

17

Environmental Sanitation



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Situation

Overcrowding, a harsh environment and disruption of normal sanitation habits can threaten the lives and well-being of the refugees in emergencies. Proper sanitation is a key aspect of the hygiene cycle involving water and health and is fundamental to a multi-sectoral approach in emergency response.

Objective

To prevent the spread of disease and promote a safe environment for the refugees.

Principles of Response

- The co-operation of the refugees is essential for success. Programmes must be developed with them, and, to the extent possible, run by them. The measures taken must be culturally acceptable to the refugees;
- Swift provision of a basic system for human waste disposal is better than delayed provision of improved systems;
- Take full account of sanitation needs in site selection and layout;
- Make full use of locally available human, material and technological resources. This includes using both skilled and unskilled refugee labour, using public health or sanitary engineering expertise available in the national institutions, and relying on the traditional practices of the refugees and the local people;
- The materials and technology chosen should be as simple as possible;
- The sanitation programme must include provisions for continuous maintenance of the sanitation facilities and services;
- The best guarantee that latrines will be used and kept clean is to allocate them on an individual or family basis. Refuse disposal should be arranged on a community basis;
- Wherever possible, restrict the use of chemicals (for the control of rats, flies and other pests particularly) to specific places and for a limited period of time. Environmental measures should be favoured instead.

Action

- Localize defecation and prevent contamination of the water supply;
- Collect baseline data on the site and draw a sketch of the area to locate potential zones for sanitary facilities;
- Develop appropriate systems for disposal of excreta, garbage, and wastewater. Control vectors of public health importance such as mosquitoes, flies, fleas, lice, bugs, rodents and other vermin;
- Plan the amount of facilities and services to be provided. Optimum standards are: for excreta disposal: one latrine per family; for refuse: one bin of 100 litre capacity for 10 families or 50 persons; one sanitarian for every 5,000 persons, and one sanitation assistant for every 500 persons;
- Establish sanitation teams for the construction and maintenance of infrastructure;
- Set up services for vector control and burial of the dead;
- Establish a monitoring and reporting system for all environmental health services in co-ordination with the general health surveillance system;
- Include environmental sanitation as an integral part of health education.

Introduction

1. Environmental sanitation includes: safeguarding water quality; disposal of human excreta, waste water and garbage; insect and rodent control; safe food-handling practices; and site drainage. All these services, and the provision of health care, are very much inter-related and should be considered together. In particular, this chapter should be read in conjunction with the chapters on water, on health and on site planning.

2. Disruption and crowding people together who are accustomed to living in different and less crowded conditions, makes adequate sanitation of critical importance. Basic services are often lacking and habits may have to change. In these conditions, indiscriminate disposal of human and other waste poses a serious threat to health.

3. Due to unfavourable environmental factors or unfavourable socio-cultural habits the implementation of sanitation programmes in refugee camps can be difficult. Additional constraints include:

- i. Sites that are easily flooded, barren and/or inaccessible;
- ii. Lack of space;
- iii. Limited availability of local materials due to either natural factors or considerations related to environmental protection;
- iv. Limited time for the community to get organized if only in a rudimentary way; and,
- v. Lack of qualified personnel.

4. The key to reducing health hazards is to have acceptable and practical waste disposal systems. These must be developed in co-operation with the refugees and be culturally appropriate, even if circumstances necessitate a departure from traditional practices. Special public health education may be required.

5. The refugees must also run the services to the extent possible. Monitoring will be essential: the effectiveness of the services will depend to a significant degree on regular and thorough maintenance and inspection.

Basic Principles And Standards

- ◆ Take full account of sanitation needs in site selection and layout;
- ◆ Analyse sanitation and environmental hygiene issues as part of the initial needs and resources assessment;

- ◆ Seek professional advice from those with local knowledge;
- ◆ Consult and involve the refugees in the design and location of sanitary facilities, and particularly their maintenance;
- ◆ Educate the refugees as part of the public health education programme and devote special attention to sanitation matters at school for refugee children.

6. As stressed in the chapter on site planning, environmental sanitation will be a very important consideration in site layout, and the organization and operation of the sanitation services must be integrated with other community services.

7. Developing adequate sanitation in a refugee emergency is difficult; but correcting mistakes is even more difficult. Expert advice should be sought from a public health engineer who is familiar with the habits of the refugees and nationals of the country of asylum, and if possible has experience of refugee emergencies. Assistance should first be sought locally from sources such as government departments, the UN system, NGOs, universities, consultants or contractors. If these cannot meet the need, Headquarters' assistance should be requested.

8. Good sanitation depends to a great extent on the attitudes of the community and the people who run the system. The systems and services developed should be able to operate effectively with a minimum of outside involvement. Refugees themselves must be trained to run the environmental sanitation programmes.

9. The public health education programme must place proper emphasis on the importance of sound environmental sanitation practices. The link between excreta contamination and disease must be clearly understood by all.

Whatever the success of the sanitation system with adults, children will present a special challenge.

Children are both the main sufferers from excreta-related diseases and also the main excretors of many of the pathogens that cause diarrhoea. Teaching environmental sanitation in schools is therefore essential.

