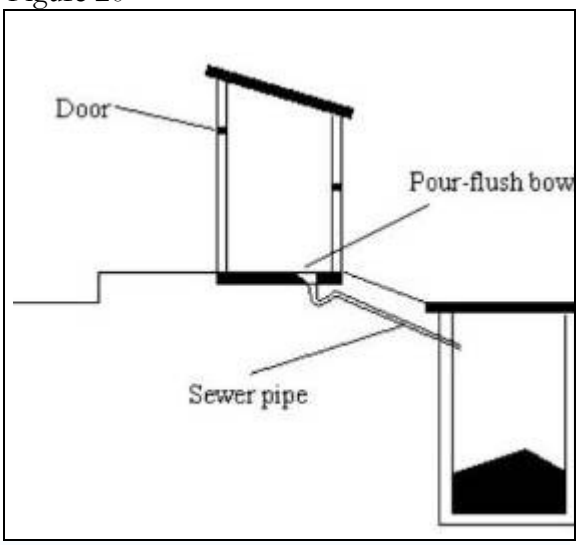
1. The *diversion* of urine and feces. This is necessary because they cannot be sanitized easily if mixed. Urine is commonly almost free of pathogens. The urine can be diverted by using urinals or special pedestals or squatting slabs, and then collected to be used as fertilizer or infiltrated into a vegetation bed with plants that feed on urine, located in close proximity to the toilet.
2. The *collection and storage* of feces in a secure vault where pathogens are broken down. The pathogens can be broken down by decomposition (composting), a biological process in which bacteria, worms and other types of organisms break down organic substances to make humus, an excellent soil conditioner. Another process used is dehydration: Feces can be dehydrated fairly quickly by diversion of urine, and in the processing vault with the help of heat, ventilation and the addition of dry material (such as ashes, lime and soil). A solar collector can be integrated to generate heat to accelerate the dehydration process.

Only when all users and other stakeholders support and promote ecological sanitation, is it a feasible option. Handling the waste, even though it has been processed and is harmless and odor-free, may not be directly acceptable in all cultures. Sweden, Vietnam and China have traditionally used ecological sanitation in one form or another. Nevertheless, ecological sanitation systems require more promotion, support, education and training than conventional systems since they are more sensitive to bad design and management.

Ecological sanitation systems are not necessarily more expensive than well-constructed traditional systems. Money can be saved because excavation is often not necessary and the lifespan of the facility is longer than that of a traditional toilet. The system does not depend on water and pipe networks and operation and maintenance costs are low.

Water flush toilets

Figure 20



Offset single pit toilet with pour-flush

The superstructure of an offset single pit toilet with pour-flush is half a meter away from the leach pit. A short length of sufficiently sloping (1:10) PVC leads from the U trap of the pan down to the pit. The pour-flush toilets overcome the problems of flies, mosquitoes and odor by the installation of a pan with a water seal (a U-shaped conduit partly filled with water) in the defecation hole. After using the toilet, it is flushed by pouring a minimum of two and half liters of water in the pan.

A design which has been used on a large scale in Zimbabwe and other parts of Africa is the Blair Toilet as developed by Dr. Peter Morgan. Its design makes use of air currents, a septic tank like pit, over which is built an upper structure with an open light-trap entrance and ventilation pipe from the bottom pit with a fine wire grate to keep out flies but more importantly to trap those entering the toilet hole from flying out towards the light. The result is odorless and hygienic, as flies cannot escape from the fecal matter to spread disease, and the gases produced by the decomposing waste are redirected outside. It can be used as a dry toilet as well as a water flush toilet.

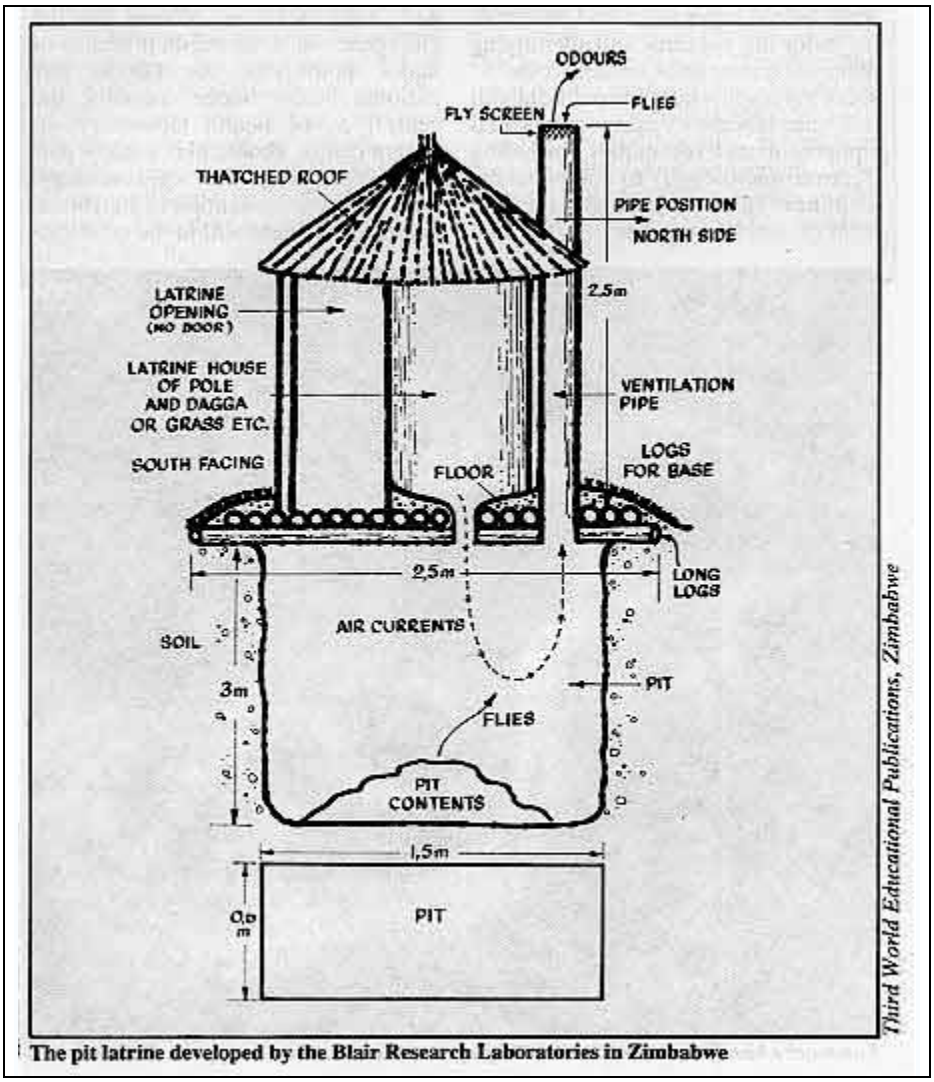
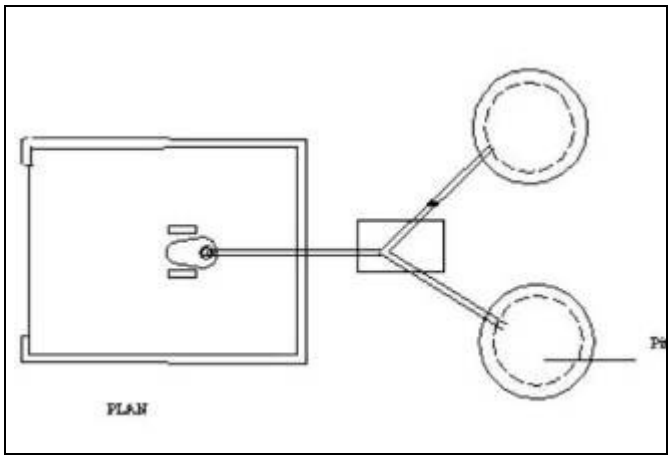

ODOURS
FLIES
FLY SCREEN
THATCHED ROOF
PIPE POSITION
NORTH SIDE
2,5m
LATRINE OPENING (NO DOOR)
LATRINE HOUSE OF POLE AND DAGGA OR GRASS ETC.
SOUTH FACING
VENTILATION PIPE
LOGS FOR BASE
FLOOR
2,5m
LONG LOGS
SOIL
AIR CURRENTS
PIT
3m
FLIES
PIT CONTENTS
1,5m
PIT
Third World Educational Publications, Zimbabwe
The pit latrine developed by the Blair Research Laboratories in Zimbabwe

Figure 21

Offset double pit toilet with pour-flush, figure 22

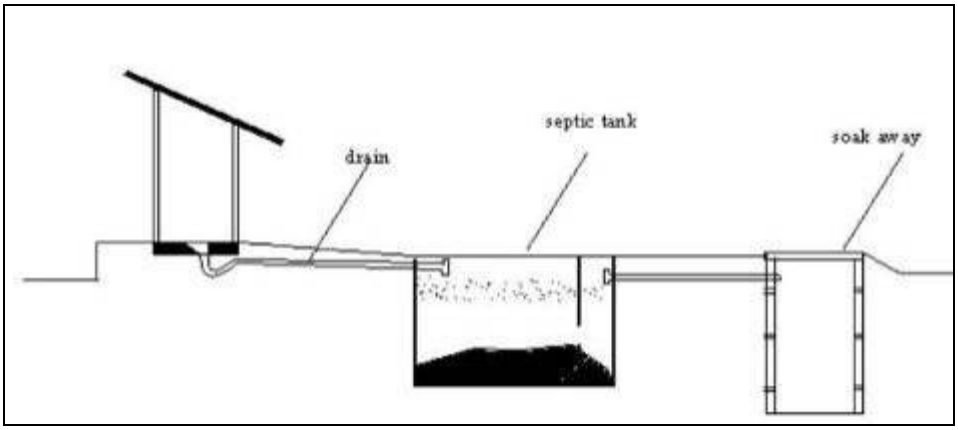


The superstructure of an offset double pit toilet with pour-flush toilet is a short distance away from the two-leach pits. A short length of sufficiently sloping (1:10) PVC leads from the U trap of the pan down to the pit. The pour-flush toilets overcome the problems of flies, mosquitoes and odor by the installation of a pan with a water seal (a U-shaped conduit partly filled with water) in the defecation hole. After using the toilet, it is flushed by pouring a minimum of two and half liters of water in the pan. The double offset system enables alternating use of the two pits. When the first pit is full it should be left for at least twelve months, the period required for adequate pathogen destruction. After this period, the decomposed contents of the first pit can safely be removed by hand and used as organic fertilizer. The first pit can be used again while the second pit gets time to decompose its contents.

Considerations:

- Frequent problems could be the blocking of U-trap because of bad design or improper use or the damage of U-trap caused by improper unblocking. Pour-flush toilets are unsuitable where it is common practice to use bulky materials for anal cleansing which cannot be flushed through the U-trap.
- An extra concern for the offset double pit toilet with pour-flush could be that the content of the pit may not decompose safely because the double pits are too close to each other without an effective seal between them, allowing liquids to percolate from one pit to another.

Pour-flush toilet with 2-chamber septic tank with soak-pit, figure 23



The pour-flush toilet is about one meter away from the septic tank. A short length of sufficiently sloping PVC (1:10) leads from the U trap of the pan down to the tank. The pour-flush toilet overcomes the problems of flies, mosquitoes and odor by the installation of a pan with a water seal (a U-shaped conduit partly filled with water) in the defecation hole. After using the toilet, it is flushed by pouring a minimum of 2.5 liters water in the pan.

A septic tank is a watertight settling tank to which wastes are carried by water flushed down a short PVC pipe. A septic tank does not dispose of wastes; it only helps to separate and digest the solid matter. The liquid effluent flowing out of the tank is from a health point of view as dangerous as raw sewage and remains to be disposed of by soaking into the ground trough the soak-pit. The sludge accumulating in the tank must be removed regularly, usually once every one to five years, depending on site, number of users and kind of use.

In double-compartment tanks the first compartment has twice the volume of the second. The total volume of the tank should be at least three times of the average volume of water used daily. The conventional septic tank works well where the soil conditions are suitable. Every tank must have a ventilation system to allow escape of explosive gases from the tank. Septic tanks are more expensive than other on-site sanitation systems and require sufficient piped water.

A soak-pit is a pit into which the liquid effluents from the septic tank are disposed to infiltrate into the ground. The capacity of the pit should not be less than that of the septic tank. The pit may be filled with stones, broken bricks, etc., in which case no lining is needed, or lined with pre-cast RCC rings. The top 0.3 m (the upper ring) should be a "non" perforated ring. If no lining is used, the top 0.5-meter should be lined to provide a firm support for the reinforced concrete cover slab.

Considerations:

- Many problems are caused by too much disposed liquid. Large flows entering the tank may cause a temporarily high concentration of suspended solids in the effluent owning to disturbance of the solids, which have settled out.
- This type of toilet is unsuitable for areas where water is scarce and where financial resources are insufficient for construction of the system, or where safe tank emptying cannot be done or afforded.

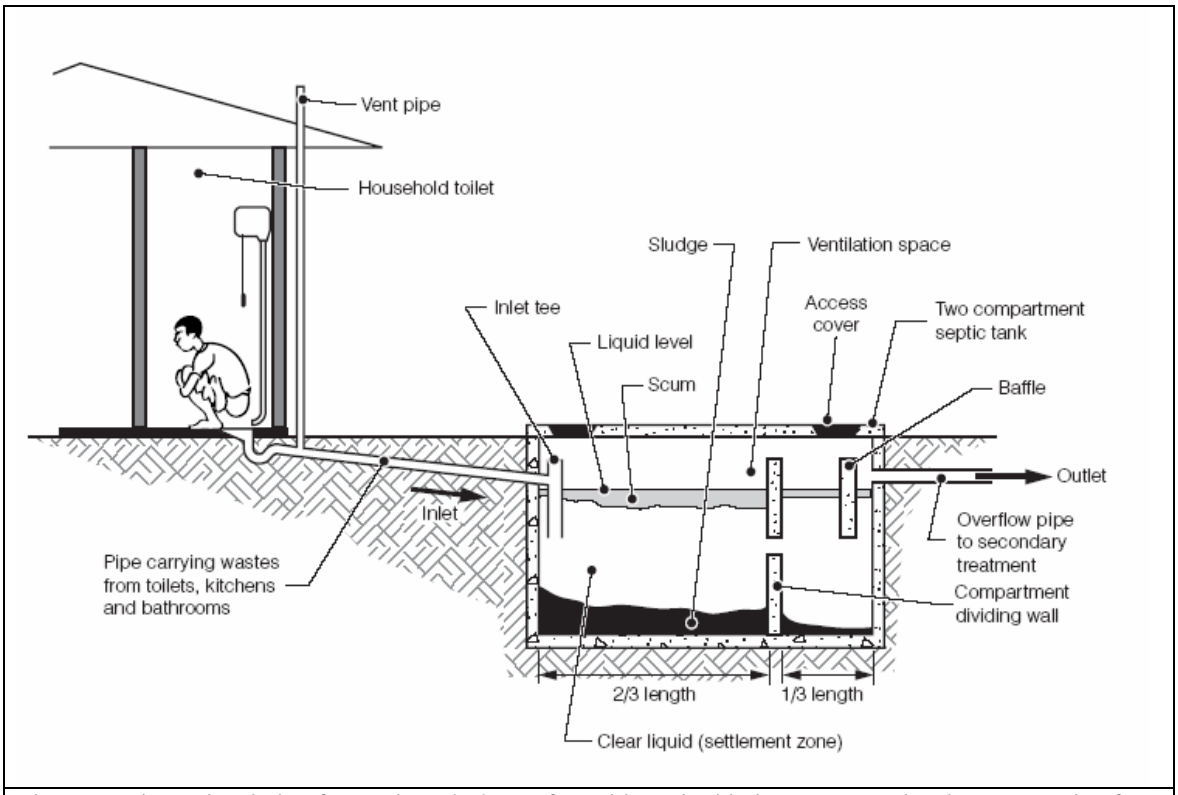
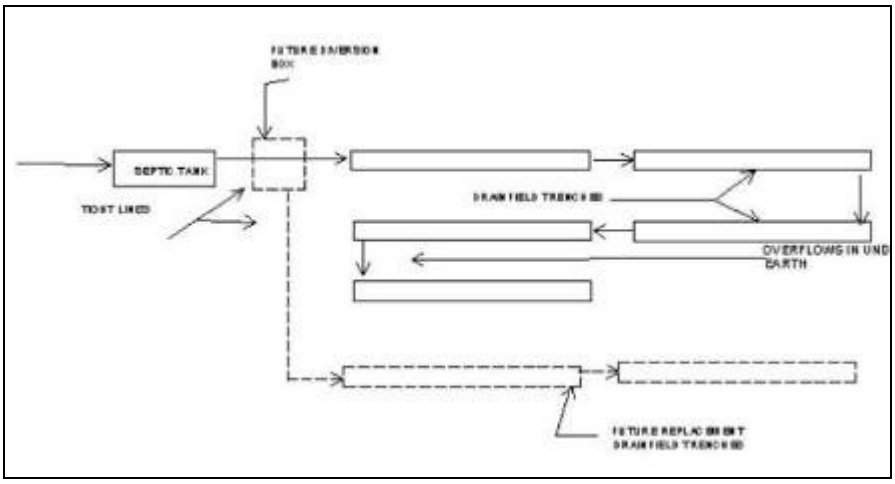


Figure 24 Alternative design for septic tanks by Oxfam with a raised hole to prevent clogging, a vent pipe for ventilation, and a horizontal soak pit for quicker infiltration (drawing from WEDC 1999).

