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Excreta Disposal in Emergencies

A Field Manual

An inter-agency initiative by
IFRC, Oxfam GB, UNHCR and UNICEF

Excreta Disposal in Emergencies: A field manual

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1. Introduction

It is generally accepted that excreta disposal is given less priority in emergencies than other humanitarian interventions such as healthcare, food and water supply. This is despite the fact that many of the most common diseases occurring in emergency situations are caused by inadequate sanitation facilities and poor hygiene practice. Many aid agencies are aware of these facts and wish to give a greater emphasis to excreta disposal. In the past, however, they have often been hampered by a lack of experience and resources to support their field staff.

1.1 About this manual

Oxfam, IFRC, UNHCR, UNICEF and WEDC have previously collaborated on several research projects and share a common desire to create and capture knowledge to produce information resources that can be shared by different implementing agencies and that promote consistent good field practice.

This manual is a result of this shared goal and is designed for use by field-based technicians, engineers and non-technical staff responsible for sanitation planning, management and intervention in emergencies. This may include international personnel sent to an emergency, local, national and regional staff.

The purpose of the manual is to provide practical guidance on how to select, design, construct and maintain appropriate excreta disposal systems in emergency situations. Relevant situations include natural disasters, relief for refugees and Internally Displaced Persons (IDPs), and complex emergencies, focusing on rural and peri-urban areas.

The manual presents a process, which can be followed to assess the current excreta disposal needs and priorities, and to design an appropriate programme to respond to those needs. It can also be used to select appropriate excreta disposal technologies, systems, and hygiene promotion interventions. The manual provides guidance on how

to plan, design and construct systems, and how to maintain and promote appropriate use of those systems.

1.2 Excreta disposal, health and survival

Inadequate and unsafe disposal of human faeces can lead to the transmission of faeco-oral disease, can result in the contamination of the ground and water sources, and can provide breeding sites for flies and mosquitoes which may carry infection. In addition, faeces may attract domestic animals and vermin which spread the potential for disease. It can also create an unpleasant environment in terms of odour and sight.

The importance of excreta disposal can not be overestimated. Diseases transmitted via the faeco-oral route, such as diarrhoea, have been shown to account for 40% of all childhood deaths in an emergency (Davis and Lambert, 2002) and this figure may be significantly higher in some cases. Studies (Esrey, 1996; Esrey & Habicht, 1996) have shown that whilst improvements in water quality alone can produce limited reductions in childhood diarrhoea by 15-20%, greater reductions can be produced through safer excreta disposal (36%) and hand washing, food protection and improvements in domestic hygiene (33%).

Transmission of excreta-related diseases is largely faecal-oral or through skin penetration. Figure 1.1 illustrates the potential transmission routes for pathogens found in excreta.

The introduction of safe excreta disposal can reduce the incidence of intestinal infections and helminth infestations. Excreta-related communicable diseases include cholera, typhoid, dysentery (including shigellosis), diarrhoea, hookworm, schistosomiasis and filariasis (Franceys et al., 1992). The likelihood of all these diseases, and especially epidemics such as cholera, increases significantly when a population is displaced or affected by a disaster.

Poor hygiene practice, particularly involving food and hands, may be a major cause of disease transmission, even where appropriate excreta disposal facilities are in place. For this reason it is difficult to obtain a direct correlation between the incidence of excreta-related disease and the provision of appropriate facilities.

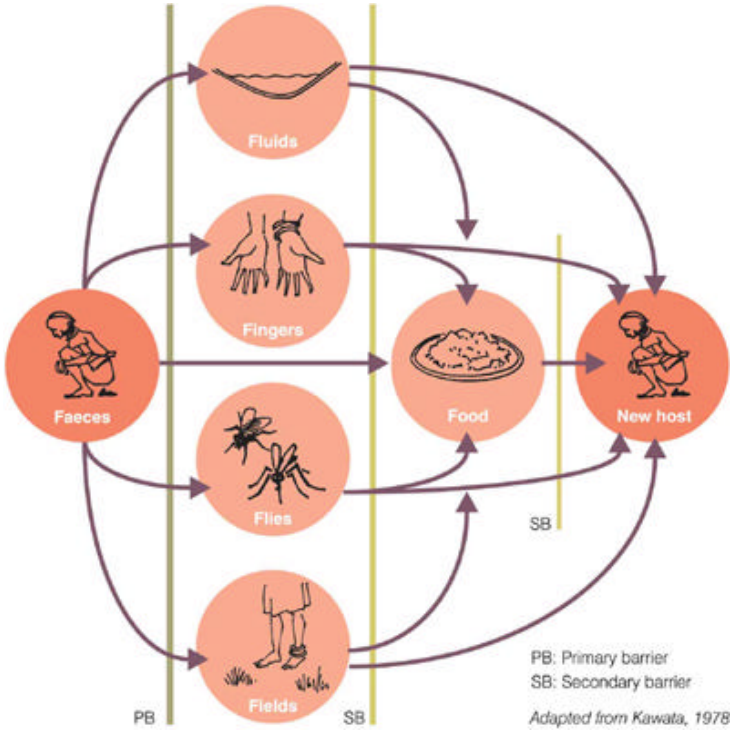


Figure 1.1. Faeco-oral transmission routes

Children under five years of age are most at risk from communicable diseases since their immune systems have not developed. Increased malnutrition, as is common in emergencies, increases this risk further. Since young children are unaware of the health risks associated with contact with faeces it is essential that faeces are safely contained. Severely malnourished children and adults are at increased risk from diarrhoeal disease, as are elderly people, especially if exhausted after travelling considerable distances.

1.3 Phases of an emergency

Davis and Lambert (2002) define five phases for a refugee emergency:

- Immediate emergency 1-2 weeks
- Stabilization 0.5-2 months
- Recovery several moths
- Settlement perhaps years
- Resolution

For the purposes of excreta disposal applied to all types of emergency these phases can be reduced to two, the 1st and 2nd phases.

1st Phase acute emergency

This is the immediate emergency phase where intervention is required to provide basic facilities to contain and separate excreta and to ensure survival. Response interventions are generally implemented rapidly and designed for short-term use. In this phase mortality rates are often high (over 1 per 10,000 per day) and the risk of major epidemics may also be high. In a large scale population displacement (>20,000) the first phase typically lasts several weeks, though this may be more prolonged where response is slow or where the affected population increases rapidly.

The objective of a excreta disposal programme should be to achieve or surpass the Sphere minimum standards. It is recognised however, that it may not be possible to achieve these standards in the 1st phase of a large-scale emergency. The minimum standards should be met however, during the 2nd phase.

2nd Phase stabilized emergency

The second emergency phase applies to all subsequent stages of an emergency, where the situation becomes stabilized and more sustainable interventions can be implemented for longer-term use. During this phase community structures may start to reassemble and morbidity and mortality rates should start to fall. However, the risk of epidemics may still be high. This typically lasts several months, though in complex emergencies it may stretch to several years.

The definition of these phases of an emergency is not fixed and many situations do not follow a linear progression. Some programmes may commence in the 2nd phase or become more acute and fall back to the 1st phase because the security situation deteriorates or an epidemic occurs.

1.4 Programme process

The overall programme process for excreta disposal in emergencies is summarized in Figure 1.2.

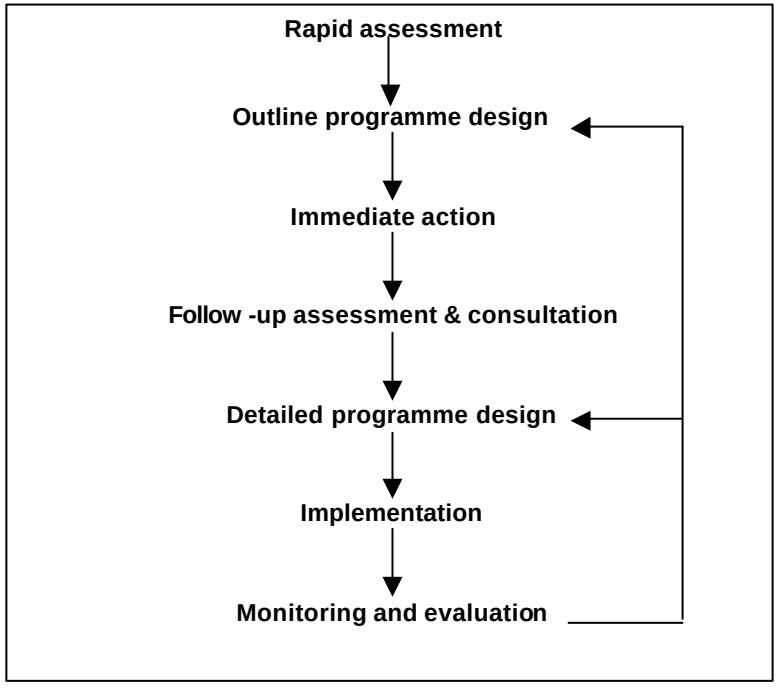


Figure 1.2. Programme process for emergencies

The process outlined above is an expansion of the traditional project cycle that recognizes the unique conditions faced in many emergencies, that differ significantly from those encountered in more stable situations.

Rapid assessment is the initial assessment stage designed to gather key relevant information rapidly and analyze it quickly in order to prioritise intervention. This approach is designed to identify the need for immediate action as well as longer-term interventions.

Outline programme design follows on from the rapid assessment stage when a rapidly produced action plan is outlined. This identifies key actions that need to implemented immediately as well as longer-term interventions, and is intended for submission to the donor for initial approval of the programme and budget.

Immediate action is the implementation of first phase emergency measures to stabilize the current situation and minimize the spread of excreta-related disease. It is important that the key longer-term actions have already been identified in the outline design to ensure that immediate actions do not have any negative effect on future interventions.

Follow-up assessment and consultation is a more detailed stage of data collection, analysis and consultation that should be carried out once the outline design has been approved. This should adopt a more participative approach involving all affected groups in the decision-making process.

Detailed programme design is a comprehensive plan of action for longer-term intervention (if required) based on the follow-up assessment and consultation process.

Implementation of the second phase longer-term excreta disposal programme can now be conducted. This should include management and implementation of construction, hygiene promotion, operation and maintenance activities.

Monitoring and evaluation is the final stage in the assessment and planning process and is an ongoing process. All programme activities and the overall situation should be monitored to identify future needs and priorities, and to assess performance. On the basis of monitoring results it may be necessary to repeat the outline and detailed

programme design stages leading to future immediate and longer-term interventions as required.

Rapid assessment and follow-up assessment and consultation are addressed in Chapter 2; outline programme design and detailed programme design are addressed in Chapter 3; immediate action is addressed in Chapter 4; implementation is addressed in Chapters 5, 6, 7 and 8; and monitoring and evaluation are addressed in Chapter 9.

2. Assessment

2.1 Assessment principles

The importance of assessment should not be underestimated. Even in an acute emergency, assessment is the cornerstone of a successful excreta disposal response programme. Assessment involves the collection and analysis of a variety of information and data. The key points to remember when undertaking assessments are:

?? Key information should be collected from as many different people and sources as possible to corroborate findings. Additional data may be collected after decisions have been made for confirmation.

?? It is essential to understand local political and social structures and to be aware of conflicting interests and biases within communities when collecting information. It is also important to discuss the purpose of the assessment with communities to avoid raising expectations unrealistically.

?? Collect *enough* data to implement an *effective* response. Time spent collecting unnecessary information is time wasted. Focus on the most relevant factors (the checklists provided below can assist in this.

?? Keep good records of any gathered information and store them in such a way that others can access them.

?? Remember that in most situations things are constantly changing, it is therefore important to look at both the present situation and what is likely to happen in the near future.

The rapid assessment and follow-up assessment stages must address a number of key issues, as outlined below.

Health and hygiene issues

The primary purpose of an excreta disposal programme in emergencies is to sustain or improve health by minimizing the transmission of disease-causing pathogens. Health and hygiene issues therefore have particular relevance when conducting any assessment.

The current health status of the affected population and potential threats to health are key assessment indicators. Excreta-related diseases include, among others,:

?? diarrhoea;
?? bacillary dysentery (shegellosis);
?? hepatitis;
?? cholera;
?? cryptosporidiosis; and
?? roundworm.

In an emergency situation Crude Mortality Rate (CMR), in deaths per 10,000 people per day, is the most practical indicator of the health status of a population. As long as the CMR remains above 1 death/10,000/day the situation is generally classed as an emergency (Médecins Sans Frontières, 1997).

Morbidity rates for excreta-related disease can also be useful indicators. Although it is not possible to provide 'acceptable' incidence rates for different diseases (Rottier & Ince, 2003), figures should be lower than those presented in Table 2.1.

Table 2.1. Indicative acceptable incidence rates in camps for displaced persons or refugees (after de Veer, 1998)

Disease	Incidence rate (in cases/10,000/week)
Diarrhoea total	60
Acute watery diarrhoea	50
Bloody diarrhoea	20
Cholera	Every suspected case must be acted upon

Transmission of excreta-related diseases is exacerbated by lack of appropriate hygiene practices, such as hand-washing after defecation, disposal of children's faeces, and regular cleaning of latrines.

A lack of baseline information on hygiene behaviour can lead to project failure. While it is difficult to assess whether all sections of the population are aware of priority hygiene practices, it is always useful to conduct a small study on issues such as hand-washing and disposal of children's faeces (see Box 2.1).

Box 2.1. The importance of incorporating baseline information on hygiene behaviour in Eritrea

(Source: Oxfam Eritrea Programme Assessment, Dec.– Jan. 2000)

In Eritrea, the Ministry of Health did some research on health behaviours in the IDP camps (Deda, Mai Haber and Adi Keshi camps) in September 2000. The results showed that the residents knew a great deal about health problems in their camps and knew about the causes of health problems. However, based on formative research on the health behaviours in selected IDP camps, it was concluded that "there exists a great gap between what people know and what they do." Research identified problems with using latrines, "in spite of the efforts Oxfam has made to provide latrines in the camps." The potties distributed by Oxfam were not being used and children's defecation was observed everywhere.

Following on from this research an Information, Education and Communication (IEC) strategy was drafted for the IDP camps by the Ministry of Health. This was presented in a tabulated form, with the problem behaviour matched to factors promoting problem behaviour and factors supporting behaviour change. This information could then be used to help guide the Oxfam programme, particularly concerning health behaviour.

HIV/AIDS is also of particular relevance to excreta disposal in emergency situations. Poor sanitation raises particular risks for people living with AIDS as their weakened immune systems are less resistant to opportunistic infections. The HIV/AIDS epidemic is therefore increasing the need to provide sanitation and improve hygiene practices because diarrhoea and skin diseases are among the most common opportunistic infections. Poor hygiene and sanitation is one of the leading causes of the progression of asymptotic HIV to AIDS. For some patients, diarrhoea can become chronic, weakening them and often resulting in death.

Particularly in countries where HIV prevalence is high, assessments should be conducted taking into account the extreme vulnerability of adults living with HIV/AIDS. Emergencies occurring against a backdrop of high HIV prevalence challenge all response groups to revise their hitherto accepted mode of response.

Socio-cultural issues

Excreta disposal provision is essentially people-centred and the importance of socio-cultural issues is paramount if programmes are to be successful. Relevant socio-cultural issues to consider in assessments include:

- Population and demography – numbers of men, women and children, breakdown by age, ethnic and religious groups, population density;
- Vulnerability and disability – numbers of people with physical and mental disabilities or sickness, most vulnerable groups;
- Cultural beliefs, practices and preferences relating to excreta disposal and hygiene (e.g. menstruation);
- Existing knowledge relating to health and hygiene;
- Anatomical considerations (e.g. how people squat); and
- Anal cleansing materials.

Such information is essential to set up a baseline for an effective excreta disposal programme.

Women are potential agents of change in hygiene education, and children are the most vulnerable victims, but men usually make the decisions about whether to tackle the problem, and how. Women often need privacy and security in sanitation more than men, yet they are unable to express those needs effectively in many societies.

Plans for designing and locating sanitation facilities, must consider cultural issues, particularly as excreta disposal is usually focused on the household. Excreta disposal may be a difficult subject for a community to discuss: it may be taboo, or people may not like to discuss issues they regard as personal and unclean. In some cases, people may feel that facilities are not appropriate for children, or that children's faeces are not harmful. Such issues need to be addressed with sensitivity at an early stage. This is essential to ensure that interventions are appropriate, facilities will be used and people affected by emergencies maintain their dignity.

Environmental and technical issues

The range of technical options that can be applied in any particular situation will depend both on the human environment and the physical environment in which the emergency occurs. Environmental and technical issues to consider in assessments include:

- Ground conditions – soil types and infiltration rates (see Appendix 1), groundwater levels, bearing capacity of soil, ease of excavation;
- Location and risk of contamination of water sources;
- Topography and drainage patterns;
- Climate and rainfall patterns; and
- Natural, physical and human resources (and skills) available locally or that can be procured rapidly; and
- Possible environmental constraints or impacts.

Twenty key questions to be applied to collect baseline data in initial assessments are presented below. These are generic and may not all be relevant in all emergency situations. The question 'so what?' is a useful test of relevance - ask it frequently (Davis & Lambert, 2002).

Twenty Rapid Assessment questions:

1. What is the estimated population and what is the population density?
2. What is the crude mortality rate (number of deaths per 10,000 people per day) and what are the main causes of mortality and morbidity?
3. What are the current beliefs and traditions concerning excreta disposal especially regarding women and children's excreta? (do men and women or all family members share latrines, can women be seen walking to a latrine, do children use potties, is children's excreta thought to be safe?)
4. What material/water is used for anal cleansing? Is it available?
5. Is soap available?
6. Are there any existing facilities? If so are they used, are they sufficient and are they operating successfully? Can they be extended or adapted? Do all groups have equal access to these facilities?
7. Are the current defecation practices a threat to health? If so, how?
8. What is the current level of awareness of public health risks?
9. Are there any public health promotion activities taking place? Who is involved in these activities?
10. What health promotion media are available/accessible to the affected population?
11. Are men, women and children prepared to use defecation fields, communal latrines or family latrines? Consult people with disabilities and those who are elderly.
12. Is there sufficient space for defecation fields, pit latrines etc?
13. What is the topography and drainage patterns of the area?
14. What is the depth and permeability of the soil, and can it be dug easily by hand?
15. What is the level of the groundwater table?
16. What local materials are available for constructing latrines?
17. Are there any people familiar with the construction of latrines?
18. How do women deal with menstruation? Are there materials or facilities they need for this?
19. When does the seasonal rainfall occur?
20. Whose role is it normally to construct, pay for, maintain and clean a latrine (men, women or both)?

2.2 Assessment tools and techniques

Field assessments can incorporate a variety of techniques, including:

- Observation;
- Measurement and testing;
- Surveys;
- Interviews; and
- Participatory techniques.

Observation

Perhaps the simplest way of gathering information is through observation. This method allows the assessor to record non-verbal behaviour among the affected population, the physical condition of the affected area and the characteristics of the surrounding landscape. It can also explore interactions among the affected population and local residents or other stakeholders.

On arrival in the field the first step in assessment is to conduct a rapid reconnaissance of the affected area. This is best done on foot and may be a useful starting point in producing a simple sketch map. Transect walks can be made through the site to take notes on any existing excreta disposal facilities and practices and associated indicators. A huge amount of information can be gathered in this way but care should be taken not to make sweeping assumptions based on limited observation.

It should be noted that observation methods based on people's behaviour are subjective and time consuming. They cannot detect what members of the affected population are thinking, and the presence of an outsider can change the behaviour of those being observed.

Measurement and testing

Measurements can be used to determine quantities such as:

- available area;
- geographical position;
- elevation and slopes;
- latrine superstructure dimensions for existing facilities or materials;
- quantity of water available for hand washing / anal cleansing;
- ease of excavation for pits; and
- soil infiltration rates.

Measurements are likely to require the data collector to have some skill and experience in using appropriate instruments. Assessment teams can be trained reasonably quickly for most measurements, but should be carefully supervised throughout data collection.

Surveys

Surveys can be used to examine opinions or behaviour made by asking people set questions. Surveys can be used to collect both quantitative and qualitative information. This may be quantitative statistical data concerning demography, health and geography, or qualitative social data such as community opinions and behaviour. There is a broad range of survey techniques which can be used for emergency sanitation programmes, including random and selective methods. The use of surveys should be balanced against available time, human resources, logistical support, and the need for statistical analysis and interpretation of results. In most rapid assessments this is not necessary but surveys may be appropriate for more detailed follow-up assessments.

Interviews

Since excreta disposal is essentially a people-centred sector, not all information can be gathered through observation. Even in the initial rapid assessment it will be necessary to interview some groups and individuals. There are various interview techniques ranging from open-

ended discussion with randomly selected members of the affected population to more directed interviews with key informants or personnel from NGOs. Care should be taken in conducting interviews; the assessor should avoid asking leading questions (where the desired answer is obvious) or restrictive questions (with yes or no answers only). Interviewees can include:

?? key informants (engineers, teachers, health staff etc.);

?? men, women and children from the affected population;

?? formal leaders; and

?? representatives of minority or vulnerable groups.

Refugee women and children, as well as men, should be questioned. Female translators should be used where possible in interviewing women, especially in cultures where women's contact with men is restricted.

It is important to remember that in some situations, interviewers and observers may pose a threat to the people, interpreters and authorities concerned. Rapid assessment teams can compromise these groups by asking the wrong questions or quoting their answers to the wrong person (Gosling & Edwards, 1995).

Some countries also have a ministry specifically concerned with women's affairs and it is useful to discuss any gender issues relevant to sanitation with them. However to obtain more in depth information about practices and beliefs it may also be useful to undertake participatory techniques, such as a community mapping session, with separate male and female groups. Community members will then be able to give you important information about where there are problems with excreta disposal, what sort of toilets most people have, where people dispose of children's faeces and what possible solutions people would like to see.

Participatory techniques

There are many participatory techniques that can be used in assessment. The most common at the raid assessment stage are group discussion and community mapping. In focus group discussion the assessor guides conversation among a small group of the community with common interests. These groups may be of mixed sex and age,

although single sex focus groups may promote greater freedom of expression by participants who may not want to express their opinion in a mixed group.

Discussions are semi-structured and the assessor will introduce a list of topics to encourage wider discussion among the group's members. This will enable the facilitator to learn about their concerns, opinions, problems, and what they consider to be priorities in the various sanitation sectors.

Mapping is a useful exercise which can be used to gain an overview of the situation and to identify excreta disposal problems which are causing a risk to people's health. A mapping exercise should also allow people themselves to appreciate possible risks and can often be a catalyst for community planned action. This can build on the observation process during the initial reconnaissance by sketching site plans or schematic maps. This may be used to record locations of:

?? existing sanitation facilities and practices;

?? key public services and institutions;

?? indiscriminate disposal of excreta;

?? standing water;

?? water sources, storage and distribution points; and

?? slopes, drainage and geological features.

Mapping can be carried out relatively quickly by community members in conjunction with local staff. This is another way of stimulating discussion and obtaining information on a wide range of issues from those present. Maps (no matter how rough) can be very useful in co-ordination and planning meetings with other individuals, organisations and agencies.

Whatever technique is adopted, care must be taken during the initial rapid assessment that the expectations of the affected community are not raised unduly prior to programme approval.

A guide explaining how to conduct a mapping exercise is presented in the box below.

How to Conduct a Mapping Exercise

A mapping exercise can be initiated simply by approaching a small group of people or by organising groups of people in advance. It is useful to conduct separate mapping exercises with women and men to ascertain their different views.

- ?? Have a clear idea in your mind of the possible things that might be identified on a map such as church, market place, schools, areas of open defecation, houses or shelters without latrines, areas of fly breeding etc.
- ?? Identify possible resources that might be used for the map such as stones, leaves etc. but allow people to make their suggestions as you go along.
- ?? Explain who you are and that you would like their help in conducting the exercise.
- ?? Explain what you hope to find out and how the participants might go about making a map.
- ?? Allow plenty of time for discussion of the idea of making a map - many people may be sceptical that they cannot do this because they have never been to school.
- ?? If necessary begin the process yourself with a central landmark using a stick to draw on the ground. Try to "hand over the stick" as much as possible to other participants.
- ?? Listen carefully to what people say and allow free discussion and debate amongst participants.
- ?? Keep a record of who took part and when and where.
- ?? When the map is finished, offer to transcribe it or get one of the participants to transcribe it onto paper. Ask the participants to decide where they would like the map to be kept, or who will keep it.

It might also be useful to compile quantifiable data from the mapping exercise. A table showing the quantities of each thing that has been drawn on the map (i.e. numbers of latrines in different locations.) can then provide a baseline for subsequent quantifiable evaluation or for the triangulation of results from questionnaire surveys. This can also be displayed with the map for those who can read.

2.3 Follow-up assessment and consultation

Assessment is not simply a one-stage process. The initial rapid assessment is designed to collect key information quickly in order to prioritise intervention activities and produce an outline programme design. The assessment tools and techniques described above can be applied at any stage of an excreta disposal programme, and techniques used in the initial assessment can be revisited and repeated in the follow-up assessment.

Once the outline programme design has been produced and immediate actions are implemented to stabilize the initial situation, a follow-up assessment and consultation process should begin in order to gather more comprehensive information and produce a detailed programme design.

This more in-depth consultation phase takes time but is essential to ensure that interventions and facilities are socio-culturally acceptable, and that they will be operated and maintained effectively. There are a variety of more comprehensive assessment tools that can be applied in the follow-up assessment, including:

- ?? Community ranking and voting;
- ?? Questionnaires; and
- ?? Health and hygiene surveys.

In some cases it may help to prepare a standard questionnaire for the use of the assessor. This method should be used with all sections of society and may give the interviewer a chance to get more complete information. Furthermore, it may provide an opportunity to clarify any misunderstandings between interviewer and interviewee. However, there are disadvantages in using this method in that questions may be biased and respondents may give the answers that they believe the interviewers want.

3. Programme Design

3.1 Outline programme design

The objective of the outline programme design is to use the information collected in the initial assessment to set objectives for intervention, identify intended outputs and outline the key activities required to achieve these. Every programme should have a clear:

- **Goal** – the overall aim of intervention (e.g. to sustain or improve the health and well-being of the affected population);
- **Purpose** – the reason for implementing an excreta disposal programme (e.g. to reduce the incidence of excreta-related disease and create a pleasant living environment);
- **Outputs** – the key objectives that should be met by the programme (e.g. to ensure adequate excreta disposal in line with Sphere minimum standards);
- **Activities** – the actions required to achieve the outputs (e.g . latrine construction, hygiene promotion). and
- **Inputs** – the resources required to implement the activities identified (e.g. raw materials, tools, equipment, finances, personnel).

The cause and effect, or **if** and **then**, relationship is a useful principle on which to base the planning process (see Figure 3.1). **If** we complete the activities **then** we will achieve the outputs. **If** we achieve the outputs **then** we will have fulfilled the purpose. **If** we fulfil the purpose **then** we will have met the goal. Activities and outputs should be routinely reviewed in relation to the overall purpose and goal of the programme.

Logical framework

The logical framework is a planning tool based on the cause and effect relationship, which is increasingly required by donors to ensure that objectives are well defined. Its use can also encourage more effective

monitoring and evaluation and ensures a more rigorous and accountable approach to emergency response. In a rapidly changing environment, it is accepted that such a framework will be less than perfect and may need to change frequently to accommodate the situation on the ground.