10. Measures to contain human excreta and to dispose of refuse should be taken immediately. Since it is almost impossible to

Table 1: – Number and Types of Sanitary Facilities Required

	FIRST OPTION	SECOND OPTION	THIRD OPTION
EXCRETIA DISPOSAL	1 latrine / family	1 cubicle / 20 persons	1 cubicle / 100 persons or defecation field
	STORAGE	TRANSPORT	FINAL DISPOSAL
REFUSE/GARBAGE	1 bin, 100 litres / 10 families or 50 persons	1 wheelbarrow / 500 persons and 1 tipper / 5,000 persons	1 pit (2 m x 5 m and 2 m deep) / 500 persons and 1 incinerator and 1 deep pit for each clinic

estimate how long refugees will stay in a given site, more durable facilities should also be established simultaneously. For example, once a defecation field has been established, latrine construction should begin at once; the greater the time lag between those two actions, the more difficult to shift people from their previous habit (defecation in the open) to subsequent building and use of latrines. Even in hot, dry climates, human excretia disposed of on the ground can favour the transmission of diseases.

11. Communal facilities, especially latrines are difficult to maintain in a permanent state of cleanliness. However, refuse management (especially transportation and final disposal) is better to organize on a communal basis. Domestic wastewater drainage requires a combination of both individual and communal systems. Drains collecting wastewater from each household have to be connected to main ones which will channel those waters away from the living quarters.

12. General norms and standards related to specific activities (excretia disposal, solid waste, vector control, etc.) should be seen as indicative only and be adapted in each case to the prevailing social, cultural and physical conditions. Table 1 above gives standards which can help to work out a preliminary quantitative estimate of the most urgent needs.

13. Surveys of the status of environmental sanitation programmes should be carried out regularly and corrective action taken (see Annex 1, Environmental Sanitation Survey Form).

Human Resources And Organization

- ◆ Appoint a focal point;
- ◆ One sanitarian for every 5,000 persons and one sanitation assistant per 500 persons should be recruited from among the refugees or from other sources;

◆ Community participation is the key to successful sanitation projects.

14. A focal point for sanitation must be appointed at the very start of the emergency, and responsibilities of various partners clearly defined. There are not many agencies specializing in environmental sanitation.

15. The first step in appointing the focal point is to investigate the availability of local expertise (a civil engineer specialized in sanitary engineering as an ideal example). Recourse to outside assistance has to be contemplated if local expertise is not available.

16. At camp level, sanitation teams or brigades, provided with basic hand-tools, should be set up to carry out urgent tasks (digging trenches or pits for excretia and waste disposal). A health education programme should be launched simultaneously. Each team should be headed by staff who have good knowledge of sanitation (including medical and engineering aspects).

One sanitarian for every 5,000 persons and one sanitation assistant per 500 persons should be recruited.

17. It is always more efficient to have only one agency responsible for both sensitizing people to environmental sanitation and supervising related activities. Education for environmental sanitation should focus on the “how and why” of hygienic containment of human excretia, and simple methods for waste disposal and hygiene at household level (water storage in the home, habitat and personal hygiene, etc.) Women, teachers, leaders, and school children should be the first target of such a programme.

18. Community participation is a key to the success of sanitation projects. Health education and sensitization are a prerequisite to that participation. It should nevertheless be recognized that it takes time to convince both the commu-

nity and individuals about benefits they can expect from a sanitary environment. Concrete examples such as pilot latrines near clinics, market or other places are therefore very important to support environmental health programmes.

19. Refugees should be provided with tools and basic materials (and incentives in some cases) to encourage them to contribute to the improvement of their own living conditions. They should be gradually integrated into the sanitation teams, the ultimate goal being that the refugees themselves should do most of the maintenance tasks.

20. Annex 2, Resource Inventory Form, gives a checklist of the human and material resources needed for environmental sanitation.

Human Excreta Disposal

- ◆ Take immediate action to localize excreta disposal and prevent contamination of the water supply;
- ◆ Carefully consider cultural and physical factors and ensure that appropriate anal cleaning materials and hand-washing facilities are available;
- ◆ Communal trench latrines may be needed initially, but in most circumstances pit latrines are much better;
- ◆ Ensure that latrines can be used at night and are safe for women and children.

Introduction

21. The priority is to create an efficient barrier against faecal contamination. This can be assured through a sufficient number of sanitary facilities, ensuring that these facilities are properly used and kept clean, and do not become the source of problems such as bad smells and flies, and do not collapse when it rains.

The most common cause of breakdown is inadequate maintenance, even for properly designed and installed systems.

22. The best guarantee of proper maintenance is the individual family allocation of latrines. Breakdown of latrines will lead to contamination of the environment and a high risk of infection and disease. There must be regular inspection and maintenance.

Even when in working order, latrines will not be used unless they are clean. Latrines must be cleaned daily.

23. Individual families will be responsible for their own units, but where communal latrines are unavoidable, special arrangements to keep them clean will be essential. Particular attention must be given to the maintenance and cleanliness of the latrines serving community facilities such as health centres. Refugee workers with proper supervision will be required. It may be necessary to pay or otherwise compensate those who are responsible for keeping communal latrines clean and operational.