Pour-flush toilet with 2-chamber septic tank with drainage field, figure 25



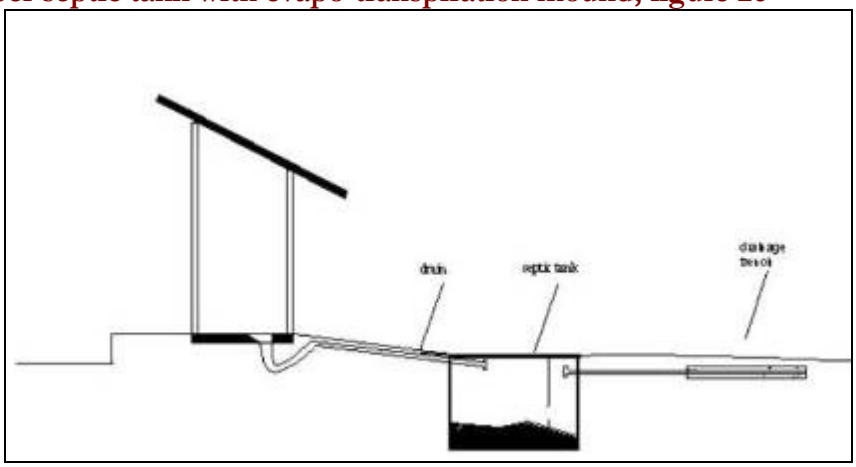
In this part, only attention has been given to the drainage field. The sheet should be read in combination with the sheet on the pour flush toilet with 2-chamber septic tank and soak-pit.

A drainage field consists of gravel filled underground trenches, into which the liquid effluents coming from the septic tank are led through open-joint (stoneware) or perforated (PVC) pipes, allowing the effluents to filtrate into the ground. Initially the infiltration into the ground might be high, but after several years the soil clogs and equilibrium infiltration rate is reached. If the sewage flow exceeds the equilibrium rate of the soil, eventually the sewage will surface over the drainage field.
Trenches are usually 0.3-0.5 m wide with a depth of 0.6-1.0 m below the top of the pipes. They are laid with a 0.2-0.3% gradient and containing 20-50 mm diameter gravel with 0.3 to 0.5 m of soil on top, with a barrier of straw or building paper to prevent soil from washing down. They should be laid in series so that as each trench fills it overflows to the next one. This ensures that each trench is used either fully or not at all. Trenches should be 2 m apart, or twice the trench depth if this is greater than 1 m. The bottom of a trench should be at least 0.5 to 1 m above groundwater, bedrock or impermeable soil and land slope should not exceed 10%. An equal area of land should be kept in reserve for possible extension or replacement of the drain field if it becomes clogged. A drainage field is often used where larger quantities of liquid effluents are produced.

Considerations:

- The problems that can occur are overflowing leach lines, unpleasant odor, groundwater contamination and social conflict over location of the drainage fields.
- A drainage field is unsuitable where insufficient space, water or financial resources for construction are available, where bedrock or groundwater is at a shallow depth.

Pour-flush toilet with 2-chamber septic tank with evapo-transpiration mound, figure 26

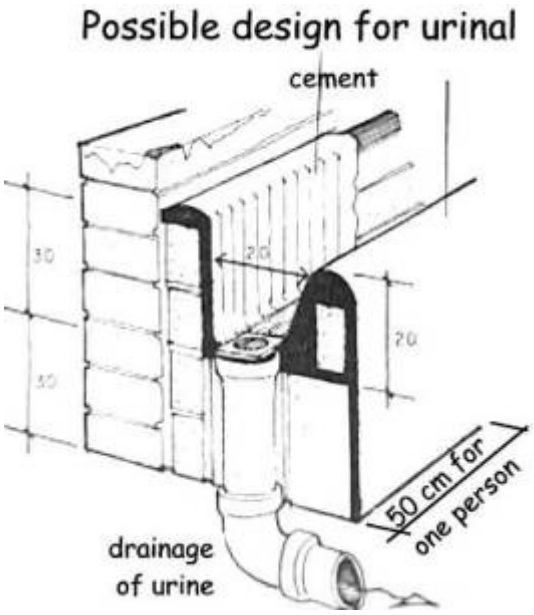


In this part, only attention has been given to an evapo-transpiration mound. The sheet should be read in combination with the sheet on the pour flush toilet with 2-chamber septic tank and soak-pit.

Where the soil is impermeable or difficult to excavate or where the water table is near the surface, a possible solution is the use of an evapo-transpiration mound. This ensures a greater depth and dispersion of the effluent's travel into the soil, as well as removing much of its water content through the evapo-transpiration of the plants planted on the top. An evapo-transpiration mound is filled with sand and gravel into which the liquid effluents coming from the septic tank are led through perforated laterals allowing the effluents to filtrate into the ground or to evapo-transpirate.

Urinals for men

Figure 27



An other design for an urinal (drawing by Jaap

Urinals must be seen as part of the package of sanitation facilities, but are mainly used in public buildings like schools, hospitals, offices, etc. The construction of urinals reduces the number of toilets needed and are cheaper than toilets. Furthermore the use of urinals might prevent the accidental fouling of the boy's toilets, which is in many cases the prime cause of unpleasant odors. One urinal can include several urinal spaces. A urinal space is 0.6 meter of a urinal channel. Urinals can be built as separate buildings or as part of a toilet block, i.e. using the back or sidewall of the toilets. A raised footstep with a slope separates the urine channel from the concrete floor. It is very important that a though plastic or stainless steel trap is incorporated in the drain to prevent debris blocking the pipes. The compartment walls should be plastered and steel floated up to 1.2 meters above the floor. This should then be painted with a "urine" resistant washable paint. The urinals will be connected to a soak-pit.

Urinals for women

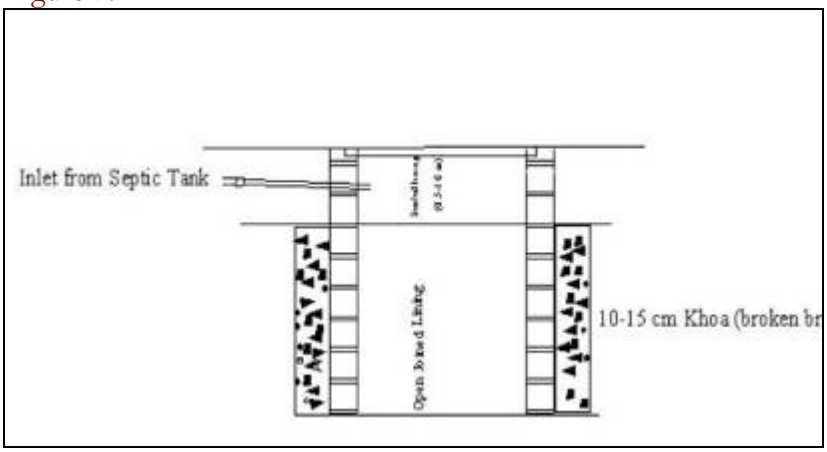
A recent development is the construction of urinals for women. It is a cheaper design than building fill toilets and can, particularly for younger girls that do not demand much privacy, be a good alternative for traditional solutions.

Figure 28

Urinals for girls in a school in Vietnam (pictures by Christine van Wijk)

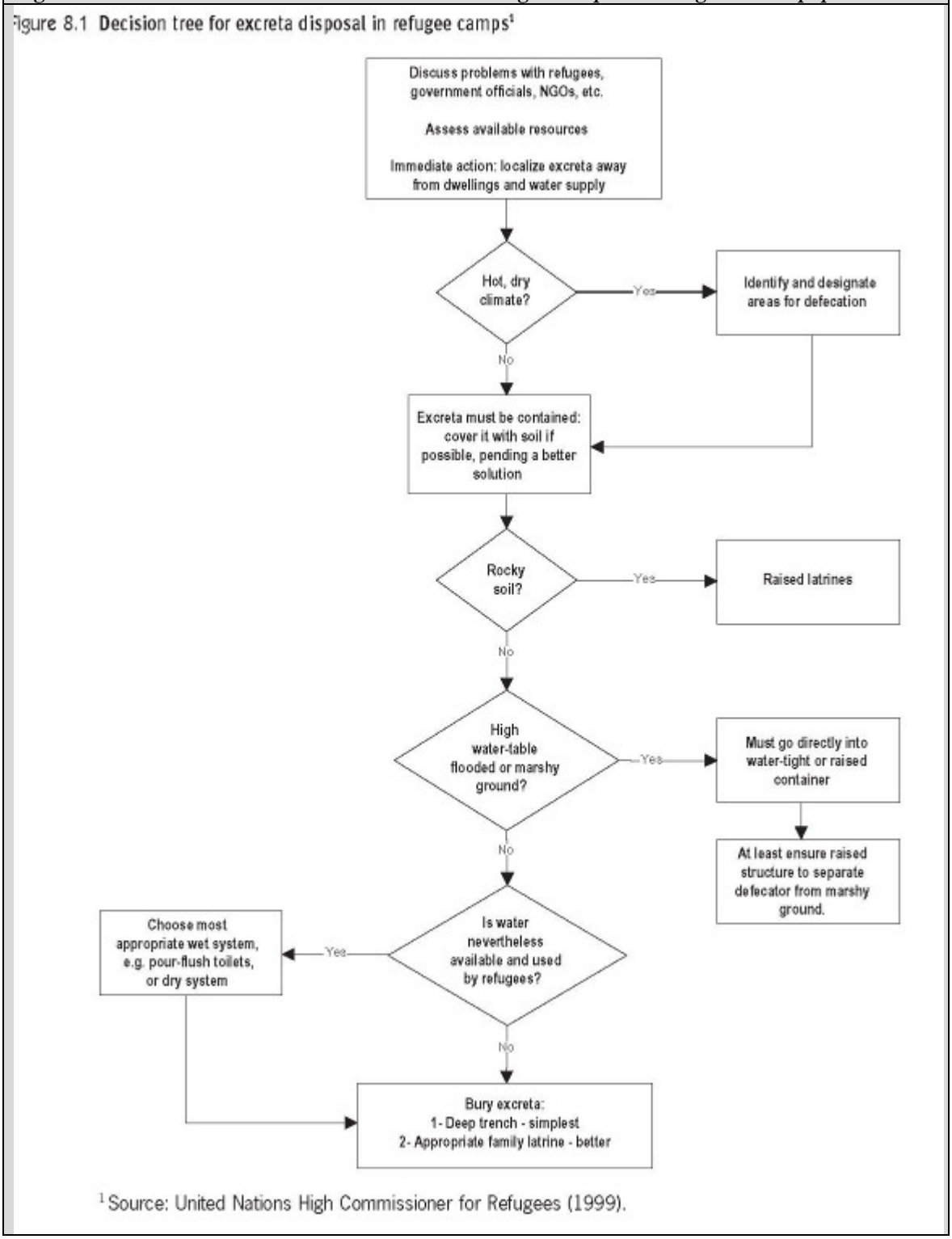
Soak Pit

Figure 29



A soak-pit is a pit into which the liquid effluents from the leach pit are disposed to infiltrate into the ground. The size of the soak-pit should not be less than that of the leach pit. The pit may be filled with stones, broken bricks, etc., in which case no lining is needed, or lined with pre-cast RCC rings. The top 0.3 m (the upper ring) should be a "non" perforated ring. If no lining is used, the top 0.5-meter should be lined to provide a firm support for the reinforced concrete cover slab.

Figure 30 Decision Tree for Sanitation Solutions in refugee camps or among nomadic population



Anal Cleansing

Anal cleansing is the main risk practice for transmission of pathogens from feces to mouth. However, when professionally addressing sanitation, the act of anal cleansing will normally be ignored. The reason for this is quite obvious: in almost all cultures dealing or touching feces is not very much accepted and surrounded by many taboos. Therefore, it sometimes seems easier to 'just forget' about the subject.

In the past, sanitation projects have been set-up where the project planners and implementers did not have a knowledge on the existing local habits for anal cleansing e.g. constructing flush toilets where people wipe with leaves or corn cobs that they throw in the toilet and subsequently blocks the pipe.

Pathogens are micro-organisms that can cause disease in humans. They fall into three major classes:

- *Bacteria* are single-celled organisms
- *Viruses* are protein-coated genetic material that lack many cell structures, and are much smaller than bacteria
- *Parasites* are unicellular or multi cellular organisms that depend on the host organism on nutrition, oxygen and protection. They cannot live alone without the host and some of them are harm full to the host or help full to the host. They may live different tissues of the host body. The host can be a human, animal or a plant.

Box 9

Cleansing methods

The main methods used for anal cleansing are:

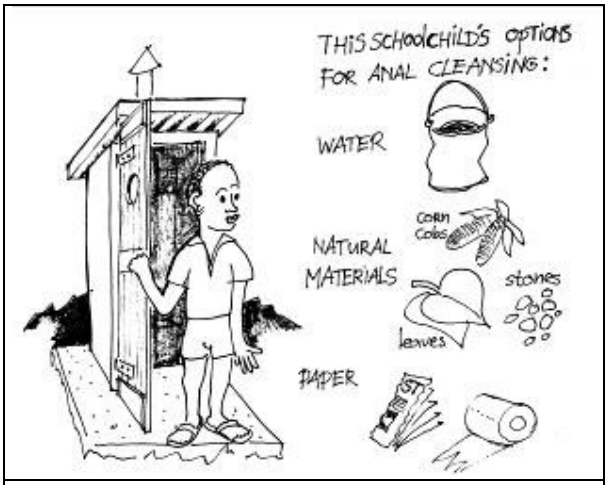


Figure 31 Drawing by Jaap Zomerplaag

- **Water:** Mainly common in countries with Islamic traditions and in Asia. If water is not readily available, users will carry a bucket or jar of water to the toilet. For dry pit toilets, water can create problems because of discharge problems in the pit.
- **Natural materials, such as leaves, corn cobs and stones**: Common in rural areas. Normally the people have to collect the materials before entering the toilet. After use they throw those materials in the pits which leads to quick filling-up of the pits and regular blocking of the pipes.
- **Paper, such as old news papers and in some cases toilet paper**: common in (poor) urban areas where paper can be collected or bought. In some cases, children will use pages of their note or text books for cleansing. Often, people throw those papers in the pits after use which leads to quick filling-up of the pits and regular blocking of the pipes. In cases where the materials are separately collected in a container they have to be hygienically handled.

Which of the above methods is being used by the people will depend on several aspects and can differ due to the:

- **Cultural setting:** e.g. water is common in countries with Islamic traditions and in Asia, while e.g. in Latin America mainly wiping materials are being used. In some countries there is a difference in methods being used by men and women.

- **Socio-economic circumstances:** rich and often also middle-class people in developing countries use toilet paper. Communities influenced by those groups will often choose for the use of paper, even if it is not financially feasible resulting in short supply of paper.
- **Location (urban/rural):** in urban settings natural materials, such as leaves, might be scarce, where recycled paper might be easy to get. In rural areas the contrary is the case.
- **Locally available materials***:* if natural materials are being used, this will be determined by which appropriate materials are easily and free available, e.g. it is obvious that leaves will not be commonly used in dry areas of Saharan countries, etc.
- **Age group***:* when people have to search for materials at safety and accessibility places, there might be difference between younger children and older people.