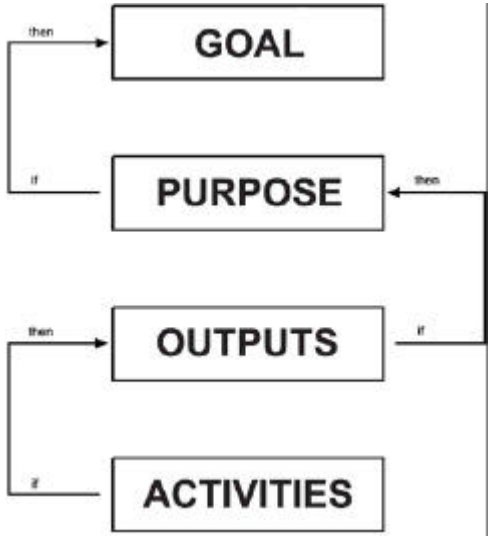


Figure 3.1. Cause and effect relationship

The example logical framework in Table 3.1 assumes a population of 50,000 newly displaced people in a camp setting and considers the excreta disposal requirements only. In reality, close co-ordination and collaboration would also be needed with those involved in the provision of water and health services. Sphere Minimum Standards have been used to promote familiarity but output objectives should be more specific if presenting this framework to donors. In the outline programme design the key activities and inputs should be included only. These will be defined more comprehensively during the detailed design process when the logical framework should be revisited and refined.

Table 3.1. Example logical framework

Narrative summary	Measurable indicators	Means of verification	Key assumptions
Aim/Goal: To contribute to improving the health of the at risk population	Mortality and morbidity rates from all causes	Health centre records, mortality records from morgue	Assumes that stability is maintained and that further migration, does not take place, assumes easy access to population
Purpose: To reduce the incidence of diseases associated with inadequate excreta disposal for 50,000 displaced persons for six months	Mortality and morbidity rates from diarrhoeal diseases	Health centre records, volunteer and public health team's monitoring forms	Assumes that the major cause or risk of mortality and morbidity is associated with excreta related disease and that beneficiaries see the project as a priority need for them
Output: To ensure adequate excreta disposal in line with Sphere minimum standards All sections of the community are aware of what they can do to prevent diarrhoeal diseases and are mobilised to take action to control them	Ratio of latrine coverage 1/20 Public Toilets available in public places People feel the toilets are safe and private People use the toilets available and children's faeces are disposed of immediately and hygienically, household toilets are cleaned and maintained, people wash their hands after defaecation and handling children's stools	Project records, observation, focus group discussions Observation of camp, latrine monitoring forms, excreta maps, focus group discussions, pocket charts,	Assumes government support for project continues and land is available for the construction of latrines Assumes project meets a felt need of the community
Activities: 1.Recruit & train personnel 2. Design & construct latrines …….etc.	No.s of staff and training completed Etc…	Project records, training evaluation Etc…	Assumes availability of willing/able people Etc..
Inpits:	Tools and resources	Logistics and financial records	Resources and finances are rapidly available

Setting priorities

Once the overall output objectives have been decided upon, the priority first phase intervention activities must be identified. Several activities may start at the same time or may need to continue into the next phase of the programme:

?? It may be necessary to immediately start a clean up campaign if there has been open defecation which is causing an obvious health hazard. The population can be mobilised, using rapidly identified and recruited public health promoters (community mobilisers) and given the resources (lime, spades, wheelbarrows, sacks) to mobilise people to do the clean up. It may be necessary to pay workers to do this, but care should be taken in making such decisions, since once people have been paid it will be more difficult to mobilize voluntary participation for other programme activities.

?? In the first phase of an emergency public health promoters would also need to initiate an information exchange. The population needs to be informed about where they can and can not defecate and why indiscriminate defecation is a problem in areas of high population density. They may also need to be reminded of the importance of hand-washing especially following defecation and handling children's stools

?? As part of the sanitation team, the Public Health Promoters also need to obtain information about which system of excreta disposal is most appropriate and where facilities should be sited.

?? If appropriate, start shallow trench defecation enclosures immediately, while beginning the planning for communal or family latrine construction (see Chapter 4 for more details).

?? Consider whether there need to be special facilities for children through discussions with the Public Health Promoters.

?? Dig a number of trial pits around the camp to determine: soil stability and permeability, depth to bedrock and depth to water table. This will influence the decision to build lined or unlined pits, raised latrines or to go for more technical solutions such as septic tanks, small sewage systems or small treatment systems.

?? If appropriate, start building communal latrines and ensure that latrine attendants have been selected and trained.

?? It may be possible to initiate a family latrine programme at the same time as providing a minimum of communal latrines if families are willing to dig latrine pits themselves. They may want to borrow tools for digging. This aspect of the programme could be managed by the public health promoters.

?? It is also important to consider whether it is possible to upgrade any existing sanitation facilities in the location.

Action plan

The logical framework should include a list of intended activities which can be used to develop a more detailed action or activity plan (see Table 3.2). Each activity can then be allotted an appropriate time period to produce a programme schedule in the form of a Gantt chart.

Table 3.2. Example activity plan

Activities	Week number							
	1	2	3	4	5	6	7	8
Recruit and train 5 mobile sanitation teams each with a supervisor to organise excreta clean up within three days of arrival								
Recruit and orientate five Public Health Promoters to collect baseline data and information about community latrine design preferences								
Establish communal latrine system for entire population within two weeks including hand-washing facilities and trained latrine attendants								
Hold regular community meetings with camp leaders and representatives (ensuring representation from women, elderly and disabled) to discuss family latrine programme and operation and maintenance								
Distribute potties to each family with children between one and five (1 potty for every two children) and nappies for children under one (four nappies per child)								
Establish family pit latrines for 10,000 families within 2 months ensuring privacy and safety for women								

Immediate action

Once the outline programme design has been drawn up to produce a rough plan for the overall programme, immediate action should be taken. Such action should entail the implementation of first phase technical options (as described in chapter 4). The outline design should be produced within one or two days to avoid any unnecessary delay in implementing emergency measures. It is important, however, that longer-term objectives are clearly defined before rushing headlong into action, to minimise mistakes and ensure that time and resources are used efficiently. While immediate action is underway, the outline programme design can, if necessary, be submitted to the donor or agency headquarters for approval.

3.2 Detailed programme design

The detailed programme design is simply an extension of the outline design which contains more detail regarding activities, designs, materials, resources and timeframes. While immediate emergency measures are being implemented the outline design should be revisited and expanded to produce a more comprehensive plan of action for second phase interventions.

Key design criteria

The key design criteria for emergency response, that should be applied in the detailed design, are based on the Sphere Minimum Standards in Hygiene, Water Supply and Sanitation (Sphere, 2004). These criteria are summarized below.

Coverage

Sphere Standard: **Maximum of 20 people per latrine** (in the initial phase it is reasonable to aim for 50 p/p/latrine).

Trench latrines should be designed for a maximum of 100 people per 3.5m length of trench at 1m deep and 300mm wide.

Separate toilets may need to be provided for women and men, the distances to which should be determined following consultation with the

intended users. Toilets and facilities for people living with disabilities, the elderly and children should also be provided.

Location

Toilets should be **no more than 50m from dwellings**. Pit latrines should be a minimum of 6m from dwellings. Latrines should be at least 30m from any ground water sources. Latrines should be available in public places such as markets, health centres & food/non-food distribution points.

Pit depth

The bottom of the latrine should be **at least 1.5m above the water table**. In fine unsaturated soils and unconsolidated strata within 1.5m virtually all bacteria, viruses and other faecal organisms are removed. This distance will increase in large grained soils, gravels or fissured/fractured rock.

Accumulation rates

Sludge accumulation rates are useful indicators for designing and sizing pits for excreta. Approximate rates are given below:

Solids: 0.5 litres/person/day in emergencies (<0.15m^3/person/year in stable situations)

Liquid: 0.8 Litres/person/day where water is **not** used for anal cleansing or 1.3 l/p/d where water **is** used for anal cleansing.

Note: Where there are no bathing facilities people may wash in latrines, in which case the accumulation rate could be 8–10 l/p/d.

User issues

All latrine doors should be lockable from the inside. Security lighting is often necessary, and special rails, access ramps and larger cubicle spaces may also be necessary to assist the disabled and elderly. Hand-washing facilities, and if necessary, water or other materials for anal cleansing should also be provided.

In order to select appropriate excreta disposal facilities and interventions it is essential to consider key socio-cultural issues relating to gender, HIV/AIDS, people with disabilities, the elderly and young children. (These issues are examined in more detail later in this chapter.)

Family or communal latrines

It is widely accepted that family excreta disposal facilities are, in general, preferable to communal facilities. In the initial stages of an emergency it is often necessary to construct communal latrines, as there is insufficient time to implement family-based facilities. However, due to management and maintenance problems associated with communal services, communal latrines are normally seen as only a short term measure before family latrines can be built, or for use in public places such as markets, food and health centres.

Perhaps the most important factor concerning the choice between communal and family latrines is operation and maintenance (O&M). Field experience tends to indicate that there is a direct relationship between the ratio of facilities to the affected population and the involvement of that population in O&M activities. Responsibility for O&M of communal latrines is often the source of tension or resentment, and as a result facilities may not be adequately maintained leading to increased health hazards.

Where possible, it is preferable, in order to promote ownership, care and maintenance, for family members to build their own latrines. In some cases the population may be rapidly mobilized to dig their own family pit latrines, and there may be no need for communal facilities even in the initial phase of an emergency.

If community members are to build their own latrines, it may be necessary to provide tools and equipment and additional help to those who may be unable to do this, such as female-headed households, families with disabilities and the elderly. In many cases families are given concrete latrine slabs and are expected to construct the pit and superstructure themselves, using local materials.

It is also important to consider that it is possible to implement one type of facility parallel to another in such a way that they complement each other. For example, communal latrines may be provided for new arrivals at a refugee camp but after a short period of time these are replaced with family latrines.

There are many advantages and disadvantages of both communal and family latrines. The final decision will depend on a variety of factors as outlined in Table 3.3.

Table 3.3. Advantages and disadvantages of communal and family latrines (adapted from Adams, 1999)

Factor	Communal	Family
Speed of construction	Can be constructed fast by well-trained and well-equipped team, although rate of construction limited by number of staff and equipment.	May take considerable time to train families in the initial stages, but large numbers of latrines may be built quickly.
Technical quality	Quality of design and construction easier to control but innovative ideas from users may be missed.	Potential for innovative ideas of users, but more difficult to ensure good siting and construction.
Construction costs	Use of materials can be easily controlled but labour must be paid for.	Construction labour and some materials free of charge; families may not have time or skills
Maintenance costs	Maintenance, repair and replacement costs easier to predict and plan; staff required to clean and maintain facilities in long-term.	Users take responsibility for cleaning and maintenance but recurrent costs are less predictable.
Technical possibilities	Heavy equipment and specialised techniques may be used where necessary (e.g. rocky ground).	Families may not be able to dig in hard rock or build raised pit latrines where the water table is high.
Cleaning and hygiene	Users do not have to clean latrines, but these are often dirty, and a greater mix of users increases the risk of disease transmission.	Latrines are often cleaner but many users may prefer not to be responsible for construction, cleaning and maintenance.
Access and security	Latrines may be less accessible and more insecure, particularly for women.	Latrines are often more accessible (closer to dwellings) and safer.
Development issues	People may lose or not acquire the habit of looking after their own latrine.	People keep or develop the habit of managing their own latrine.

It is likely that in the following scenarios communal latrines will be the most appropriate or only option:

- hard shelters (schools, public buildings, factory buildings, emergency centres);
- enclosed centres (prisons, hospitals, orphanages, feeding centres etc.);
- difficult physical conditions (e.g. rocky ground, high water table level);
- over-crowded peri-urban areas;
- crowded camps with little available space (population density >300 per hectare);
- transit camps where facilities are temporary; and
- where the local authorities do not permit family units.

Gender considerations

Emergency interventions and life saving strategies have a greater impact when there is understanding of different gender impacts, and of men and women's different needs, interest, vulnerabilities, capacities and coping strategies. The equal rights of men and women are explicit in the Humanitarian Charter. Rights and opportunities for both men and women should be enhanced and not compromised by aid interventions. Increased protection from violence, coercion and deprivation in emergency situations, particularly for women and girls, but also for specific risks faced by men and boys, are essential to effective emergency relief.

It is also important to pay attention to the impact of programmes on women's roles and workloads, access to and control of resources, decision-making power, and opportunities for skill development, in order to make sure that interventions support and do not diminish the role of women.

Excreta disposal is a sensitive socio-cultural issue and in many societies there are particular cultural beliefs relating to excreta disposal practices and facilities. In some cases the sharing of facilities by people of

different gender is a taboo, even within family groups. There is also often a need for facilities and resources for menstruation which must be considered when providing latrines.

Privacy and security in relation to using excreta disposal facilities is a key issue (see Box 3.1). Women's safety may be compromised if toilets are too far from their dwellings and they may not use them if they think they are not safe. Night lighting may need to be provided to avoid this problem. Sexual harassment often increases in the confines of a camp or in an emergency situation and the location of sanitation facilities should ensure that the risks to women are minimised.

Box 3.1. Privacy and security for women

Privacy and security are vital if people are going to use latrines. In Albanian refugee centres women were forced to go to the toilet in pairs because the toilets had no locks on the doors.

Due to a lack of appropriate latrines in IDP camps in northern Uganda women and girls have been sexually assaulted and even killed when going into the bush to defecate at night. Children, both boys and girls, have also been abducted by rebels in similar situations.

Disability considerations

Disasters and armed conflict are major causes of disability. Millions of children are killed by armed conflict, but three times as many are seriously injured or permanently disabled whether from amputations, head injuries, untreated stress or other trauma. Disasters not only create disability, but destroy existing infrastructure and services that were meeting their needs.

Access to sanitation for people with physical impairments is often extremely difficult in emergency situations. Most excreta-disposal facilities provided in emergencies are inaccessible for physically disabled people, and as most disabled people do not use soap to wash

their hands, because of a lack of help, their health is at increased risk (Jones et al., 2002). Families struggling for their survival are often too busy to consider the needs and health of disabled members.

Where there are people living with disabilities within an affected community, excreta disposal facilities should be designed to cater for their specific needs. Requirements will depend on the nature and extent of disabilities and it is important that people with disabilities are consulted to determine individual practices and needs. In general, the following aspects of design and operation should be considered:

- Ensure easy access to latrines by locating them closer to households with disabled people, avoiding steps, steep inclines and slippery surfaces;
- Provide increased cubicle sizes for physically-disabled people and construct hand rails and raised pedestals where necessary;
- Ensure door handles and locks are not situated too high so that people with limited reach can used them;
- Provide easily accessible hand-washing facilities that are simple to operate and provide support to facilitate hand-washing if required;
- Raise awareness among staff and family members to avoid overprotection, pity, teasing or rejection, and to ensure that appropriate support is provided.

Considering HIV/AIDS

The Inter Agency Standing Committee Task Force on HIV/AIDS in Emergency Settings (IASC, 2003) describes a number of key actions related to excreta disposal and people living with HIV/AIDS. Some of these key actions include:

- Provide hygiene education for family and caregivers with clear instructions on how to wash and where to dispose of waste when providing care to chronically ill persons.
- Consider the appropriate placement of latrines and water points to minimize girls' and women risk of sexual violence en route.

- Provide hygiene education for family and caregivers with clear instructions on how to wash and where to dispose of waste when providing care to chronically ill persons.
- Help to dispel myths about contamination of water with HIV, thereby reducing discrimination against people living with or affected by HIV/AIDS.
- Facilitate access to sanitation for families with chronically ill family members; people living with HIV/AIDS may have difficulty accessing services due to stigmatization and discrimination and limited energy to walk long distances or wait in queues.
- Include appropriate sanitation facilities in health centres and education sites, and provide hygiene education in emergency education programmes.
- Make extra efforts to ensure that the voices of people living with HIV/AIDS are heard either directly or indirectly by representation; infected people and their families can be inadvertently or intentionally excluded from community based decision making.

CAFOD has developed an approach to analysing the interconnectedness of emergencies and HIV/AIDS (see Table 3.4). This analysis suggests a set of key questions that can be asked by practitioners working in sectors such as water supply and sanitation, to ensure that activities are planned and carried out with an awareness of HIV/AIDS.

Table 3.4. Water Supply and Sanitation and HIV/AIDS Checklist
(Source: Smith & Dutton, 2004)

Question 1:
How does the current emergency affect the well-being of people already infected with HIV? *Emergency's effect on people with HIV/AIDS*
How does HIV/AIDS affect the current emergency and post-emergency rehabilitation? *HIV's effect on emergency*

What are the implications for humanitarian aid practitioners? *Consequences for policy and practice*

Question 2: How does the emergency affect people with HIV or AIDS?
General escalation of infectious diseases because of poor/no sanitation and increased pathogens in water.
Inability of families affected by HIV to maintain good infection control standards, to adhere to water-based treatment regimes or to sustain desirable levels of personal hygiene
Consequently a more rapid health deterioration among children and adults with HIV or AIDS.

Question 3: How do HIV and AIDS affect emergency and rehabilitation responses?
Reduced ability to cope of families affected by HIV because their reserves are already depleted. Thus family and community recovery may take longer.
Sick family members cannot walk long distances to water supply or toilet facilities
Child-headed households resulting from AIDS
May not be able to carry larger water rations/operate heavy machinery for pumping water etc
May not be counted in needs assessment surveys

Question 4: What are the implications for humanitarian aid practitioners?
Ration sizes may vary, e.g. families with sick members might need more water for washing
Water quality more critical for immune-compromised people
Location of, & supervision at, water distribution points, washing facilities & toilets (security from sexual violence e.g. well-lit single-sex toilets located centrally not peripherally- & easy access for sick people)
Programmes administered by women & men
Families' ability to cope is reduced, e.g. smaller water containers, collective labour, reduced skills
Priority target groups may be different e.g. may include families with sick members, child-headed households, single women, unaccompanied children
Increased training/skills and support needs of practitioners because of HIV

Children's and infants' excreta

Children's faeces are generally more infectious than those of adults since children's immune systems take several years to develop, and many young children are unable to control their defecation. Consequently, preventing indiscriminate defecation by children is a high priority in many emergency situations. Some key points related to children's and infants' excreta are outlined below:

- The implications for proper disposal of excreta are immense: diarrhoea, which is spread easily in an environment of poor hygiene and inadequate sanitation, kills about 2.2 million people each year, most of them children under five.
- Children under five often make up a significant proportion of the population in many poorer countries – up to 20% in some instances, and this may be considerably higher in some emergencies.
- People often feel that sanitation facilities are not appropriate for children, or that children's faeces are not harmful.
- Children are both the main sufferers from excreta-related diseases and also the main excreters of the pathogens that cause diarrhoea (UNHCR Handbook, 2000). Special measures must be taken to ensure the safe disposal of children's and infants' excreta and to provide adequate and specialized facilities for children.
- This issue must be discussed with mothers especially to identify whether nappies, potties or specially designed latrines will be necessary. The unsafe disposal of child stools, and failure to wash hands with soap (or ash) after coming into contact with stools, are probably the main practices which allow microbes into the environment of the vulnerable child.

Depending on the age of the child, the principal defecation sites for young children are in potties, appropriately designed toilets, diapers, and on the ground in or near homes.

Even if it was the case before the emergency, children should be discouraged from defecating directly on the ground due to the potential public health risks which could be encountered due to high numbers of children often in a relatively small area in camps. This should be particularly communicated with parents of children who are mobile (generally children older than 12 months of age) as greater mobility allows children to get out of view of the parents more quickly and they may be able to defecate without their parents' awareness. In such instances it is important to monitor toddlers and make sure that stools are disposed of adequately.

To ensure the proper use of latrines by children, they must be made safe for children and must be able to be used at night. In terms of security, there should be some form of lighting for communal units so that they can be used at night, and it may sometimes be necessary to provide guards.

Other Criteria

There are a number of barriers to safe excreta disposal for children under the age of five years old which need to be addressed in programmes. These include:

- Inadequate access to sanitation facilities;
- Financial constraints;
- Construction unfriendly to children;
- Knowledge deficits;
- Unsafe social/hygiene behaviours; and
- Socio-cultural constraints.

Programs can be implemented which address these barriers through:

- Expanded access to child-friendly facilities;
- Reducing the costs of facilities by reducing their size and superstructure to accommodate children;
- Addressing the knowledge level of care-givers;

?? Promoting safe behaviours in a playful way for children;

?? Identifying constraints and solutions with input from genuine decision-makers in households and communities.

While in emergency events it may not be possible to incorporate many aspects of child-friendly designs into latrines, it is nevertheless important to plan facilities taking into account certain considerations, such as smaller sized latrines and squat holes, so that the greatest uptake by children is encouraged. A number of different response options are summarized in Box 3.2.

Box 3.2. Excreta disposal solutions for infants and children

In camps in Freetown, Sierra Leone, 2000, potties were distributed to all families with children under five – one potty between two children.

In Albania and Macedonia in 1999 disposable nappies were provided in some of the hygiene kits distributed to refugee families by aid agencies. Whilst they were convenient they were also difficult to dispose of and were often found to be creating an additional Public Health risk as they were often found littered around the camp. Washable nappies would have been preferable and mothers claimed they preferred them as it was what they were used to.

In Rwanda in 1994 special children's latrines were provided in IDP camps and used by children of two years and above. The latrines had smaller squat holes and were open so that children were not frightened of using them.

In the cyclone-affected areas of Sindh Province, Pakistan, in 1999 the normal practice was to cover infants' faeces with mud and discard these outside the house. In response, a hygiene promotion programme commenced to raise awareness of the associated health risks and successfully persuaded mothers to bury infants' excreta further away from dwellings.

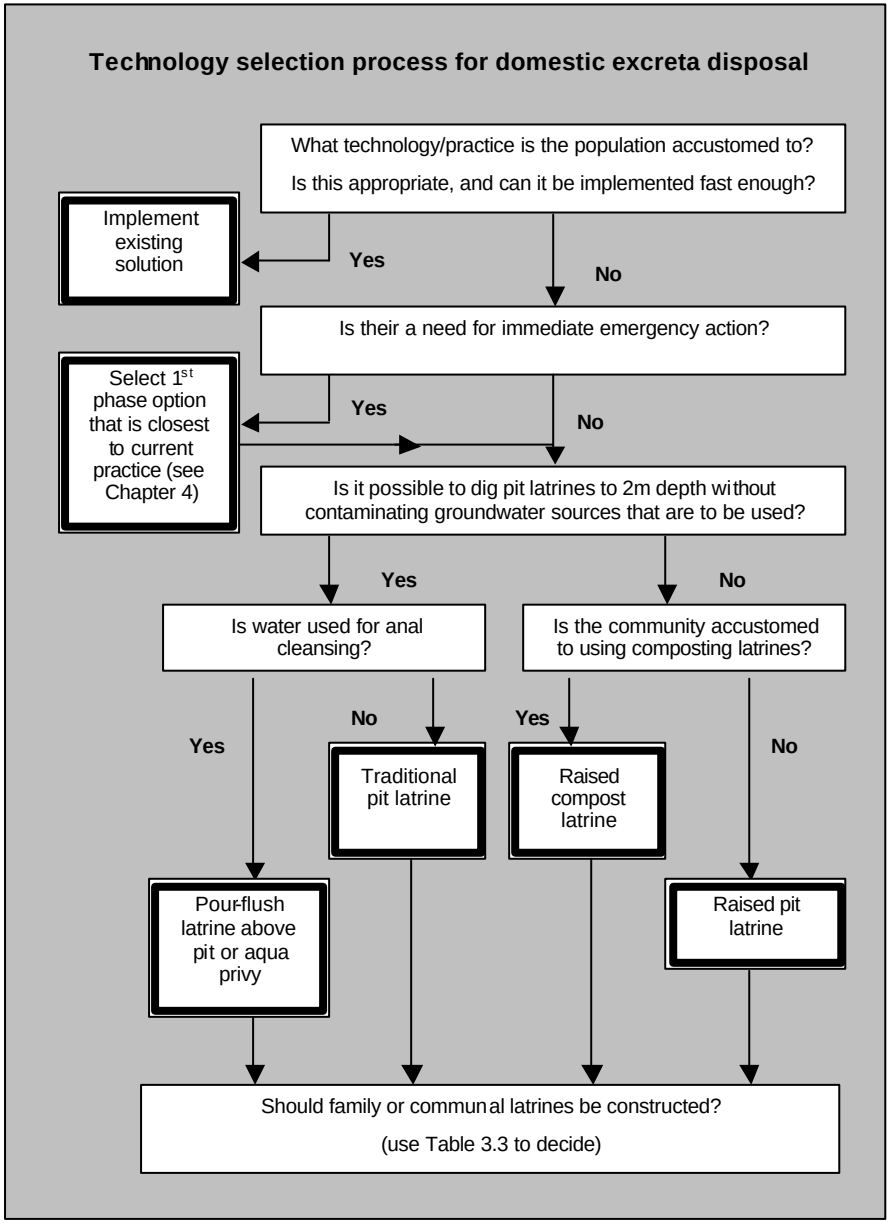
Selecting appropriate technologies

In selecting appropriate excreta disposal interventions there are many criteria that must be considered. These include:

?? Socio-political factors
?? Socio-cultural factors
?? Available space
?? Ground conditions
?? Water availability
?? Anal cleansing material
?? Menstruation
?? User-friendliness (e.g. for children)
?? Time constraints
?? Design life
?? Mandate of agency
?? Financial constraints
?? Availability of local materials
?? Transportation means
?? Human resources
?? Operation and maintenance

It is important that technologies are not pre-decided before adequate assessment and consultation. In some cases latrine construction might not be the most appropriate option. For example, in rural communities where people go to the bush to defecate and population densities are low, it may be perfectly acceptable to continue this practice while encouraging people to bury faeces.

Even during chronic emergencies, there should be a participatory approach to selecting appropriate interventions that considers environmental and social issues. A simplified technology selection process for domestic excreta disposal is summarized in the box below. Options for implementation in the first and second phases of an emergency are presented in chapters 4 and 5 respectively. Alternative options for difficult situations are presented in chapter 6.



3.3 Implementation

Implementation is transforming a planned programme into reality in the field. To ensure that implementation runs smoothly it is first necessary to have a properly thought-out plan, or programme design. Once the planning has been done, implementation is simply a question of managing the various programme components as efficiently and effectively as possible.

The primary goal of any excreta disposal programme is to:

Improve and sustain the health and well-being of the affected population.

Such a goal is crucial and should be kept in mind at all times during implementation. All activities should be geared towards this ultimate goal. Implementation targets are simply a means to an end and should always be viewed as such.

The term 'implementation' should not apply solely to the practical implementation of activities outlined in the detailed programme design. It should also apply to the day-to-day planning of those activities and how they are to be managed or co-ordinated. It also includes how contingencies are to be planned for and managed, and how the programme is to be monitored.

Implementation involves managing, planning for, and monitoring the seven key components indicated below. These components can then used to form frameworks for implementation and monitoring.

?? **Staff** – ensure fair recruitment and remuneration; provide job descriptions, appropriate training, supervision, and security.

?? **Resources** – use locally available materials and tools wherever possible, to stimulate and contribute to the local economy and to avoid extensive delays caused by ordering, purchase and transportation of resources from international sources.

?? **Finances** – in preparing budgets generous margins should be made to allow for contingency plans, operation and maintenance costs; in most situations it is best to budget for the long term, as it is likely to be easier to secure funds in the earlier stages of an emergency.

?? **Time** – ensure time is managed effectively and that activities are prioritised; breakdown activities into short, distinct time-bound

targets; allow realistic time-frames for logistical procedures and training needs.

?? **Outputs** – completed facilities or services, effective operation and maintenance systems and improvements in hygiene practice must be constantly monitored to assess progress and priorities.

?? **Community** – community members should be involved in programme development and in various areas of implementation (i.e. not just by providing construction labour); ways in which to promote and sustain the capacity and self-sufficiency of the affected community must continually be sought.

?? **Information** – develop an information flow system that runs through the technical team, hygiene promotion team, logistics and finance; develop reporting formats, schedules and a regular meeting plan with the team and other key stakeholders.