24. Disinfectants would prevent the biological degradation of excreta. However the regular addition of soil, ashes or oil, if available, to trench or pit latrines may help control insect breeding and reduce odours.

Disinfectants should not be poured into the pits or tanks of latrines.

25. Two main factors will affect the choice of an excreta disposal system: the traditional sanitation practices of the refugees and the physical characteristics of the area, including the geology, the availability of water, rainfall and drainage. Failure to take proper account of these can easily result in the system itself rapidly becoming a health hazard.

26. The essential starting point is to find out the traditional sanitation practices of the refugees and how these can be modified to reduce health risks in a refugee emergency. The following information will be required:

- Previous sanitation system and practices;
- Method of anal cleaning;
- Preferred position (sitting or squatting);
- Need for privacy;
- Segregation of sexes and other groups or individuals with whom it is culturally unacceptable to share a latrine;
- Cultural practices for children;
- Cultural taboos (for example, against contact with anything that may have touched excreta of others);
- Social factors, including likelihood of community action to ensure proper use of proposed system;
- Need for special orientation (direction) of latrines in some cultures;
- Systems used locally in neighbourhood of site.

27. Arrangements must be made to assure the availability of appropriate anal cleaning materials at or near all latrines. This is essential for hygiene.

The latrines must be safe for children, and must be able to be used at night.

Pay attention to security for women: for communal units some form of lighting should be provided and it may be necessary to provide guards.

Immediate Action

28. Initially the refugees are likely to defecate indiscriminately, contaminating their environment and often the water supply. In consultation with the community leaders, the best first step is to demarcate defecation fields to localize and contain excreta.

29. Designate an area or areas (about 50 m x 50 m each) away from the dwellings and down wind, but sufficiently close to be used. Separate areas for men and women are usually desirable. Within the defecation field, strips of land – roughly 1.5 m wide, 20 m long, on each side of a central access path – will be used, one after the other, beginning with strips farthest from the entrance.

30. Based on a recommended surface area of 0.25 m² per person per day, exclusive of access paths, defecation fields of the size above would be sufficient for about 250 people during a month, or 500 people during two weeks. Operating defecation fields beyond one month is not advisable.

31. Fence the area(s) and provide privacy by means of partitions and shallow trenches (in the strips) and spades, if possible. Covering excreta with ash, lime or just soil lessens health risks. Locate such areas where the surface water run-off will not cause contamination. Protect the area with cut-off ditches.

32. A publicity campaign will be required to encourage refugees to use these areas and not defecate indiscriminately near dwellings or the water supply. At least one attendant should be assigned to each defecation field. To the extent possible, hand-washing facilities should also be installed nearby.

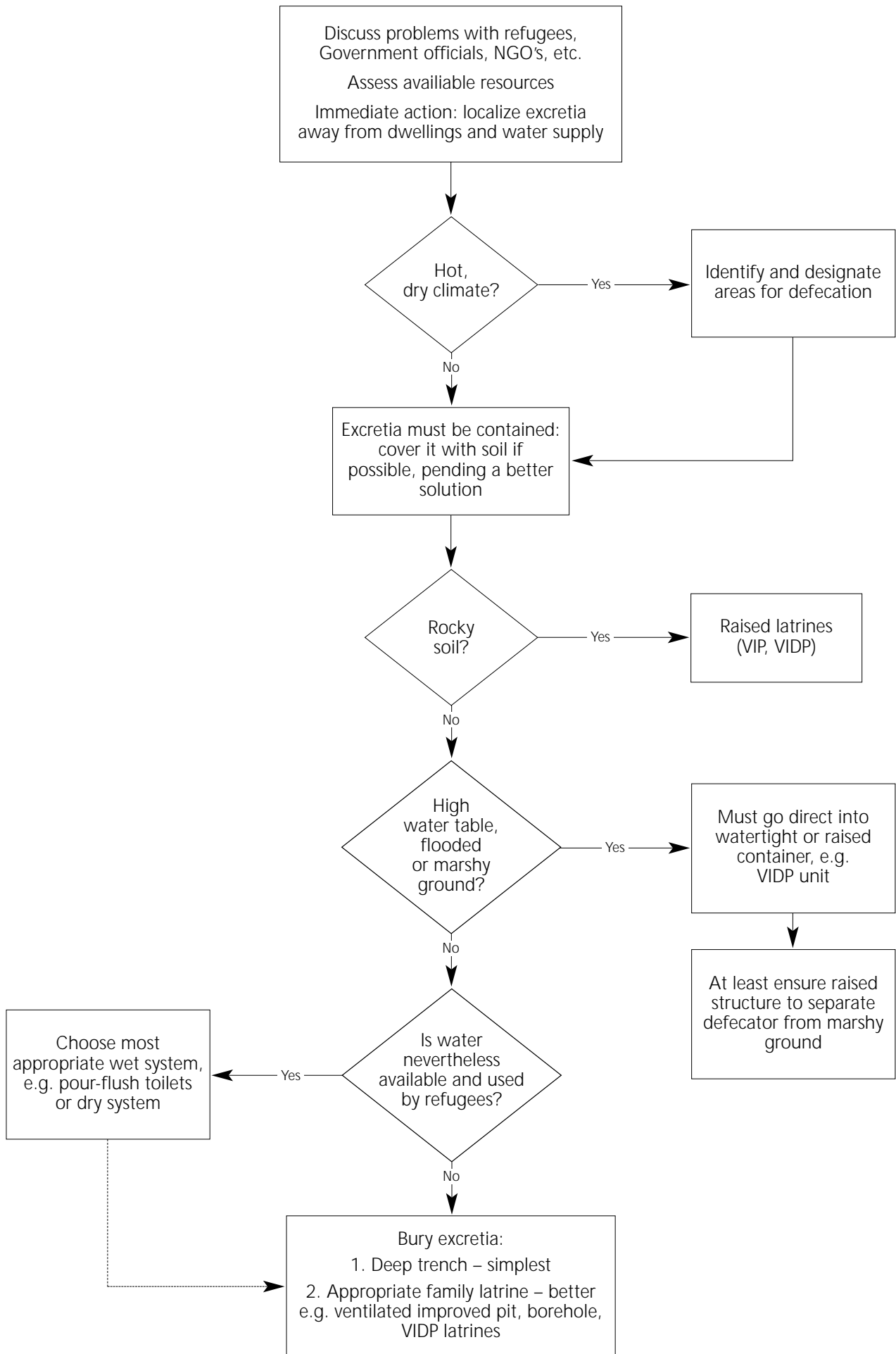
Selection of a System: Basic Considerations