Following the above, for the **design of facilities** the (desired) method of anal cleansing will be one of the factors that determines the choice of sanitation technology:

Table 13 Method of Anal Cleansing	**Sanitation Technology**	
	Dry toilets	**Flush toilets**
Water	• Double chamber ecological toilet with urine and wash water diversion	• All types
Natural materials	• Simple pit toilet • Double pit or double chamber ecological toilet with or without urine diversion	• All types as long as they are not disposed of in the toilet
Paper	• Simple pit toilet • Double pit or double chamber ecological toilet with or without urine diversion	• All types as long as toilet paper only is used for anal cleansing and not other objects

F. Environmental Aspects

Globally[42], some 80 countries with 40% of the world's population are suffering from water shortages at some time during the year. Chronic fresh water shortages are expected within the next decade in much of Africa, the Middle East, northern China, parts of India and Mexico, the western United States, northeastern Brazil and in Central Asia. These shortages are being caused due to two main reasons: (1) the pollution of fresh water sources, and (2) the overuse of the existing fresh water sources.

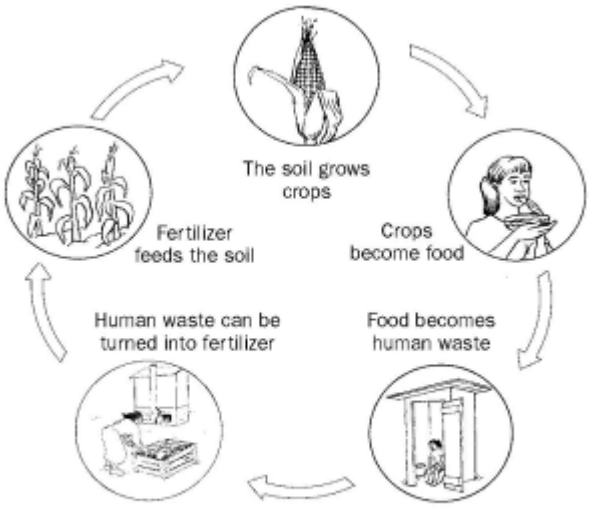


Figure 32 From: Conant, J. (2005), *"Sanitation and Cleanliness for a Healthy Environment"*. Hesperian Foundation, Berkeley, USA

Figure 33

WASH improvement can have an adverse impact on the overall environment. Scarce water resources will be used to supply drinking water and provide water for handwashing. Specific sanitary solutions, such as pour flush toilets require water, while they discharge wastewater directly into open water courses. If no specific measures are taken this wastewater can pollute neighboring surface water, which in many cases is also being used as a household water source. The 'drop-and-store' systems, such as simple pit and VIP toilets, do not have these disadvantages, but pose risks for soil and groundwater contamination. They are also more likely to result in bad odors, unhygienic surroundings and insect breeding.

[42] From: Esrey, S., et al. (1998), *"Ecological Sanitation"*, SIDA, Stockholm

Improving 'traditional' WASH facilities

The following principles can be applied to a variety of contexts.

- Recycle facilities: Where facilities are already available, consider upgrading or rehabilitation instead of newly construction to demolition and creating surcharge garbage. Use local materials instead of materials means that there are limited fuel and other transport costs and resources involved.

- Conservation of valuable water resources: Scarce water resources should not be wasted. For example: Preferably, toilet technologies should be used that do not need water for flushing, such as ecological and pit toilets.

- Leaking taps have to be repaired in time.

- Handwashing facilities have to be designed in such a way that a minimum amount of water (0.5 liter) will be used for hygienic handwashing.

- Hygiene promotion can raise the awareness of community members on the importance of conserving water while handwashing, washing clothes, cleaning, watering plants, etc.

- Prevention of soil and groundwater pollution: Pits should be properly located to avoid seepage into the surrounding soil and groundwater. To minimize pollution, a sand filter can be provided around the pit.

- Wastewater from water source and handwashing facilities has to be drained in such a way that it does not contaminate other water sources. This can be done through a sand filter or soak pit. The use of proper technologies to avoid possible environmental hazards during disasters: Pits can overflow as a result of extreme rainfall and floods, causing severe health risks. Suitable solutions, such as construction of the toilets at an elevated level, should be provided in areas where these hazards are likely to occur.

- Under take measures to increase the recharge rate of water sources, such as: sub-surface dams, check dams, or tree planting near water sources etc.

G. Handwashing

Handwashing is important for good health. Washing[43] hands with soap reduces the risk of diarrheal diseases by 42–47%. Overall, interventions to promote handwashing might save a million lives a year. There are also indications that handwashing is also an important preventive measure in the incidence of acute respiratory infections.

Unfortunately, still many houses have inappropriate handwashing facilities. These facilities, if at all available, may encounter the following problems:

- The facilities are not appropriately located.
- No soap, ash or mud or other agent for handwashing available.
- No hygienic way to dry hands after handwashing.
- The facility is available but locked up because of fear for theft.
- The handwashing facilities are available but not being used due to lack of water.

Table 14

Handwashing with Soap??

A number of studies suggest that handwashing with soap is the critical component of this behavior and that handwashing only with water provides little or no benefit (Cairncross, 1993; Ghosh *et al.*, 1997; Khan, 1982; Oo *et al.*, 2000). Hoque and Briend (1991) showed that whilst less effective than when using a rubbing agent, such as **soap, mud or ash**, some reductions in contamination were found when washing with water alone, but that use of alternative rubbing agents (mud or ash) provided the same benefits as soap. Hoque *et al.* (1995) also found that the use of mud, ash and soap all achieved the same level of cleanliness.

It suggests that it is the action of rubbing hands that was more important than the agent used. The authors recommend that rinsing with 2 liters of clean water was also protective, although this seems to be a large quantity, which may be difficult to sustain in the absence of on-plot access to water.

Quote from: Howard, G. and Bartram, J. (2003), "*Domestic quantity, service level and health",* WHO

If upgrading or rehabilitation of the existing handwash facilities is not possible, the design used for new facilities will be determined by the water source and the available budget. Only if there is regular water supply, a conventional washbasin can be considered. In settings with no piped water, a **range of alternatives** is available. Some of the below drawings might present some options.

Table 15

How to wash hands appropriately

Not all people know how to water hands correctly[44]. Five simple rules are:

1. Pour a bit of water on both hands.
2. Put soap, ash or mud on hands.
3. Rub both hands well and all over.
4. Rinse well. Rinse off all the soap. This will need more than 1/2 liter of water.
5. Shake off water or dry hands with a clean piece of cloth.

[43] Curtis, V., and Cairncross, S. "*Effect of washing hands with soap on diarrhoea risk in the community: a systematic review.*", The Lancet infectious diseases, Vol 3 nr. 5, 1 May 2003

When to wash hands

In addition to understanding how to wash hands correctly, people need to know when. Key times for handwashing include:

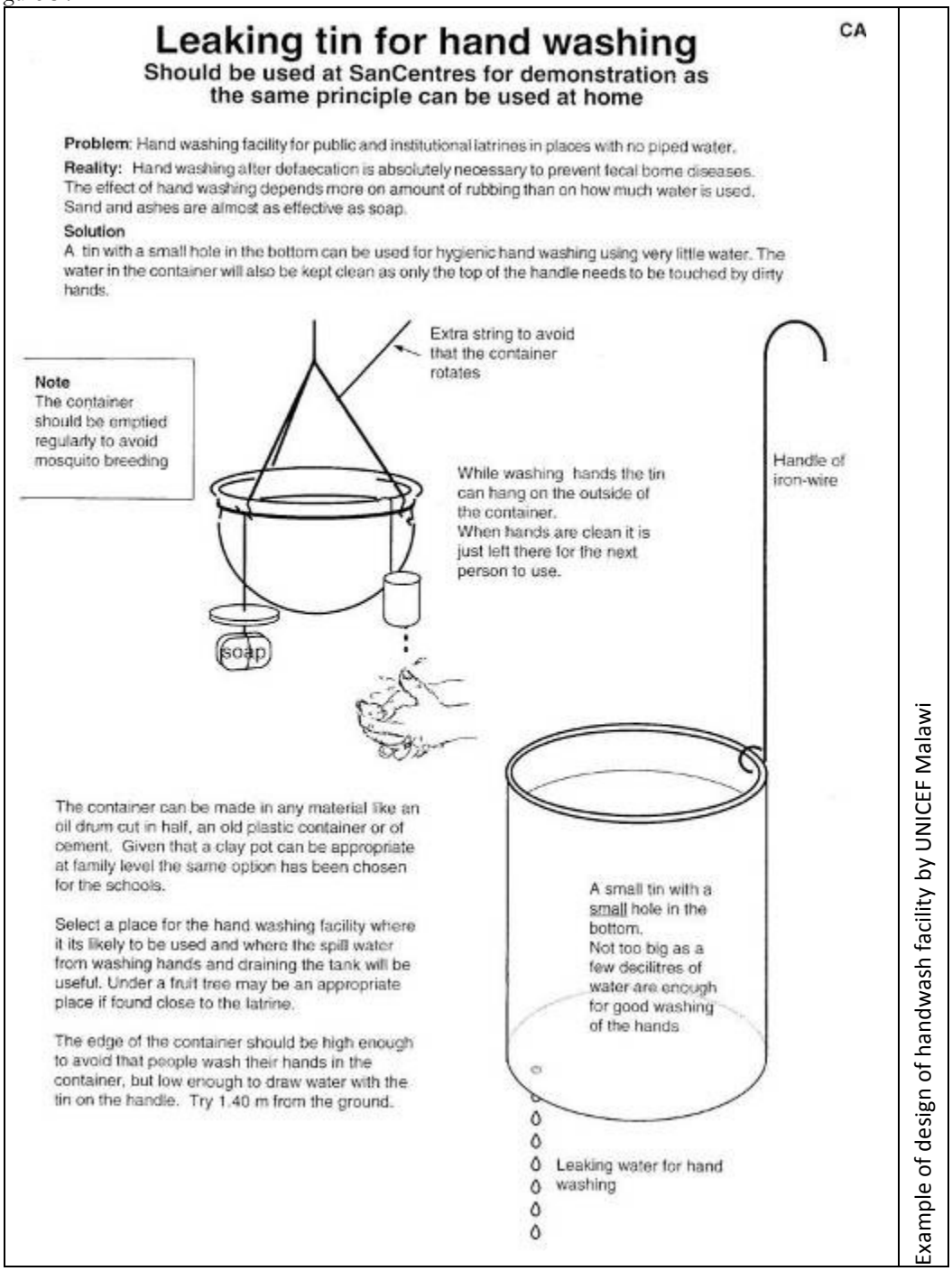
- After toilet use
- Before/after eating
- Before preparing food
- After cleaning babies
- After handling domestic pets and animals
- After working in the field.

Examples of handwash facilities in schools and homes as introduced by Mercy Corps, Indonesia

[44] Adapted from draft sheet by K. Shordt, IRC for SSHE-project India

Alternative handwash facilities designs

Figure 34



Example of design of handwash facility by UNICEF Malawi

Figure 35

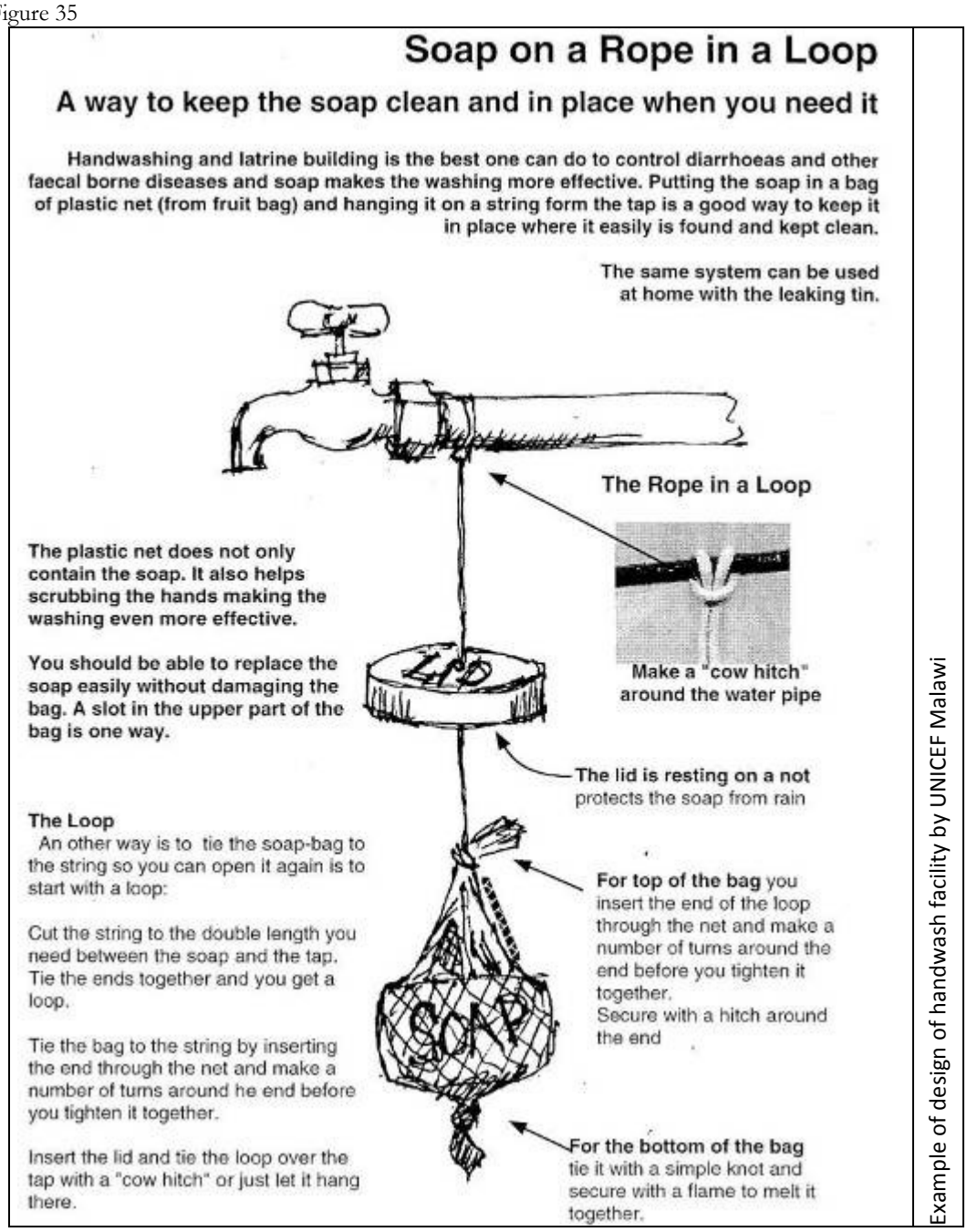
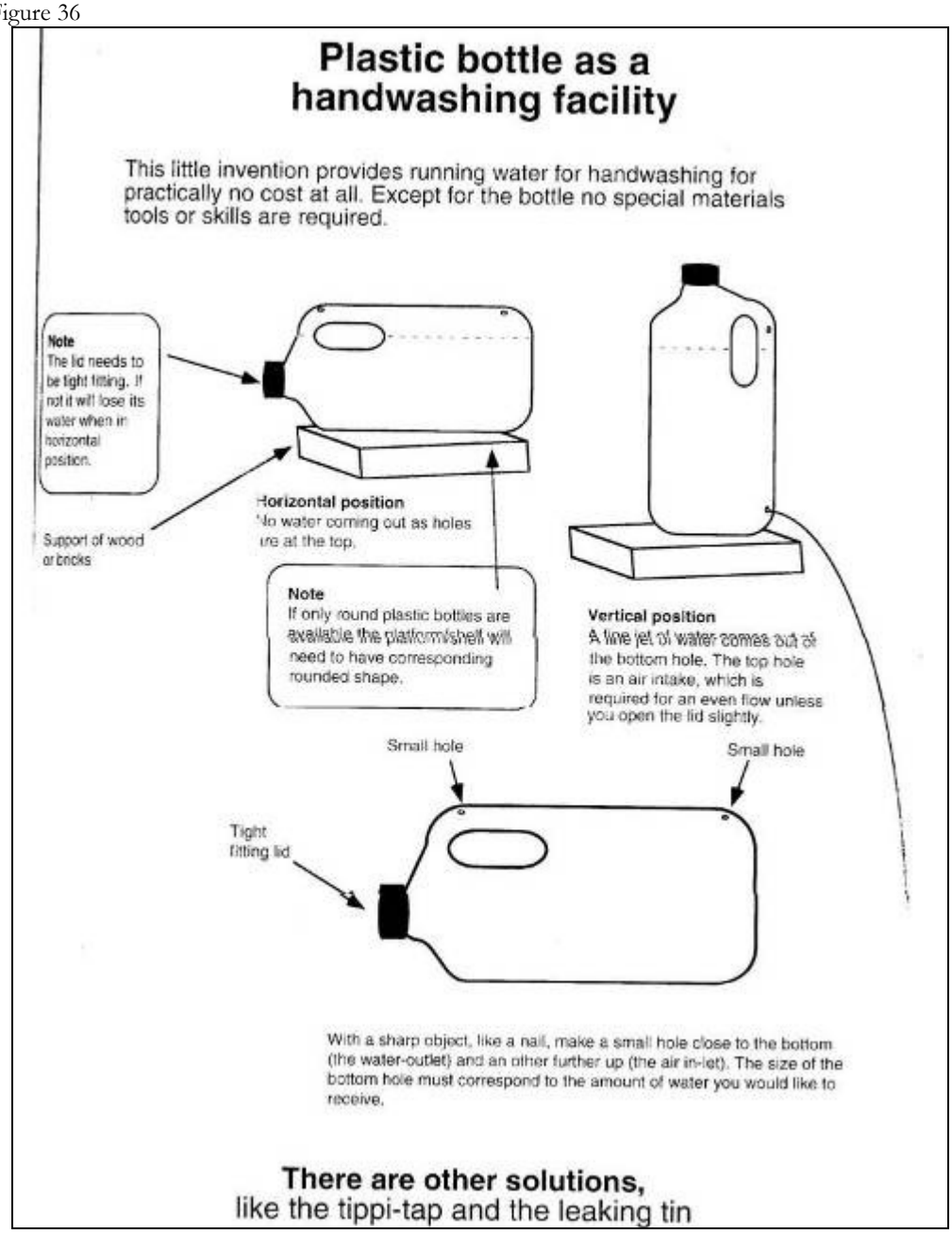