Programme management

A common problem affecting emergency relief programmes is ineffective management of the components listed above. Programme management can be defined as the planning, organisation, monitoring and control of all implementation components. This must, however, be coupled with motivation of all those involved in a programme to achieve its objectives. The management and co-ordination of activities is necessary to:

?? achieve the programme objectives and targets;

?? take immediate corrective actions for problems encountered;

?? promote better communication among technical and hygiene staff in order to harmonise resources and activities for the achievement of project objectives; and

?? establish communication between the affected population and other stakeholders.

The programme co-ordinator or manager is responsible for ensuring that these aims are met. The key roles of any manager are to:

?? plan;

?? lead;

?? organise;

?? control; and

?? motivate.

Management can involve any or all of the following:

?? Self-management

?? Recruitment and training

?? Motivation and supervision

?? Contract negotiation

?? Conflict resolution

?? Information and record keeping

?? Communication and report writing

?? Financial management

This is not an exhaustive list; a good manager should, however, be adept at each of these and adopt a management style suitable for the current situation. For example, in the immediate stage of an emergency it may be appropriate to adopt a directive management style, whereby decisions are made rapidly with minimum input from subordinates. It is unlikely that such an approach would be appropriate in later stages of the programme, however, where a more consultative style may be more effective. Therefore, a flexible management style is likely to be necessary.

Managing implementation

A simple way to manage programme implementation is to use implementation milestones. This technique can be used with a multidisciplinary management team and usefully feeds into the monitoring process. A milestones table should be produced for each intended project output in the logical framework. Each table lists time-

bound specific targets or 'milestones' which are necessary to achieve the project output. The table also includes who is responsible for achieving each milestone and when they should be completed. The final column is to be used by the management team to monitor programme progress, identify any problems or constraints, and make changes to implementation plans and time-frames.

Table 3.5 shows the typical framework for a milestones table with examples of the type of milestones and responsible bodies that may be included.

Table 3.5. Implementation by milestones

Selected milestones (general examples)	Who	When (date)	Current status
Recruitment	Agency staff		
Training of staff	Agency staff		
Resource procurement	Logistics team		
Construction of latrines	Construction team; Community		
Hygiene promotion activities	Hygiene promotion team; Community		
Monitoring activities	Agency staff; Community; Other agencies		

Contingency planning

Due to the unpredictability of many emergency situations, a key aspect of managing an emergency programme is the ability to undertake contingency planning for unforeseen events. In any emergency situation, it is difficult to plan for everything and impossible to predict exactly what will happen during the implementation phase. It is worth considering what assumptions have been made during programme

design, and what is likely to happen if these assumptions prove to be wrong.

Whilst it is not necessary to make detailed contingency plans, it is good practice to consider possible emergency situations such as an influx of a large number of refugees, an outbreak of cholera or an increased security threat. Contingency plans may include:

- **Training:** appropriate training of staff in contingency procedures
- **Equipment:** local storage of small stocks of equipment in case of emergency
- **Sites:** identification of possible sites for relocation/settlement of refugees
- **Logistics:** identification of most efficient transport types and access routes

Co-ordination

One common problem in sanitation programmes is the lack of communication and collaboration between technical staff and hygiene promotion staff. This is largely a result of the fact that personnel with different professional backgrounds and interests are usually employed for each. This book takes the approach that hygiene promotion activities are an essential part of any sanitation programme and hence all activities should be integrated from the onset of implementation. Integration of personnel and cross-sectoral activities are key factors in achieving this aim.

It is also essential that there are good communication links between the affected community and other stakeholders, in order to avoid conflict and promote co-operation. These links should be co-ordinated by the programme manager.

The manager may also be responsible for co-ordination with other programmes and agencies working in the programme area. Ideally, different activities within the same agency should be integrated, and co-operation or collaboration with other agencies should be encouraged where possible. Integrated programmes may include sanitation, hygiene promotion, water supply, food distribution and health care activities.

4. 1st Phase Technical Options

4.1 Immediate action

Once the outline programme design has been produced, immediate actions should be implemented to stabilize the current situation and prevent rapid deterioration as a result of disease transmission. A range of technical options for immediate action in the first phase of an emergency are presented in this chapter.

First phase excreta disposal options should:

?? be rapid to implement;

?? be simple and easy to understand;

?? use locally (or rapidly) available materials and resources;

?? successfully contain excreta and separate it from sources of food and water; and

?? have minimal negative impact on future interventions and the environment.

The priority for first phase options is undoubtedly speed of implementation. It is essential that technologies can be installed rapidly to contain excreta. Options may have limited socio-cultural acceptability due to the need for speed, but wherever possible members of the affected community should be consulted regarding the distribution and type of facilities to be implemented. Efforts should be made to separate facilities by sex and to address any major cultural practices or beliefs relating to excreta disposal. If this is not done there is a real danger that facilities will not be used at all.

Selected options are likely to have limited sustainability, since they are designed for use in the immediate emergency phase only. It is important, however, that likely future excreta disposal options are considered at this stage to ensure that immediate measures do not have a detrimental effect on longer-term solutions.

4.2 Managing open defecation

In the initial stages of an emergency, areas where people **can** defecate, rather than where they cannot, should be provided immediately. These should be located where excreta cannot contaminate the food chain or water sources.

In some emergency situations it may be perfectly acceptable for the affected population to practice open defecation. Indeed, in some cultures defecating in the open is preferred to using a latrine. Where people are accustomed to open defecation it may be appropriate to continue this, providing there is adequate space and vegetation to allow people to find an appropriate defecation space so that the risk of disease transmission is minimised.

Where open defecation is not the norm but there is insufficient time to provide facilities for a disaster-affected population, open areas or fields surrounded by screening may be set up, with segregated sites for each sex. People should be encouraged to use one strip of land at a time and used areas must be clearly marked. It is also possible to use internal partitions to provide more privacy and encourage greater use.

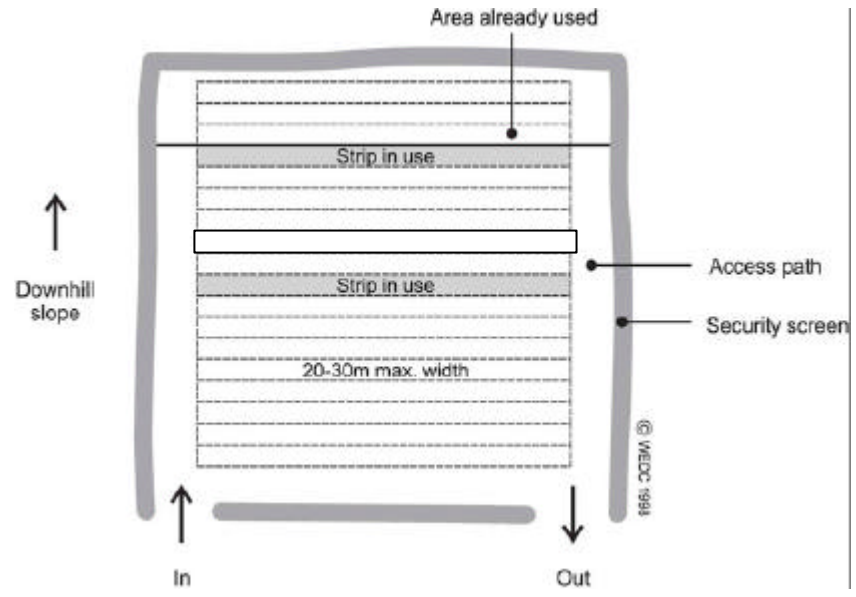
It is essential that defecation areas are:

- ?? far from water storage and treatment facilities;
- ?? at least 50m from water sources;
- ?? downhill of settlements and water sources;
- ?? far from public buildings or roads;
- ?? not in field crops grown for human consumption;
- ?? far from food storage or preparation areas.

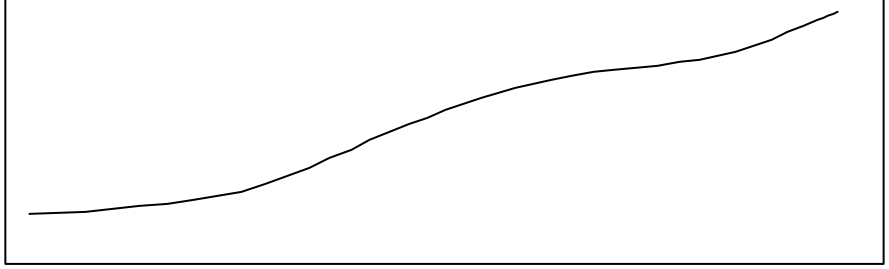
Advantages: Rapid to implement; minimal resources required; minimises indiscriminate open defecation.

Constraints: Lack of privacy for users; considerable space required; difficult to manage; potential for cross-contamination of users; better suited to hot dry climates.

Open defecation field



Dimensions



In really extreme situations it may be necessary to make open defecation fields by just marking off areas with tape. However, this is rarely necessary and the lack of privacy may make them ineffective. It is nearly always possible to at least surround an area in plastic sheeting or fabric and dig a few shallow trenches.

Whilst simple in concept and construction, the operation of defecation fields requires careful control to ensure they are used as intended to keep health risks to a minimum. Attendants will need to be recruited and provided with training to encourage effective use of the trenches and to encourage hand-washing following use. A network of Public Health Promoters will also be needed to sensitise the population on the importance of using the fields. It is rare that these fields will be used by everyone, as privacy will be a major issue, and therefore they should only be instigated if the risks are significant and if there is no other rapidly implemented alternative.

Location of defecation fields

The location of the field must be discussed with the population. The field should be at least 30 metres from dwellings but located as centrally as possible to the people who are going to use them (within 100 metres of shelters if possible). They should be on land sloping away from the camp and surface water sources, the field should be surrounded by a drain so that surface water cannot enter and to prevent any runoff from the field contaminating other areas. Whilst an open field is easier to manage, the affected population may prefer a site with trees, and bushes to provide privacy. Consideration should be given to the direction of prevailing winds, to reduce nuisance caused by odour. Areas subject to flooding or containing running water should be avoided. The soil should be easy to dig so that faeces can be buried. The defecation field should be provided with adequate surface drains to prevent surface water running across them from above and to collect and contain any seepage of liquid effluent.

Operation of defecation fields

Users need to be encouraged to use the strips furthest away from the entrance and to cover their own excreta with earth and to wash their hands afterwards. To ensure the sanitary use of the field:

?? provide full time supervision in the form of paid attendants;

?? provide anal cleansing materials and methods for its safe disposal;

?? provide hand-washing facilities.

Each field should have at least two persons present at all times to guide the individual to the right area and ensure that other areas of the field are not used. Marking tape and paint are in the ***Oxfam Defecation Field Kit (Code LF/1)*** to facilitate marking out of the zones and for making signs to direct people to the correct area for defecation and for posting other simple messages on any suitable board or surface. Also, in the ***LF/1 kit*** is a 200l plastic barrel which can be situated at the entrance of the area. Soap or ash will also need to be provided for effective hand-washing. If neither is available, the barrel can be filled with a 0.05% chlorine solution. A 0.05% solution is made by adding half a table spoon (7.5g) of HTH (70%) chlorine granules, or 15g of bleach, to 10l of water. It may be necessary to provide extra hand-washing facilities depending on the numbers of people using the field. All excreta should be covered with soil as soon as possible to prevent the breeding of flies and reduce odours. If the users do not cover their faeces then the attendants should.

Where water is used for anal cleansing, a container of water should be supplied at the entrance to the field, together with small pots for individual use. This can be managed by the attendants along with the hand-washing facilities. Where solids are used, the appropriate material may also need to be provided along with receptacles to collect soiled material. These materials should then be buried or burned and not deposited where they will create a health hazard.

Wherever possible avoid defecation fields and install trench latrines as a first option.

4.3 Shallow trench latrines

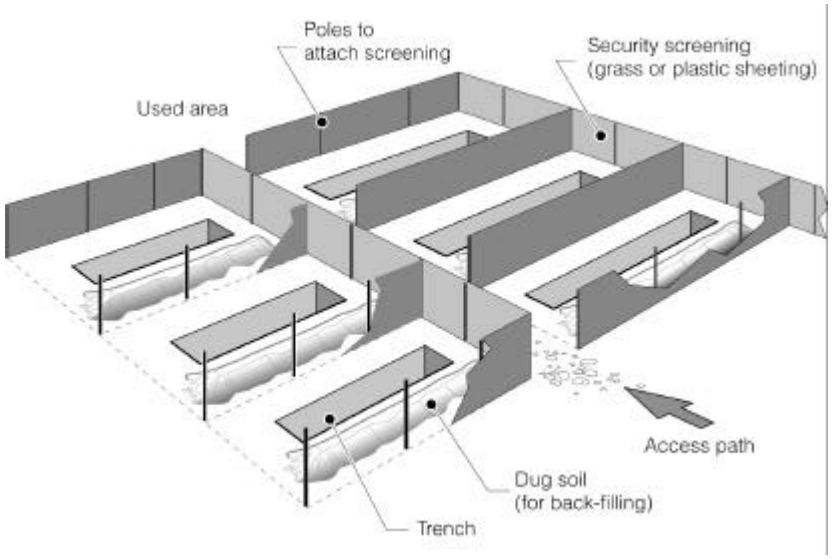
A simple improvement on open defecation fields is to provide shallow trenches in which people can defecate. This allows users to cover faeces and improves the overall hygiene and convenience of an open defecation system. Trenches need only be 20-30cm wide and 15cm deep, and shovels may be provided to allow each user to cover their excreta with soil.

Divide the field into strips 1.5m wide with access paths**.** Use strips furthest from the entrance first. When a section of trench has its bottom layer fully covered with excreta it is filled in. Only short lengths of trench should be opened for use at any one time to encourage the full utilization of the trench in a short time. It may be appropriate to have a number of trenches open at the same time. A rule of thumb is to allow 0.25 m^2 of land per person per day. This means 250 m^2 per 10,000 people per day, or nearly 2 hectares per week. Men and women's areas should always be separated.

Advantages: Rapid to implement (one worker can dig 50m of trench per day); faeces can be covered easily with soil.

Constraints: Limited privacy; short life-span; considerable space required.

Shallow trench latrines



Side elevation with dimensions

4.4 Deep trench latrines

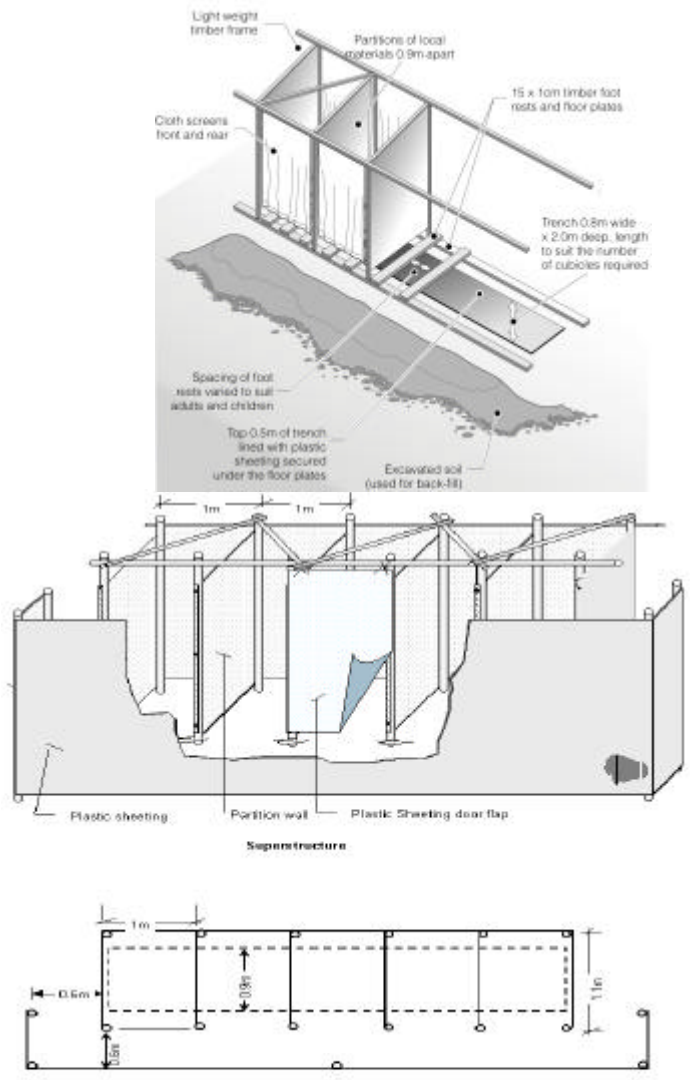
Deep trench latrines are often constructed in the immediate stage of an emergency and will be appropriate if there are sufficient tools, materials and human resources available. These involve the siting of several cubicles above a single trench which is used to collect the excreta. However, care should be taken not to provide too many latrines side by side. The recommended maximum length of trench is 6m, providing six cubicles.

Trenches should be 0.8 -0.9m wide and at least the top 0.5m of the pit should be lined. After the trench has been dug the quickest option is to put self-supporting plastic slabs straight over the trench. If slabs are not available then wooden planks can be secured across the trench until proper wooden or concrete slabs can be made. The trench should be covered with planks leaving out every third or fourth plank, which is where people defecate. Ideally, all designs should be previously discussed with the community and should take into account the safety of women and children and elderly or disabled people.

Advantages: Cheap; quick to construct; no water needed for operation; easily understood.

Constraints: Unsuitable where water table is high; soil is too unstable to dig or ground is very rocky; often odour problems; cleaning and maintenance of communal trench latrines are often poorly carried out by users.

Deep trench Latrines



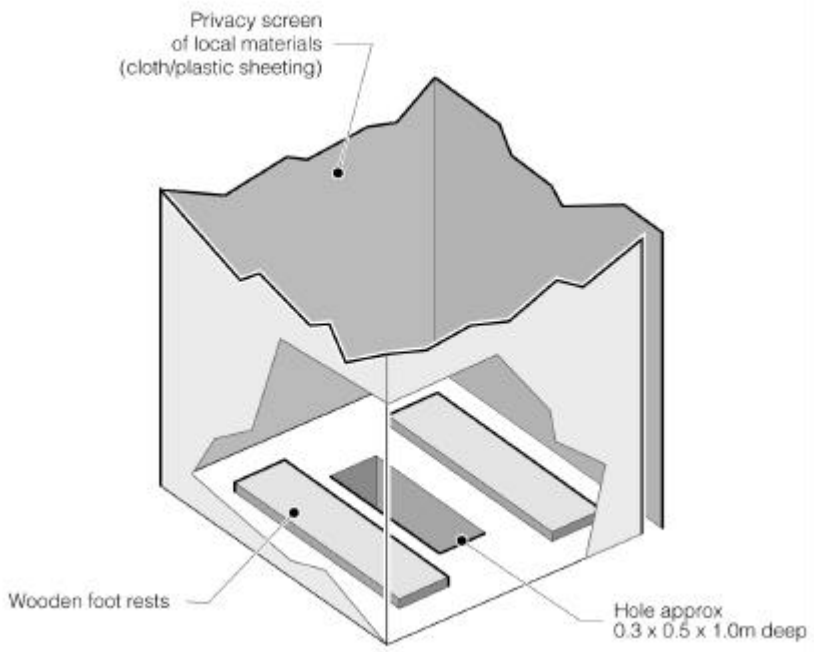
4.5 Shallow family latrines

In some situations it may be more appropriate to provide shallow family (rather than trench) latrines. This is particularly suitable where people are keen to build their own latrines or have experience of latrine construction. A shallow pit of approximately 0.3m x 0.5m x 1m depth may be excavated. Wooden foot rests or a latrine slab (approximately 0.8m x 0.6m) can be placed over this, overlapping by at least 15cm on each side. This latrine should be an immediate measure only and back-filling should occur when the pit is full to within 0.2m of the slab. A simple superstructure for privacy can be made from local materials.

Advantages: Increased privacy; rapid to implement; reduced labour input from agency; allow people to actively participate in finding an appropriate solution.

Constraints: Community must be willing and able to construct family latrines; difficult to manage siting and back-filling of pits; large tools and materials required.

Shallow Family Latrine



4.6 Bucket and packet latrines

Bucket latrines

In situations where there is limited space it may be appropriate to provide buckets or containers in which people can defecate. These should have tight-fitting lids and should be emptied at least daily. Disinfectant may be added to reduce contamination risks and odour. Containers can be emptied into a sewerage system, a landfill site or waste-stabilisation ponds. This measure will only be appropriate where there are no other immediate acti on options and users find the method acceptable, it is therefore not used in most situations.

Advantages: Defecation containers can be easily procured and transported; once containers are provided only the final disposal system need be constructed; can be used in flooded areas.

Constraints: Many people find the method unacceptable; large quantities of containers and disinfectant are required; extensive education regarding final disposal required; containers may be used for alternative purposes.

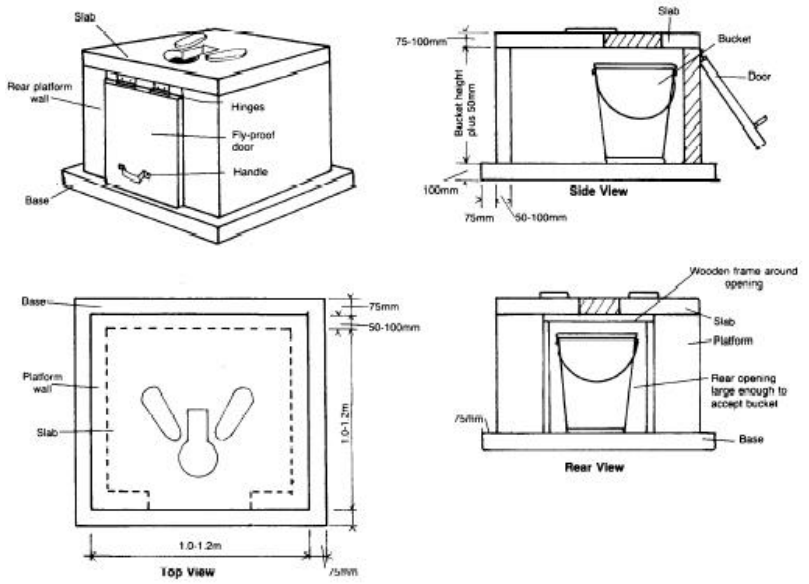
Packet or 'flying' latrines

In some emergency situations relief agencies have provided disposable packet latrines. These are plastic packets (similar in appearance to a plastic bag) in which the user can defecate, the packets contain a blend of enzymes which assists the breakdown of the excreta, and must be disposed of in a safe place. These are sometimes referred to as 'flying' latrines since the packets can be thrown into a disposal pit.

Advantages: Lightweight and easy to transport; may be used where space is severely limited or in flooded areas.

Constraints: Method may not be acceptable to affected population; final disposal site must be clearly marked, accessible and used.

Bucket Latrine



4.7 Chemical toilets

Chemical toilets (known as "porta-loos") are portable sanitation units that consist of a sit-down toilet and water-tight excreta holding tank, which usually contains a chemical solution to aid digestion and reduce odour. This is contained in a single prefabricated plastic unit with a lockable door. They range in quality from very basic units to luxury units which come complete with warm water hand washing facilities.

Chemical toilets have been adopted to permanent solutions where pit latrines or septic tanks are unsuitable or unacceptable. The initial charge of chemical is adequate for 40 to 160 uses, depending upon the model. Floors are typically made from non-absorbent material, and the finish is easily cleanable. There is often a means of ventilation through a screened pipe which extends above the roofline.

Chemical toilets have been used in a variety of humanitarian situations including the Kosova refugee crisis in 1999 and in response to the floods in Dominican Republic in 2003 where people were displaced from their homes into community shelters. They were also implemented in response to earthquakes in Turkey and Greece in 1999, and the Iraq crisis (in 2003/04) where chemical toilets were provided in a range of centres throughout the country where people would take shelter.

There are several considerations that should be taken into account when implementing this solution. The siting of the toilets is important as they must be serviced and desludged regularly to prevent overflow. This means that the toilets must be located in an area that can be accessible to a big truck. However, another important consideration is that because of their strong smell, especially when they are being cleaned, it may not be preferable to locate them close to public thoroughfares or close to areas where people are living. The toilets must also be positioned on a very flat surface to avoid them tipping over.

Advantages: Portable; hygienic; minimised odour; can be mobilized rapidly.

Constraints: High cost; difficult to transport; unsustainable; regular servicing and emptying required; uncommon outside Europe, North America and parts of Latin America.

DRAFT – OCTOBER 2004

Box 4.1. Chemical toilets deployed in flood response in the Dominican Republic

The use of chemical toilets were chosen in flood response in Dominican Republic in 2003 as they were mobile and could be quickly deployed, once local suppliers were identified. The toilets arrived approximately 2 days after people had been in the shelters and supplemented latrines already at these sites. The cost of 30 units for the first month was US$ 148 each and for the next 2 months US$ 118 each per month for 40 units. The total cost in Monticristo for these toilets was US$ 13,880. Chemical toilets at displaced centres were a rapid and effective solution as was the initial period of installation in the communities as all latrines were either flooded or destroyed.

In this case, two types of chemical toilets were used – one which had a separate urinal for men and one with a box seat. In these particular toilets, prior to use the excreta holding tank is charged with a mixture of water (between 30 and 100 Litres) and chemical concentrate. The chemical is a solution of sodium hydroxide or other approved chemical. Its purpose is to disinfect, to neutralize offensive odours and to convert waste into sludge that can be deposited into a sewer without any adverse effects.

The latrines were cleaned every other day. While there were no problems during everyday usage, the strong smell which came up every time the toilets were cleaned so the latrines were moved to a different location away from the shelters after the first monitoring round. The chemical toilets were used for a longer duration of time than originally planned because the second-phase intervention, the construction of twin pit dry latrines had taken longer to construct than originally planned.

It was necessary to find level ground to site the toilets – in this photo, toilets were installed on the roof of a community centre, and a ladder was provided at the rear of the building. One toilet was provided beside the building for use by disabled or elderly people.

Lessons Learned: Various problems were encountered – a main disadvantage was that the use of the toilets ended up being a relatively expensive solution, especially when the use lasted longer than originally expected. Siting was also an issue as the latrines needed to be in a location that was accessible to the cleaning truck, such as near a roadway or thoroughfare.

Hygiene promotion issues included providing an adequate amount of toilet paper for all people, in order to maintain hygienic conditions. Some people were afraid that the use of the toilet seats would transmit disease. Other problems were related to social aspects of communal toilet use, with families not wanting to share with other cultural groups (e.g. Haitian families) and with families wanting to move the toilets into their home for their own use.

In the future, provision for damage in the contract or insurance should be taken out to cover against unexpected accidents as on the units vandalised and burnt down in Los Solares. Insurance against theft and vandalism should be discussed with the local supplier. Also, Oxfam should have not left the toilets in the communities as long as they did. The slow removal was compounded by the slow start up of the raised compost latrine programme and in some cases when they were finished people preferred the chemical toilets and didn't want Oxfam to take them away. The community should have been involved from the onset of the process of implementing the toilets, and beneficiaries should have been informed of how long the toilets will be used for and the staging/phasing of sanitation in the community.

5. 2nd Phase Technical Options

A range of technical options for implementation during the second phase of an emergency are presented in this chapter. These are standard options that can be applied in most situations. Solutions for more difficult environments are presented in Chapter 8.

5.1 Simple pit latrines

Simple pit latrines are by far the most common technology choice adopted in emergency scenarios. This is because they are simple, quick to construct and generally inexpensive.