33. The selection of an excreta disposal system suitable for a particular situation requires consideration of a number of factors. In an emergency, however, time is the critical factor. Pollution of the environment by excreta, with all its attendant risks, cannot be stopped without immediate sanitation measures. Thus the range of choice is always much more limited at the very outset of an emergency.

34. Temporary systems, to meet the most immediate needs, will have to be improved or replaced by others as soon as possible, in order to maintain adequate sanitation standards.

In emergency sanitation, act first and improve later.

Figure 1 – Considerations in Excreta Disposal



35. Figure 1 illustrates some considerations to be taken into account in excretia disposal.

36. The design of sanitary facilities should be governed by cultural factors (discussed above) and by the following physical considerations:

i. *Flies and smells*: these can be reduced by: installing vent pipes topped with anti-corrosive screens; covering faeces regularly with ash; treating latrines with biological larvicides to control fly larvae; using fly traps, etc.;

ii. *Flooded pits or collapsed walls*: these can be avoided by ensuring proper construction including having a raised superstructure, well-built base and mound, pit lining, and good drainage. Sometimes these steps are not taken because of, for instance, financial considerations. However, a large number of latrines built quickly and cheaply will not necessarily solve environmental health problems;

iii. *Life-span*: to dig a pit for excretia is not a very exciting exercise. Normally, the pit should be designed to last two to three years (the capacity of a dry pit should be at least 0.07 cubic meters per person per year). If its dimensions have not been properly calculated, people will have to dig a new pit a short time later. Community members would understandably be reluctant to do this and the site would become covered with pits, some containing un-stabilised faecal matter hazardous to human health. In addition, shortage of space limits the number of latrines which can be built;

iv. *Cleanliness and privacy*: Communal installations are rarely kept clean and become unusable within a very short period of time and encourage transmission of diseases. Therefore family latrines should be preferred whenever possible. Sanitary facilities should preserve users' privacy. Cubicles should be partitioned off within each block. At family and individual level, socio-cultural considerations often make it compulsory to build separated units for men and women. Disregard for these simple criteria might result in misuse and abandonment of facilities;

v. *Location*: groundwater pollution must be nil or at a minimum. Latrines should be at least 30 m from any groundwater source and the bottom of any latrine at least 1.5 m above the water table. Latrines must be

close enough to users' shelters to encourage their use (not more than 50 m). They must be far enough from shelters and other buildings to prevent potential smells and pests from bothering or harming the population (at least 6 m from shelters if possible).

37. There are a number of latrine options: once cultural and physical factors have been taken into account, the key factors to consider are low cost, simplicity of construction and ease of maintenance.

Trench Latrines

38. Trenches can be used for a few months. If necessary, and where space is available, this solution can continue for longer periods, with new trenches being dug as old ones fill up.