Soap on a Rope in a Loop
A way to keep the soap clean and in place when you need it
Handwashing and latrine building is the best one can do to control diarrhoeas and other faecal borne diseases and soap makes the washing more effective. Putting the soap in a bag of plastic net (from fruit bag) and hanging it on a string form the tap is a good way to keep it in place where it easily is found and kept clean.
The same system can be used at home with the leaking tin.
The Rope in a Loop
Make a "cow hitch" around the water pipe
The plastic net does not only contain the soap. It also helps scrubbing the hands making the washing even more effective.
You should be able to replace the soap easily without damaging the bag. A slot in the upper part of the bag is one way.
The lid is resting on a not protects the soap from rain
The Loop
An other way is to tie the soap-bag to the string so you can open it again is to start with a loop:
Cut the string to the double length you need between the soap and the tap. Tie the ends together and you get a loop.
Tie the bag to the string by inserting the end through the net and make a number of turns around he end before you tighten it together.
Insert the lid and tie the loop over the tap with a "cow hitch" or just let it hang there.
For top of the bag you insert the end of the loop through the net and make a number of turns around the end before you tighten it together.
Secure with a hitch around the end
For the bottom of the bag tie it with a simple knot and secure with a flame to melt it together.
SOAP
Example of design of handwash facility by UNICEF Malawi

Figure 36


Plastic bottle as a handwashing facility
This little invention provides running water for handwashing for practically no cost at all. Except for the bottle no special materials tools or skills are required.
Note
The lid needs to be tight fitting. If not it will lose its water when in horizontal position.
Support of wood or bricks
Horizontal position
No water coming out as holes are at the top.
Note
If only round plastic bottles are available the platform/shelf will need to have corresponding rounded shape.
Vertical position
A fine jet of water comes out of the bottom hole. The top hole is an air intake, which is required for an even flow unless you open the lid slightly.
Small hole
Small hole
Tight fitting lid
With a sharp object, like a nail, make a small hole close to the bottom (the water-outlet) and an other further up (the air in-let). The size of the bottom hole must correspond to the amount of water you would like to receive.
There are other solutions,
like the tippi-tap and the leaking tin

H. Hygiene Promotion

Hygiene promotion is a planned approach to preventing diarrheal and other WASH-born diseases through the widespread adoption of safe hygiene practices. It begins with, and is built on what local people know, do and want[45]. Effective hygiene promotion aims to reduce the incidence of poor hygiene practices and conditions that pose the greatest risks to the health of children, women and men and in particular people with disabilities and chronic diseases. It does so in a measurable way, to a significant level, in a pre-set period and with available resources. This is not only important for the development of hygiene promotion materials, but also for the design and evaluation of hygiene promotion projects and facilities.

Teaching appropriate hygiene behavior is most successful when it targets just a limited amount of behaviors and those with the biggest overall health impact. Too many behaviors will diffuse the attention that can be given to each because too little time will be available to teach each sufficiently in-depth. More knowledge on the background of certain promoted hygiene behavior can be introduced by using the sanitation and hygiene related **F-diagram**[46]. The F-diagram shows the path in which germs can spread from person to person.

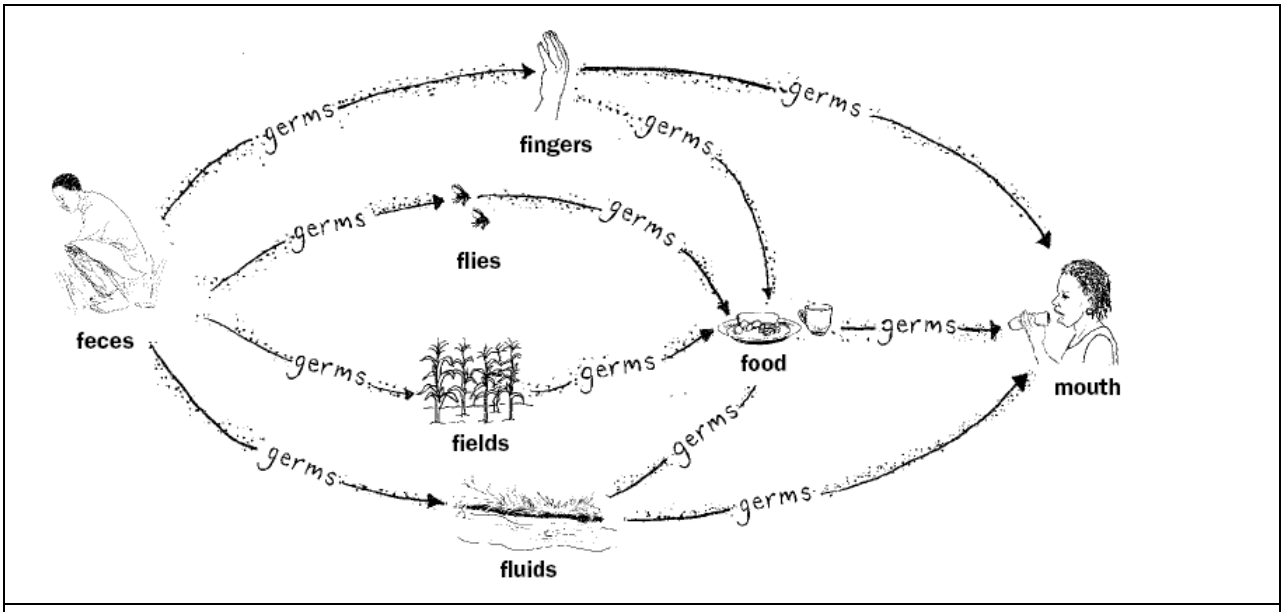


Figure 37 F-diagram (source drawing[47])

Fingers: Human feces stick to hands, fingers and under nails
Flies: Flies and other insects sit on feces and than on the food for human consumption
Fields: Human feces are being used as fertilizer or disposed on the fields and eaten through not fully cooked food that grew on the fields
Fluids (water): Feces mix with drinking water

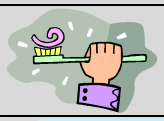
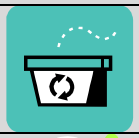
[45] Definition adapted from: UNICEF (1999). *"Towards better programming: a manual on hygiene promotion",* Water, Environment and Sanitation Technical Guidelines Series No. 6, UNICEF New York, USA
[46] It is called F-diagram because all paths start with F.
[47] Conant, J. (2005), *"Sanitation and Cleanliness for a Healthy Environment"*, Hesperian Foundation, Berkeley, USA in collaboration with the United Nations Development Program

The most prevalent diseases, such as diarrheal or worm infections are being spread by germs related to feces. Germs cause infections. Although transmissions routes can also be air borne, through direct contact or water borne, fecal contamination and fecal-oral transmissions are considered the key causes of WASH-related health concerns.

Fecal contamination can be stopped through: provision of safe toilets and the protection of water sources. (see left side of the diagram)
Fecal-oral transmission can be stopped through washing hands with soap after toilet use, before eating, before preparing food, after cleaning babies, after handling domestic pets and animals, protection of water between source and consumption. (see right side of the diagram)

Based on the F-diagram and demands from stakeholders, the following **key hygiene behaviors** have been identified as having the **most impact** (although they may vary slightly in different settings):

Key Hygiene Impact Behaviors, Table 16

1.	**Safe use of toilets and urinals** Diarrhea and worm infections are two main health concerns that affect people at a large scale and that can be improved through appropriate toilet and urinal use.	
2.	**Personal hygiene and infant care** There are many diseases that can be contributed to poor personal hygiene.	
3.	**Promotion of handwashing with soap** Handwashing at critical moments is important for good health because it reduces the risk of diarrheal diseases by 42–47% and significantly reduces the cases of acute respiratory diseases.	
4.	**Female and male hygiene** Genital hygiene and menstrual hygiene is important for health conditions of women and reproductive health in general	
5.	**Waste management and water drainage** Appropriate handling of solid waste produced as well as handling of stagnant water.	
6.	**Water treatment, handling and storage** Basic concepts on water contamination, provision of safe water and water testing.	
7.	**Food hygiene** Eating healthy food is essential for the well-being and survival of each human being. Eating "contaminated" food (also known as "food poisoning") can be an important source for diarrheal diseases.	

Depending on the local setting and circumstances, this list might be expanded with additional key hygiene behaviors, such as:

- Taking care of sick people
- Hygiene after working in the fields or caring for animals
- Prevention and treatment of diseases such as: malaria, cholera, bilharzias, HIV/AIDS,

- Food security and knowledge on good food.

Table 17

Key Principles of Hygiene Promotion:

Target a small number of risk practices. From the point of view of controlling diarrheal disease, the priorities for hygiene behavior change are likely to include handwashing with soap (or a local substitute) after contact with stools, and the safe disposal of adults' and children's stools.

Target specific audiences. These may include mothers, children, sisters, brothers, fathers, teachers, health professionals or other groups.

Identify the motives for changed behavior. While the argument for washing hands with soap will be mainly health related, the motivation for the use of toilets might have often nothing to do with health. People may be persuaded to use a toilet so that their neighbors or classmates will respect them, so that their yard looks nice, or for other motives. By working with the target groups one can discover their views of the benefits of the safer hygiene practices. This provides the basis for a motivational strategy.

Hygiene messages need to be positive. Children and also adults learn best when they laugh, and will listen more attentively if they are entertained. Hygiene promotion projects, which attempt to frighten their audiences, will alienate them. Therefore it is better not to emphasize negative emotions and scary stories about doctors, death or diarrhea.

Identify appropriate channels of communication. It is important to understand how the target audiences communicate. For example, what proportion of each listens to the radio, attends social or religious functions, or goes to the cinema? Traditional and existing channels are easier to use than setting up new ones, but they can only be used effectively if their nature and capacity to reach people are understood.

Decide on a cost-effective mix of channels. Several channels giving the same messages can reinforce them. There is always a trade-off between reach, effectiveness and cost. Mass media reach many people cheaply, but their messages are soon forgotten. Face-to-face communication can be highly effective in encouraging behavior change, but tends to be expensive per capita. Therefore is recommended to choose for a mix of different channels to get the best of all.

Hygiene promotion needs to be carefully planned, executed, monitored and evaluated. At a minimum, baseline assessment as well as data and information collection is required at the start and on regular intervals on the outputs and the population coverage achieved. Finally, indicators of the impact of hygiene promotion on the target behaviors must be defined and periodically assessed.

Adapted from the Well Fact sheet on Hygiene Promotion at:
http://www.lboro.ac.uk/well/resources/fact-sheets/fact-sheets-htm/hp.htm

I. Methodology for Implementation

Depending on the characteristics of the target communities and the budget available, several options for hygiene promotion activities are available:

Table 18

Hygiene Promotion Options- At a Glance[48]

Advantages	Disadvantages
Option 1: Hygiene promotion	
• Provides education opportunities (especially for women in remote areas) • It is very easy to monitor knowledge (before and after) • One set of lessons or lectures can be used for an entire area	• Does not usually lead to improved hygiene behavior (knowing is not necessarily doing) • Risks alienating local people because of the "I know more than you do" assumptions of educators/trainers • Often does not monitor behavior, so its effectiveness is unknown • Requires a lot of materials • Usually based on the assumption (which may not be the reality) that desire for good health is the motivator for behavior change
Option 2: Mass Media Campaign	
• Can reach wide audiences with minimal expenditures (per-capita costs of each person reached are minimal) • Can focus on a few key messages (i.e. not too much information for people to grasp) • Short & quick; requires minimal follow-up • Can be very timely (i.e. information about cholera just before the rainy season) • Does not need a high number of personnel	• May only reach selected audiences (i.e. only better-off households which own a television or radio) • Not very effective for long-term behavior change • Monitoring behavior change is difficult • Requires a lot of pre-testing • Tends to be centrally produced and therefore may not be appropriate in a country with many ethnic/ linguistic groups • Requires a lot of technical knowledge and materials
Option 3a: School Sanitation – Educational Approach	
• Can reach a large number of families through the children • When children tell their families what they've learned at school it isn't as intimidating as when a stranger comes to "educate" the adults • Could potentially reach an entire generation (what does this mean??) • Monitoring of knowledge is simple • Makes good use of existing institutions for a hygiene promotion forum • Teachers often hold a high position of respect	• Focus is on increasing knowledge (and therefore does not necessarily lead to improved hygiene behavior) • Depends on the teacher: an enthusiastic person will carry it out but not every teacher is enthusiastic. There may be no incentives to do so. • Requires monitoring of teachers which may exceed human resource capacities • Requires a lot of materials (books, posters, pamphlets, quizzes etc.)
Option 3b: School Sanitation- Promotional Approach	
• A flexible method which is suited to each specific schools' needs (to better reach the children of that	• Success of the project depends on the teacher and support set-up

[48] Source: Water and Sanitation Program for East Asia and the Pacific (2001), Promoting Options for Cleaner, Healthier Lives: Translating Sector Strategy into Better Hygiene Practices in Lao PDR; From Strategy Into Practice, LAO PDR, November 2001

particular school) • Focus is on motivating behavior change • Monitoring systems are put in place as part of the project – indicators are developed by the students and teachers together • Motivation to change focuses on the feelings of the target audience (rather than health) • Students, teachers and community all monitor thereby reducing the burden on teachers alone • Requires minimum equipment/materials • Can create healthy habits in the long term	• Requires time to assess each school's situation and modify the project accordingly • Takes time and committed staff to find the real motivating factors for change in teachers', students' and communities' behavior • May require considerable communication between community and school; school and private sector; school and different local government departments
Option 4a: Participatory Hygiene Promotion	
• Based on local beliefs and knowledge • Builds on what people see as their own needs and their own priorities for behavior change • Success of project is success of local people: high level of community ownership • Very relevant to the village situation • Can monitor behavior change • Usually very effective at leading to specific behavior change • Requires minimal equipment/materials • Behavior change will be long term	• Requires time (many visits) by project staff • Usually requires teams of project staff to go to each location regularly, and therefore requires a lot of human resources • May not show quick results • Reaches only small concentrated audiences (for example one village at a time) • Quality and effectiveness highly sensitive to the quality of facilitators. • Difficult to scale up quickly
Option 4b: Social Marketing	
• Uses marketing techniques which have proven effective for private sector • Principles are to create a demand for services or products (e.g. for toilets or for hand-washing facilities), and based on what really motivates people • Can reach large audiences or small target areas • There may be several national examples of successful social marketing to follow in other sectors (private or public) • Work (and costs) can be shared with private sector	• Focus-group interviewing techniques require trained facilitators • May take time to find out motivational factors from the target populations • Advertising campaigns can be expensive • Initially, will be most effective with affluent people who can easily afford the product (e.g. soap) or change in habit

After carefully comparing the hygiene promotion options, in consultation with the community one or more options can be chosen and implemented.

Box 10 PHAST and CHAST: successful approaches for hygiene approaches

PHAST,[49] developed by WHO in the mid 1990s in Africa, stands for Participatory Hygiene and Sanitation Transformation. It is a widely used innovative approach designed to promote hygiene behaviors, sanitation improvements, and community management of water and sanitation facilities using specifically developed participatory techniques. It is an adult methodology, but because its use has become so common in developing countries, it is now being adapted for use with children. The advantage of adapting PHAST is that in many countries a group of promoters who know how to train on PHAST is already in existence. One such adaptation is CHAST[50], Children's Hygiene and Sanitation Training, in Somalia. Unlike PHAST, the CHAST approach skips activities such as mapping, planning, and selecting options. Instead it uses methods such as coloring drawings, playing games, and doing hygienic activities more suitable to children.