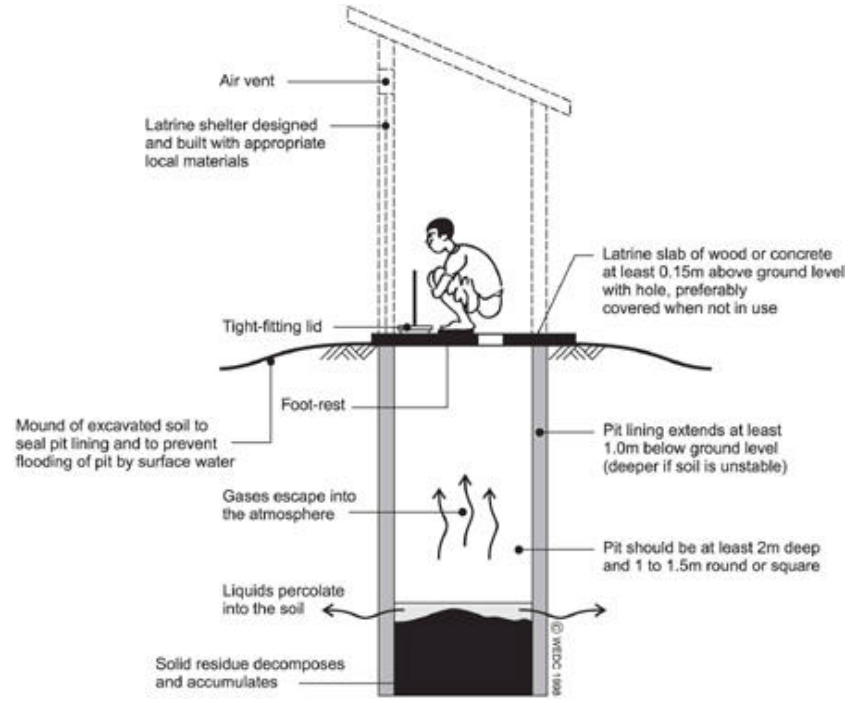
The pit should be 2m or more in depth and covered by a latrine slab. The slab should be firmly supported on all sides and raised above the surrounding ground level to prevent surface water entering the pit. If the soil is unstable, the pit should be lined to prevent collapse. A squat or drop hole is provided in the slab which allows excreta to fall directly into the pit, this can be covered with a removable lid to minimise flies and odour.

The superstructure can be made from materials available locally, such as wood, mud and grass, or can be a more permanent structure of bricks and mortar. The rate at which pits fill will depend on the sludge accumulation rate and the infiltration rate of the soil.

Advantages: Cheap; quick to construct; no water needed for operation; easily understood.

Constraints: Unsuitable where water table is high, soil is too unstable to dig or ground is very rocky; often odour problems.

Simple Pit Latrine



Dimensions

5.2 Ventilated-improved pit (VIP) latrines

The Ventilated Improved Pit (VIP) latrine is an improved pit latrine designed to minimise odour and flies. A vent pipe is incorporated into the design to remove odourous gases from the pit. This should be situated outside the latrine interior, should extend at least 50cm above the latrine superstructure, should be at least 30cm from the squat hole, and should ideally be black to increase solar heating of the air in the vent pipe, causing it to rise. Air should be able to flow freely through the squat hole and vent pipe; therefore no drop-hole cover is required.

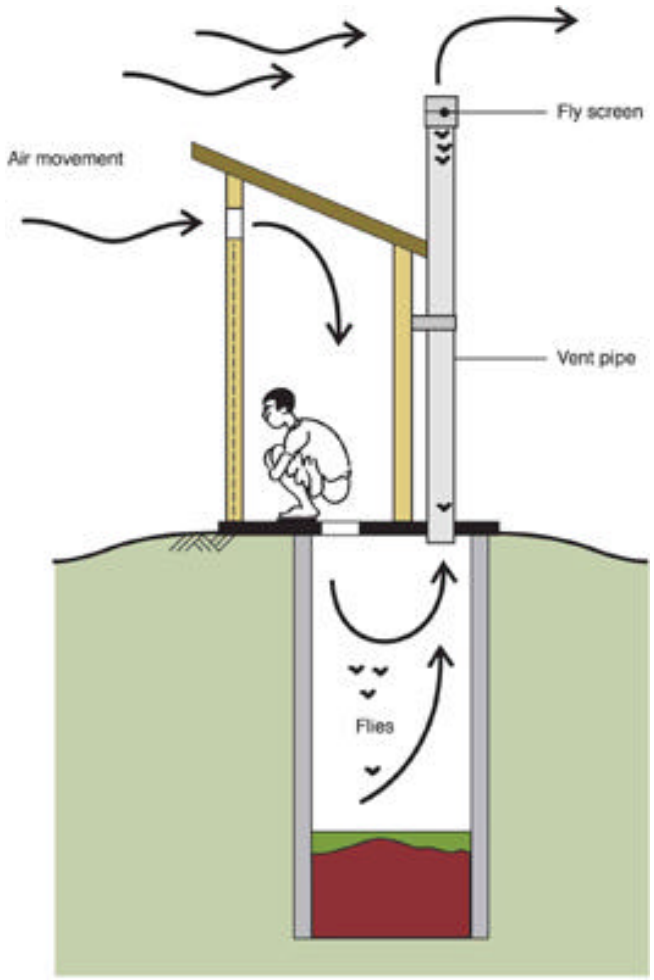
The open end of the pipe is covered with a gauze mesh or fly-proof netting which is designed to prevent flies entering the pit and trap any flies trying to leave. This should have a mesh size of about 1.2-1.5mm. The gases given off by the decomposition of excreta are very corrosive. For this reason, fly mesh made from mild steel will rot very quickly and plastic mesh will last about two years. Mosquito netting is often used but aluminium or stainless steel are the best materials for this purpose.

The superstructure interior should be kept reasonably dark to deter flies, but there should be a gap, usually above the door, to allow air to enter. This gap should be at least three times the cross-sectional area of the vent pipe (Franceys et al., 1992). Air flow can be increased by facing the door of the superstructure towards the prevailing wind. Each drophole should have it's own compartment and there should always be **one vent pipe per compartment.**

A wide variety of materials can be used for the vent pipe, such as uPVC, asbestos cement, fired clay, concrete or even mud covered bamboo or reed. If the pipe is smooth inside (such as plastic or asbestos cement) then an internal diameter of 150mm should be sufficient. Otherwise vent pipes should be at least 200mm diameter or square. The pipe should extend at least 0.5m above the superstructure roof to ensure the air flow is unobstructed.

Advantages: Reduced odour; reduces flies; good quality long-term solution.

Constraints: Difficult and expensive to construct properly; design and operation often not fully understood; construction may take time; dark interior may deter young children from use; does not deter mosquitoes; increased odour outside.



Dimensions

5.3 Pour-flush latrines

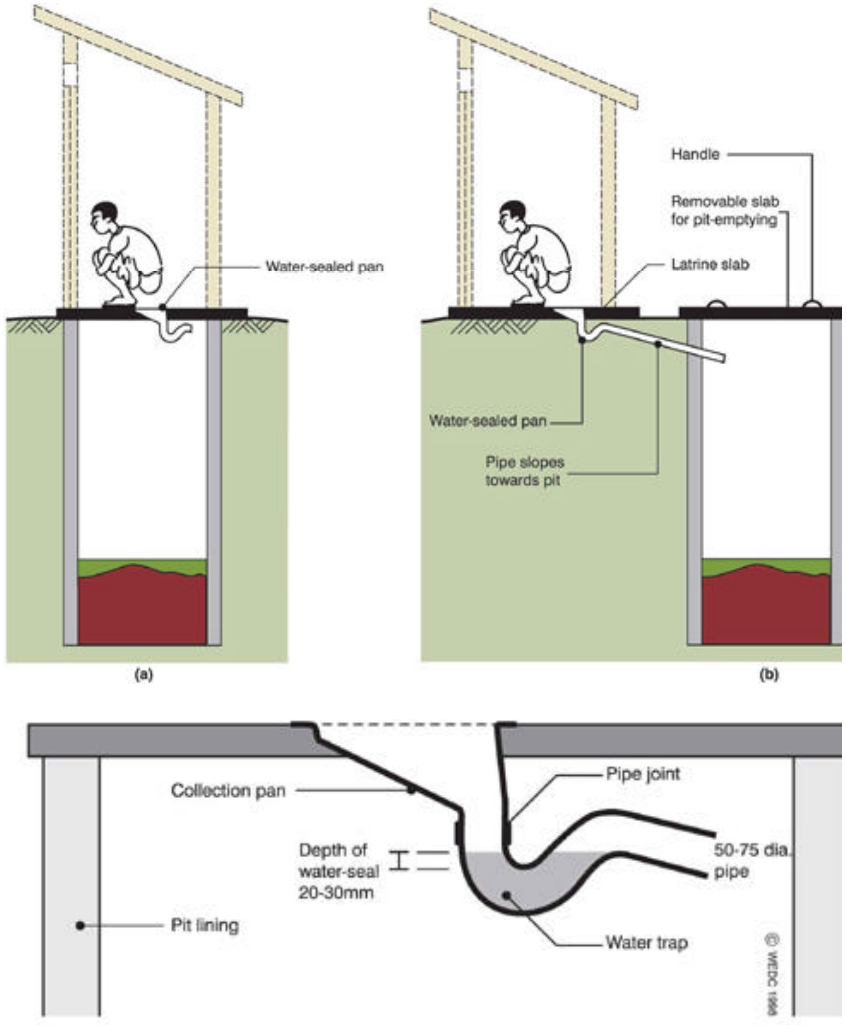
Pour-flush latrines rely on water to act as a hygienic seal and to help remove excreta to a wet or dry disposal system. The most simple pour-flush latrines use a latrine pan incorporating a shallow U-bend which retains the water. After defecation, a few litres of water must be poured, or thrown, into the bowl in order to flush the excreta into the pit or sewerage system below.

Pour-flush latrines may be constructed directly above a pit or may be offset whereby the waste travels through a discharge pipe to a pit or septic tank.

Advantages: Lack of odour; ideal where water is used for anal cleansing; easy to clean.

Constraints: Increased quantity of water required; solid anal cleansing materials may cause blockages; more expensive than simple pit latrines.

Pour-flush Latrines



Dimensions

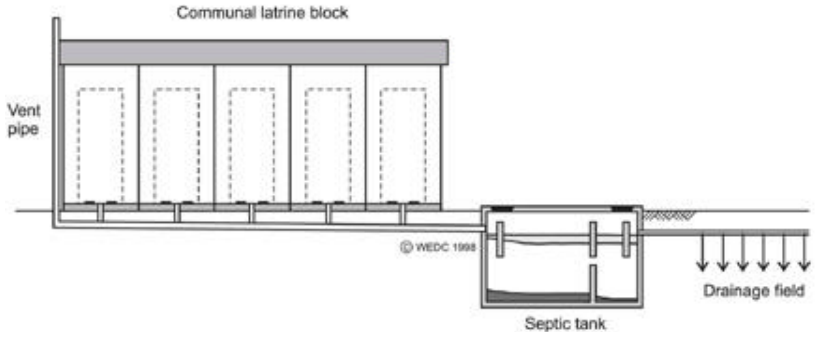
5.4 Communal aqua-privies

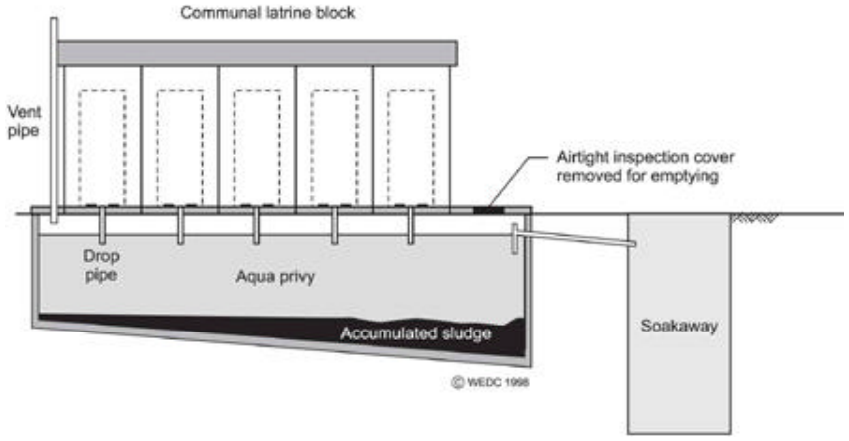
An aqua privy is simply a latrine constructed directly above a septic tank. Aqua privies are appropriate where pit latrines are socially or technically unacceptable but the volume of sullage is small. The amount of water required for flushing is much smaller than for a septic tank due to the location of the tank. The water seal pan and extension of the drop pipe 75mm below the water surface help to exclude odours from the superstructure. The tank of the aqua privy must be watertight to maintain a constant liquid level in the tank. The outlet pipe should extend at least 50mm below the water surface to provide an odour seal.

Advantages: Reduced odour; ideal where water is used for anal cleansing; easy to clean; more efficient to empty tank than for individual pour-flush latrines.

Constraints: Increased quantity of water required; solid anal cleansing materials may cause blockages; more expensive and more difficult to construct than simple pit latrines.

Aqua -privies





Dimensions

A septic tank is designed to collect and treat toilet wastewater and other grey water. Its use is likely to be appropriate where the volume of wastewater produced is too large for disposal in pit latrines, and water-borne sewerage is uneconomic or unaffordable. Septic tanks are therefore particularly suited to systems involving high water use, especially where water is used for anal cleansing.

Wastes from toilets, and sometimes kitchens and bathrooms, pass though pipes to a watertight tank where they are partially treated. After one to three days the liquid wastes leave the tank and are carried to a secondary treatment system. This is usually some form of underground disposal system, sewer or secondary treatment facility.

The treatment process in a septic tank occurs in four stages:

Settlement: Heavy solids settle to the base of the tank to form a sludge which must occasionally be removed; about 80 per cent of the suspended solids can be separated from the liquid in a well-designed tank.

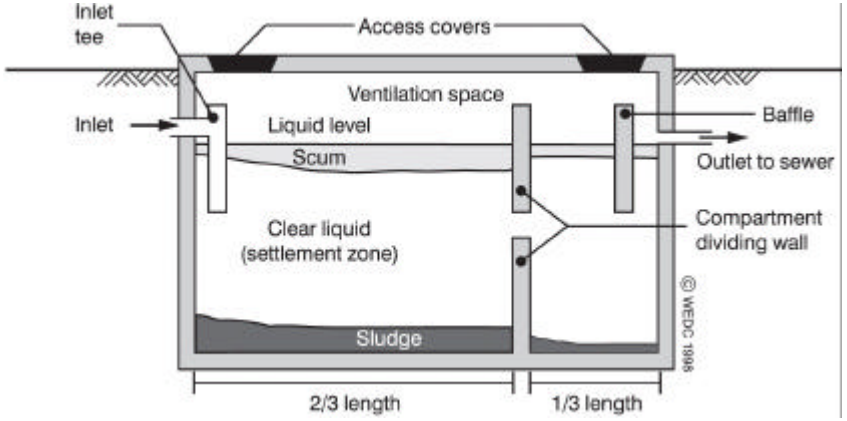
Flotation: Grease and oil float to the surface to form a layer of scum; over time this scum layer becomes thick and the surface may be hard.

Sludge digestion and consolidation: The sludge at the bottom of the tank is compressed by the weight of new material settling on top, increasing its density; and organic matter in the sludge and scum layers is broken down by bacteria which convert it to liquid and gas.

Stabilisation: The liquid in the tank undergoes some natural purification but the process is not complete; the final effluent is anaerobic and will contain pathogenic organisms such as roundworm and hookworm eggs.

The final effluent leaving the septic tank must be disposed of in an appropriate location such as a sealed pit or sewerage system.

Septic tank



Dimensions + design & sizing specifications

5.6 Composting latrines

Ecological sanitation (or Eco-San) refers to excreta disposal solutions which recycle nutrients from human excreta for agricultural production. The most common Eco-San option is the anaerobic composting latrine which uses a dry disposal system in which urine and faeces are managed separately. The deposited faecal matter is dried by exposure to heat or the sun and the addition of lime, ash, sawdust or earth, which controls the moisture content. Vegetable or other organic waste can also be added to control the chemical balance. The latrine contents are then isolated from human contact for a specified period to reduce the presence of pathogens and make the waste safe for handling. This period should be **at least** ten months and some practitioners recommend longer periods of two years or more. The longer the waste is stored the more pathogens will be destroyed. The waste may then be re-used as fertiliser or as fuel.

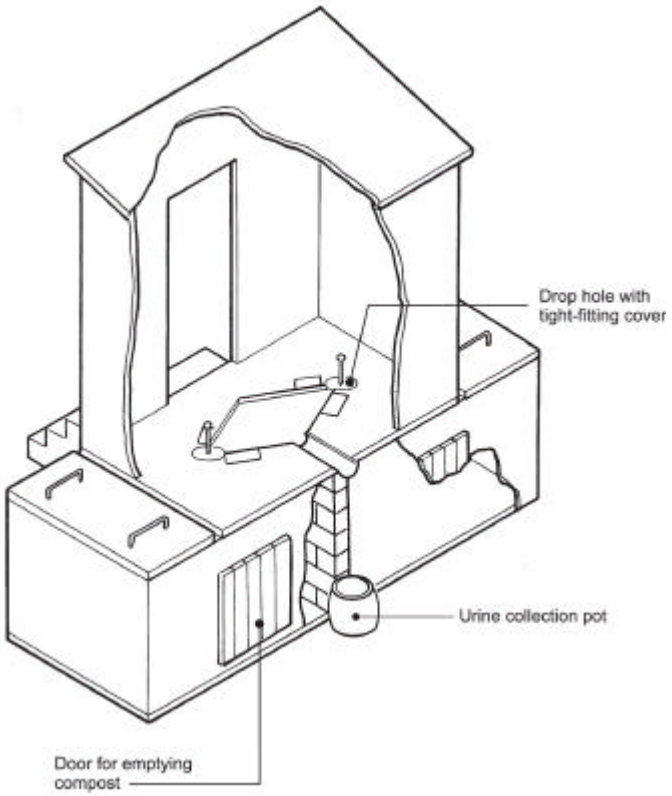
The primary difficulty in using this type of toilet is the separation of urine and faeces. Users have to be made aware of the importance of separation and the addition of ash after defecation. Such a system is unlikely to work where water is used for anal cleansing since this will increase the moisture content. In general, composting latrines are not appropriate in the initial stages of an emergency, due the time taken to educate, train and construct. However, it requires no water and can be adopted where infiltration techniques are impossible and may be a viable longer term option.

The double-vault composting latrine is a common solution in which one vault is used initially then sealed when full. The second vault is then used until that is full, at which point the first vault can be emptied and re-used. The vault size must be carefully calculated to ensure that the waste is retained for one to two years. Heavy usage, as is likely in many emergency situations, may lead to serious problems because of inadequate time for decomposition. **This type of latrine is rarely appropriate in an emergency, unless the population is already accustomed to using similar systems**.

Advantages: Reduced odour; ideal where the affected population normally uses composting latrines and agricultural activity occurs.

Constraints: more difficult to construct than simple pit latrines; high level of user awareness required; complex to operate and maintain.

Double-vault composting latrine



Dimensions + side elevation

5.7 Borehole latrines

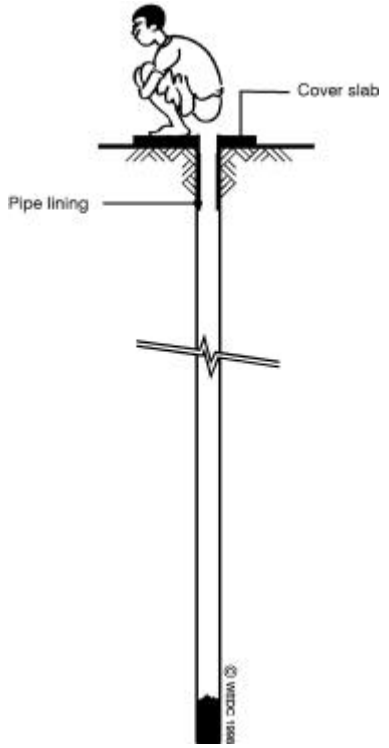
Borehole latrines can be constructed very rapidly if an auger or a drilling rig is available. A deep soil profile (more than 7m) is required which is relatively easy to drill with a hand auger or a mechanical drill. The borehole has a typical diameter of 400mm and a depth of 5-10m. A hole 300mm diameter and 5 metres deep should last a family of five approximately 2 years, depending on the material used for anal cleansing. At least the top 0.5 m should be lined although it is rarely necessary or appropriate to line the entire depth.

Borehole latrines are most appropriate in situations where boring/drilling equipment is readily available, where a large number of latrines must be constructed rapidly, and where pits are difficult to excavate, either due to ground conditions or lack of a suitable labour force.

Advantages: The borehole can be excavated quickly if boring equipment is available; suitable in hard ground conditions (where there are no large stones or rocks); and appropriate where only a small workforce is available.

Constraints: Drilling equipment is required; there is a greater risk of groundwater pollution due to greater depth than pit latrines; life span is short; sides are liable to be fouled, causing odour and attracting flies; and there is a high likelihood of blockages.

Borehole latrine



Dimensions + specifications

5.8 School latrines

In some emergency situations there may be a large proportion of school-age children and the need to provide excreta disposal facilities at schools in the affected area.

Table 5.1 summarizes the recommended **minimum** number of users per toilet for schools (in all cases numbers should be rounded up).

Table 5.1. Minimum toilet provision for schools
(Source: Deverill & Still, 1998)

Group	Females	Males
Nursery school children Age: 3 - 5 yrs	1 cubicle per 20 users + 1	1 cubicle per 20 users + 1
Primary school children Age: 5 - 12 yrs	1 cubicle per 30 users + 1	1 cubicle per 40 users 1 urinal space per 40 users
High school children Age: 12 - 18 yrs	1 cubicle per 30 users + 1	1 cubicle per 50 users 1 urinal space per 40 users
Teaching staff	1 cubicle per 10 users (with a minimum of 2)	1 cubicle per 10 users

It is essential that separate facilities are provided for boys and girls. The number of cubicles required for boys can be reduced by building urinals.

Hand-washing facilities should also be provided alongside latrines. Ideally, there should be **1 tap for every 4 cubicles**.

There is a range of latrine types that can be used for schools, including trench latrines, VIP latrines and aqua-privies. In general, toilet blocks consisting of 4-6 cubicles are easiest to construct and maintain.

School latrine design

In determining the layout of school latrines, the following factors should be considered:

Segregation: Toilets and hand-washing facilities for boys and girls must be segregated and situated in different parts of the school grounds to ensure privacy for girls.

Convenience: Facilities should be near enough to the school buildings to ensure that they are used. A **maximum distance of 50m** is recommended. Where some pupils have disabilities toilets must be designed appropriately and must be easily accessible to them.

Privacy: Tapstands for girls should be surrounded by a privacy wall or situated inside to enable them to wash sanitary cloths.

Security: Where possible facilities should not be right next to a fence or school boundary where the user may be afraid or intimidation or abuse.

School latrines can be made 'child-friendly' by incorporating certain design features, including:

?? squat toilets with smaller, 'child-size' holes;

?? for younger children toilets can be open (i.e. with no walls separating them), meaning they can talk to their friends while using the toilet instead of being in a small, dark enclosure;

?? providing for child-friendly colourful artwork on the sides of the superstructures; and

?? ensuring cubicle interiors are well-lit.

Schools can also be used to impart hygiene promotion messages to pupils and determine baseline behaviours. Children can be effective facilitators for hygiene promotion passing on messages to other children and family members.

Intervention agencies can work with schools and local communities to instigate sustainable school sanitation programmes (see Box 5.1).

Box 5.1. Providing school latrines in East Timor

(Source: ECHO Final Narrative Report – Water, Sanitation and Hygiene for East Timorese Children/ 2001 – 2002)

As a first step in developing a latrine design for schools in East Timor, Oxfam instigated a consultative process with the Ministry of Education (MoE), the Ministry of Health (MoH), Water Supply and Sanitation (WSS), community leaders such as the *aldeia* chiefs and headmasters, as well as potential users of the water systems, in order to assess the water and sanitation needs of target schools. Discussions included the project objectives, the respective responsibilities of all stakeholders, history of each school (including the destruction in 1999), and the community's views on any operational challenges that may be faced by Oxfam. An operational plan was developed based on these discussions.

Where a school was close to a community, discussions were held with each community and the relevant headmasters regarding the formation of a Water Management Committee (WMC). These meetings focused on the responsibilities expected of the WMCs/headmasters and the difference between the present political and social situation compared to the Indonesian-controlled times. Oxfam pledged technical training and organisation support to the WMCs while the community acknowledged their responsibility for the health of their children through the maintenance of the water supply and sanitation facilities. A commitment to establish WMCs was obtained from these discussions.

Prior to the construction of facilities, meetings were held between Oxfam and community representatives to discuss the most suitable facilties to be installed, as well as the most suitable WMC organisational structure to be established. The responsibilities of each member of the WMC was jointly decided and the WMC formally established with open and transparent proceedings. Community-recognised WMCs were formed to manage and maintain facilities in all communities linked to schools.

5.9 Wastewater treatment systems

In most emergency situations it is possible to use on-site excreta disposal systems whereby human wastes are disposed of without treatment. In some cases, however, it is necessary to treat wastewater prior to disposal. This occurs most often in densely populated areas where traditional on-site solutions cannot be implemented, these include urban environments, rocky terrains that do not allow pits to be dug, where prevention of groundwater contamination is crucial, or where there is simply a cultural resistance to 'third-world solutions'.

Collection and transport

Wastewater treatment systems achieve safe excreta disposal by first of all, collecting and transporting the waste from the settlement or designated area. This requires a much smaller area that that required for in-situ solutions providing on-site disposal of excreta such as pit latrines. Collection and treatment can be done essentially in three ways:

?? by temporarily storing the excreta in appropriate tanks and frequently emptying these by vacuum or similar trucks. Logistics and operating costs may be a problem with this as with chemical toilets.

?? by settling part of the waste in an arrangement similar to a septic tank and transporting the liquid portion of the waste to the treatment or disposal site by means of a small bore sewerage system by gravity or pumping. This considerably reduces the emptying frequency required but requires water for operation.

?? by transporting the whole waste directly to the treatment or disposal site by means of a larger bore systems and more water. These have some of the highest installation costs and require large amounts of water.

Treatment and disposal

The waste once collected and transported to a more suitable site may be either disposed as it is, or treated before disposal into a watercourse or pit. Simple disposal is not recommended due to the high pathogen content of the waste together with a high polluting load for the

environment; this may be the only option at the beginning of an emergency, though the risk may be mitigated by the addition of lime. Furthermore, UK NGOs may be legally bound to follow UK regulatory requirements (e.g. on effluent quality) when none or insufficient ones exist locally (Walton-Knight, 2002); nevertheless it is understood that relaxations of these may be possible under emergency conditions. Some form of wastewater treatment is therefore required with emphasis on pathogen reduction.

Oxfam Sanitation Unit

The Oxfam Sanitation Unit was developed in the 1970s to deal with cholera outbreaks. It consists of a sanitation block where squatting plates are arranged over two sewage pipes. These pipes are flushed intermittently from a tank at one end of each pipe; the design flushing water requirement is 7 litres per person per day though lower volumes have been used. The flushed waste is received into two bladder tanks (18,000 litres each) connected in series where anaerobic treatment takes place in the absence of oxygen. The effluent from these tanks is spread over a percolating filter where further treatment is performed.

Figure 5.1 - Oxfam Sanitation Unit (taken from Pacey, 1978)

The units have been designed to deal with 500 people though higher populations have used it. The site area for these units is about 30 by 5 metres though this may vary depending on the final layout.