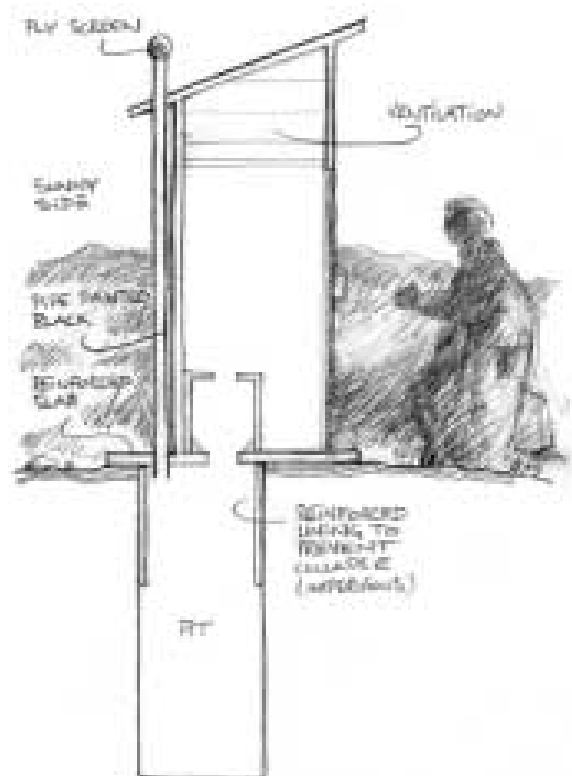
Trench latrines should be dug 1.8 to 2.5 m deep and 75-90 cm wide. Recommended length per 100 persons is 3.5 m.

39. A platform and structure will be needed, providing a seat or squatting hole as appropriate, with lid. When the trench is filled to within 30 cm of the top, it must be covered with soil and compacted. Trench sides must be shored up if there is a danger of collapse.

Pit Latrines

40. The pit latrine is the most common excretia disposal system used around the world

Figure 2a



(see figure 2a). It has major advantages over a trench latrine. It consists of four basic components: a pit, a base, a squatting slab (or plate) and a superstructure.

41. If used by only one family these latrines are usually well maintained. Pit latrines can also be used in clusters as communal facilities.

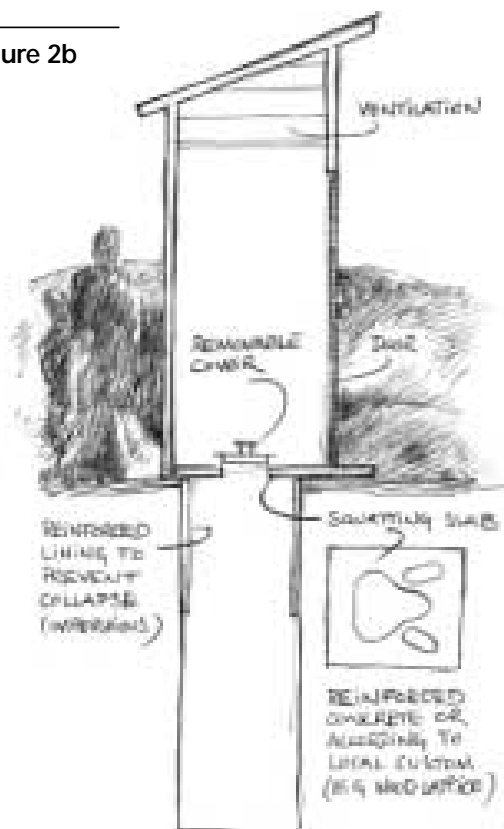
42. Pit latrines are most suitable in conditions of low to medium population density – up to about 300 persons/hectare – but have been used satisfactorily in areas with twice this density. Space is needed not only for the construction of one pit latrine per family, but also for new pits when the old ones are full. This is an important consideration when pit latrines are used as communal facilities.

43. When the pits are three-quarters full, they must be filled with soil and the superstructure and squatting plate moved to a new pit. Applying layers of ashes as the pit fills will speed up the decomposition of excreta and in time the site can be used again.

44. The pit should be about one meter across and over two meters deep. The rim of the pit should be raised about 15 cm off the ground and ditches should be dug around the base to divert surface run off. The pit wall should always be reinforced for one meter below ground level to prevent collapse.

45. The basic variety has both odour and insect problems, but these can be considerably reduced by making the simple improvements

Figure 2b



of the ventilated improved version (VIP) (see figure 2b), and by adding oil and using lids.

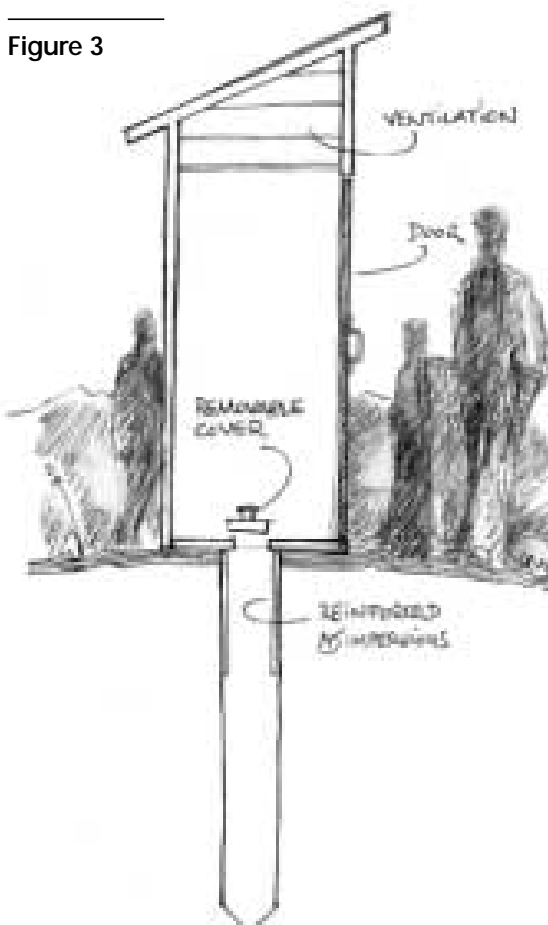
Where pit latrines are used, the ventilated improved version should be built whenever possible.