PHAST consists of seven steps. The first five help to take the community group through the process of developing a plan to prevent diarrheal diseases by improving water supply, hygiene behaviors, and sanitation. The sixth and seventh steps involve monitoring (that is, checking on progress) and evaluation. The information gained from these activities is used to work out whether the plan has been successful.

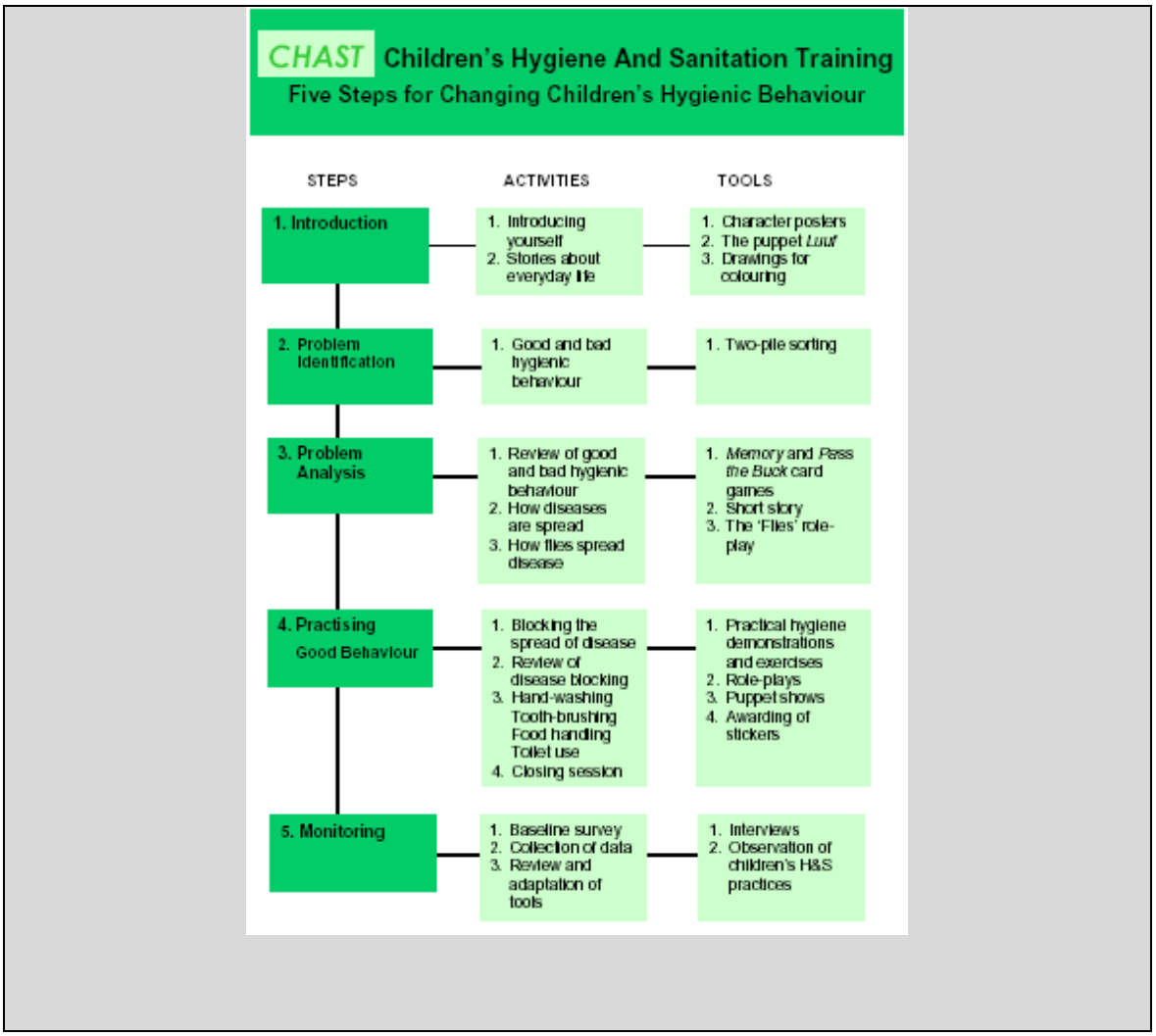
More on the games and steps can be found in the PHAST and CHAST manuals.

- http://www.who.int/water_sanitation_health/hygiene/envsan/phast/en/
- http://www.schoolsanitation.org/Resources/Readings/Kenya-Vreede-CHAST.pdf

CHAST follows the schedule shown below.

[49] Original documents on the methodology can be downloaded from http://www.who.int/water_sanitation_health/hygiene/envsan/phast/en/

[50] For more on CHAST: http://www.schoolsanitation.org/Resources/Readings/Kenya-Vreede-CHAST.pdf


CHAST
Children's Hygiene And Sanitation Training
Five Steps for Changing Children's Hygienic Behaviour
STEPS
ACTIVITIES
TOOLS
1. Introduction
1. Introducing yourself
2. Stories about everyday life
1. Character posters
2. The puppet Luuf
3. Drawings for colouring
2. Problem Identification
1. Good and bad hygienic behaviour
1. Two-pile sorting
3. Problem Analysis
1. Review of good and bad hygienic behaviour
2. How diseases are spread
3. How flies spread disease
1. Memory and Pass the Buck card games
2. Short story
3. The 'Flies' role-play
4. Practising Good Behaviour
1. Blocking the spread of disease
2. Review of disease blocking
3. Hand-washing
Tooth-brushing
Food handling
Toilet use
4. Closing session
1. Practical hygiene demonstrations and exercises
2. Role-plays
3. Puppet shows
4. Awarding of stickers
5. Monitoring
1. Baseline survey
2. Collection of data
3. Review and adaptation of tools
1. Interviews
2. Observation of children's H&S practices

J. Hygiene Promotion for Children

Focusing on changing children's hygiene behavior as well as the hygiene behavior of their family members and neighbors will be a challenge because it aims to change often long-existing hygiene behavior. Hygiene promotion should therefore no only focus on knowledge, but also on "doing" and "feeling" new behavior

A. **Knowing** is receiving the information and understanding it.

Example: all children know that illnesses, such as diarrhea and worm infections, result from poor hygiene practices like not washing hands soap after visiting a toilet.

B. **Doing** involves the ability to carry out specific behaviors to deal with the demands and challenges of everyday life.

Example: Children keep their hands clean to avoid illness and infection. Or children help to bury or burn solid waste.

C. **Feeling** depends on personal preferences, and own judgments that influence one to act or respond in an appropriate way.

Example: Children want to keep themselves clean and healthy. Or feel responsible and confident to help others, particular younger children, to practice good hygiene.

Developing Knowing, Doing and Feeling (on hygiene) is called Life-Skills (on hygiene).

LIFE-SKILLS = KNOWING + DOING + FEELING

The life-skills approaches entail developing "knowing, doing and feeling" by focusing on the personal and social skills required for people to:

- Think and behave competently and confidently when dealing with themselves and others
- Solve problems and make good decisions
- Think critically and creatively
- Communicate effectively and build healthy relationships
- Empathize with others, be self-aware
- Cope and manage their lives in a hygienic, healthy, and productive manner.

Participatory learning

Teaching life-skills is best being done by using participatory methods. In this way, knowledge as traditionally received through teacher instruction can be transferred into "feeling" and "doing". It works better because when children actively participate in the process of learning, they will understand the hygiene problems and solutions better. They will develop a feeling of responsibility for their own hygiene behavior and conditions. At the same time, children will be encouraged to test/try what they learn at home and in the wider community. In this way, they will find out why appropriate hygiene behaviors are not being applied and how changes could be achieved. When children are asked to think about hygiene problems, to find out more about them and to plan action, they are involved in the process that will ask them to use the new knowledge in a different way. It will strengthen their self-esteem and confidence to solve problems and undertake action.

What is Participatory Learning?[51]

IT IS:
The teacher challenging children to think
The teacher helping children to make their own decisions and to take hygiene action
Interesting and funny

IT IS NOT:
The teacher deciding on behalf of the children what action to take
The teacher deciding who will be involved
Dull and boring

Box 11

It can be carried out with the whole group in a class room setting or with several small groups. Working with a whole class is best when dealing with a method in which students give each other positive feedback. Working in small groups is recommended when active participation of all students is essential.

Box 12

Points of Consideration when Working in Smaller Groups:

- Groups should consist of no more than seven children to allow for all children to actively participate.
- All the children in the group work together. The group work helps the children to develop cooperation and teamwork skills. Cooperation is important, not competition.
- Making a sitting arrangement in a circle stresses that all children in the group are equal and have the same possibilities to speak and give their opinion.
- The teacher should supervise the process (outside) the circle and intervene if s/he sees that some of the students are dominating the process. In that case the teacher should stimulate that all children can express their opinions.
- At the end of small-group work at least a few minutes should be dedicated to work with the whole class. An elected spokesperson of each group then responds back to the class about what the group was doing and what conclusions and results they reached.

A project or program can decide to apply educational materials in two ways. First of all, lesson plans can be followed as described in pre-developed instruction books for teachers. Secondly, teachers can use a set of background materials and develop their own lesson plans.

Box 13 Developing Lesson Plans for schools

After an intensive training, teachers are being encouraged to develop their own lesson(s) plans. In this way, lessons can be developed that suit in the needs, conditions and demands of the specific class,

[51] Text adapted from: Child-to-Child Trust (2005), *Children for Health; Children as partners in health promotion*, Macmillan Education, Oxford, UK

school and wider community.

Target Behavior
Choose the specific Target behavior to be addressed: (1) Safe use of toilets and urinals (2) Personal hygiene (3) Promotion of handwashing with soap (4) Female and male hygiene (5) Waste management and water drainage (6) Water treatment, handling and storage, or (7) Food hygiene.

Always start with an introduction lesson to the target behavior.

Target Group
Define for which age-group the lesson will be developed.

Learning Goals: Separated by knowing, feeling and doing
Define clearly the different lesson goals differentiated in knowing, doing and feeling. For lesson plans all three goals (knowing, feeling and doing) can be addressed. A sole goal, can only be applied if the emphasis on the two other goals will be addressed in follow-up lessons.

Teaching Methods
Choose from the age-appropriate methods as given in below table

Teaching Materials
If provided educational materials are not enough, describe all materials necessary. Preferably choose for low or no cost materials that are easily available and accessible for the school and students so it can be easily duplicated.

Description of Activities
Describe in detail all activities to be undertaken with the points of special attention or difficulties that can arise as well as the expected objectives.

Time Required
Given the fact that the curriculum in most countries dedicated only 0.5 – 2 hours/week to life-skill education, the lessons should indicated the time required and try to use this as efficient as possible.

Participatory learning methods for hygiene promotion for children[52]
Table 19

Methods suitable for the grades 1-2: children ages 6-8 years	**Methods suitable for the grades 3, 4 and 5: children ages 8-11 years**	**Methods suitable for the grades 6, 7, 8 and 9: children ages 12-15 years**
Listening to and telling stories	Listening to and telling stories	Listening to and telling stories
Reciting poems and songs, and singing songs	Reading and analyzing stories	Reading and analyzing stories as well as writing stories
Drama/short role-plays	Doing quizzes	Group and class discussions
Seeing and doing various types of puppet plays	Conversations and discussions	Singing and dancing
Simple sorting games	Singing and dancing	Drawing and painting
Language and number games and assignments	Drawing and painting	Brainstorming
Reading and reacting to stories	Making various types of models	Drama, role-plays, pantomime, skills demonstrations
Walks, doing simple observations	Writing compositions and creative writing	Peer and family members observations and analysis of behavior
Skills demonstrations, with peer observation and analysis	Brainstorming	School/community observation and mapping or excursions
Movement games, competitions	Excursions	Language and math games, quizzes and puzzles
Conversations and discussions	Drama, role-plays, pantomime, skills demonstrations	All kinds of competitions
Drawing, painting, coloring, claying	Peer observations and analysis	Doing hygiene tasks (with an educational purpose) such as helping younger children visiting toilets and washing hands
Doing simple hygiene tasks	Language and math games such as crosswords	
Presentation to parents and family members	All kinds of competitions	

Since more and more schools have access to technical equipment (certainly in urban areas), also **modern tools** for hygiene promotion could be used using messages through mass media as well as "new technologies", like computer packages and games on hygiene, DVDs or video on hygiene promotion and more and more schools are getting access to internet which can be used for literature research and background information.

[52] Adapted from: Postma, L., R, Getkate and Van Wijk, C (2004), "Life-skills-Based Hygiene promotion; A guidance document on concepts, developments and experiences with life-skills-based hygiene promotion in school sanitation and hygiene promotion programs", IRC International Water and Sanitation Centre, Delft, the Netherlands in cooperation with UNICEF

Below table gives some insight into the different development stages of childhood related to knowing, feeling, doing and participation.

Table 20 **Pre-school and Grade 1 and 2 (5-7 years)**
Knowing and feeling: Children understand the positive effects of personal health and care on their appearance (washing themselves, combing their hair and brushing their teeth). They tend to value things in a simple way, e.g. looking and smelling good means feeling good.
Doing**:** Children are very imaginative and discover the world and their own capabilities in a playful way, meanwhile gaining self-confidence and taking the first steps towards independence. They like to imitate older children and adults.
Children's participation: Children could become actively involved in design, planning, maintenance and operation of facilities. However, they can only have limited responsibilities and require close guidance of adults or older children.
Grade 3, 4 and 5 (8-11 years)
Knowing and feeling**:** Children become aware of the consequences of poor hygiene practices, although they still find abstract concepts difficult to understand. They like watching and taking part in practical demonstrations and can be very helpful if asked to do so. They also like to be given particular responsibilities. They also learn that different measures or practices can lead to the same overall result, requiring the comparison of possible solutions. Some children begin to develop sexually. They want to know more, including about personal hygiene, but are often shy and insecure.
Doing**:** Children show responsibility and interest in their own health, hygiene and well-being. They can work well with others and discuss experiences and practices with friends.
Children's participation: Children can be involved (in groups) in activities to plan, maintain and manage facilities. They can also be given partial responsibility for implementation, operation and maintenance such as refilling of the handwashing facilities, cleaning, etc. However, the overall responsibility should be with adults or older children.
Grade 6 and 7 (12-13 years)
Knowing and feeling**:** Children are aware of their own development and growth. Girls start to menstruate, which leads to greater sensitivity towards gender differences. This awareness creates a need for gender-related privacy. They start to understand abstract concepts around 'hygiene' and 'environment' and like to be given responsibilities and be trusted to see things through implementation.
Doing**:** Children start to develop social and analytical skills and begin to explore their position in the community.

Children's participation: Girls and boys can be actively involved in the planning, construction, operation and maintenance with responsibilities. The final responsibility should be with adults
Grade 8 and up (14-16 years)
Knowing and feeling**:** This age group understands the complex concept of disease transmission and how proper hygiene practices can prevent this. They acknowledge that they are part of certain social groups (community, ethnic, caste, age) and are aware of social injustice. They can develop a strong sense of self-confidence, self-esteem, self-control and social responsibility.
Doing: Children are able to manage their lives and positions in society. They can make interrelation between the different skills, so they can be complementary to one another.
Children's participation*:* Children can, to a large extent, be responsible for operation and maintenance of the facilities, including monitoring use and practices and evaluation of the effects of the facilities on the health situation at the school. They can and should also be involved in the design, baseline studies and possibly construction as well as giving simple instructions and lessons to younger children. Linking this age group with the younger children in school might stimulate the learning and development of all the children involved. This is also an age where children are ready to help schoolmates or families in less fortunate circumstances than they are.

Note: On many occasions children (1) enter school when they are older than the official entry age or they (2) have to duplicate classes and would therefore sit in a lower grade than you would expect according to their age. For those children, who have a similar physical growth and socio-emotional development as children in higher grades with the same age, it might be better to teach age-appropriate rather than grade-appropriate hygiene promotion.

Example: a 9 year old boy in Grade 1 should rather learn from the Grade 3 instructions than the Grade 1 instructions.