Advantages:

?? Simple, low-cost treatment

?? Very simple transport, installation, operation and maintenance

?? No energy or chemicals required

?? Provides effective pathogen reduction especially of cholera

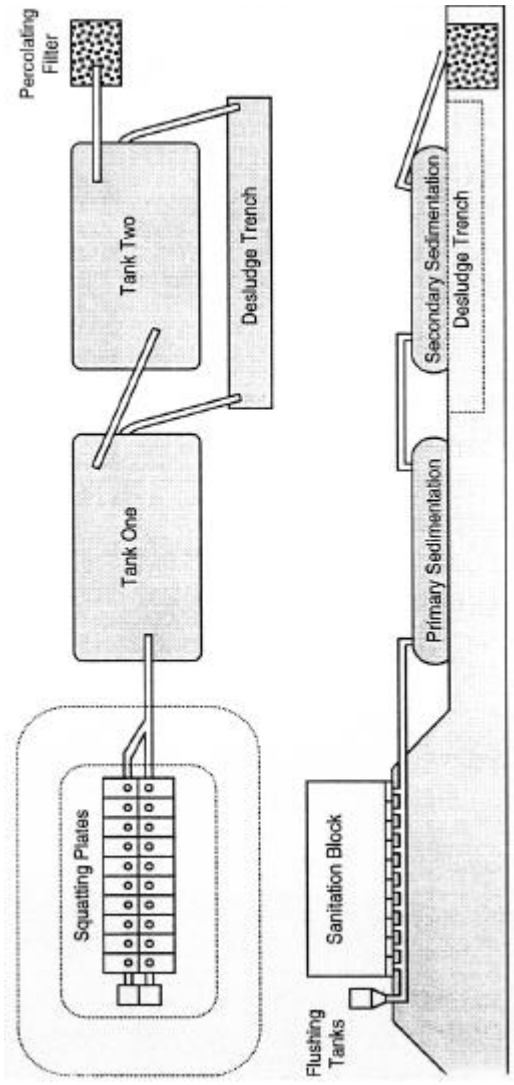
Constraints:

?? Poor quality of the effluent in terms of organic pollutants (BOD_5, COD and NH_4-N) as required for environmental protection and by law

?? Fairly large area requirements

?? Not suitable for temperate climates as the anaerobic and disinfection processes slow down considerably as temperature drops.

Oxfam emergency wastewater treatment system



Cambridge Wastewater Treatment System

An alternative treatment system for emergencies has been developed by Edoardo Piano and Peter Guthrie at the University of Cambridge in collaboration with Oxfam GB. The system relies on the collection of settled sewage from sanitation blocks with limited storage capacity located around a settlement or urban area. In the treatment system, the incoming wastewater is distributed over a bed of rock where it undergoes a first stage of treatment by means of the biomass formed on the rocks. It then proceeds into an aerated tank where suspended biomass further reduces the organic pollutants; after this, it enters a settling tank or clarifier where the biomass is recovered and sent back to the aerated tank. A disinfection tank as used for drinking water reduces the pathogen load.

This system is designed to cater for a population of 5,000 and can fit in an area of about 20 by 20 metres. The design water requirement for the system is 6.5 litres per person per day, though different volumes may be allowed as long as the collection system is not disrupted.

Advantages:

?? Designed specifically for operation in emergency scenarios

?? Designed to meet effluent quality standards

?? Based around existing relief equipment such as T series tanks, disinfection units etc.

?? Much lower capital costs compared to commercial units (about $8 per person)

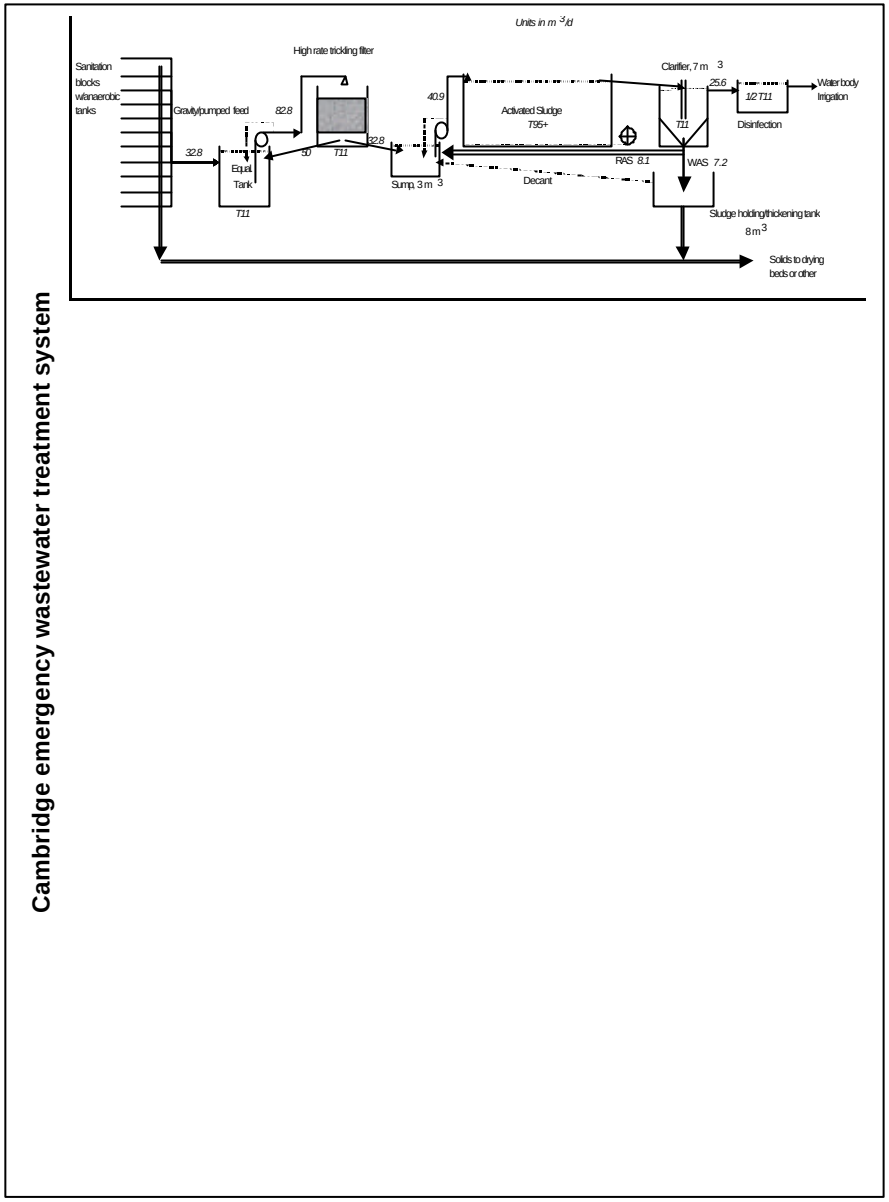
?? Flexible as it can deal with a wide range of climatic conditions, flows and pollutant loads

Constraints:

?? Relatively high energy use and requires chemical supplies

?? Requires daily attention (though operation is relatively simple and can be carried out by low-skilled workers)

?? Requires pH control and alkalinity addition to achieve the ammonia target (as all low water systems do)



Commercial systems

There are several package wastewater treatment units available in the market. The main types are:

Rotating Biological Contactors (RBCs) which treat the waste by having many disks mounted on a shaft which rotates slowly to alternatively submerge and aerate the biomass on these disks

Biological Aerated Filters or Submerged Aerated Filters (BAFF/SAFs) which rely on mobile or fixed submerged media in a tank where the biomass is attached and is continuously aerated from diffusers underneath it.

Membrane Bioreactors (MBRs), which rely on, submerged membranes within an aerated tank that essentially filter the incoming wastewater.

Activated Sludge processes which again rely on continuous aeration followed by a settling stage to recover the biomass. All-in-one tank batch versions of this process exist and are called Sequencing Batch Reactors (SBRs).

Advantages:

?? Highly automated units which require little maintenance and attention.

?? Quick to install as they usually come in containerised units.

?? Generally, good performance with built-in disinfection.

?? Membranes provide a physical barrier against pathogens.

Constraints:

?? Very expensive for the population served, typically over $85 per person served.

?? High energy requirements as most of these are based on aerated processes for compactness.

?? Requires experienced personnel for installation and skilled workers to deal with the electronic controls. Membranes may require aggressive chemicals for their maintenance.

?? Not designed to treat the highly concentrated waste arising from emergency settlements as this may inhibit their performance.

?? SAFFs, BAFs, and to a certain extent RBCs are not suitable for operation with intermittent power supplies.

Sludge handling

All the above wastewater treatment systems produce sludge as part of their treatment process either continuously or intermittently. This sludge will tend to have a large number of pathogens, and would therefore require careful handling. Disposal can be to a pit, to an incinerator or to land. The two main options for dealing with it in the field are either composting or lime addition. Both, if done following the recommended guidelines, will produce a safe sludge suitable for reuse on agricultural land.

6. Technical design information

In the design and construction of any latrine it is important to consider the following four key factors:

?? Safety;

?? Comfort;

?? Privacy; and

?? Health.

6.1 Siting latrines

Perhaps the most important design factor regarding latrine construction is **where** the latrine should be sited. The following factors are important siting selection criteria; each latrine constructed should be:

?? not more than 50m away from dwellings to be served;

?? at least 30m away from water storage and treatment facilities;

?? at least 30m away from surface water sources;

?? at least 30m horizontal distance from shallow groundwater sources (more in coarse or fissured ground, seek local hydrogeological expertise where possible);

?? downhill of settlements and water sources, where possible;

?? at least 50m away from communal food storage and preparation areas;

?? close to hand-washing facilities;

?? easily accessible to all intended users including children, old people, pregnant women and disabled people.

Siting 'sanitation corridors' parallel to and approximately 10m from dwellings is a useful way to separate accessible sanitation facilities.

Accessibility is a key issue since this is likely to influence how often latrines are used, and hence whether indiscriminate defecation takes place or not. Security of users, especially women and children, must also be considered, particularly where communal latrines are in place. If necessary, facilities can be lit at night for security and convenience.

6.2 Use of local materials and designs

The single most important factor in the selection of construction materials and tools is local availability. There is often a tendency to focus on the use of typical relief agency materials, such as plastic sheeting, when there may be much better local alternatives available. It is inefficient and inappropriate to import expensive materials if suitable materials are available locally. Possible construction materials include:

- Wood
- Grass and leaves
- Mud
- Earth blocks
- Bamboo
- Bricks
- Cement
- Gravel
- Sand
- Corrugated iron
- Plastic sheeting
- Cloth or sacking

Tools are also often available locally, and although these may sometimes be of lower quality than imported ones, they are likely to be much more cost-effective, and the local population will be more accustomed to their use. Heavy equipment, or specialised equipment, may also be available and this may influence the selected construction method as well as the overall technology choice.

The use of local materials and existing designs is to be encouraged for various reasons. Depending on local resources that are readily available in the local community, they can be deployed immediately for quick construction in the first phase of emergency response – typically for traditional pit latrines. As the emergency response progresses and local conditions are monitored, the move towards the use of improved latrines can be considered.

There is also the added benefit that the resulting technology brought in will be viewed by beneficiaries as a local good. This encourages an enhanced sense of community ownership and helps mobilize local communities to undertake repair, maintenance and cleaning.

In many cases community members are capable of designing and constructing their own facilities if they are provided with appropriate tools and technical advice (see Box 6.1). The construction of a demonstration latrine can be a useful way to show people the stages in construction, and for those who have constructed before to share techniques and ideas with other community members. The team supervising and facilitating the process should ensure that basic design principles are followed and that latrines are technically safe.

A system of rotation of toolkits can also be implemented, with each kit being shared between 10-15 households. The kits are signed over to a representative of the local community. The recipient of the toolkit is then responsible for ensuring that all households wishing to construct latrines have access to the tools, and that they are returned when the household has finished, allowing rotation to the next household. Once all the households have finished construction, the majority of the toolkits are then returned to the implementing agency for use in a new community, and approximately 1 kit per 100 latrines constructed is left with the representative of the community. This is to allow newly-returning families to be able to construct their own latrines, drawing on the advice and knowledge gained by other community members, and for families to replace their latrines when they are full. A typical community toolkit should consist of:

- 1 shovel;
- 1 pickaxe;
- 1 metal bucket;
- 1 hoe;
- 1 machete; and
- 5m of rope.

Experience shows that it can take a family as little as four days to construct a latrine from local materials, 2 days to dig the pit, and 2 days to construct the superstructure. A system of support for those who are unable to construct the latrines for themselves – such as the elderly, people with disabilities, or female-headed households – should also be implemented. This aspect of the programme needs to be carefully monitored, to ensure that vulnerable people and their families are not being excluded or exploited.

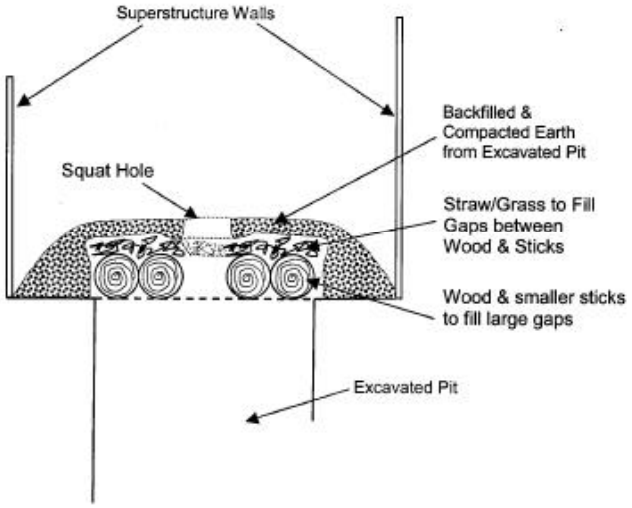
Box 6.1. Using local designs for latrine structure in Angola

Following the closure of IDP camps in Angola, populations started returning to their areas of origin and a public health programme started within the returned communities. Initially a methodology similar to that used in the camps was adopted whereby concrete dome latrine slabs were introduced. The budgetary constraints of the programme allowed only 1 latrine per 20 people, and with the memory of the problems associated with shared latrines in the camps, communities were unenthusiastic to participate unless a solution could be found to allow each household to construct a latrine of their own.

A community consultation and sensitisation process was carried out to gain a better understanding of what was stopping the families from constructing latrines without external support and to find an alternative solution. This process led to an understanding that the communities were willing and able to construct traditional family latrines using locally available materials, but they required tools and advice in order to do this.

The implementing agency therefore provided this toolkits and technical advice and the community began to construct their own latrines. This approach led to high levels of uptake among returning families and allowed know-how and tools to remain in the community, ensuring that newly returning families would have the opportunity to create basic sanitation infrastructure without the need for further external support. The cost of constructing a latrine using local materials and was approximately 1/9th of the cost of producing the concrete domed slabs.

Traditional latrine using local materials



Traditional latrine designs typically consist of a pit, a wooden platform packed with grass and covered with soil, and a timber and grass or mud superstructure. A flexible approach should be taken to allow individuals to incorporate their own variations and preferences. Technical guidance should be given regarding:

?? the depth of the pit and need for lining;

?? the number and size of pieces of wood needed to ensure the stability of the squatting platform; and

?? the need to raise the platform above ground level to prevent damage from surface water.

The advantages and disadvantages of a traditional latrine programme using local materials only are summarized in Table 6.1.

Table 6.1. Advantages and disadvantages of traditional latrines

Advantages	Disadvantages/Challenges
Use of locally-available materials	Possible contribution to deforestation as trees are harvested to constructed the latrine platform
Inexpensive	Cleaning of slab more difficult than with concrete slab
Replicable: can be constructed by the community themselves, while the knowledge and tools stay within the community.	Reliance on mobilisation, and thus reliance on the commitment and acceptance of the implementing agency to promote the methodology
Flexibility of design and process, can be adapted by individuals and communities to suit local preferences.	Not all community members or households will be physically or materially able to construct their own latrine. Solutions to enable such households to participate need to be identified and implemented within target communities.
Adaptation of traditional approach to latrine building means that programme emphasises the use of local knowledge and skills	

6.3 Pit excavation and lining

Most single pits for household or family use are about 1m across and 3m deep. It is difficult to excavate pits less than 0.9m diameter because there is not enough room for the person to work. However, there is no maximum size for a pit and sizes vary greatly.

The best shape for a pit (in plan view) is circular. Circular pits are more stable because of the natural arching effect of the ground around the hole – there are no sharp corners to concentrate the stresses. Pits with flat sides are much more likely to need supporting and require a bigger area of lining than a circular pit of the same internal volume. However, many communities prefer to excavate square or rectangular pits as their construction is similar to the process used for building domestic houses.

In general, the **top 0.5 m of a pit should always be lined**, but the decision as to whether to line the rest of the pit will depend on the type of soil in which the pit is dug. When a pit is first excavated it may appear stable, and it may be impossible to tell whether or not the walls will collapse after some time. One way in which this can be assessed is to examine other excavations (such as hand dug wells) in the area. If existing excavations have not collapsed and are not lined, then it is fairly safe to assume that pit latrine excavations will not need lining. Where there is doubt it is advisable to line the pit. Table 6.2 suggests the types of soil that, in general, do and do not require lining.

Table 6.2. Lining requirements for different soil types

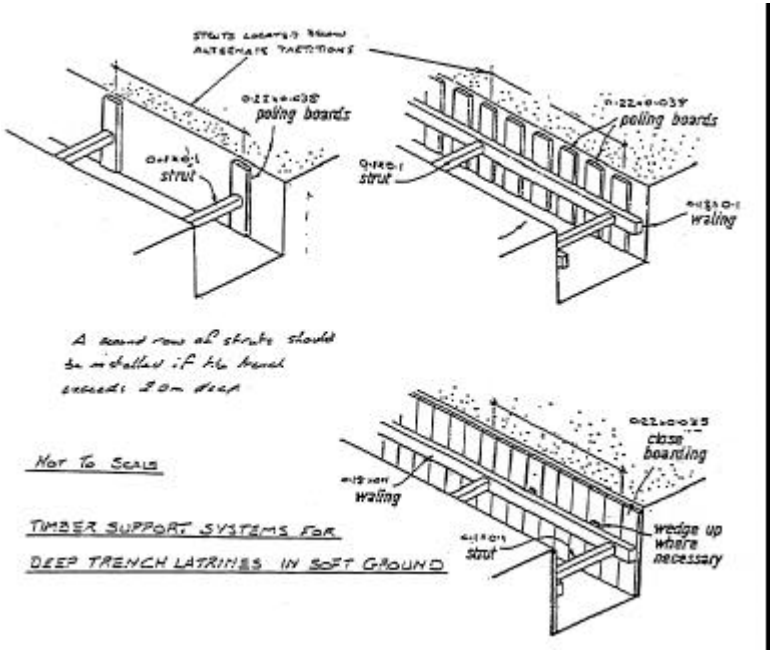
Soils that require lining	Soils that do not require lining
Soft sands and gravels	Soils with significant clay content
Unconsolidated soils	Most consolidated sedimentary rocks
Filled land	Soils with high proportion of iron oxides (laterites)
Compressed mudstones and shales	

The following are commonly used pit lining materials:

- ?? **Wood** – time-consuming and difficult to position cross-struts to provide a proper retaining wall; prone to r otting even when treated.
- ?? **Concrete blocks** – can be built honeycomb style to allow good infiltration.
- ?? **Bricks/Stone** – time consuming but may be a preferred alternative to concrete blocks if locally available bricks or stone.
- ?? **Mud blocks** – local alternative to concrete blocks or bricks.
- ?? **Pre-cast concrete rings** – the liquid cannot easily escape unless the ring is made with drainage holes; ring moulds required; expensive.
- ?? **In-situ cast concrete** –relatively time-consuming to construct mould; no infiltration, therefore pits must be emptied; expensive.
- ?? **Oil drums** – holes must be made in sides for liquid to infiltrate; small diameter limits diameter of pit size and ease of excavation.
- ?? **Ferrocement** – time-consuming and relatively expensive.
- ?? **Corrugated iron sheets** – very little infiltration can take place unless holes made; needs support bracing.
- ?? **Tyres** – requires high quantity of tyres; allows infiltration through spaces and provides stability.
- ?? **Bamboo / cane** – rots faster than wood and less strong but may be in more plentiful supply in some areas and encourages community participation and income generation (see Box 6.2).

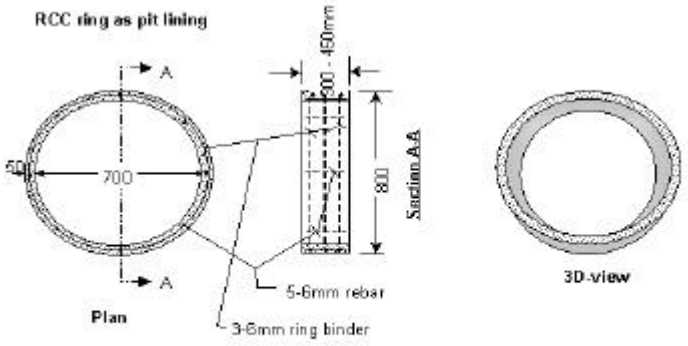
Pit lining is most cost-effective where pits are to be emptied regularly.

Timber support systems for deep trench latrines



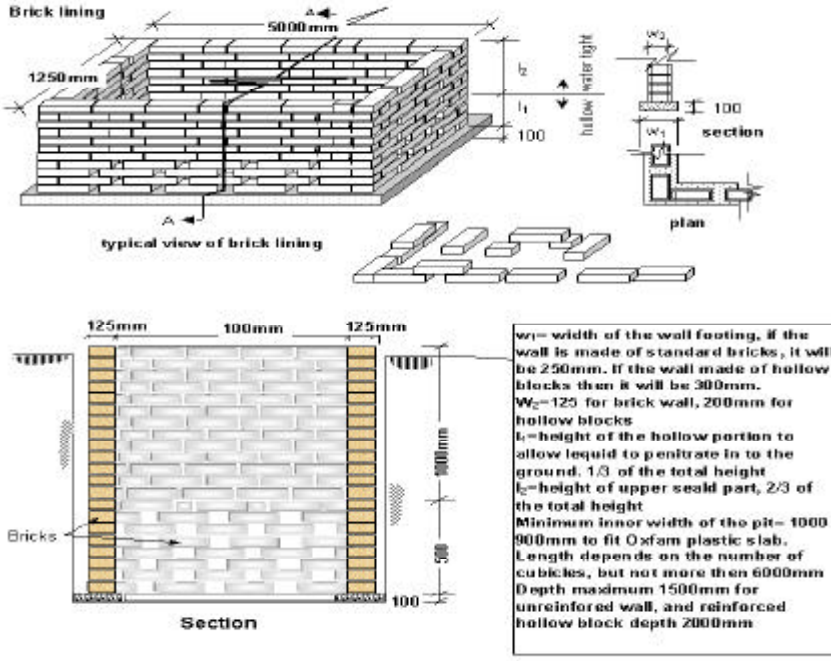
Notes

Pre-cast concrete ring pit liner



Notes

Brick lined pit



Notes

Box 6.2. Pit lining with local materials in Mozambique

In Mozambique in response to floods, latrines were being built to accommodate affected populations. The latrines were located in an area of sandy soils so the excavated pits had to be lined to ensure that they would not cave in. Baskets woven by local women were evaluated with other different options available, and it was decided that this would be the most viable option for lining the pits. The domed latrine slab was used to cover the pit and other local materials such as grasses and reeds were used to build the superstructure.

The baskets were made out of rigid, dried local grasses (reeds) that are typically used for storing grain. A slightly modified design was first discussed with the women, as a basket with a smaller diameter would accommodate the slab better. Agency staff were able to order a number of baskets and then pick them up. Due to their rigid and sturdy design, it was easily used to allow the sides of the pit to not cave in. It proved to be a relatively cheap solution and was quick to install.

Sizing pits

In order to size pits or tanks it is important to determine the rate at which sludge (including faeces, urine and anal cleansing material) will accumulate, and the rate at which effluent will infiltrate into the surrounding ground. The top 0.5m of a pit should not be filled; this is to allow safe back-filling and to prevent splashing, unpleasant sights and increased incidence of problems with odour and flies.

The approximate size of the pit in m^3 can be calculated from the following equation:

$$\text{Volume of pit, } V = \frac{(N \times S \times D)}{1000} + 0.5A$$

? Equation 1

Where: N = number of users

S = sludge accumulation rate (litres/person/year)

D = design life (years)

A = pit base area (m^2)

If the size of the pit is fixed, the time taken to fill it can be calculated by rearranging Equation 1 to find the design life:

$$\text{Design life, } D = \frac{(V - 0.5A) \times 1000}{(N \times S)}$$

Sludge accumulation rates vary greatly and local figures should be obtained if possible. In the absence of local knowledge, Table 6.3 gives guideline sludge accumulation rates for different wastes and conditions.

This method assumes that liquid wastes are absorbed by the surrounding ground. If liquid remains in the pit it will fill much more quickly. This is likely to happen where large volumes of water are used, where pit walls have a low infiltration capacity, or where the pit is poorly ventilated. It should also be noted that soil pores become clogged with time, reducing or even stopping infiltration. For this reason, pits should be over-sized rather than under-sized, especially where soil infiltration rates are relatively low.

Table 6.3. Suggested maximum sludge accumulation rates
(Source: Franceys et al., 1992)

Wastes deposited and conditions	Sludge accumulation rate 'S' (litres per person per year)
Wastes retained in water where degradable anal cleaning materials are used	40
Wastes retained in water where non-degradable anal cleaning materials are used	60
Wastes retained in dry conditions where degradable anal cleaning materials are used	60
Wastes retained in dry conditions where non-degradable anal cleaning materials are used	90

Notes: *The term 'wastes retained in water' when applied to a pit latrine means that wastes are in a section of the pit below the water table.*

In many emergency situations latrines are subjected to heavy use and excreta and anal cleansing materials are added much faster than the decomposition rate. Where this is the case it is suggested that these sludge rates be increased by 50%.

6.4 Latrine slabs

An important component of a pit latrine is the latrine slab situated above the pit. The purpose of the latrine slab is to cover the top of the pit and, sometimes, provide a surface on which the user puts their feet. The slab should be able to support the weight of a person, easy to clean and should usually be sloped slightly towards the squat-hole to allow liquid to drain. In the early stages of an emergency, many agencies use pre-moulded plastic squatting plates. These are appropriate for immediate rapid implementation and are often suitable for use in emergency trench latrines, health centres, schools and reception centres. However, for

long-term use it is more efficient to use locally manufactured slabs where possible.

Slabs can be made of concrete, wood, ferrocement or plastic. A number of options with advantages and disadvantages are presented in Table 6.4.

Table 6.4. Comparison of latrine slabs

Slab Type	Comments
Oxfam Plastic Slab (LOP/1) Size 1.1m x 1m	Needs no supporting timbers – just need to ensure the pit edges are stable and place it on hole. Trench must be 90 cm wide as slab length is 1.1m. A superstructure kit designed to fit slabs is available.
Monarflex Plastic Slab (LP/1) Size 0.8m x 0.6m	Not big enough for cubical alone, need to construct platform to place slab on which makes it more expensive & time consuming than the LOP kit. Hole covers rapidly go missing.
Wooden Slab	Can be quick if materials available locally, not easy to clean. Prone to termite attack and rotting. Not a good long term solution (deforestation issues).
Bush timber and sticks covered by plastic sheeting and covered with packed earth	Fast and cheap, and can be easily upgraded with a SanPlat concrete slab or plastic slab. Difficult to keep clean, badly affected by rainfall or people washing in the latrine. Wood rots over time.
Dome Slab (LS/3) 1.2m diameter	Needs proper mould, 1 bag of cement (sand & gravel) per slab, no rebar. A good longer term solution.
SanPlat Slab(LSP/1) Size 0.6m x 0.6m	Good for upgrading log/mud slabs. Quick to produce, doesn't need rebar.
Ferrocement Slabs	Can make slabs thinner, therefore cheaper, than traditional concrete slabs.
Concrete Slab - various sizes	Sand, cement and gravel are usually available, easy to make and clean. Require rebar, which can be difficult & expensive to purchase. Large slabs are not easily transportable.
Plywood Slab	Water resistant ply is very expensive. Not always easy to purchase.