46. In a VIP latrine the vent pipe should be at least 15 cm in diameter, about 2.5 m high, painted black and placed on the sunny side of the latrine for maximum odour and insect control. Blackening the external surface of the vent pipe only marginally increases the venting velocity, but this factor may be of greater importance under "no wind" conditions. The vent pipe must be fitted with an insect proof gauze screen (so it works as a fly trap). The hole should not be covered by a lid as this impedes the air flow.

Bore-Hole Latrines

47. Bore-hole latrines (figure 3) are dug with a hand auger or mechanical drill and require a smaller slab than a pit. The bore-hole is 35-45 cm in diameter and any depth up to 7 meters. The advantage of the bore-hole latrine is that it can be constructed quickly as a family unit if augers are available. The disadvantages are that the side walls are liable to fouling and fly breeding, they are smellier than vented systems and the risk of ground water contamination is greater because of the depth.

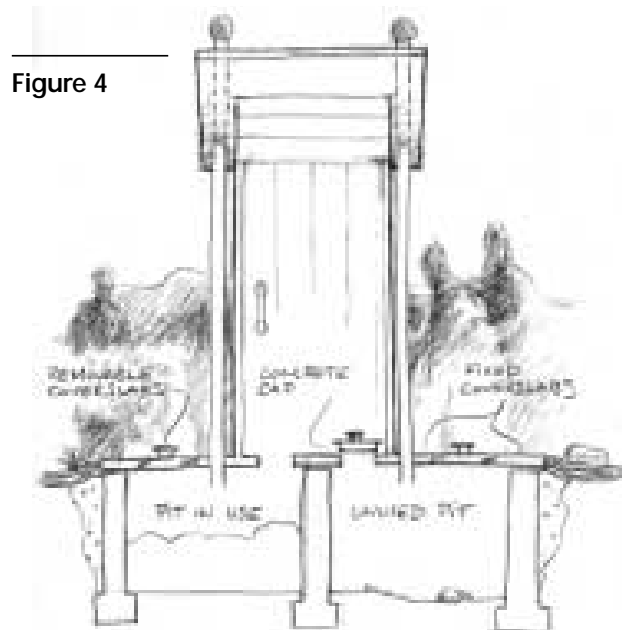
Figure 3



Ventilated Improved Double-Pit (VIDP) Latrine

48. Raised (or built-up) pits can be used where it is not possible to dig deep pits because the water table is high or excavation is difficult (for example in rocky ground).

49. The VIDP latrine (figure 4) (also called alternating-twin pit ventilated latrine) has two shallow pits, both of which are ventilated by separate vent pipes capped with fly screens. It is a good option in crowded areas which may become even more crowded, as it preserves the space needed for replacement latrines.

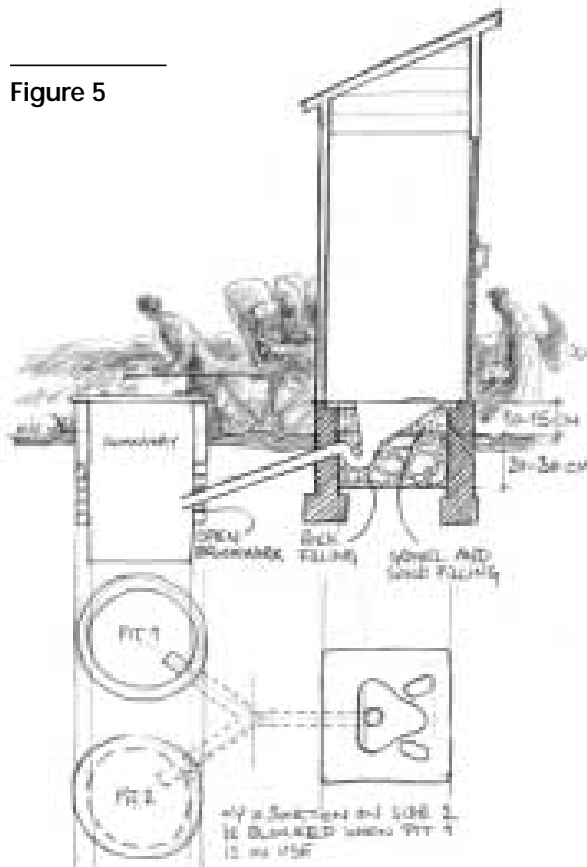


50. Two pits give more flexibility. A pit fills up in two to three years, and it should then stand for at least one year. This gives enough time for the night soil to dry out and decompose, so that it can be removed more easily and not pose a health hazard. While the full pit is decomposing, the other pit is used. The two pits must not be used at the same time.