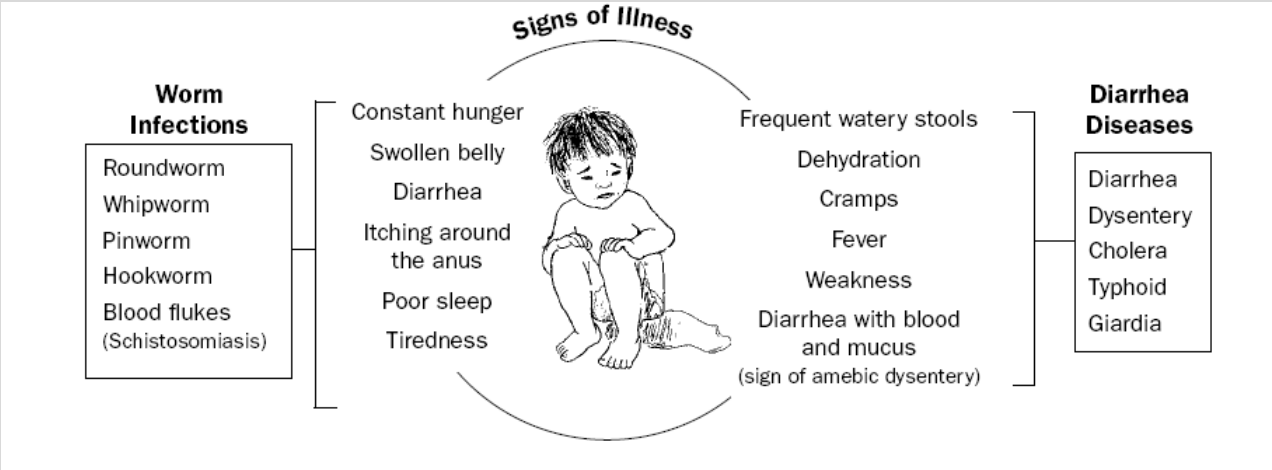
Information Sheets on Key Hygiene Behavior and Background Information

Table 21 Safe Use of Toilets and Urinals

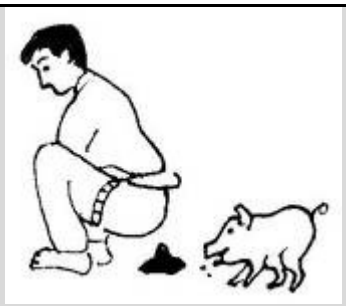
Diarrhea and worm infections are two main health concerns that affect school-age children at a large scale and that can be improved through appropriate toilet and urinal use. Diarrhea causes children to lose too much fluid and essential nutrients from their bodies which results in seriously illness and sometime even death. The causes of diarrhea include a wide array of pathogens.

Worm infections are spread through unhygienic environments (soil or water) and unhygienic behavior (through food or hands). The most common types of worms are: roundworm, whipworm, hookworm, pinworm and tapeworm. School-age children are often the group that has the highest infection rate as well as the highest worm burden.

Worms are parasites that destroy tissues and organs in which they live; and can cause pain, diarrhea (but that is not very common), intestinal obstruction, anemia, ulcers, and various other health problems. These infections also contribute to poor appetite and decreased food intake. Roundworms, pinworms and tapeworms can be seen in the children's stools. Hookworms and pinworms can only be discovered through testing. Since most children are infected, school de-worming programs normally de-worm all children without pre-testing if they are infected.

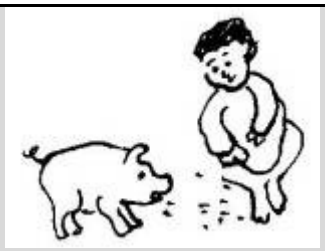


Children who have heavy worm infections are more likely to be absent from school for a greater proportion of the time than those who are lightly infected or worm free. In addition those children perform worse than children who have no worm infections or who have been treated against them.



1. A man infected with parasites has diarrhea outside

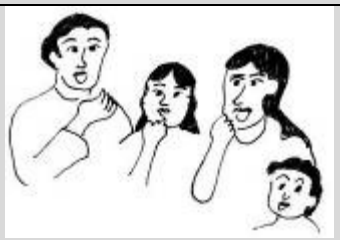
2. A pig eats the man's feces



3. One of the man's children plays with the pig and gets the feces on himself

4. Later, the child cries and his mother comforts him meanwhile cleaning his fingers with her skirt. She also gets feces on her hands

5. The mother prepares food for the family, forgets to wash her hands first. She uses her soiled skirt to keep from burning her hands.



6. The family eats the food. Soon everyone gets diarrhea.

Drawing adapted from The Hesperian Foundation (1997), *Where Women have no Doctor.*

Improving sanitary conditions in community, home and school plus strengthening hygiene behavior will drastically reduce the incidence of worm infections. These actions in combination with drug treatment for those that are already infected will stop the re-contamination process and end the spread of worm infections. Medical treatment should not just happen once. It has been shown that after one-time treatment for worms (without a strong education component), the infection tended to return.

Learning goals

Knowing – Exposed excreta are the biggest cause of spreading diseases and makes people sick.

Knowing – Behaviors that can lead to worm infections (see block on next page)

Feeling & Doing – The safe use of toilets and urinals including the safe disposal of feces and hygienic anal cleansing followed by washing hands with soap.

Doing – Maintenance and operation of school toilets and urinals

Behaviors that can lead to worm infections

Unhygienic habits that allow worm eggs to enter the mouth from the hands include:

- Failing to wash hands before eating
- Failing to clean anus and wash hands after defecating
- Failing to wash hands after playing on the ground
- Allowing dirt to remain under the fingernails
- Sucking on fingers

Behaviors that allow hookworms to penetrate the skin or enter the body include:

- Walking or working in the field without wearing shoes or sandals
- Working in the field with bare hands
- Ingesting unwashed raw vegetables

Behaviors that allow eggs or young worms to be spread back into the environment include:

- Defecating on soil or in water with which others come in contact
- Using untreated or partly treated human excreta as fertilizer for crops

Behaviors that allow worms and eggs to enter the body with food include:

- Eating unwashed raw vegetables may lead to worm infection
- Eating raw or undercooked fish, shellfish and meat can result in infection with flukes

Behaviors that may result in continuation of infection or spread to others include:

- Not having stool samples examined
- Failing to comply with treatment

Source: WHO (1997), "Strengthening Interventions to Reduce Helminth Infections; as an entry point for the development of Health-Promoting Schools", WHO Information Series on School Health

Table 22

Personal hygiene and infant care

There are many diseases that can be contributed to poor personal hygiene. In below table the main health risks and recommended habits for prevention are indicated from "head to toe"[53].

	Health concerns	Prevention
Head	Lice	Washing face and hair with water and soap as well as avoiding use of the same towel and cloths by different persons.
	Respiratory tract infections	Washing hands with soap/ash/mud
	Eye diseases: conjunctivitis, river blindness and trachoma	A (chronic) eye infection spread from person-to-person by touching or flies. It develops slowly and gets worse and worse, eventually it can even cause blindness.
Mouth	Tooth decay and tooth loss Gum infection	All teeth and gums should be cleaned twice a day. Use a brush, stick or finger wrapped with a piece of rough cloth. If no toothpaste is available, salt, charcoal or just plain water will also work.
Body	Impetigo, scabies, ring worms, yaws, lice	All these skin problems are very much related to personal hygiene and cleanliness. Bathing daily and body washing *with soap* as well as changing cloths daily can very much reduce the spreading.
Hands	Diarrhea, food poisoning, colds dysentery, intestinal worm infections, typhoid, paratyphoid, cholera, hepatitis A, polio	Washing both hands, rubbing with plenty of water with soap/ash/mud after toilet use, before/after eating, before preparing food and after cleaning babies. Cutting nails and washing under nails with soap
Feminine and Male hygiene	Vaginal, bladder and kidney infections Genital infections (for men)	Cleaning of genitals (for women and men) and wiping from front to back after using toilet Frequent drinking and urinating Urinating after intercourse
Feet	Hook worms	Some worms enter a person's body through feet that get in touch with baby worms in moist soils. Particularly when feet have wounds, this can be a route of infection. Wearing shoes or slippers can avoid this.

Cleanliness of clothing is not considered as part of the learning goals because it is considered to have a cosmetic impact rather than a health impact.

[53] For full table see chapter 2

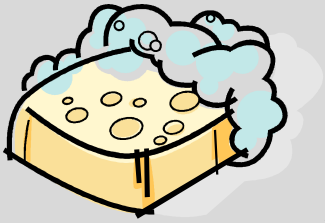
Learning goals

Knowing – Links between personal hygiene and diseases.

Feeling & Doing – Appropriate personal hygiene: washing hands with soap (see separate point), wearing shoes or slippers, cutting nails, brushing teeth, combing hair, regular washing of body and hair.

Table 23

Promotion of handwashing with soap



Although handwashing is also part of overall Personal Hygiene, it has also been included as a separate sheet because of the special emphasis that should be given to washing hands as an essential measure to improve the health conditions of people.

Handwashing is important for good health:

- When washing hands with soap after toilet use, before eating, before preparing food, after cleaning babies, after handling domestic pets and animals, working in the field, this reduces the risk of diarrheal diseases by 42–47%.
- Washing hands with soap also significantly reduces the cases of acute respiratory diseases among school children.

Handwashing *with soap* is the critical component of this behavior and handwashing with only water provides little or no benefit reducing the amount of gems on somebody's hands. Clean *Mud* or *ash* clean as effective as soap and can be used when soap is not available.

Learning goals

Knowing - Links between handwashing with soap and drastic reduction of diarrheal diseases.

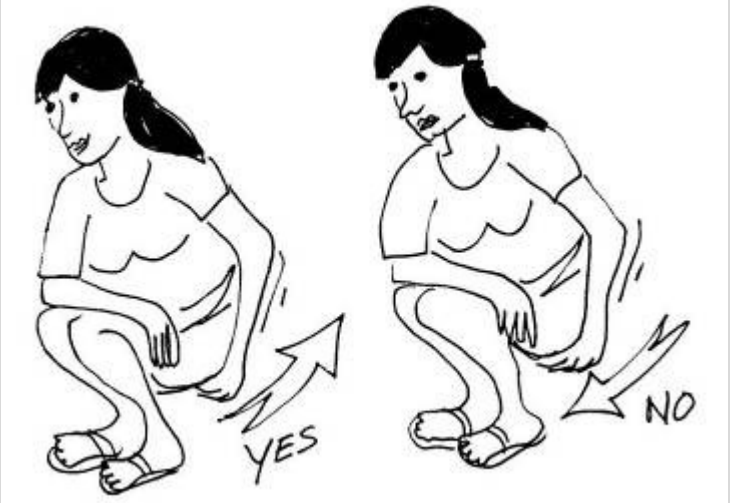
Feeling & doing - Handwashing with soap after toilet use, before/after eating, before preparing food and after cleaning babies

Table 24 Female and Male hygiene

Female

Most girls have their first menstruation (also known as menarche) between the ages 11 and 16. On average, menstruation comes in a cycle of 28 days and lasts 3-6 days. However, this can vary a lot for

each girl and does not mean anything is physically wrong with them. At the same time, an estimated 66% of the girls know nothing until confronted with their first menstruation. Making it a negative and sometimes even traumatic experience. Therefore it is extremely important that the subject is being covered in school



Women cleansing

Girls are often absent from school due to menstruation related issues. 15% of the girls aged between 15 and18 years, report to be absent due to cramping pains experienced during, and sometimes just before, their monthly period (dysmenorrhoea) making that a girl misses 10-20% of her school days. If adolescent girls[54] attend schools which lack adequate toilets and water supplies for girls to comfortably change sanitary pads and wash themselves in privacy, they may be unable to remain comfortably in class during their menstruation. Especially in rural areas but also sometimes in the poorer urban areas, there is very limited availability of commercial sanitary products or if they are available they are financially out of reach for most women and girls. Girls might be embarrassed by their own body odor caused by using the same cloth or rag without changing and washing for which, they are often teased by the boys.

Patterns of menstrual hygiene that are developed in adolescence are likely to be continued when the girls are adults. Therefore, the girls should be taught how to use and how often to change pads and to effectively wash, dry and store their menstrual cloths if they re-use them as well as cleaning of genitals and wiping from front to back after using toilet and urinating within reasonable time after sexual intercourse to avoid bladder infections. In addition, many adolescent girls suffer from excessive vaginal discharge and kidney and bladder infections due to poor genital hygiene.

Male

Also for men, hygiene of the genitals is important. Genitals should be washed properly (with just water or mild soap) at least once a day and before and after each sexual intercourse. This is necessary because the last drops of urine usually remain under the foreskin where "smegma", that is a special lubricant, is produced. The mixture of urine and smegma is a good environment for bacteria reproduction. These bacteria can easily provoke various kinds of inflammations.

Learning goals

Knowing **(for both girls and boys)** – Menstrual blood is not dirty or unhygienic and unclean. It is simply blood and tissue sloughed from lining of the uterus. The odor during menstruation is caused by bad hygiene of the genitals.

Knowing& Feeling – **Female -** Recognizing the symptoms of bladder and kidney infections:

frequent urinating, pain while and just after urinating, urine smells and looks cloudy and when serious infection in kidney: fever, nausea and vomiting. Knowing what remedies the infections through home cures (drinking lots of water) and doctor's medicines.

Feeling & Doing – **Female -** Wash the genitals daily with mild soap and water particularly during menstruation and using sterile pads as well as cleaning of genitals, wiping from front to back after defecation and urinating within reasonable time after sexual intercourse to avoid bladder infections.

Feeling & Doing – **Male -** Genitals should be washed daily with just water or mild soap and before and after sexual intercourse.

Table 25

Waste management and water drainage

Solid waste

Solid waste is left-over materials that result from human activities that are no longer wanted or needed by their users. *Solid waste management* is the collection, transport, processing or disposal of waste materials, usually the ones that are produced by human activity. In communities solid waste generally consists of: paper (note books, books and wrapping material), plastic packing material and bottles and little organic waste (fruits and other uneaten food).

If the community is not regularly cleaned, the solid waste left behind will attract rats, flies and cockroaches and other animals that can carry and spread diseases. This is also known as *vector breeding*. Therefore, from a health perspective, it is important that solid waste is being managed properly (collected and treated).

So far, whenever solid waste is collected it is burned, buried or collected by a municipal service. In order to get most "advantage" from the waste that is left behind, it is essential that **solid waste is being separated and as much as possible reduced, re-used and recycled,** as followed:

- *Paper and cardboard*: In many areas, paper can be used for anal cleansing but paper and cardboard can also be collected separately by a recycling enterprise and sometimes it can even be sold to provide some funds that can be used for school maintenance or school improvement. In addition it helps to saves trees. E.g. For the production of 3600 kg of paper, 36 ~ 60 trees are needed!!
- *Plastic bags, bottles and containers:* Just like paper, plastic can be re-used and recycled. When collected at school, the plastic could be sold to a recycling enterprise.

- *Glass bottles and metals:* Can also be separately collected and sold.
- *Organic waste:* could serve as food for the animals or also *composting* organic waste in special bins would be possible
- *Other waste:* Some of the waste cannot be made of use. This waste, just a fraction of the original amount of solid waste, could be burned, safely buried or collected by the municipal services.

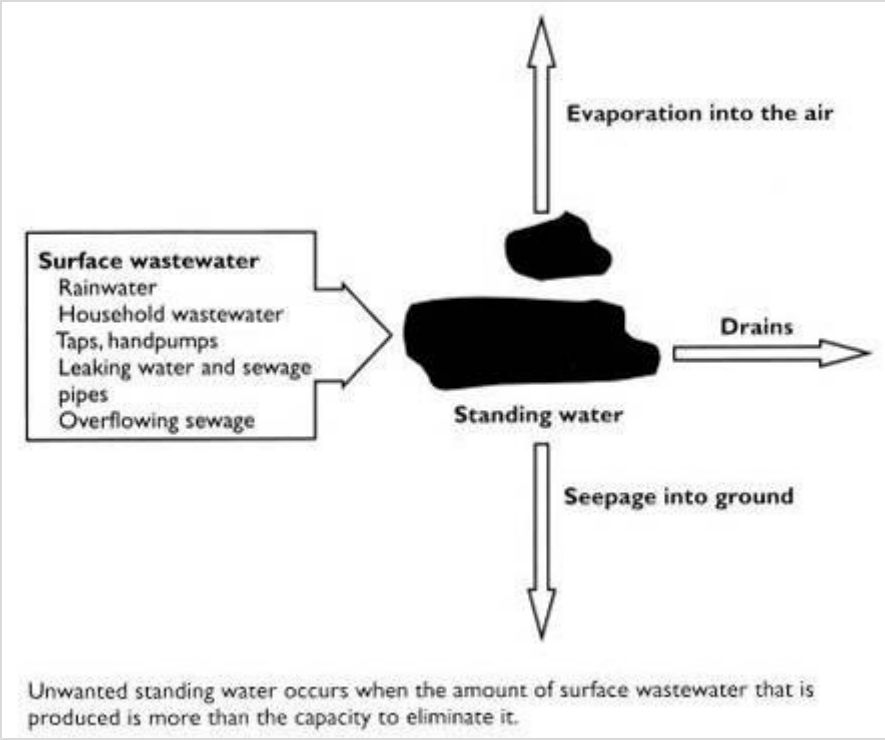
Wastewater

Especially in the rain season, muddy paths, puddles and pools of stagnant water are common sights in communities. Most of water will come from rain but also significant amount of water comes from water run-off from taps, leaking pipes, pumps or even overflow from septic tanks.