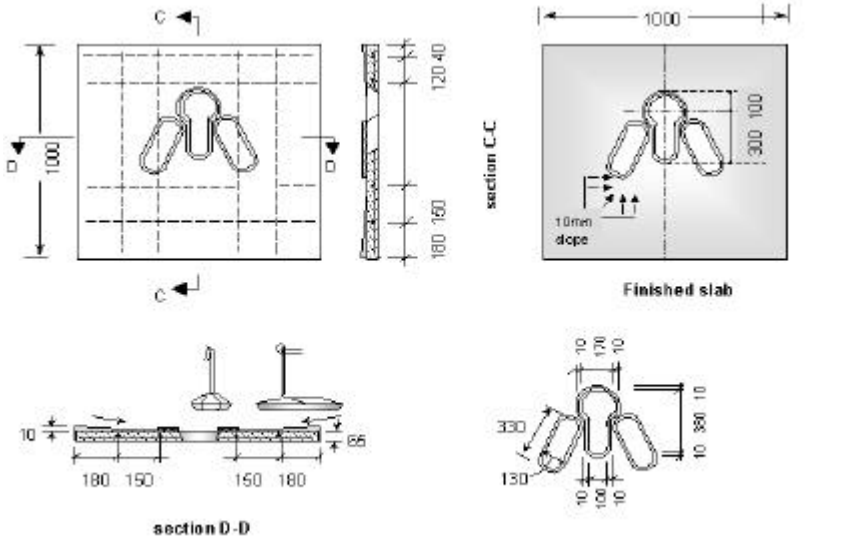
Concrete is usually the preferred material for second phase implementation since it is cheap, durable, easy to clean and simple to manufacture. Most concrete slabs are reinforced with steel bars to prevent breaking, reinforcing bars should be placed near the base of the slab to carry the tension forces. The amount of reinforcement will depend on the size of the slab and the load to be carried. Table 6.5 gives suggestions for the amount of reinforcement required for different slabs. Slabs may be rectangular or circular.

Table 6.5. Spacing for steel reinforcing bars in pit latrine slabs

Slab thickness (mm)	Steel bar diameter (mm)	Spacing of steel bars (mm) in each direction for minimum spans of:				
		1m	1.25m	1.5m	1.75m	2m
65	6	150	150	125	75	50
	8	250	250	200	150	125
80	6	150	150	150	125	75
	8	250	250	250	200	150

The squat-hole in the latrine slab should be large enough to allow defecation and urination without fouling the floor, whilst being small enough for the young and old to span in safety. Ideally, this should be a 'keyhole' shape, 160-170mm in diameter and 300-400mm in full length.

Reinforced Concrete Latrine Slab



Slabs without reinforcement can be made provided the slab is domed. The dome shape causes all the forces in the slab (apart from the rim) to be compressed so reinforcement is not needed. Domed slabs are cheaper than reinforced slabs but more care is required in their manufacture and transport. Such slabs have a typical diameter of 1.2-1.5 metres.

Concrete mixes

Concrete is a mix of cement, sand, gravel (aggregate) and water. Generally one of the two following design mixes is used:

Cement:	Sand:	Aggregate	
1:	2:	4	*Mix 1*
1:	3:	6	*Mix 2*

Mix 1 will be slightly stronger than Mix 2 due to the increased proportion of cement. In both cases gravel makes up approximately 60% of the volume of concrete. The ratio of water to cement is generally:

Water:	Cement	
1:	2	*or*
1:	3	

Once the concrete is poured into the mould it must be **compacted** to eliminate voids (air holes). This can be done manually by using a wooden plank to pound the concrete surface.

The final stage of concrete preparation is **curing**, this simply means keeping the concrete damp while it sets. Concrete can be cured by covering, regular spraying or submerging in water.

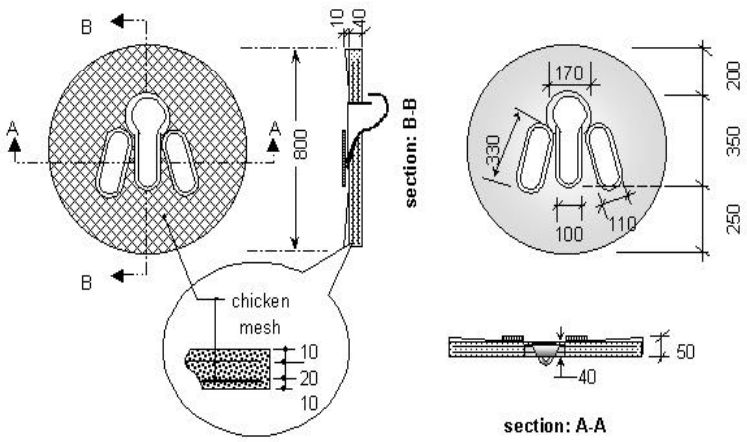
The strength and workability of concrete is affected by the:

?? concrete mix;

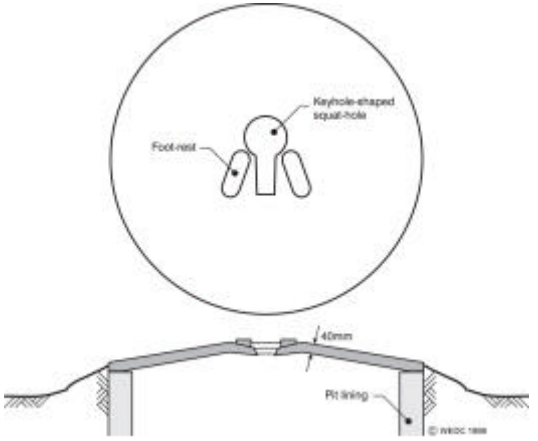
?? water/cement ratio; and

?? the curing process.

Ferrocement slab with pour-flush bowls



Domed concrete slab (without reinforcement)



Dimensions

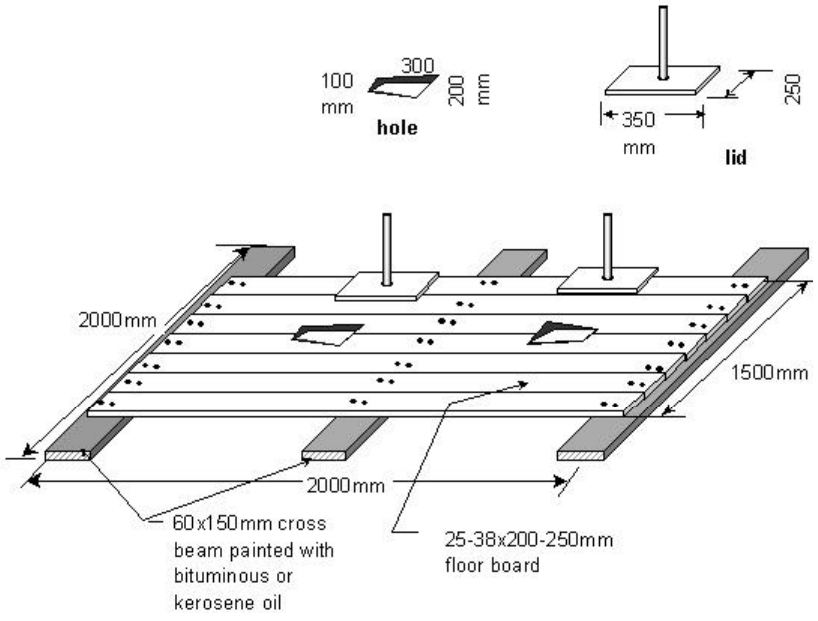
Wooden slabs can also be used where concrete is too expensive or is unavailable. Wooden slabs can consist of whole poles covered in mud or soil, or can be sawn timber platforms. Pits with wooden slabs can be improved by placing a small concrete slab on top to cover the area used for defecation. The slab is quite small (typically 400mm x 600mm) but it covers the area of slab most likely to be fouled. Alternatively, if wooden slabs are to be used it is recommended to put a thin covering of cement, approximately 25mm thick, on top to facilitate cleaning.

Squat-hole covers

The squat-hole cover for a simple pit latrine is designed to cover the hole when not in use, to minimise flies and odour. A common problem concerning these covers is that they are often not replaced on the hole after use. This may be due to worries of faecal-hand contamination, or may be because covers are taken away for alternative uses.

In some cases, the cover is designed with a long handle, or is tied with a piece of string to the surrounding superstructure. An is to use a hinged cover which can be opened and closed with the use of an attached piece of string, by hand, or even with the user's foot. The hinges can be made from old tyre rubber, which is available in most situations. The rubber hinges can be attached to the reinforcement within a concrete latrine slab, or tied to the wooden poles of a wooden slab.

Wooden slab for twin compartment latrine



Wooden slab for twin compartment latrine

Timber	
1. 60x150x2000mm joists across pit	3 pcs
2. 38x200x2000mmfloor board	7 pcs
3. 25x250x350mm lid board	2 pcs
4. 25mm dia x 500mm lid handle	2 pcs
Hardware	
5. 75mm tall wire-nails	42 pcs
6. Bituminous or kerosene	0.5 ltr

6.5 Superstructure design

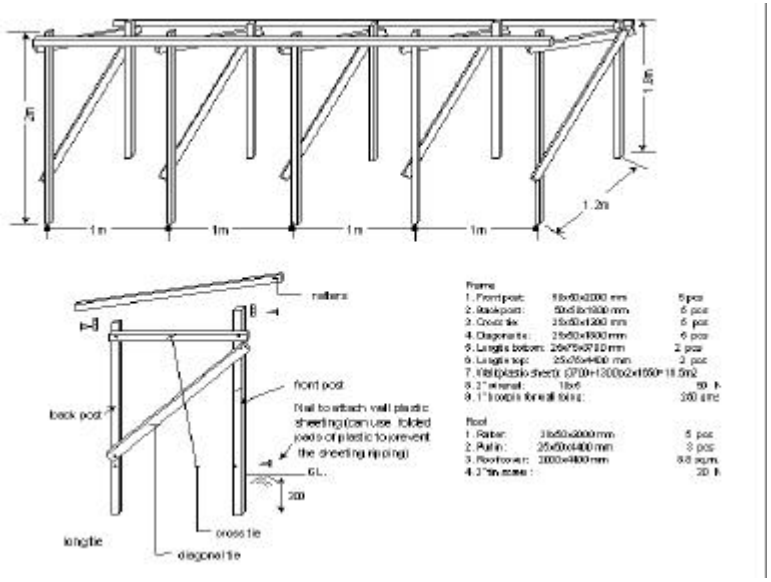
To the user, the superstructure is likely to be the most important part of the latrine. For this reason alone, due attention must be given to its design. In some cultures people prefer to defecate in the open and a superstructure may not be required. In general, however, the superstructure must provide the necessary privacy for the comfort and dignity of the users. Materials and techniques used for the superstructure should generally be the same as those used for people's shelters, as this will facilitate ease of construction.

In areas of high rainfall, or for VIP latrines, a roof will be essential, although roofing materials may be stolen where shelter is a priority. In other situations roofs may not be necessary. The superstructure may have a door where desired, or a spiral-shaped entrance can be constructed. The superstructure can, more or less, be of any size and shape that the user desires, although a minimum base area of $1m^2$ is recommended.

Although the superstructure has little direct impact on the health benefits of the latrine (with the possible exception of a VIP latrine), its design is likely to influence whether the latrine will be used and looked after. It is therefore essential that the users are involved in the superstructure design, to ensure that it is socio-culturally acceptable and to promote the user's pride in their toilet.

A number of options for latrine superstructure design, including technical specifications where appropriate, are presented in the following pages.

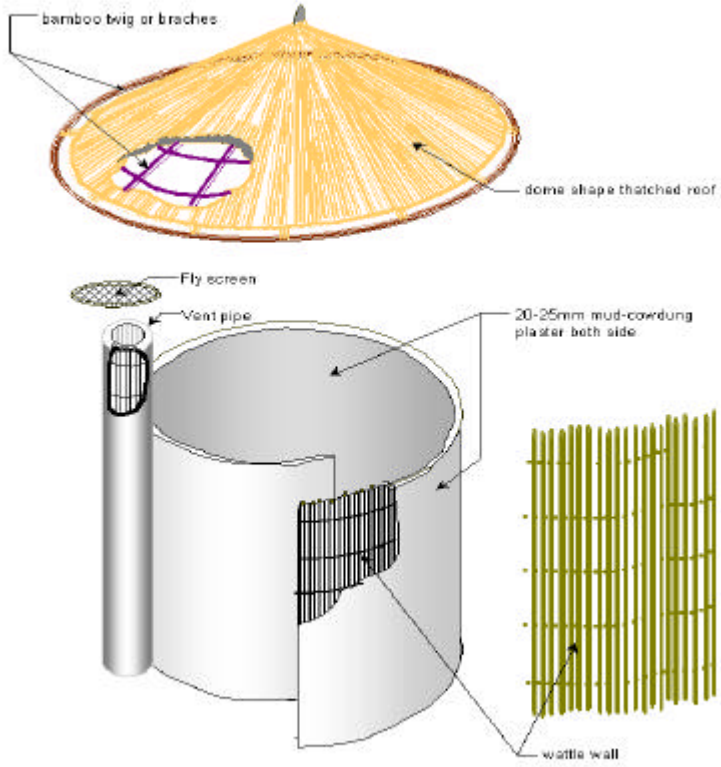
Timber frame for trench latrine superstructure



Notes

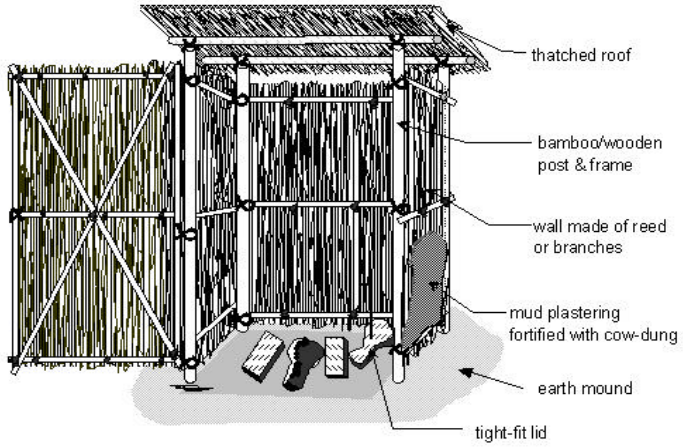
Materials for covering frame etc.

Superstructure for family VIP latrine with spiral entrance



Spiral superstructure

Low -cost latrine superstructure



low-cost superstructure

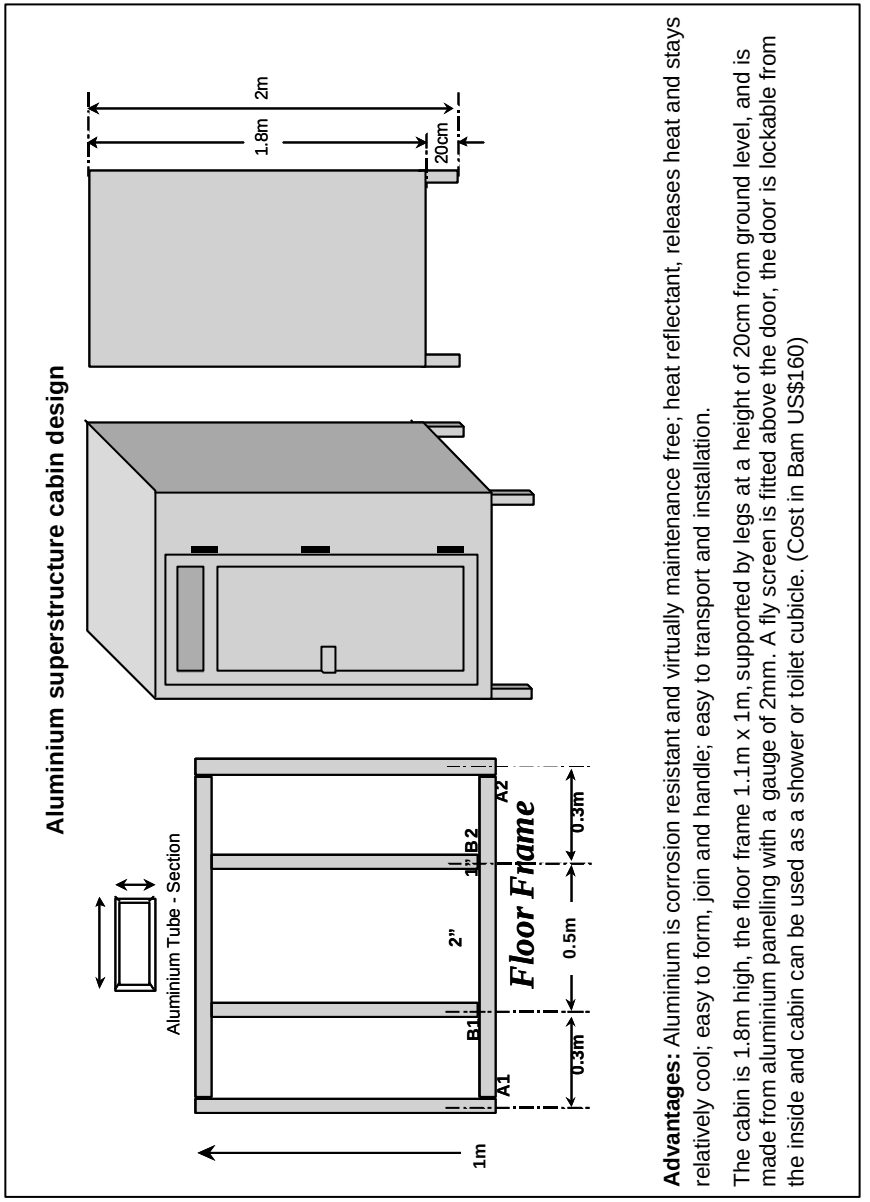
Superstructures must be locally appropriate, and where traditional emergency facilities are not acceptable it may be necessary to seek non-traditional solutions through consultation with the intended users and local artisans.

Box 6.2. Bathing and latrine facilities after the Bam earthquake in Iran

Following the Bam earthquake in December 2003, in the initial emergency phase aid agencies implemented shallow pit latrines and communal trench latrines but these were not widely accepted. There was, therefore, a need to find a more acceptable longer-term option.

The local custom in Bam was to construct two pour-flush latrines per house, one inside and the other in the courtyard, both connected to deep unlined pits – with an average pit depth of 20m. It was therefore decided that the quick but long-lasting solution would be to provide appropriate portable superstructures for the outside latrines, which could be recovered and cleaned from the rubble in the family courtyards.

The agencies then called for a joint tender to design and construct an appropriate superstructure locally. Several options were presented, using materials such as fibreglass, canvas and galvanised iron, but the selected design was an aluminium cabin. Over the course of 2 months 234 aluminium cabins were installed as toilets and led to a high level of user satisfaction with the design, which was also approved by Government. The decision to fabricate the cabins locally in Bam acted as a big booster for the revival of the local economy, and helped build the capacity and skills of local artisans.



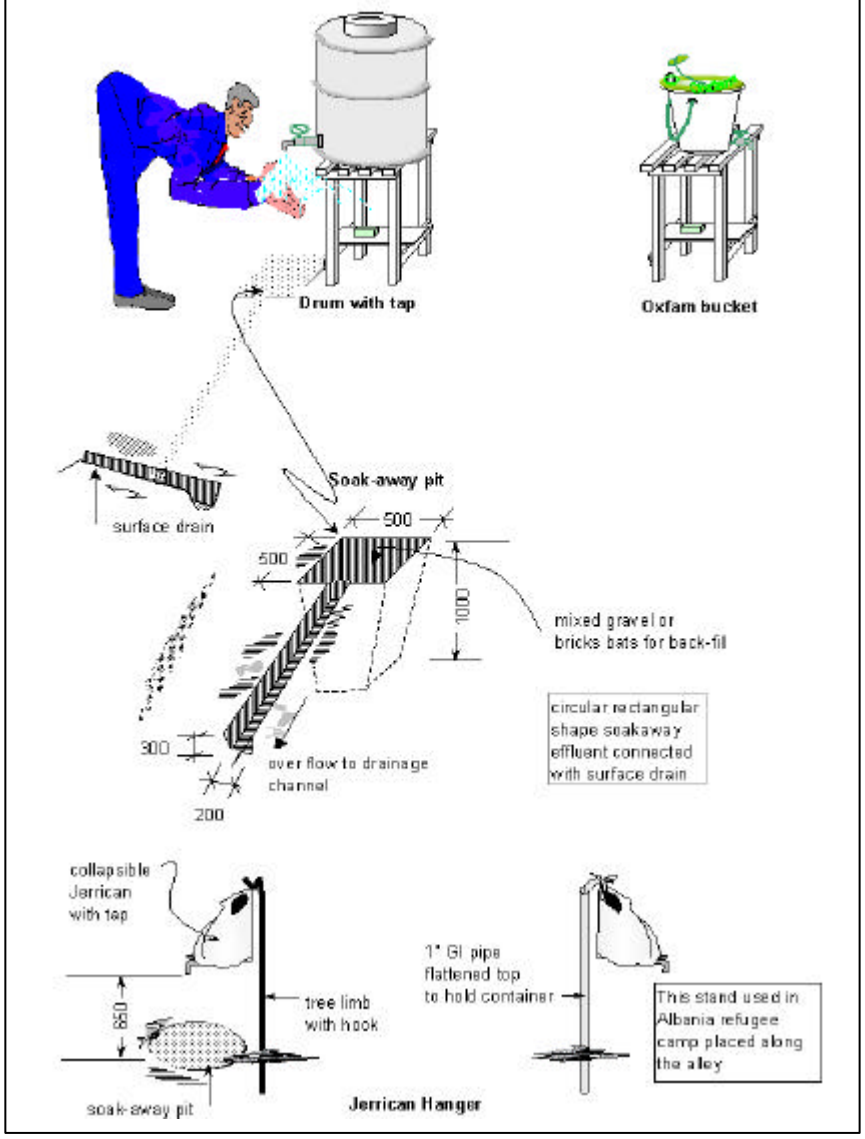
6.6 Hand-washing facilities

Excreta disposal facilities should, wherever possible, be accompanied by appropriate hand-washing facilities. The task of hand-washing is an ambiguous and awkward activity simply because ones hands must be used for the task of washing ones hands. A few appropriate technical solutions have been used in the past to make hand-washing easier, more convenient and more accessible.

These solutions include:

- Miscellaneous containers with taps fitted to them
- Small leaking containers fitted with a handle. The leaky container is used to provide water sparingly by dipping it into a body of water and hanging it up. The water then drizzles out a small hole in the bottom over a person's hands.
- The 'Tippy Tap' (Cairncross & Curtis 2003) has been one of the more well known and popular designs from the view point of the development worker. The Tippy Tap is made from an old cooking container or such like that is suspended. It allows water to flow into a spout when it is tipped upright and drizzles out a small hole in the end of the spout onto the hands.
- The 'Handy Andy' is a small plastic device believed to have originated from Zimbabwe which works by fitting into a reservoir and releasing water in small amounts when the user pushes up the plastic pin in the bottom.
- The hand washing dispenser unit is a plastic moulded device designed and developed in South Africa. It screws onto a plastic drinking bottle filled with water. The bottle is then turned upright and fits into a wall bracket ready to dispense small amounts of water by lifting an inverted plunger.
- The 'Captap' (Harries, 2004) is a spring loaded device that fits into the cap of a Jerry-can. It dispenses water through the centre of the cap by moving the handle, up or down. The Captap stems the flow of water by using a rubber seal that is pulled against the inside of the cap under the tension of the spring. The seal is made out of a bicycle or car tyre tube. See Appendix 2 for design details of the Captap.

Traditional hand-washing devices



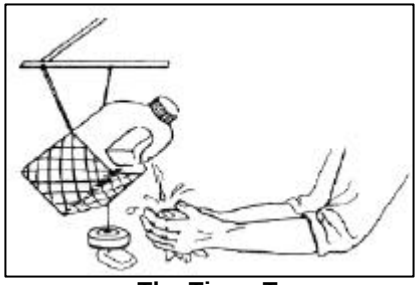
Without appropriate devices hand-washing is often accomplished with the help of a second person who simply pours water from a container onto the hands while the hands are washed beneath the required flow. Containers with taps are the most commonly used device but do not last very long because the taps break or begin to leak.

Taps are also problematic in that they become contaminated by dirty hands when they are turned on and then transfer the contamination back onto the clean hands when the tap is turned off. This problem is obviously counter productive to what is trying to be achieved. Pathogens can be transferred onto surfaces such as taps by previous users and contaminate those that come in contact with them. To avoid this risk many public restrooms or food handling centres in developed countries now use infrared taps that automatically dispense water when a hand is placed under the tap. This system negates the need to touch the tap at all. The solution is of course not at all appropriate to low-income communities because of the cost and the availability of spare parts and the necessary skills for installation and ongoing maintenance.

In addition to these problems, taps are not water conservative and can be left on by children or careless users. This is a major issue when the water is a scarce resource as in many emergencies. Despite the problems associated with taps fitted to containers they are the most commonly used hand-washing device in emergency situations.

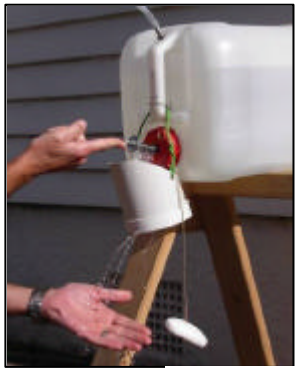
Most hand-washing devices available are suitable only for use at a family level. Yet communal facilities are needed in most emergency situations. The devices made for use at a community level that are most suitable for low-income communities are the Captap and the Handy Andy. The main advantages of these are that they minimize water use and minimize the need to touch the device, therefore conserving water and minimizing the spread of faecal-oral disease.

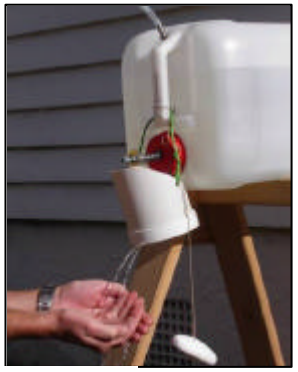
Improved hand-washing devices



The Tippy Tap

The Handy Andy





The Captap

7. Operation and Maintenance

7.1 Public health promotion

Any excreta disposal programme must include the promotion of public health. This means that communities must be mobilized to promote appropriate hygiene practices related to the design, use and maintenance of facilities.

A number of studies have suggested that the impact of hygiene practices on sanitation-related disease could be as great as that of the actual provision of sanitation facilities. Public health and hygiene promotion is widely believed to be one of the most effective means we have to reduce the toll of diarrhoeal diseases. It can also be an effective way to encourage participation and empower communities. Public health promotion in relation to excreta disposal should focus on:

?? the appropriate use and maintenance of excreta disposal facilities;

?? the safe disposal of faeces (especially those of children);

?? hand-washing after defecation and prior to food preparation;

?? the use and safe disposal of appropriate anal cleansing material;

?? the control of flies and other insect vectors.

It is recommended that the practitioners keep to the following seven principles of hygiene promotion (from Curtis, 1999)**:**

1. Target a small number of risk practices – from the viewpoint of controlling diarrhoeal disease, the priorities for hygiene behaviour change are likely to include hand-washing with soap (or a local substitute) after contact with faeces, and the safe disposal of adults' and children's faeces.

2. Target specific audiences – these may include mothers, children, older siblings, fathers, opinion leaders, or other groups. One needs to identify who is involved in childcare, and who influences them or takes decisions for them.

3. Identify the motives for changed behaviour – these motives often have nothing to do with health. People may be persuaded to wash their hands so that their neighbours will respect them, so that their hands smell 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.