Pour-Flush (PF) Latrine

51. Pour-flush latrines (figure 5) are simple in design but need permeable soil for their soak-away. A water seal is made by a U-pipe filled with water below the squatting pan or seat. It is flushed by hand with some 1-3 litres of water into a pit or soak-away. This system is suitable where water is used for anal cleaning and where refugees are used to flushing. It is not suitable where paper, stones, corncobs or other solid materials are used for anal cleaning. Pour-flush latrines will be used properly only if water is readily available. A large container with a 3 litre dipper should be made available close by the latrines.

Figure 5



Stabilization Ponds

52. Where liquid effluent has to be disposed of in impermeable soil, stabilization (oxidation) ponds are a simple and cheap solution, particularly in hot climates. Various systems are described in the technical references. If ponds are used they must be securely fenced off.

Solid Wastes

- ◆ Improper garbage disposal increases the risk of insect and rodent-borne diseases, and an effective system must be established for the storage, collection and disposal of garbage;
- ◆ Garbage disposal areas must be designated and access to them restricted;
- ◆ Large amounts of dust can damage health. Preventing destruction of vegetation is the best preventative measure against dust.

General Considerations

53. The quantity of garbage generated by refugees is often not considered substantial and it therefore tends to be neglected. However, the daily amount of garbage as well as its weight can be significant, in market places in particular.

Uncontrolled accumulation of garbage is unhealthy, and promotes an increase in rodent and insect borne disease.

At the beginning of an emergency hygiene and waste disposal is usually poor, so vermin and other pests including rodents proliferate very rapidly.

54. Food is occasionally distributed to refugees in metal cans. How those are disposed of should be given particular consideration not only for aesthetic reasons but also because of health hazards (injuries to children, potential breeding sites for mosquitoes, etc.). In addition, this kind of garbage is far from biodegradable.

55. Medical waste (used syringes and needles, contaminated bandages, laboratory specimens, etc.) generated by health centres, are a hazard. Access to medical sanitary services should be well controlled, and the waste should be treated separately, without delay (see below).

The safe disposal of all medical waste requires particular attention.

There should be routines for the storage, collection and disposal of garbage – this will be particularly important in high-density sites.

Garbage Management

56. Storage: metal drums can be used as refuse bins at individual dwelling level. A 200 litre drum cut in half is often used. Bins should have lids if possible and drainage holes in the bottom. A ratio of one container (100 l capacity) per 10 families has proved to be effective. The containers should be placed throughout the site in such a manner so that no dwelling is more than about 15 meters away from one. Using concrete structures as refuse bins is neither economical nor practical: they are difficult to empty properly so rodents are encouraged and garbage is dispersed around the area.

57. Collection and Transportation: garbage should be collected from the containers regularly, daily if possible. Camps near a city could benefit from existing refuse-dump services. Using tractors with trailers is expensive and should be considered as a last option and only for large and densely populated camps. Wheelbarrows and/or carts (hand or animal carried) are usually more appropriate.

58. Disposal and Treatment:

i. Sanitary land-filling (also known as controlled tipping) remains the most advisable method. Areas designated for burying garbage should be well away from dwellings, and fenced off;

ii. Incineration is justified on a small scale and usually only for medical waste. After each incineration, cover the waste with a layer of soil;

iii. Composting is an attractive option but requires technical knowledge, which may not be available. In addition, garbage must be sorted to produce good compost.

Dust

59. Large amounts of dust carried in the air can be harmful to human health by irritating eyes, respiratory system and skin, and by contaminating food. The best preventive measure is to stop the destruction of vegetation around the site. Dust can also be controlled by spraying roads with water or oil, especially around health facilities and feeding centres, and limiting or even banning traffic.

Wastewater

◆ Sources of waste water must be controlled as soon as possible and drainage provided.

General Considerations

60. This aspect of environmental sanitation should always be considered from the beginning. Drainage prevents water from stagnating around water distribution points, and drains the rainfall as well as domestic wastewater originating from various sources (toilets, showers, kitchens, etc.). Other measures to help control vectors include eliminating ponds.

61. Drainage can very quickly become a problem and corrective measure are difficult once shelters and other infrastructure have been built. For example, people often wash next to water sources, causing problems which could be avoided if special separate washing areas are constructed with duckboards or stones and proper drainage.

62. Some families manage to channel wastewater away from their homes and use it to irrigate vegetable gardens. Although this should be encouraged it should not disrupt the main drainage system.

63. Good drainage should be a priority at the following locations:

i. Water points (standpipes, taps, hand-pumps);

ii. Sanitary facilities such as showers, toilets and washing areas. Waste water from these places should either be used to irrigate veg-

etable gardens and fruit trees or drained into absorption trenches or soak-away pits;

- iii. Shelters: household members usually manage to protect their shelters from runoff waters by means of perimeter drains. It is nevertheless important to ensure that such water is collected and disposed of through main drains.

Treatment

64. In some circumstances, waste water should be treated, for example waste from sewers collecting effluent from pour-flush toilets. Some treatment package units are available on the market; but these are usually expensive, complex, and difficult to operate and maintain.

65. However, there is a broad range of waste water treatment technology. Sanitary engineering professionals should be consulted to select the most appropriate technology.