Stagnated water will provide a breeding site for mosquitoes. Mosquitoes can cause diseases like: malaria, dengue fever and filariasis. The water also can get contaminated with feces and cause diarrheal diseases if people use this water. .

Following the below schedule, the wastewater problem can be solved in several ways: (1) by

decreasing the amount of surface wastewater (repairing leaking taps and pipes, preparing good drainage around taps, wells and pumps, clean septic tanks, reduce the amount of rain water by collecting it for other uses) (2) by increasing the amount of water that seeps into the ground (e.g. through soak pits) (3) by increasing the drainage of wastewater out of the community (construction of drainage channels).



Unwanted standing water occurs when the amount of surface wastewater that is produced is more than the capacity to eliminate it.

Source[55]

Learning goals

Knowing – Health risks of non-collection of solid waste. Health risks of standing water

Feeling & Doing – Collection and treatment of solid waste. Avoiding of standing water.

Table 26 Water treatment, testing, handling and storage

If the water supplied through a water supply system is contaminated, some kind of treatment will be necessary. Only water that will be used for drinking and food preparation must be treated; for other uses such as washing hands with soap, mildly contaminated water can be used.

Meanwhile, teachers and parents must make sure that children know the risks associated with this water and should forbid drinking it.

At household level, the recommended options for microbiological water treatment are:

- **Boiling of water:** very safe and reliable form of treatment but because of the costs for fuel or firewood often too expensive for people in poor areas. There are some discussions on the desired length of boiling. In general, somewhere between 1-3 minutes is enough.
- **Filtering of water through a sand filter:** very safe if properly operated. This form of treatment requires maintenance through regular replacement or cleaning of sand and trained staff.
- **Solar disinfection:** This is a simple water treatment method using solar radiation and temperature to inactivate pathogens causing diarrhea. It can treat small quantities of water at a time. Contaminated water is filled into transparent plastic bottles and exposed to full sunlight for six hours. It is a cheap option, but it is hard to detect if the water is safe for drinking (more at www.sodis.ch) creating a risk of use of unsafe water.
- **Chemical disinfection:** ongoing research is taking place for reliable chemical disinfection of water. Traditionally, chloride is being used for disinfection. When properly dosed this is a very reliable way of treating water at a low cost. The disadvantage of the use of chloride is the changed taste of water (normally considered 'bad taste' and therefore unattractive for human consumption) and the fact that it is hard to detect whether the water has been safely treated.

Even if drinking water can be collected from a safe source it can be contaminated if not handled properly during **collection, storage and use**. Therefore, it is always important to collect water in a clean container, cover the container during transportation to not allow dust to enter and to keep the water covered as long as it is stored. When water is taken from the container for consumption it should be taken with a clean cup with handle or ladle or even better by using a jar.

In addition there can be problems with the contamination of drinking water that have a **chemical** origin (e.g. too high level of salt, arsenic or fluoride). Regular testing should check if established levels are not exceeded. And if exceeded, it cannot be used as drinking water. For chemical pollution specialized treatment measures will be required. Often those measures are too expensive or too complex for a small and rural community. If this is not possible, alternative safe sources should be found.

Learning goals

Knowing – Where possible collect water from a safe source and collect and store water safely.

Knowing, Feeling & Doing – If the source is not safe always treat the water through boiling, filtering, solar or chemical disinfection.

Feeling & Doing –- The container in which the water is collected should be clean. During collection and storage water should be covered and protected against contamination. A cup with handle or ladle should be used to take water from container.

Doing – Water in schools should be regularly tested for chemical contaminations

Table 27 **Food hygiene**

Eating healthy food is essential for the well-being and survival of each human being. Eating "contaminated" food (also known as "food poisoning") can be an important source for diarrheal diseases.

In general there are three sources of food poisoning that can be easily avoided with some simple measures:

- **Spreading of germs through food preparation** (1) Hands should be washed with soap before food preparation to avoid spreading of germs through hands. (2) Couching, spitting or chewing near food should be avoided to clock contact between possibly disease spreading salvia and food.
- **Special precaution when handling raw food** (1) Fruits and vegetables that are eaten raw should be washed with safe water or peeled. (2) Raw meat, poultry or fish should not touch other food that is eaten raw. (3) Cooking utensils that have been in touch with raw meat, poultry or fish should be cleaned thoroughly with water and soap.
- **Food storage** (1) Cooking food kills germs. All meat, poultry or fish should be cooked well. (2) Where possible, freshly prepared food should be eaten immediately after preparation. (3) If food is stored, it should be covered to avoid that flies and dust enter (4) Food should be kept as cool as possible (5) Last but not least: when food smells bad, changes taste, changes color, produced bubbles or gets slimy…. It should be thrown away because the it can cause food poisoning. This can be biological or chemical and is the result of toxins produced by micro organisms. These toxins cannot be destroyed by boiling and make people and animals sick.

Learning goals

Knowing – Links between food hygiene and diseases

Knowing & Feeling – Recognizing common signs of spoiled food, appropriate food storage

Doing – Treatment of raw fruits and vegetables; raw meat, poultry or fish. Storage of food.

K. Finance and Cost Recovery

As for the development of any development project, for WASH projects good financial management is important for sustainability, efficiency and equity. Because still many projects start off as fully subsidized demonstration or pilot projects the financial part is not always given enough importance leading to projects without commitments to recover recurring and replacements costs. Therefore, it is important to establish clear financial policies that can help to underpin a more efficient, equitable and sustainable use of resources through the promotion of cost recovery and reduction of non-essential costs.

First of all, it is important to have an insight in the WASH project costs. The calculation of the cost for a WASH project comprises of the following components:

- **Initial Capital Costs:** these include the costs for the construction, rehabilitation or improvement of facilities, the development of the methodologies and materials for hygiene promotion and the costs of capacity building and training.
    - Fixed costs (do not vary)
- **Recurring Costs***:* are incurred for goods and services consumed in the course of a budget year that must be regularly replaced.
    - Loan repayments
    - Wages of operators and maintenance crew
    - Reproduction of hygiene promotion materials
    - Soap for hand washing and cleaning of facilities (for communal facilities)
    - Chemicals or fuel for water treatment
- **Replacement Costs:** Depending on the technology used for the WASH facilities, spare parts and other replacement parts will have the be purchased regularly. The use of "discounted cash flow" is needed in order to arrive at the total life-cycle cost since not all of elements above occur at the same time.

If a **national cost recovery policy exists for the water sector**, it should be determined if this policy is also valid for projects on sanitation and hygiene promotion. If the traditional local or national government channels cannot subsidize services, as resource allocation from the public sector is insufficient, cost recovery from the communities can be organized in different ways:

- Provision of labor to reduce costs
- Income generating activities in the community through (i) the sale of surplus water from pump or well to other communities or private enterprises, (ii) charge for the use of communal toilets by outsiders,
- Payment in kind: provision of soap, cleaning, cleaning liquid, etc. for communal services.
- A combination of all those mentioned above

Cost recovery

An effective cost recovery policy is built upon some basic design principles:

- Quantify all program costs. Investments for facilities but also expenditures for hygiene training, educational materials, project supervision, follow-up, and support.
- Ensure that local contributions to investment costs rise in proportion to the service level of the facilities. This is essential if the community is to making a meaningful choice among service level options (e.g. household water connection versus community standpipes). Experience has shown that the use of subsidies for all service levels leads to the use of inappropriately expensive facilities and creates expectations that cannot be replicated or effectively scaled up.
- For facilities, at least operation and maintenance (O&M) costs should be recovered to ensure sustainability. Ideally, the cost of building, operating, and maintaining facilities should be charged.
- In general the following guidelines should be followed:
- Subsidize only the most basic level of facility, leaving the community to make improvements as able.
- Ensure that the economic ranking of various technical /service level choices remains the same based on the real costs, so that a more expensive option does not become more attractive than a less expensive option because of the subsidy.
- Find out what the community is willing to pay or what is affordable.
- Establish a common financing strategy for the sector. The lack of such an agreement can lead to projects and programs undermining each other.
- Establish financial management and cost sharing at the community level. Financial plans to ensure operation and maintenance of facilities should be developed before project implementation and should include, at a minimum, recurring and replacement costs. If resource allocation from community is insufficient, cost recovery of O&M can be organized through user fees to be paid for the use of facilities (ensuring that this does not hamper the ability of the poor to use it); payment in kind through the provision of soap, cleaning materials, or labor.

If possible, the **costs to be recovered** should be tested for:

- **Willingness to Pay (WTP):** WTP is the maximum amount that individuals state they are willing to pay for a good or service. Determining WTP is not easy. If people want something, it does not automatically imply that they want to pay for what they get. It requires in-dept research based on observing and interviewing people.
- **Ability to Pay (ATP):** ATP does depend on the socio-economic circumstances in the project area but is always closely linked with the 'willingness to pay' because if cheaper or free alternatives are available (e.g. the 'bush' instead of a toilet), people might opt for the free option instead of the 'safe' alternative they have to pay and are able to pay for.

Because, generally, WASH projects or programs financed by Mercy Corps consist of a string of smaller projects in different settings, it might be too costly to make an in-depth study on ability and willingness to pay which is applicable for all communities. In that case there are two options to consider:

- **Learn from others:** research other social rehabilitation projects in the project area and investigate which rates of cost-recovery or tariffs are feasible for those projects.

Subsequently translate those findings to the WASH project.

Join efforts: try to link the study on ability and willingness to pay with other WASH initiatives in the project area so that the costs can be shared.

L. Community Ownership

Community members have an important role to play in keeping the community hygienic and using appropriate hygiene behavior in the homes. In most communities, local committees could be established as an entry-point in the community.

There are a couple of roles that local committees and community members can play:

- **Key partners during planning and implementation:** community members often have to provide unskilled labor and local construction materials for WASH facilities. Involving them in the planning can lead to a stronger feeling of project ownership. Decisions and arrangements could be made on the use of e.g. the communal stand pipe or toilets if those facilities are not commonly available at household level. To obtain commitment and consensus from the entire community, the local committee should report their findings and decisions taken to the community. To get a balanced view, the committee should be equally balanced as regards sex, ethnic groups and social class.
- **Gate keepers and fund holders:** if a financial contribution is demanded for maintenance and operation of communal facilities, the democratically elected local committee should keep the funds to overcome any potential distrust among community members.
- **Operation and Maintenance** for community water systems (and sometime communal toilets) is the responsibility of the local committees.
- **Target group for educational activities:** to make sure that the facilities provided are being used hygienically and appropriately and that appropriate hygiene behavior is being applied.

It is also advisable to introduce a system of **participatory community-based monitoring.** A monitoring system by the local committee and the community will motivate the users when the positive impact of interventions are measured and shown, motivate them to quickly reported when repairs or corrections are needed and … last but not least is an inexpensive way of monitoring.

M. Cooperation with Government Partners

The long term sustainability of any program or project depends on political will and commitment. A favorable policy environment in which government partners actively support the initiative is essential to a program´s success. To develop political will and commitment it is important to advocate for WASH programs illustrating the relation between hygiene, health, and water and sanitation services, meanwhile focusing on the potential benefits for children, families, communities, and countries.

National Government

The roles and responsibility of government partners at national level can be defined as follows:

- The health services for people fall under the responsibility of the *Ministry of Health* and they should therefore also play a key role. In many countries, hygiene promotion delivery by teachers or other agents can formally only proceed with the explicit permission of the Ministry of Health and hygiene messages disseminated through schools or health centers must be coordinated and streamlined with the other hygiene messages disseminated through the Ministry. It is therefore obvious that the Ministry of Health should be the coordinating ministry for hygiene promotion in any WASH intervention.

- *National (or Regional) Water and Sanitation Authorities* are the main experts and managers of WASH systems in communities (particularly in urban and urbanized areas). Involving the Water and Sanitation Authorities from the start will increase the program's operational and technical sustainability by using their expertise for issues, such as, design, supervision, operation, and maintenance. Agreeing on the roles and responsibilities of the different national ministries can be formalized through two instruments:

- *A Memorandum of Understanding (MOU)* between Mercy Corps and ministries involved. Experience has proven that a MoU is very valuable for sustainability and continuity on the long run. Particularly when there is no financial or regulatory need to cooperate with the government and a pressure to start implementing on short term, there might be a tendency to not enter into a formal MOU because it requires a long, strategic process of partnership building. Once signed, the details of the MOU should be disseminated among all partners involved in the implementation of the program, to make sure that all involved know its contents.

- *A Collaborative Group or Council* coordinated through the Ministry of Health in which a representative group of ministries and other organizations dealing with WASH meet regularly. It should serve as a platform for information exchange but also to agree on issues such as: cost-sharing, synchronized hygiene messages, minimal standards for facilities, common goals, common monitoring and evaluation systems, etc. If it functions well, it will be the motor in scaling up activities. The Group should meet at least twice or year or more whenever challenging developments are taking place.

Regional Government
To improve efficiency in the use of government funds, many countries in the developing world over the past years have decentralized government tasks from the national level to regional level. Therefore, in many programs government funds will be provided through regional authorities. Ministries at regional government level are often the local fund holders for WASH expenditures and they are responsible to adapt activities to local needs and demands.

The roles and responsibility of government partners at regional level are similar to the roles at national level although many official policies will still be determined at national level. Considering the circumstances it might also be useful to establish a MoU and Collaborative Group at regional level.

Local Government
If a project or program has to be responsive to local needs and to fulfill its potential as a focus and generator of local development, it must have deep roots in the community it serves. Local governments can ensure maximum harmonization at the community level through coordination of services and resources available for WASH programs as well as through advocacy and collaboration with higher levels of authority. Depending on the existing structure and level of decentralization of services and authority, this can be done through a local public health agency. Because of the role it has to play, each local government should have full knowledge of the MoU agreed upon at the national level and/or regional level.

N. Partnerships with others involved

There are a couple of motivations to establish active partnerships with "others" involved in WASH. "Others" are not only traditional organizations working through communities, such as NGOs, UN and bi-lateral donors, but also the private sector[56] through soap and tooth paste producers who promote hygiene behavior or local constructors. The main motivations for partnerships are:

- To *jointly advocate* for political and social commitments from the government as well as to create a community demand for the interventions. Where democratic leaders are chosen, the voice of the people and civil society influences the political decisions taken.
- To *avoid that conflicting messages* are being used by interventions from different organizations.
- To *avoid that duplicated efforts* are taking place in the same region or even at the same community.
- To create interest *to co-develop initiatives* for joint program methodologies and expand the coverage of those methodologies.
- To create *common agreements on financing and cost-recovery*. If one program is highly subsidized and contracted while for another program there are pre-conditions related to financial and/or physical input from the community members, this can create frictions.

Possible models for partnerships
Preferably, a **Collaborative Group or Council** coordinated through the Ministry of Health should be established at national, regional and local-level. In the Collaborative Group are representatives of ministries and organizations dealing with WASH meet regularly.

If the government is not yet "ready" to initiate or participate in a Collaborative Group or Council, it could be initiated by Mercy Corps. It has is a similar set-up and task as the above, except that the

government does not particularly have to participate. In view of sustainability of program interventions this structure is less desirable than a structure in which the government participates.

The least desirable partnership is the informal structure. Such a structure will meet on an ad hoc basis and is often founded on interpersonal contacts. Although this might work well for shorter periods, there will be no continuity in the information exchange when there are staff changes and will seldom go beyond cooperation between two organizations.

To establish formal partnerships, Mercy Corps will have to allocate funds for logistical support during the first of initiation and invest in meeting with other organizations and private sector.

Step 4: Monitor implementation

Monitoring is the process of continuously gathering information on all aspects of a project or program to make informed decisions on project implementation. It is the basic and universal management tool to identify strengths and weaknesses of the project or program. It provides possibilities to modify a project or program when things are not working as planned. If the baseline study and project or program framework have been properly set-up and all information collected, monitoring is fairly easy. It follows the established indicators and uses the data collection sources and techniques as agreed upon in the indicator plan (see chapter 3). However, there is one main difference: where a baseline follows **project** indicators, monitoring also keep track on time planning and other **process** related aspects of the project, such as staffing and budgeting.