4. Hygiene messages need to be positive – people learn best when they laugh, and will listen for a long time if they are entertained. Programmes which attempt to frighten their audience will alienate them. There should therefore be no mention of doctors, death or diarrhoea in hygiene promotion programmes.

5. Identify appropriate channels of communication – we need 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.

6. Decide on a cost-effective mix of channels – several channels giving the same messages can reinforce one another. 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 behaviour change, but tends to be very expensive per capita.

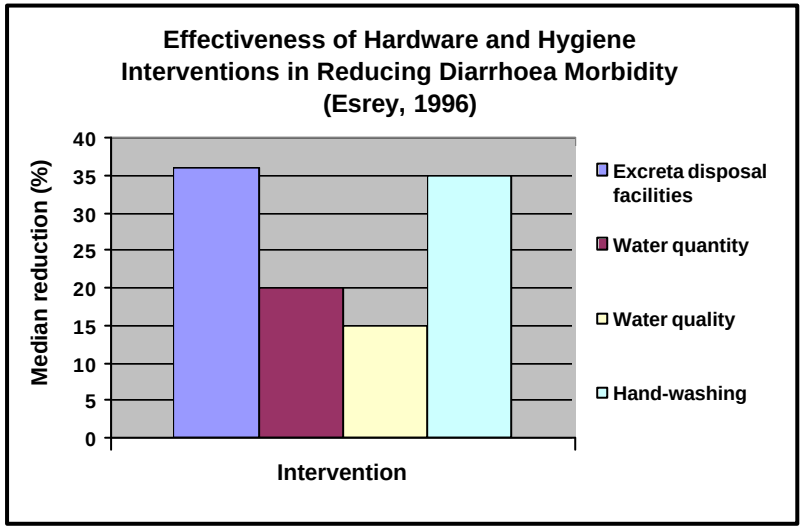
7. Hygiene promotion needs to be carefully planned, executed, monitored and evaluated – at a minimum, information is required at regular intervals on the outputs (e.g. how many broadcasts, house visits, etc.), and the population coverage achieved (e.g. what proportion of target audiences heard a broadcast?). Finally, indicators of the impact on the target behaviours must be collected and fed into the planning process.

7.2 Hand-washing

Many studies have been conducted demonstrating the importance of hand-washing with soap as an important means of reducing the risk of diarrhoeal disease in regular development and during emergencies as a means of improving public health conditions. Studies generally indicate

that washing hands with soap can reduce the risk of diarrhoeal disease by 42-47% (Curtis and Cairncross, 2003); while a study in a refugee camp in Malawi, indicated that the presence of soap in a household led to a reduction of 27% of diarrhoeal episodes (Peterson et al., 1998).

Because diarrhoeal diseases are of faecal origin, interventions are needed which prevent faecal material from entering the domestic environment. The key primary barriers to the transmission of enteric pathogens are safe stool disposal and adequate hand-washing, especially after contact with faecal materials during anal cleansing of adults and children.



If diarrhoea is a major problem with evidence or risk of high morbidity or mortality (and it often is) the focus of response should be excreta disposal, hand-washing, protection of water from contamination and the provision of clean water in adequate quantities. The necessary software or promotional interventions should similarly focus intensively on these aspects until the risks have been mitigated.

Hand-washing with soap (or ash if soap is not available) should be promoted at three key times: after defecation; after cleaning child excreta and before eating or preparing a meal.

7.3 Cleaning and maintenance

The cleaning and maintenance of excreta disposal facilities, especially communal latrines, is often the single biggest problem faced in promoting their use. Latrines should be cleaned daily to prevent disease transmission through contact with faeces and flies, and perhaps more crucially, to prevent insanitary conditions and odour which may deter people from using them.

Individual families should be responsible for their own units, but where there are communal facilities special arrangements must be made to keep them clean. Members of the affected community can usually be effectively employed through paid work or other incentives to undertake these tasks with proper supervision, equipment and training. Education should also be provided to the wider community to ensure that people are aware of the importance of using provided sanitation facilities and the uptake of corresponding hygiene practices, such as hand-washing. Where there are latrines at health centres, particular attention should be paid to their maintenance and cleanliness as patients are likely to be more susceptible to disease.

Even where latrines are not particularly well designed and there are no lids on drop-holes, thorough cleaning and maintenance are the key measures in reducing odour and flies. When cleaning latrines disinfectants such as chlorine can be used to clean squatting plates but should **not** be poured into pit latrines or tanks as this inhibits the natural biological degradation of the excreta. Public health promotion activities are crucially important to mobilize communities to promote and ensure cleanliness of latrines.

Although thorough cleaning can go a long way in controlling and reducing flies or smells, it is generally accepted that most latrines will attract some level of these. Pit latrines should be at least 6 metres away from shelters and other buildings to minimize the effects of odour, flies and pests from bothering or harming the population (UNHCR, 2000).

7.4 Anal cleansing material

Arrangements must be made to assure the availability of appropriate anal cleansing materials at or near all latrines, and an appropriate method of disposal if necessary, as this is essential for hygiene. All people use some form of anal cleansing material and it should not be assumed that the population will have their own supply. In the initial phase of an emergency it is essential that the affected community is consulted to determine the preferred and current methods of anal cleansing. This is important to determine what facilities are appropriate and what measures need to be put in place. Where possible, the consultation process should occur in conjunction with public health promoters who should also promote hand-washing after defecation and after handling infant's stools.

Anal cleansing materials range from water to stones, leaves, corn husks and paper. However, while it is important to recognise what people traditionally use, there may also be the need to encourage people to use more available materials such as paper or water, in a densely populated site affected by an emergency.

Where water is used for anal cleansing, a container of water should be supplied at or in facilities, together with small pots for individual use. This can be managed by the attendants along with the hand-washing facilities. If this is not done people may use plastic bottles and drop these into latrines making them inoperable.

Where solids are used, the appropriate material may also need to be provided. If biodegradable objects, such as corn cobs, are used it may be acceptable to drop these into latrines but these will cause pit latrines to fill up faster. Where space is limited or water-based sanitation systems are in place it may be necessary to provide receptacles to collect soiled material. These materials should then be buried or burned and not deposited where they will create a health hazard.

Box 7.1. Anal cleansing in Panjshir Valley, Afghanistan

In response to IDPs affected by severe drought conditions and the effects of civil war in Panjshir Valley, Afghanistan a hygiene promotion programme commenced. Immediately there were reports of problems with anal cleansing, particularly for children. Affected populations were apparently finding it difficult to use stones or mud because of the cold and were therefore not undertaking anal cleansing properly. Also, some people were finding it difficult to excavate mud balls and store them in appropriate places, particularly bearing in mind the coming winter and snow cover in most of the valley.

As a result, some of the community memebrs were requesting toilet paper, but on reflection, the implementing agency decided not to provide toilet paper as not only did this go against cultural norms, it also provided only a temporary and unsustainable solution. The distribution of sufficient quantities of toilet paper for the whole of the winter to even 1000 families would have been an expensive and complicated matter. Also the problems as articulated by those people requesting toilet paper were not particularly convincing as local people in Panjshir have been managing well enough over countless previous winters. If the problem of storage for mud balls, peculiar to IDPs, was found to be the main issue, then it was agreed that Oxfam could look into ways of resolving this. Finally, Oxfam distributed plastic sheeting to facilitate outdoor storage.

7.5 Fly reduction

Flies, which tend to breed in areas where human excreta is present, can cause eye infections, particularly among infants and children and can also be a vector in the transmission of diarrhoeal diseases. They are capable of transmitting dysentery and typhoid, although evidence suggests that they rarely involved in the transmission of cholera. Flies may also influence whether people are willing to use facilities or not. Between five and ten thousand flies can breed in one kilogram or one

litre of organic matter. They usually have a lifespan of one to two months. Fly control measures include:

- Physical screens;
- Fly traps;
- Lids on latrine squat holes (except for VIP latrines);
- Keeping latrines interiors dark;
- Covering faeces with soil, ash or oil;
- Regular cleaning of latrines; and
- Application of chemical insecticides.

Reducing the number of flies quickly in an emergency can be difficult. Consulting with the affected community on the best method of controlling flies should be a first step in preventative action, and if necessary, educational measures should be promoted where solutions chosen are unfamiliar. Physical screens or fly traps may be the best immediate measure. Installing vent pipes topped with anti-corrosive screens can reduce flies and smells, and lids should always be provided for squat holes, except in the case of VIP toilets where a lid should not be used to allow air currents.

Preventative action to eliminate or limit breeding areas and make conditions less favourable to flies is the best long-term solution. Improving personal hygiene along with safe excreta disposal, drainage and garbage disposal will assist in preventing flies. Regular cleaning of latrines and safe food storage can help prevent the transfer of faecal-oral disease. It may also be relevant to look at the type of latrine model being used – for instance, with trench latrines, use of excavated soil to cover faeces after each use is recommended.

Chemical insecticides can also be used to kill flies. In general, however, systematic recourse to chemical control should be avoided, as such products are costly and toxic to humans and the environment, and insects can quickly develop resistance to the chemicals used. Insecticides should only be used when absolutely necessary and as a short term measure only.

Another way to reduce fly populations is to control fly larvae. The following options can be used to prevent fly larvae growth:

- Using a whitewash of lime and salt on pit walls to prevent the larvae from climbing the walls;
- Regular addition of small amounts of ash, soil or oil to cover faeces;
- The use of biological larvicide and other organic products, including pyrethrum flower powder.

7.6 Sludge reduction

Sludge reducing agents have been developed to speed up the sludge digestion process. These bioadditives are designed to boost one or more of the three basic ingredients of digestion: nutrients, enzymes and bacteria. Sludge reduction agents include Biologic PVH (nutrient-based) Sannitree Biogranules (enzyme-based), and PitKing (bacteria-based). If successful, such bioadditives could be added to pit latrine contents to reduce sludge volumes so that pits will require emptying less frequently.

Several studies have been conducted to test the effectiveness of various sludge reduction additives and indicated that some bioadditives are successful in accelerating reductions in sludge volumes and reducing fly infestation. In these trials, however, recorded increases in sludge reduction rates vary considerably from 5% to 50% and all studies indicate the need for further testing and research (Redhouse, 2001).

Due to the generally faster rate of sludge accumulation in emergencies it is not yet known how appropriate such technologies are for emergency excreta disposal programmes. There are also significant constraints to their application, including cost, procurement and ideally the need for regular stirring to maximize volume reduction.

Sludge reduction bioadditives do not increase liquefaction of sludge, and therefore do not make it any easier to empty latrines by desludging.

7.7 Latrine desludging

Many excreta disposal technology choices involve the construction of a pit or tank which does not rely on infiltration but will need emptying if

used in the long term. Where possible, pits should be appropriately sized or replaced to prevent the need for regular emptying or desludging. This is not always possible, often due to lack of space, and where this is the case facilities for emptying must be in place. Desludging should be considered in situations where:

- land availability is scarce, i.e. it is not possible to dig another pit nearby when one is full;
- ground conditions mean that raised latrines have had to be built: e.g. high water table, impermeable ground or hard rock areas; or
- latrine pits have been lined, for stability or to prevent groundwater pollution.

If latrines are to be desludged, then either the hole in the squatting slab needs to be large enough to allow a hose through for pumping or a removable slab or a removable cover, outside the cubicle, needs to be made to allow a hose or a person to enter. The preferable option is a removable cover so that solids that cannot be pumped out can be dug out and any spillage during desludging does not contaminate the inside of the latrine.

Mechanical emptying

The easiest and most hygienic method for emptying latrines is to use a vacuum tanker (sometimes know as a 'sludge-gulper') which is a truck with a large tank fitted with a mechanical pump. After pumping out the contents of the pit, the tanker can be driven to a safe disposal site, such as an off-site underground pit or sewage treatment works, where the contents can be emptied. Vacuum tankers are good at removing liquids but poor at removing solid material. Dry pits or pits containing large quantities of solid materials such as stones, sticks, plastic bags, etc. cannot be emptied. Another problem with vacuum tankers is that they are very large and may be difficult to manoeuvre close to latrines.

Where a purpose-built vacuum tanker is unavailable or inappropriate, a collection tank can be mounted on a flat-bed truck, and a portable pump used to pump the waste from the pit to the tank. Such pumps must be carefully selected, particularly where hard anal cleansing materials are used, and specialist sewage pumps are recommended. Again, this is

most suitable for wet conditions, and if necessary a small volume of water can be pumped into the pit first and stirred into the sludge to help liquefy it.

Oxfam Kit WSDP/6 is an electrical submersible sludge pump which is capable of desludging pit latrines. It has a metal grill to prevent large bits of rubbish, bottles, bones etc clogging up and jamming the impeller. If extra pumping head is required these pumps can be put in series. This kit could be used to pump slurry into ex-water tankers, barrels or metal tanks mounted flat bed trucks, tanks for transportation to a disposal area. The aim of this type of desludging is not to remove everything from the latrine but only the slurry component. Removing the top two-thirds of the pit sludge can extend the life of the latrine by a few years before eventually the compacted solids will have to be dug out by hand.

Hand-operated latrine-emptying pumps are available in some countries. These are usually mounted on a hand-pushed cart which can be wheeled close to the pit to be emptied. These are much slower in operation than a mechanical pump and experience in their use is likely to be necessary. Such pumps are most appropriate if available and used locally, and where pit contents are wet.

Difficulties encountered in mechanical desludging include:

- difficult vehicular access to latrines;
- dry excreta with little liquid content which cannot be pumped, and lack of available water to dilute pit contents;
- solid anal cleansing materials which clog up pump or hose;
- difficulty to keep up with demand where there are large numbers of pits that fill rapidly;
- lack of an appropriate site for final disposal of waste; and
- where latrines are inaccessible or poorly maintained people may choose instead to defecate into plastic bags and throw them into the latrines – this is likely to cause blockage of the sludge truck.

Box 7.1. Desluding after a flood in Mozambique

In order to respond to the floods which occurred in Mozambique in 2000, a large desludging programme was initiated to desludge overflowed septic tanks during the second phase of response. This took place in a town with a large IDP population, which had a pre-existing sewerage system servicing houses with septic tanks. During the floods, the septic tanks became full with mud and flood water and had to be emptied quickly.

In this case, there was no desludging truck available so an electrical submersible sludge pump was ordered. More water was added to the septic tanks, and a hole was dug away from the tanks, a fair distance from the houses. The team then pumped water from the septic tank into the hole and afterwards covered it back up with soil, and then dug out the residue at the bottom of the tanks by hand. This option was chosen because in this case access to a truck was unfeasible, and roads were very difficult to access. The pump proved to be particularly useful in this context and didn't jam despite handling large amounts of waste – however this was directly dependent on water being mixed with the waste to increase the liquid content. Previous to this, the pump had not been tested for desludging.

A small desludging truck with a capacity of 5000 Litres was later purchased for the municipality, which could be pulled by a tractor, so that in the future the town could take charge of these issues instead of relying on the nearest larger city.

Manual emptying

As a last resort, pits can be emptied of waste manually. This generally involves workers climbing into the pit and using shovels and buckets to take the waste out. This can then be placed in a wheelbarrow, or truck, and taken to a safe off-site disposal site. This should only be attempted once a pit has been closed and the contents left to decompose for some time (preferably at least two years). Although many cultures have a tradition of hand emptying pits, in densely populated areas this should be avoided if at all possible.

In Katale Camp, Goma in 1995, latrines were emptied using buckets which were subsequently emptied into 200 litre drums on 3 tonne trucks, which disposed of the material in a dump some 6 km away. Approximately 100m^3 sludge for 150,000 people was evacuated every week using this method.

Sludge disposal

Sludge that has been left undisturbed for over two years is not a hazard to the environment. It can safely be spread anywhere convenient such as a garden or refuse tip. Its fertiliser value is not good but it will add humus and fibre to the soil which will promote plant growth.

Open disposal of fresh sludge into water or onto land is undesirable as it is an environmental and health hazard. The best solution is to bury sludge in pits where it cannot come into contact with humans or animals, and will not contaminate groundwater sources. Alternatives are to mix it with the influent at a nearby sewage works or compost it with domestic refuse.

8. Strategies for Difficult Situations

The technical solutions for latrines in areas where there is a shallow water table, areas which are flood prone or are very rocky, are limited. If conditions are obviously unsuitable a strong case may need to be made to support the movement of people to a more suitable site. However, often there is no other option to these sites and alternative solutions will need to be found.

In some situations it may be impossible to use traditional infiltration techniques (such as simple pit latrines) for excreta disposal. This is likely to be the case:

- where the water table is very close to the ground surface, limiting excavation;
- where groundwater sources are likely to be contaminated easily;
- where there is hard rock close to the surface, making excavation very difficult;
- where the ground is so soft that pit walls collapse before an adequate depth can be reached; and
- in flood-affected areas.

In addition, urban environments and situations where toilets are not wanted or accepted can pose particular challenges to the implementation of an appropriate emergency response programme.

8.1 High water tables

Generally, the base of the pit must be at least 1.5m above the wet season water table to prevent contamination, but in some geological conditions this may be insufficient. If there is a conflict between latrine provision and water supply it is usually easier and cheaper to develop another water source than provide alternative excreta disposal facilities. This may not always be possible, however, and wherever the

groundwater level is high, protective measures should be taken, especially where groundwater is used as a source of drinking water.

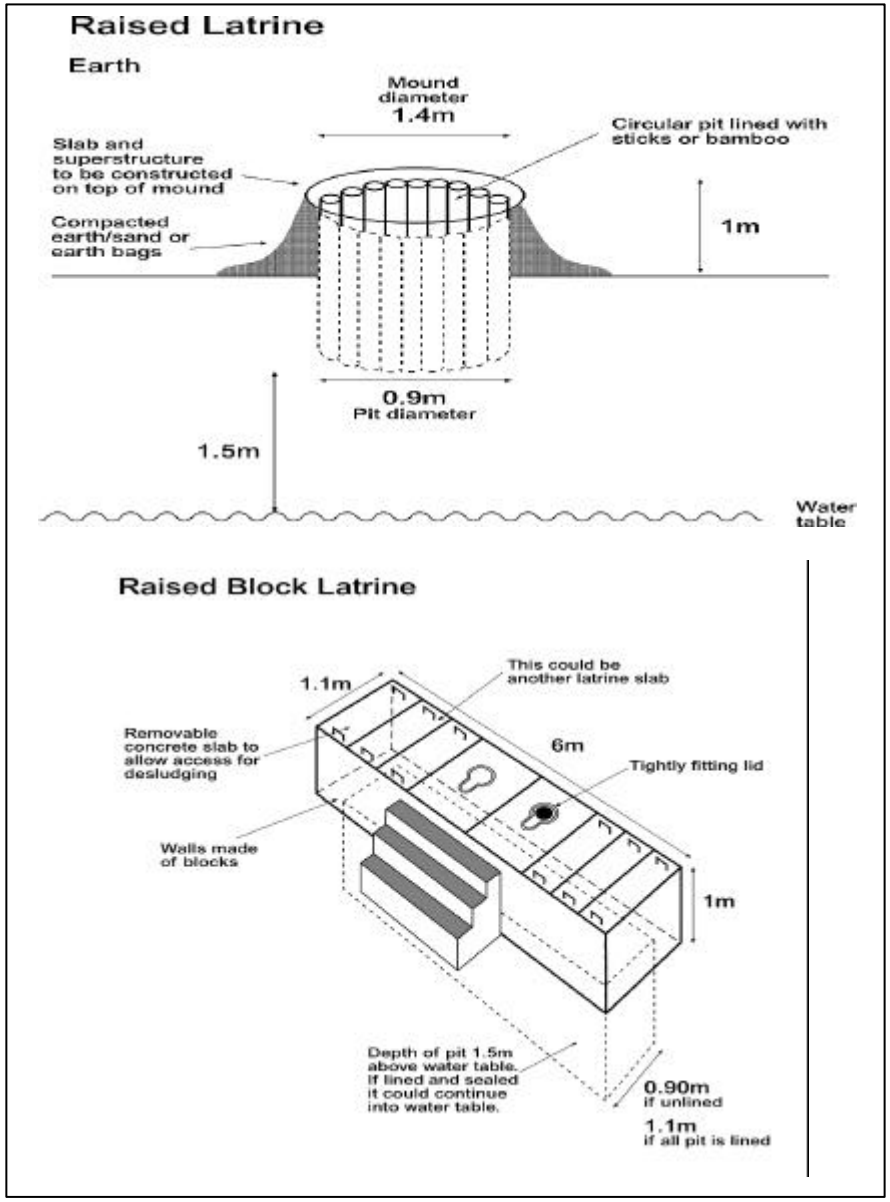
If groundwater resources are not exploited for water supply in the area, the prevention of groundwater contamination should be of secondary importance to the provision of adequate excreta disposal facilities.

Where the water table is high **and** groundwater is used as a water source, there are a number of excreta disposal options that can be applied, including:

- **Raised pit latrines** – widespread solution, relatively simple to construct, require emptying, may be single or twin-pit;
- **Sand-enveloped pit latrines** – relatively time-consuming to construct, require suitable sand, can be combined with a raised pit;
- **Sealed pits or tanks** – must be water-tight, can be above or below ground, relatively expensive;
- **Composting latrines** – can be raised or shallow twin-pit, work best where people are already accustomed to their use or where there is agricultural activity;
- **Septic tanks or aquaprivies** – can be above or below ground, relatively expensive, require water and space.

Raised pit latrines

The most common solution for excreta disposal in areas of high water table is to build raised pit latrines. These can be in the form of simple pit latrines or VIP latrines in which the pit is built upwards above ground level using bricks, blocks, stone, concrete rings, corrugated iron culverts or earth mounds. This increases cost and construction time considerably and family members may be unable to construct this type of latrine by themselves. To prevent contamination of groundwater the bottom of the pit should be **at least** 1.5m above the water table level. It is especially important to know how many people will be using the latrines and to calculate the rate of solid and liquid accumulation in the pit, to size them appropriately. A large number of small capacity latrines, wide rather than deep, are preferable to fewer large capacity latrines.



Using the same concept as the raised pit latrine mounds or platforms could be built whereby people can defecate directly into buckets or drums which can be emptied manually.

Sand-enveloped pit latrines

Where there is a high risk of groundwater contamination, and it is important to prevent this, a sand envelope can be constructed around a lined latrine pit to reduce pollution. This envelope is usually about 0.5m thick and acts as a filter to minimise the transmission of disease-causing micro-organisms. It should not be assumed that this will stop contamination completely. Where the risk of pollution of nearby groundwater sources is especially high, and there is no viable alternative, it may be appropriate to construct sand-enveloped **raised** pit latrines.

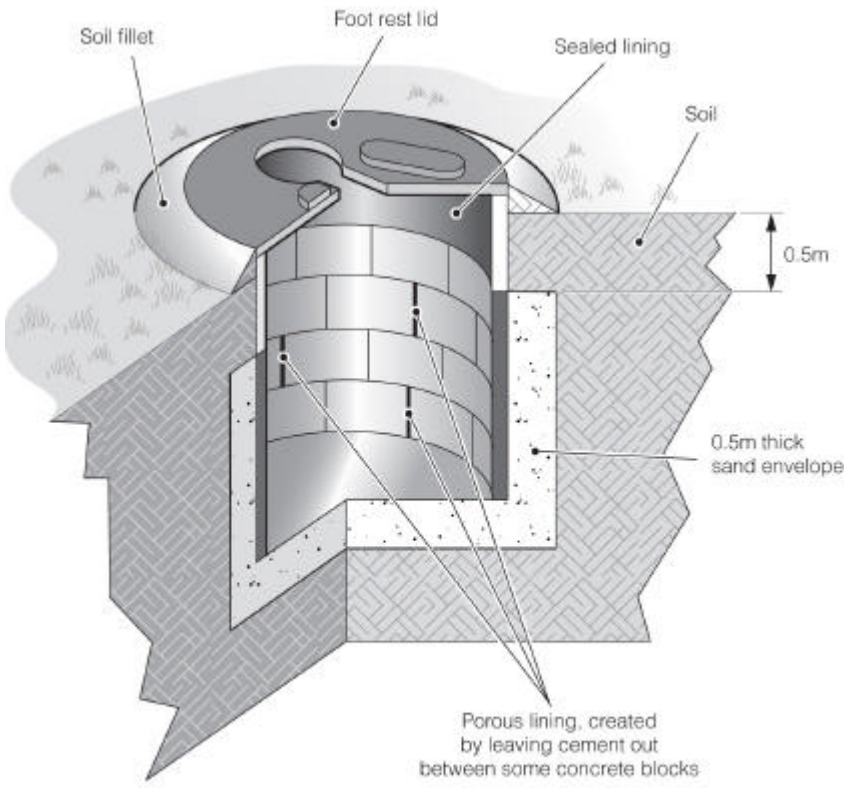
Composting and twin pit latrines

Composting latrines can be used in areas of shallow groundwater. These normally consist of two chambers and are raised above the ground to facilitate easy emptying. One chamber is used until it is full, at which point it is sealed and the second chamber is used. If the contents of the first are left to stand for 1-2 years the waste will be relatively safe to handle and the pit can be emptied. Chambers must therefore be sized so that each takes 1-2 years to fill in order to allow the contents of the first to decompose while the second is being used. Once both pits are full the first can then be emptied and used again.

In a composting latrine urine is separated from faeces and bacteria, worms, or other organisms are used to break down organic matter to produce compost. This is encouraged through the addition of organic refuse, such as vegetable waste, to the toilet chamber. The objective is to reduce excreta to a safe re-usable state. The final compost produced can then be used as fertiliser for agricultural purposes.

Composting latrines are most successful in emergency situations where the users are accustomed to their use and there is significant agricultural activity in the area. Even where this is not the case, however, they can sometimes be used in areas of shallow groundwater if an appropriate consultation process is followed (see Box 8.1).

Sand-enveloped pit latrine



Dimensions + specifications

Box 8.1. Twin-pit composting latrines in Nepal

In March 1992 around 90,000 people fled persecution in Bhutan and became refugees in the lowlands of Eastern Nepal. An initial rapid assessment indicated that communal latrines were not proving to be very effective with widespread evidence of open defecation and pollution of shallow tube wells. Following consultation, it was decided that twin pit composting latrines should be constructed in order to deal with the shallow water table, each shared between two families so that they would take responsibility and feel ownership of latrines and so that solids accumulation did not exceed shallow pit capacity.

The immediate impacts of this decision included:

?? moving from communal latrines to shared family latrines initially reduced and subsequently virtually eliminated open defecation;

?? in conjunction with improvements in water supply and hygiene promotion health problems related to excreta-related diseases started to decrease to manageable levels.

Longer-term impacts included:

?? health improved to an acceptable level for the area;

?? over a nine-year period latrine costs were kept to an affordable level as investments are only required for maintenance;

?? local government and other agencies were very satisfied with the latrine design which was subsequently introduced to local communities in villages surrounding the camps;

?? the refugee community was very satisfied with the latrine design and mostly participated in pit emptying on a voluntary basis.

Composting latrines were introduced to communities with no previous knowledge of such systems, initially for technical reasons, but with results that were not expected by many people. These latrines have proved to be popular with the users over many years without major change or problems occurring. In this regard the decision to choose this design early on was the right one.

Twin pit latrines in which there is no urine separation and no organic waste is added can also be used in areas of shallow groundwater. Where it is not feasible to dig a deep pit it may be easier and cheaper to dig two shallow pits side by side. The same process can be used by waiting 1-2 years before emptying the first pit, but unlike a composting latrine the pit contents will not be a good fertiliser, although they may help to improve the quality of the soil to which they are added. Twin pits can also be use in conjunction with VIP latrines or pour-flush latrines where pits can be off-set but still require emptying.

Sealed pits/tanks

Groundwater contamination can also be prevented if the disposal pit or tank is fully lined and sealed, so that the contents are unable to infiltrate into the surrounding ground. This can be done using locally available materials such as concrete, cement blocks, bricks, plastic tanks, Oxfam tanks, and concrete or metal culvert rings. The construction of fully lined pits is expensive and time-consuming, however, and is likely to be impractical where family latrines are desired. The second disadvantage is that such pits will need to be emptied relatively regularly, since no infiltration is able to occur.

Septic tanks and aqua privies

Septic tanks and aqua privies can also be used where the water table is high. These can be constructed above or below ground and treat sewage prior to its disposal. This minimizes groundwater contamination by reducing pathogens in the waste, especially if the final effluent is discharged on the ground surface of agricultural land. Such systems are most appropriate where water is available in reasonably large quantities and where water is used for anal cleansing.

8.2 Flooding

Flood disasters as a result of hurricanes, cyclones and heavy rainfall lead to an enormous toll of human suffering, loss of life and economic damage. There are different types of flooding events that cause different problems; we can define three main types of floods:

1) **Rapid onset floods** – these include flash floods, tidal surges, high run off from heavy rainfall, dam bursts & overtopping, canals & rivers bursting their banks; typically water rises to dangerous levels within 48 hours.

2) **Slow onset floods** – prolonged rainfall causing low-lying areas to gradually become flooded over a matter of days or weeks.

3) **Annual seasonal flooding** – many communities around the world are flooded annually and may be under water for some considerable time each year.

Millions upon millions of people have been affected, some 103,000 people killed and millions of hectares of crops lost over the last 10 years. While the majority of deaths were directly attributable to rapid onset floods many deaths were from diseases after the event due to an unsanitary environment and contaminated water. Good and appropriate excreta disposal in these situations can have a profound effect on the health of the effected populations. To ensure an environment free from faecal contamination three main areas must be addressed:

1. Promotion of good excreta disposal practices by the affected population through the involvement of the community in the design and siting of the latrines;

2. Prevention of overflowing of raw sewage from pits and septic tanks during flooding which results in a very serious environmental health hazard; and

3. Provision of adequate excreta disposal facilities for displaced people during flooding.

Particularly if sanitation systems are already inadequate, flooding can have disastrous consequences. Damage to sanitation systems can contaminate water supplies. The combined effects of open sewage and reduced opportunities for good personal hygiene also favour the spread of infections causing diarrhoea, such as cholera and gastrointestinal viruses. Countries with a good infrastructure for drainage and disposal of human waste have far fewer direct health problems during flood disasters, showing the importance of taking measures for disaster preparedness.

Flood response strategy

There is no single solution for excreta disposal in response to a rapid onset flood event. The optimum solution will depend on local cultural practices, environmental issues and what local materials are available for use.

Public consultations & awareness programmes are essential to inform people of the possible knock-on effects of floods and establish what it is and isn't possible for the community to do. If a community truly understands the enormous public health risks associated with poor sanitation they themselves can often find more creative low cost solutions than most NGOs can.

Even in a 1st phase emergency hygiene and public health promotion is a crucial component of response. The population need to be involved in decision-making and implementation as much as possible right from the start. They need to know why it is important to remove or contain the excreta and different ways in which this can be done. They should be consulted as far as possible on the siting, design and use of any excreta disposal system proposed.

Possible excreta disposal solutions for flood prone areas for first and second phase emergency response are summarized below.

1st Phase options for rapid onset floods

?? **Over-hung toilets** – in floods where there is still flowing water or there is a river nearby one of the quickest ways to eliminate the public health risk is to excrete directly in the river. While this may present a health risk for the people downstream it may avoid a health risk in a crowded area of higher land. Cubicles should be quickly erected for this as in most cultures privacy is a major concern, especially for women.

?? **Portable chemical toilets** – this is an expensive short-term option and depends on the local availability of such toilets. Chemical toilets require regular servicing and emptying and a contractor to do this, it is also necessary to have a flat stable surface on which to place each unit.

?? **Bucket latrines** – a number of large buckets/containers or barrels with squatting slabs of some sort over the top can be set up so people can defecate in them. These need to be provided in makeshift cubicles, using cloth, plastic sheeting or local building materials, and need to be emptied daily. A safe system of bucket collection and final disposal of excreta is essential if this option is to have minimal negative impacts.

?? **Plastic bags** – in the immediate aftermath of some flood events, such as those in Bangladesh in 1998, people can defecate in plastic bags and then float them away. This is an emergency short-term measure only and if the bags are not collected and disposed of properly, or a river does not take them out to sea, this would constitute a serious health risk.

2nd Phase options

?? **Raised latrines** – there is a variety of ways to raise latrines (including using earth, mud bricks, cement blocks and concrete structures depending on what is locally available) and it is normally necessary to raise them by only 1–1.5m above ground level. If this option is selected as part of a flood response strategy it is important not to forget the house; if the house is submerged then people will flee their houses anyway. There are numerous examples of excreta disposal programmes where implementing agencies have raised latrines above the level of the users' houses.

?? **Sealed pits or tanks** – such pits may need dewatering before construction can go ahead; $1m^3$ pre-cast ferrocement tanks can usually be manufactured fairly easily or plastic tanks can be used with appropriate fittings for desludging. This is the preferred option for institutions such as schools and hospitals; when used for houses one septic tank can serve a number of houses.

?? **Composting latrines** - not recommended for areas that flood frequently (see Box 8.2) but for where floods have subsided but digging pits is impossible. Where people do not have a history of excreta reuse considerable time is required for raising awareness of the process initially and later for use of the compost when the first container is full.

Box 8.2. Elevated compost latrines in Dominican Republic

In the second phase response to flood-affected communities in Dominican Republic, 210 latrines were built, some for individual families and some shared between 3-6 families. The public health promotional work before, during and after the construction was extensive and latrines were generally used properly and kept clean.

The latrines had to be elevated, as the water table was less than 1m below ground level, and composting latrines were deemed appropriate as there were other latrines of this design in the area and any other solution involving desludgeable tanks would not be sustainable. The normal rate of solids accumulation was approximately $0.06m^3$/person/year. Therefore, based on 3 families comprising 15 people, latrines were designed with a combined volume of the two compartments of $1.44m^3$, allowing for 20% reduction over a 2 year period.

After one year (or when the first compartment was full) the users were expected to move the toilet pedestal from the drop-hole of the first compartment to the drop-hole of the second. Since the area was prone to flooding, the compartments were sealed with breeze blocks to prevent floodwater entering and to ensure that the contents of the compartment were kept dry to facilitate adequate decomposition. Users were expected to crack open the breeze blocks of the first compartment to remove the compost and then reseal them.

There was concern over whether people would cement up the breeze blocks once they had cracked them open to extract the compost. Some felt that some kind of door or panel may have been more appropriate and sustainable than sealing with blocks, while others argued that this would not be watertight. This illustrates the problem of using composting latrines in flood-prone areas.

?? **Low-cost sewerage system** – if there is sufficient water available, and large bore drainage pipes, from 200mm to 3m diameter, then people can defecate directly into special holes in the pipe and water released periodically to wash the sewage into a sump for desludging

or for pumping out to sea. Washing areas could also be plumbed into these sewage drains to help the effluent flow.

?? **Small bore sewage systems** – in crowded settlements prone to flooding small bore sewage systems can remove the sewage from densely populated areas, but unless this is constructed properly it can be prone to flooding itself. Many developing countries also face the problem of lack of sewage treatment for these low cost systems.

?? **Sewage treatment system** – on-surface wastewater treatment systems such as the Oxfam sanitation unit (see Section 5.9) can also be used in flood-affected areas, but these are relatively high tech, high cost solutions.

Where latrines are situated in areas prone to seasonal flooding then the **pits need to be sealed** to stop the sewage mixing with the groundwater and polluting water sources. This can be done with cement plastered bricks or blocks, ferrocement or concrete rings.

Where flooding can be excessive **tight fitting lids should be put on the squat hole** so that the sewage cannot rise up out of the hole.

Water seals can also be used to prevent solids being able to escape when the tank/pit has become water logged.

In some cases flood events can actually have a positive effect by encouraging people to use latrines (see Box 8.3).

Box 8.3. Flooding as an impetus for latrine use in Nepal

A survey of the Brahmaptura and Ganges basin in Nepal found that less than 50% of the population of flood-affected areas initially had access to toilets. However, changes in their environment as a result of flooding, such as relocation of villages, denial of access to forests and riversides by the Government and refusal by Brahmin landowners to allow defecation on their land, resulted in an unprecedented acceptance and demand for latrines at the village level, even among groups who have never previously used latrines.

8.3 Rocky areas

The solutions suggested for high water table and flood-affected areas are also applicable to rocky areas.

In addition, for first phase emergency response in areas where the ground is extremely rocky making it virtually impossible to dig trenches or cover faeces with soil, **intensive defecation areas** may be needed. In this case a defecation area is set up and each time a person goes to use it they are given a shovel with a cupful of burned lime to take with them. They then sprinkle half of the lime on the sand before defecating on top. The other half of the lime is then used to cover the faeces, which are then scooped up on the shovel and taken out to be put in a covered container at the side of the fenced off area. Staff empty the containers into an off-site pit, or load them onto a truck for disposal elsewhere. As with other public toilet facilities, water and soap should be provided at the defecation area for washing hands. When the sand layer becomes depleted as users scoop up faeces, it should be covered again. This method was used in Goma in 1994.

Also in Goma in 1994 people were encouraged to use existing fissures in the rock for excreta disposal. However, these became full very rapidly. If using rock fissures extra care should be taken that it is not likely to contaminate an aquifer, especially where groundwater is used for drinking. If mechanical diggers are available larger pits can be excavated in soft and brittle rock and can be adapted into septic tanks.

8.4 Urban environments

It is particularly difficult to provide effective excreta disposal when working in a large urban environment. Normally, the first strategy is to make use of or rehabilitate any existing latrines, this may involve isolating part of the sewer system if some parts are damaged. If there is large scale damage to the sewerage system try and locate septic tanks and set up temporary latrines which feed into them. In some situations it maybe possible to hire portable toilets, but these require desludging almost daily in crowded sites, and should only be considered if it can be guaranteed that regular desludging can take place.

Other technical solutions are to use concrete culverts, by blocking off the ends of a row of culverts, digging them in to the ground and making squat

holes in the top of the culverts. If it is all set on a slight gradient then the "tube" can be desludged from one end. Tanks such as Oxfam tanks can also be dug into the ground and used as desludgeable excrement containers.

Emergency wastewater treatment systems can also be used in urban environments (see Section 5.9).

In urban areas it is better to concentrate on communal areas such as markets or transit centres rather than attempt to provide family latrines for everyone. Discussions with community groups should help to identify where the risks are and whether there are possible solutions, such as several families sharing one latrine or public latrines at key locations.

Sewerage systems

Sewerage systems are not common in emergency situations, although they may be used where the affected population remains or relocates in an urban area. Most sewerage systems need at least 20-40 litres of water per user per day to be flushed into the system (Adams, 1999). In addition, pumped sewerage systems and sewage treatment works may require a back-up power supply to keep the system running. This may be a major undertaking.

8.5 Where toilets are not wanted

Various situations can be encountered where the use of toilets or latrines is unwanted. This normally occurs where latrines are not usually used outside of emergency situations and the people themselves do not want to begin using them, or where the local government or landholder does not want to see any form of permanent sanitation system.

The **cat method** is an option for communities who are not familiar with latrines and do not want to use them, such as for nomadic communities. This approach encourages people who defecate on the ground to cover up faeces as soon as possible with soil, and provides the necessary tools, such as small hoes, to do this. These hoes provide another incentive to participation in the excreta disposal programme since they can also be used for farming. While other measures are preferable, the cat method is an effective alternative that ensures safe disposal of

excreta and that does not force latrines on people who do not want them.

Hygiene promotion is particularly important in promoting this method as it ensures the importance of covering up faeces so that vectors do not contaminate the local environment. This method can also be used in designated defection areas along with health promotion and hand-washing programs, or in rural marginalized areas where it is very difficult to obtain any kind of material to construct latrines.

9. Monitoring and Evaluation

The process of monitoring and evaluation should be started as soon as implementation of the excreta disposal programme begins. Monitoring and evaluation are processes used to assess whether interventions are going to plan, and what the impacts of these actions are, they can be used to:

?? assist in the planning process;

?? identify whether any readjustment to a programme is required;

?? determine the progress of a programme; and

?? provide a measure of overall success or failure.

Monitoring and evaluation are often seen by field staff as simply exercises to please the agency headquarters or the donor. However, if they are used properly they can be useful tools to support and improve programme performance. They can also provide useful information for reports, replacement staff, and allow staff and organisations to learn from mistakes

Monitoring and evaluation will:

?? save you time in the long-run;

?? ensure that you know what you are doing or trying to do; and

?? help you keep track of where you are and where you are going.

9.1 Monitoring objectives

Once implementation begins it is essential to introduce effective monitoring of programme activities. Monitoring can be built into implementation management and is necessary to answer the following questions about the programme:

?? Have the various activities been undertaken as specified in the programme design?

?? Are materials and inputs reaching the affected population in good time?

?? Are the provided facilities being used and maintained?

?? Are hygiene promotion activities encouraging the affected population to participate in project/programme activities and to use the facilities provided?

?? Are there any unexpected problems occurring and how can appropriate action be taken?

The responsibility of the field practitioner does not stop with the completion of facility construction but with their effective use and maintenance. There may sometimes be a tendency to monitor activities only during construction. If this is the case, however, it may be that new facilities are never used, and if monitoring is not on-going the reason for this will never be discovered. Monitoring of all aspects of the programme should continue for as long as the agency is operating in a given area. Time spent on this activity should ensure programme effectiveness and prevent mistakes from being repeated in future.

9.2 Monitoring methods

Monitoring aims to determine whether implementation targets are being met according to plan and if not how the programme needs to be adjusted. Monitoring should be an on-going process which starts in the immediate phase of an emergency and continues indefinitely. It facilitates programme change in changing situations. The following sections describe different monitoring methods and give examples of how these can be applied to the same situation.

Initially monitoring can be done in the form of weekly monitoring report using a simple data sheet as shown in Table 9.1.

Table 9.1. Monitoring data sheet	
Location	
Name of sanitation worker	
Name of local responsible	
Number of dwellings served	
Number of latrines	
Conditions of latrines	
Number of latrines under construction	
Target number of latrines	
Instructions and comments	

Such a report does not however tell us if the latrines are actually being used or how the community are responding in terms of construction and maintenance. The public health promotion team along with the sanitation team need to collect this information by observing behaviour and talking to members of affected community individually or in informal groups. Public health promoters can also maintain monitoring forms or encourage family members to maintain their own monitoring form for each latrine and to report any problems to the relevant public health promoter (see Appendix X).

Community members can also be involved in identifying health risks using a mapping exercise as used in the initial assessment (see Chapter 2). Areas of open defecation, full latrines, maintenance problems etc could be identified on such a map. In this way, community members are also able to observe if any improvements have been made. Maps should be developed by both men and women, and children may also have fun producing maps or placing signs. In one project in Bangladesh children put red flags in the actual areas where there was indiscriminate defecation and so shamed other people into taking more care. The responses from such surveys should be

discussed between the sanitation team and the public health promotion team to ensure there is a joint approach to using this monitoring data to improve the effectiveness of the project.

Monitoring framework

Table 9.2 presents a more detailed monitoring framework that can be used to monitor all programme activities.

SWOT analysis

SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis is a simple monitoring exercise that can be conducted through brainstorming by all key stakeholders under the following headings:

Strengths: Those things that have worked

Weaknesses: Those things that have not worked so well or could be improved

Opportunities: Conditions which are favourable and can be taken advantage of by the programme

Threats: Threats which reduce the range of opportunities for improvement

The purpose of this exercise is to provide a rapid summary of the key positive and negative aspects of the programme to date. This should help participants to focus on programme successes and how to sustain them, and weaknesses and how to overcome them.

This can be carried out at monthly intervals and can be used with different focus groups such as men, women, children, disabled people and the elderly.

Table 9.2: Monitoring framework

Monitoring component	Monitoring data
Staff	Has the target number of staff been recruited and trained? Does this include skilled staff from within the affected community? How are staff selected and trained? Is training on-going? Are staff supervised and appraised? Are staff working effectively and efficiently? Are there any personnel problems or conflicts?
Resources	Are appropriate resources procured and used as planned? Are logistical procedures clear and efficient? Is there regular feedback on order status from the logistics department? Is there a need for any additional resources? Are local materials used where possible? Are there any detrimental environmental effects?
Finances	Has the budget been kept to so far, and if not why not? How does expenditure compare with each budget line forecast? Is there regular feedback from the finance department? Are there any significant unforeseen costs or savings?
Time	Are activities being implemented according to schedule, if not why? Is time managed efficiently? Are there any unforeseen time constraints?
Outputs	Are the targets for facilities and hygiene promotion being met, if not why not? Has the overall health of the population improved? Are benefits spread equally among the affected population, is anyone excluded? Are the outputs sustainable? Are there any relevant needs which have not been addressed? Are there any unforeseen effects caused by the programme?
Community	Is the community actively involved in design, construction, O&M? Are all facilities being used and if not why not? Have hygiene practices improved? Are there any capacity building activities for the community? Are there any conflicts between different stakeholders?
Information	Are regular reports and plans produced and disseminated? Is information from reports fed back into the implementation process? Are meetings held regularly with key stakeholders? Are activities co-ordinated between teams? Are activities co-ordinated between implementing agencies? Is technical support and information available if required?

Log-frame analysis

Another method of monitoring is to use the logical framework produced in the detailed programme design. This can be done by using the measurable indicators for outputs and objectives which were identified at the planning stage. Each indicator can be used to test whether the programme has achieved the planned outputs, and this is recorded in the final column 'Recorded information'. Table 9.3 shows a simplified example.

Table 9.3. Log-frame analysis example

Narrative summary	Measurable indicators	Means of verification	*Recorded information*
Purpose: To reduce the incidence of diseases associated with inadequate excreta disposal for 50,000 displaced persons for six months	Mortality and morbidity rates from diarrhoeal diseases	Health centre records, volunteer and public health team's monitoring forms	***Acceptable CMR = 0.8/10,000/d*** ***High diarrhoeal morbidity rates 65 cases/10,000/wk***
Output: To ensure adequate excreta disposal in line with Sphere minimum standards All sections of the community are aware of what they can do to prevent diarrhoeal diseases and are mobilised to take action to control them	Ratio of latrine coverage 1/20 People feel the toilets are safe and private People use the toilets available, children's faeces are disposed of immediately and safely, toilets are cleaned and maintained, people wash their hands after defaecation	Project records, observation, focus group discussions Observation of camp, latrine monitoring forms, excreta maps, focus group discussions, pocket charts,	***1 latrine for 15 people*** ***Children's stools disposed of but many latrines remain dirty*** ***Limited water & soap for hand-washing***
Activities: 1.Recruit & train personnel 2. Design & construct latrines …….etc.	No.s of staff and training completed Etc…	Project records, training evaluation Etc…	***recruited and trained 1 hygiene promoter per 500 people etc…***
Inputs:	Tools and resources	Logistics and financial records	***50 latrine digging kits distributed etc…***

9.3 Monitoring reports

It is essential that the results of any monitoring exercise are reported and that these are used to revise and amend implementation plans. The most simple form of monitoring report is a weekly situation report but more detailed reports can be produced based on each or all of the monitoring techniques described above. Table 9.4 shows an example situation report outline.

Table 9.4: Situation report outline

Location
Agency
Reporting period
Name of reporter(s)
Position of reporter(s)
Overall situation summary (security, population, climate, etc.)
Staff issues (new staff, contracts, salaries, etc.)
Goods received in reporting period
Logistics orders outstanding (order dates)
Expenditure for reporting period
Financial requirements for next reporting period
Time constraints (reasons for delays, etc.)
Activities undertaken during reporting period
Changes made to existing plans (including reasons)
Tasks outstanding / forthcoming activities
Community issues
Information details (meetings held, data received)
Information requested
Other agencies / stakeholders (news and activities)

Fieldworkers should produce a weekly situation report (sitrep) to record progress made during the past week, any changes in the current situation and amended future plans. This may be a very brief report, but weekly reports may be used to feed into more detailed monthly monitoring reports.

Field reports from sanitation staff can contribute greatly to the monitoring process and ensure that information is available to other agency staff and any replacement personnel.

Weekly or monthly situation reports (sitreps) from the field can go a long way to assist programme planning, contribute to contingency planning and keep key personnel informed.

9.4 Evaluation objectives

Programme evaluation is an assessment of an ongoing or completed programme, in terms of its design, implementation and outputs. This evaluation can be built on the monitoring process and is designed to answer the following questions:

- Have the programme aims, activities and outcomes been appropriate?
- Have the initial programme purpose and objectives been fulfilled?
- Have the recommended minimum objectives been satisfied?
- Has the programme been effective?
- Has the programme been efficient?
- Has the programme been equitable?
- Has the programme had any other effects ?
- Are the outputs sustainable over their design life?

Generally, evaluation is conducted at, or towards, the end of the programme. An interim evaluation, or review, can be carried out during the programme and may be more useful in identifying and remedying weaknesses. (Table 9.5 represents a simple framework for evaluation.)

Table 9.5: Evaluation framework

Evaluation component	Key factors to consider
Appropriateness	Has the programme been appropriate with respect to the: ?? perceptions and needs of the affected population; ?? policies and mandate of the agency; ?? national and international policies; and ?? urgency and prioritization of needs.
Connectedness	Have local resources & capacities been identified & built upon? Has the programme enhanced community decision-making? Has the agency an appropriate phasing-out strategy? Are the programme outputs sustainable over their design life?
Effectiveness	Has the programme purpose been realised? Have there been any unforeseen side effects? Has the programme evolved in line with monitoring results? Have the recommended minimum objectives been satisfied?
Impact	Have the programme objectives been achieved? What has been the effect of the programme on morbidity and mortality rates? How can this be determined? Has the programme helped stabilize & empower the community? Have there been any unforeseen impacts?
Coherence	How has the agency collaborated with implementing partners? Have there been any overlaps with other humanitarian actors? Have community priorities and plans been incorporated into intervention strategies? Has there been effective information flow between stakeholders?
Coverage	What has been the extent of the programme impact on the affected population? Has access to appropriate facilities been adequate? Have any groups or individuals been excluded?
Efficiency	Has the ratio between outputs and inputs been acceptable for: ?? staff; ?? resources (including logistical procedures); ?? finances (cost-effectiveness); ?? time; ?? community participation; and ?? information?

Misunderstandings

Many aid workers become defensive if 'their' project is to be evaluated, since they worry that the results will be used to test them and show how poor their outputs were. This is not the purpose of evaluation. It is important that any evaluation is:

?? participative; and

?? constructive.

Often evaluations can be seen as simply a number-counting exercise, for example the number of latrines or tapstands provided, or the number of beneficiaries. Such evaluations provide little meaningful information.

9.5 Evaluation methods

All the methods used for monitoring can be incorporated into the evaluation process. Evaluation can be conducted in a similar way to monitoring using the evaluation framework in Table 9.5 (adapted from Hallam, 1998).

Cost-effectiveness

Calculation of cost-effectiveness is a useful tool to investigate whether the programme has been efficient in terms of resources versus outputs. Some agencies or donors may require a cost-effectiveness evaluation. A simple method of measuring cost-effectiveness is establishing the *cost per beneficiary* for each programme activity. Cost-effectiveness targets can be set in the programme design and implementation framework and then compared to the final values achieved.

If the programme is to be cost-effective, the benefits to the target population must be greater than the overall costs of running the programme to the community, donor and implementing agency. The cost per beneficiary ratio can be calculated for the overall sanitation programme or for each sanitation sector and incorporated into the overall evaluation.

Programme evaluation is an assessment of an ongoing or completed programme, in terms of its design, implementation and outputs. This

should be built on the monitoring process and aims to assess the appropriateness, effectiveness and efficiency of a programme.

9.6 Evaluation reports

An evaluation report should be designed for use by the following groups:

- Programme staff
- Affected community
- Implementing agency support staff
- Other agencies or staff
- The donor
- Researchers/trainers
- Staff working on future sanitation programmes

It is important that the results of any evaluation are reported and studied, otherwise the evaluation process is pointless. If used properly, programme evaluation can be a very useful tool to learn from and improve emergency sanitation programmes.

Evaluations are normally conducted by individuals who have not been directly involved in programme implementation. These may include staff from agency headquarters or external consultants. Table 9.6 shows a simplified outline for an evaluation report.

Table 9.6. Evaluation report outline

Summary
Brief description of emergency and programme (purpose, target group, budget, period, etc.) Purpose and approach of evaluation and summary of conclusions and recommendations
Programme justification
Justification as to why the agency decided to intervene
Activities
Brief description of programme activities, constraints and opportunities
Outputs
Summary of overall outputs achieved and lessons learnt
Resources
Description of human, financial and logistical resources used including their constraints, opportunities and lessons learnt
Evaluation framework
Completed framework to assess programme - Appropriateness - Connectedness - Effectiveness - Impact - Coherence - Coverage - Efficiency
Conclusions
Conclusions in terms of overall status of programme, main findings and lessons learnt
Recommendations
Overall recommendations for continuing or similar programmes

Appendix 1 – Measuring soil infiltration rates

The method outlined below (adapted from Davis and Lambert, 2002) will give a general feel for the infiltrative capacity of the soil under test and provide relevant information for infiltration from soak pits or latrines. Such a test should be undertaken at the same depth as the base of the pit to ensure that the test is not distorted by any variation in material with depth.

Method: Force an open steel cylinder (i.e. without ends) of about 300mm diameter a few centimetres into the soil so that it stands upright. Place an upright ruler or gauge stick marked in millimetres into the cylinder. Fill the cylinder with clean water and measure the fall in water level at convenient intervals (5, 10, 20, 30 minutes) as water infiltrates into the soil.

Interpretation: Determine the infiltration rate during each time period and take the average of the results. This will give a very rough guide to the infiltration rate, which is likely to be all that is required for this application.

The percolation value (or infiltration rate) in mm /day

$$= \frac{\text{drop in level (mm)}}{\text{time (days)}}$$

e.g. If the water level drops 12mm in 30minutes:

Infiltration = 12/30 x 60 x 24 = 576 mm/day (typical value for sandy loam)

*Note: The value in mm/day is always **equal** to the value in litres/m^2/day*

For soakpits or pit latrines to function correctly the infiltration rate for **clean** water should be **at least** 120mm/day

Appendix 2 – Hand-washing devices

The Captap (Harries, 2004)

The Captap is a spring-loaded device that fits into the cap of a Jerry-can. It dispenses water by moving the lever up or down.

The picture below shows how it works …

- Wash hands with the Captap using less than 250ml of water
- Germs are not transferred back onto clean hands once washing is complete
- Easily replicable almost anywhere using local materials
- Can be made to fit different caps
- Cannot be left on
- Light-weight
- Robust
- Child friendly

The Captap comprises of nine parts:

- 1x Jerry can cap
- 1x bolt M8x80 (or 5/16)
- 1x standard flat washer M8x21
- 2x Fender washers M8x33
- 1x hex nut M8
- 1x spring 70x17 approx.
- 1x rubber seal made from bicycle or car tube
- 1x knob ball M8x25 (optional)

Appendices continued….

Suggestions from Tim Forster:

Examples of practical logframes and budgets e.g ECHO and DFID formats

Spreadsheets for calculating costs and quantities for each technical brief.

Spread-sheet for calculating cleaning and maintenance costs for communal latrines

Comparative costs for desludging for different methods

Instructions with indications of costs for setting up a casting yard for sanplats

Off-the shelf sanitation kits

Monitoring forms for excreta disposal programmes

Indicators and means of verification for Sphere related to excreta disposal

Suggestions from Mel Smith:

Design drawings for moulds for domed slabs 1.2m and 1.5m

Latrine monitoring forms

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