In summary, monitoring implies:

Table 28	**Monitoring Implementation**
What	The process of continuously gathering information on all aspects of a project or program to make informed decisions on project implementation
Purpose	• Analyze the current situation • Identify problems, find solutions, and take corrective measures during implementation • Discover trends and patterns • Keep program activities on schedule • Measure progress towards objectives and revise action in order to achieve them • Make decisions about human, financial, and material resources
When	Continuously. Monitoring activities are a routine part of project implementation and planned within the project's work plan
By whom	Project or program staff with support of others involved such as water boards, community members, school children, local health workers etc.
Information type	More emphasis on quantitative data than qualitative data

Step 5: Review and evaluate Impact

The Power of Measuring Results
If you do not measure results, you cannot tell success from failure.
If you cannot see success, you cannot reward it.
If you cannot reward success, you are probably rewarding failure.
If you cannot see success, you cannot learn from it.
If you cannot recognize failure, you cannot correct it.
If you can demonstrate results, you can win public support.

Adapted from Osborne & Gaebler 1992.
Box 14

An evaluation is a "stepping back" to gain a deeper perspective on what effects and impacts have been achieved in a project or program, if the objectives have been achieved and if not, what could be done to avoid failures in the future. AN EVALUATION SHOULD BE DONE FOR ANY PROJECT OR PROGRAM. Depending on the size of the project or program and the source of funding, an evaluation will be done internally (within the organization) or by external evaluators.

In summary, evaluation implies:

Table 29	**Evaluation Table**
What	A "stepping back" to gain a deeper perspective on what effects and impacts have been achieved in a project or program
Purpose	• Determine how effective a project or program has been • Determine the extent to which objectives have been achieved • Learn how efficiently the project is implemented • Identify any critical mid-course corrections in order to complete the project successfully • Develop lessons learned so future programs and projects of a similar nature can be improved
When	Generally: 1. At project mid-point (for projects 18 months or longer) 2. At the end of project or program 3. At a point several years after implementation
By whom	Project or program staff with support of others involved and sometimes external evaluations contracted by Mercy Corps or donors
Information type	A mix of qualitative data and quantitative data

The objective of an **impact evaluation** is to attribute goals to a program and that program alone[57] or in other words: **what has changed as a result of the program and what different does it make in**

peoples' lives? To do this, a comparison group is needed to measure what would have happened to the beneficiaries if the intervention had not taken place.

Impact evaluations may improve the effectiveness of programs by asking the following questions:

- Did the program achieve the intended goal and objectives?
- Should a pilot program be scaled up? Should a large scale program be continued?
- Can the changes in objectives be explained by the program, or are they the result of some other factors occurring simultaneously?
- Do program impacts vary across different groups of intended beneficiaries (e.g. women, children, ethnic groups, low-income and higher income), regions, and over time?
- Are there any unintended effects of the program, either positive or negative?
- How effective is the program in comparison with alternative programs?
- Is the program worth the resources it cost?

Information generated by impact evaluations should lead to motivated decisions on whether to expand, modify, or eliminate a particular program and can be used in prioritizing programs.

Even more than for "normal" evaluations, for an impact evaluation it is particularly important use an approach that show *intended* as well as *unintended* changes by investigating project beneficiaries as well as a control group.

Because of the complexity, costs and time needed for preparation and follow-up, so far there are few thorough impact evaluations showing that WASH policies and investments are effective in delivering many of the desired objectives, except for health. Therefore there is an urgent call to expand the amount of impact evaluations for WASH programs.

Step 6: Mercy Corps phasing out

One of the key obstacles in scaling out is **handing over of official responsibilities to entities that exist beyond the program cycle**, such as local, regional or central government officials, community groups and water boards or the private sector. Preferably this has to be discussed with them in the planning phase (step 2) of the program or project as part of the "overall package" being offered. However, often not all details have been worked out in that phase because of uncertainties in expected objectives, costs or simply because there was a time pressure to start implementation and no time to agree on all the details. In that case, those details have to be worked out during implementation or just before handing over of the project. If a **one-time phasing out** will undermine the sustainability of the objectives, **a phasing out strategy** could be agreed upon but always with the objective for the eventual complete independence from project funding.

An important component to safeguard the program results before the phasing out are financial and cost recovery issues. Clear financial policies established by the project or program staff, local, regional or central government or through a collaborative group of project partners can help to underpin a more efficient, equitable, and sustainable use of resources through the promotion of cost recovery and financial contributions from the community. If a national cost recovery policy exists for the water sector, this policy may also be valid for the program project. If it is not, the Ministry of Public Works (or another ministry in charge of WASH) will need to set specific financial policies with input from the

Ministry of Health. The ministry will also need to define the cost sharing arrangements among national government, local government and communities.

Appendix A: Additional Resources (by topic area)

Water Supply

Conant, J. (2005), *"Water for Life".* Hesperian Foundation, Berkeley, USA – the booklet describes way to collect, store and conserve water, and to protect and treat water so it is safe to drink. It also helps to ensure water security by raising community awareness about water problems, and by showing ways to organize for change. The booklet contains many illustrations and is written in easily understandable words.

Gendrano, C., C. Hillbruner and M. Neukirchen. (2006) "*The Banga Pinoy: A Design and Construction Manual for Wire Reinforced Ferrocement Jars*" Catholic Relief Services, Baltimore, USA http://crs.org/publications/showpdf.cfm?pdf_id=256 – practical guideline for the construction of water storage tanks.

MacDonald, Aland, Jeff Davies, Roger Calow & John Chilton (2005) "*Developing Groundwater: A guide for Rural Water Supply".* Intermediate Technology Development Group (ITDG Publishing), Great Britain.

Smet, J. & C. van Wijk editors (2002) *"Small Community Water Supplies: Technology, people and partnership"*, IRC International Water and Sanitation Centre, Delft, the Netherlands – Revised version of the 1981 first published Small Community Water Supplies. It is one of the few textbooks to link water supply science and technology with the specific needs of small communities in developing countries

UNICEF (1999), "*Towards better programming: A Water Handbook",* Water, Environment and Sanitation Technical Guidelines, UNICEF, New York, USA – a practical guide for implementation of water programs.

UNICEF (2008), "*UNICEF Handbook on Water Quality".* UNICEF, New York, USA – The handbook provides an introduction to all aspects of water quality, with a particular focus on the areas most relevant to professionals working in developing countries. It covers the effects of poor water quality monitoring, the protection of water supplies, methods for improving water quality, and building awareness and capacity related to water quality.

Sanitation and Handwashing

Conant, J. (2005), *"Sanitation and Cleanliness for a Healthy Environment".* Hesperian Foundation, Berkeley, USA – the booklet targets at communities to give them information about how significant sanitation improvements can be made by better use of indigenous skills and local resources. The booklet contains many illustrations and is written in easily understandable words.

World Bank, BNWP and WSP (2005), "*The Handwashing Handbook: A Guide for developing a hygiene promotion program to increase handwashing with soap"* - the handbook describes a new approach to handwashing promotion. It explains how the latest thinking in industrial marketing can be combined with the latest research in public health to provide powerful new insights to drive effective handwashing campaigns.

Hygiene promotion and education

Almedom, A., Blumenthal, U., and Manderson, L. (1997), "*Hygiene Evaluation Procedures. Approaches and Methods for Assessing Water- and Sanitation-Related Hygiene*

***Practices"*, International Nutrition Foundation for Developing Countries (INFDC), Boston, USA** – Provides practical guidelines for evaluating water and sanitation related hygiene practices.

Ferron, Suzanne, Joy Morgan & Marion O'Reilly. (2000) "*Hygiene Promotion – A practical manual for relief and development".* Intermediate Technology Publications on behalf of CARE International, Southhampton Row, London, UK – Practical manual for field workers which provides guidance on hygiene promotion in emergency settings.

Khamal, S., Mendoza, R., Phiri, C., Rop, R., Snel, M., and Van Wijk, C. (2005) "The Joy of Learning: Participatory lesson plans on hygiene, sanitation, water, health and the environment" published collaboratively by NEWAH, Nepal; PLAN, Peru; the Zambian Ministry of Education; Maji na Ufanisi, Kenya; and IRC, the Netherlands. –the guide is dynamic because it is interactive. All those who help children from 3-13 learn better sanitation and hygiene habits are invited to react, criticize, improve and add. This will result in a rich collection that reflects the creativity of schoolchildren, teachers, parents and communities in improving the sanitation and hygiene practices, knowledge and attitudes in their schools.

Postma, L., R, Getkate and Van Wijk, C (2004), "*Life Skills-Based Hygiene Education; A guidance document on concepts, developments and experiences with life skills-based hygiene education in school sanitation and hygiene education programs"*, IRC International Water and Sanitation Centre, Delft, the Netherlands in cooperation with UNICEF – provides a good introduction to life skills-based education.

Sawyer, R., S. Simpson-Hébert, & S. Wood (1998). "***PHAST step-by-step guide: A participatory approach for the control of diarrhoeal diseases".* Geneva: WHO** – description of the methodology and use of PHAST (participatory hygiene and sanitation transformation).

Werner, D., C.Thuman, & J. Maxwell (1977, updated version 2004). *"Where there is no doctor. A village health care handbook".*, Hesperian Foundation, Berkeley, USA - the classical community health care book.

WHO (2003), "*Skills for Health; Skills-based health education including life skills: An important component of a Child-Friendly/Health-Promoting School",* The World Health Organization's Information Series on School Health, Document 9, Geneva, Switzerland – describes key concepts and explains how skills-based health education fit into the broader context of what schools can do to improve education and health.

World Bank/WSP.(2005), *"The Handwashing Handbook: A guide for developing a hygiene promotion program to increase handwashing with soap",* the World Bank, Washington, DC USA. – It describes a methodology for public-private partnerships to promote handwash promotion.

WASH for Schools

IRC International Water and Sanitation Centre (2004), "*Symposium proceeding & Framework for Action"* School Sanitation & Hygiene Education Symposium: The way forward: construction is not enough, Delft, the Netherlands, 8-10 June 2004 – proceedings of international symposium on hygiene, sanitation and water in schools

World Bank, UNICEF, WSP (2005), *"Toolkit on hygiene, sanitation and water in schools"* Washington DC, USA- the toolkit taps into sector-specific knowledge of practices and approaches that are likely to yield positive results as they coordinate multi-sector efforts to improve sanitation and hygiene in schools. Available at **www.schoolsanitation.org**

Zomerplaag, J. and Mooijman, A. (2005), "*Child-Friendly Hygiene and Sanitation Facilities in Schools; Indispensable to effective hygiene education"*, Technical paper series; no.47, IRC, Water and Sanitation Resource Centre, Delft, the Netherlands in cooperation with UNICEF – an overview of ten essential points to design child-friendly facilities for school children

Monitoring and Evaluation

Gosling, L., and Edwards, M., (2003), "*Toolkits. A practical guide to planning, monitoring, evaluation and impact assessment"*, Revised and updated second edition, Save the Children, London, UK – very good and easily accessible overview on M&E for development project and programs.

Mukherjee, N. and Wijk, C.van. (2003) "*Sustainability Planning and Monitoring: A Guide on the Methodology for Participatory Assessment (MPA)".* Water and Sanitation Program, World Bank, Washington, USA, and the IRC International Water and Sanitation Centre, Delft, the Netherlands – description and implementation guidance on a participatory assessment methodology .

Shordt, K., (2000), "*Action Monitoring for Effectiveness. Improving water, hygiene & environmental sanitation programs"*, Part I and II, Technical Paper Series TP E, DANIDA and IRC International Water and Sanitation Centre, Delft, the Netherlands - focuses on practical methods to improve projects/programs in the short term.

WHO and UNICEF, (2006), "*Meeting the MDG drinking water and sanitation target: the urban and rural challenge of the decade"*, World Health Organization, Geneva, Switzerland – official reporting on the progress on the millennium development goals related to WASH

Gender aspects

Mutunga, P., and Stewart, J. (2003), "*Life skills, sexual maturation and sanitation: What's (not) happening in our schools? An exploratory study from Kenya"*, Women's Law Centre, University of Zimbabwe, Harare, Zimbabwe – Investigation of girls' needs and demands related to sanitation in school with outreach to the community – only available in hard copy

Appendix B. Web-based Resources and Information

FAO definitions on Food security: http://www.fao.org/docrep/005/y4671e/y4671e06.htm

Gender Issues in the Water and Sanitation Sector:
http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTGENDER/0,,contentMDK:20205024~isCURL:Y~menuPK:489230~pagePK:210058~piPK:210062~theSitePK:336868,00.html

Hygiene Central, London School of Hygiene & Tropical Medicine is devoted to developing a better understanding of hygiene and sanitation practices which can be used to inform public health policy. http://www.hygienecentral.org.uk/index.html

IRC, Water and Sanitation Resource Centre, Delft, the Netherlands: News and information, advice, research and training, on low-cost water supply and sanitation in developing countries. http://www.irc.nl/

Joint Monitoring Program (JMP) for water supply and sanitation by WHO and UNICEF**.** The web site hosts information related to water supply and sanitation, both general and specific in nature. It provides a picture of the state of water supply and sanitation at different scales (global, regional and country). http://www.wssinfo.org/en/welcome.html

Mercy Corps Assessment Tools Resource Web Site This site has a variety of assessment tools developed by Mercy Corps and other organizations. They can be accessed free of charge. http://assess.mercycorps.org/

The **Public-Private Partnership for Handwashing** is a global initiative to promote handwashing with soap to reduce diarrhea, a major cause of child mortality in many countries today. http://www.globalhandwashing.org/

This **UNICEF** website gives information and resources on UNICEF´s work in WASH http://www.unicef.org/wes/

Access to **water and sanitation for disabled people**. Project implemented by Water, Engineering and Development Centre of Loughborough University (WEDC). http://wedc.lboro.ac.uk/projects/new_projects3.php?id=60

WaterAiD is an international charity what a mission to overcome poverty by enabling the world's poorest people to gain access to safe water, sanitation and hygiene education. The website contains publications and information on projects. http://www.wateraid.org/uk/

World Health Organization´s WASH website with program links and links to publications and core functions http://www.who.int/water_sanitation_health/en/

World Bank Water Supply and Sanitation information on projects and strategies. http://www.worldbank.org/watsan/index.htm

APPENDIX C. Terms of Reference (TOR) Components

Background
Description of the project (goal, purpose, outcomes)
Contribution of the job contract to the project

Purpose of the task being contracted
Main purpose, key audience(s) and expected outputs
Formal decisions that the task supports and planned use of outputs from the task

Scope and Methods
Overall scope of the work
Desired type of analysis, approach and methods, particularly what is expected in terms of participatory approaches

Issues to be covered
Delimitation of themes in relation to the purpose of the task
Extent to which cross-cutting issues (gender, poverty, empowerment) are to be dealt with

Personnel requirements
Number of people to be involved in the task and the time allotted for each
Necessary professional qualifications and experience

Schedule
Starting date, timing of interim analysis, deadline

Stakeholders to be involved
Who should be involved: authorities, institutions, groups, individuals, funding agency, cooperating institution, steering committee
How people/groups will be involved

Remuneration
Daily rates
Costs to be covered and not covered
How invoicing and payment will proceed

Documentation
Ownership of work and, therefore, extent to which documentation will be distributed

Source: Guijt, I., and Woodhill, J., (2002), "*A Guide for Project M&E*: *Managing for Impact in Rural Development",* International Fund for Agricultural Development (IFAD), Rome, Italy

APPENDIX D. Sample Report Outline for WASH Assessment or Evaluation

Title page: Author's Names, Institutions, and Date
Executive summary (this is written last – after the report has been completed)
Acknowledgments
Table of contents, List of tables and figures
List of people consulted/ List of abbreviations/ Glossary (as appropriate)
Introduction (including background to study and organization of the report)
Study design and organization • Study aims, objectives and intended outputs • Design of the study team • Study schedule • Training
Study site and population • Background (including maps of study areas) • Sampling strategies
Methods and tools used for investigation and analysis
Results (including descriptive analysis but no interpretation)
Discussion (including interpretation and judgment of findings)
Appraisal of methods/tools used
Conclusions and recommendations
References
Appendices/Annexes (including e.g. details on the study schedule, diary of activities, interview schedules used, field-notes, etc)

Copied from: Almedom, A., Blumenthal, U., and Manderson, L. (1997). *"Hygiene Evaluation Procedures: Approaches and Methods for Assessing Water- and Sanitation-Related Hygiene Practices*", International Nutrition Foundation for Developing Countries