Pest and Vector Control

- ◆ Insects and rodents carry and spread diseases and can spoil food supplies;
- ◆ Physical screens are the best immediate measures;
- ◆ Preventive action to eliminate or limit breeding areas and conditions favourable to the vectors is the best long-term solution;
- ◆ Specialist supervision of all chemical measures and local knowledge of resistance is necessary;
- ◆ Avoid chemical control where possible.

General Considerations

66. The environment in a refugee emergency is typically favourable to the proliferation of disease-carrying insects and rodents ("vectors"), which can also destroy or spoil large quantities of food.

67. Flies tend to breed in areas where food or human excreta are present, mosquitoes where there is stagnant water, and rats where there is food, garbage and cover. As a result of overcrowding and inadequate personal hygiene, lice, fleas, mites, ticks and other arthropods may also cause health problems. Table 2 gives an indication of common vectors and related diseases.

68. Reducing the numbers of flies, mosquitoes and rodents quickly in an emergency is difficult and physical screens may be the best immediate measure. Over the longer term, the most effective method of controlling insects and rodents is preventive: to improve personal hygiene, sanitation, drainage, garbage disposal and food storage and handling practices and thus make the environment less favourable for the vectors. Examples of practical measures are the removal of stagnant waste water, regular garbage collection, use of oil in latrines and provision of soap and sufficient water for washing. The recommended monthly supply of soap is 250 g soap per person per month. The programme should provide for regular inspection and be integrated with other public health measures.

69. The problems should be discussed with the refugees and education given on the significance of vector control. Where solutions unfamiliar to the refugees are employed, these must be carefully explained.

70. Whatever the nature of nuisances and pests, one should avoid having systematic recourse to chemical control by means of pesticides (insecticide, rodenticide, molluscicide, etc.). Such products are costly and toxic to both human beings and the environment. There is a risk of poisoning during transport, storage, handling and of course spraying the chemicals. Also, pests can develop resistance to the chemicals.

Table 2 – Vectors Which May Pose Significant Health Risks

VECTOR	RISKS
Flies	Eye infections (particularly among infants and children), diarrhoeal diseases
Mosquitoes	Malaria, filariasis, dengue, yellow fever, encephalitis
Mites	Scabies, scrub typhus
Lice	Epidemic typhus, relapsing fever
Fleas	Plague (from infected rats), endemic typhus
Ticks	Relapsing fever, spotted fever
Rats	Rat bite fever, leptospirosis, salmonellosis

Physical Control

71. Measures described in this chapter to deal with excretia and waste disposal will also help control pests (flies and rodents particularly).

72. The elimination of stagnant water and other breeding and resting sites for mosquitoes through drainage is important and the drainage network must be maintained.

Chemical Control

73. Obtaining precise information on chemicals which are used or authorized to be used in the country (i.e. registered list of pesticides if any) should be the first priority.

Insecticide spraying carried out on a routine basis must be avoided, and in any event should be consistent with the rules and procedures in force in the host country.

74. Advice from specialists, particularly medical entomologists, should be sought to minimize the risks and to maximize the impact on target-species.

75. Staff assigned to such tasks must be trained on technical aspects, informed about health hazards linked with handling and spraying of pesticides, and protected by means of adequate clothing (mask, boots, gloves, etc.).

76. The use of rodenticides should always be adopted in agreement with medical staff. Rats are favoured carriers of vectors (such as fleas) of bubonic plague and murine typhus. When these diseases may be present it is more important to take measures directly against the vectors themselves – i.e. the fleas, rather than the rats – because destroying the rats will simply cause the fleas to leave the dead bodies of the rats and become more of a threat to people.

77. The body louse is the only proven vector of louse-borne epidemic typhus and relapsing fever. If there is a serious increase in body louse infestation, quick action is required by properly trained personnel. This generally involves dusting individuals' inner clothing and bedding with an insecticide or the use of clothing fumigants. There is widespread resistance in lice to some insecticides and expert local advice must be sought.

General Hygiene

◆ Sanitary engineering must be complemented with sufficient health education, sensitization and community participation.

78. Habitat hygiene, food hygiene and personal hygiene, while being integral parts of environmental sanitation, are a matter of health education and community sensitization rather than of sanitary engineering. It is nevertheless worth underlining that the most effec-



tive manner to sustain "soft" activities such as education in general and health education in particular is to complement them with "hard", visible and concrete activities on the spot.

79. Community participation in sanitation activities is a key to successful implementation, however, to make participation work in practice, the community members must have the necessary resources – human, institutional and material – to enable them to take on their responsibilities.

80. Activities to improve living conditions should take place at all levels – site, community, family and individual – and not be restricted to just one level. Elementary rules of hygiene should be observed by everyone.

81. There are three essential steps to improve living conditions:

- ❑ Avoid overcrowding and overpopulation, which increase transmission (through direct or indirect contact) of diseases brought about by vectors such as fleas and lice;
- ❑ Reduce faecal/oral transmission risks by ensuring systematic hand-washing before cooking and eating;
- ❑ Encourage personal hygiene including clean clothes by providing amenities such as showers and laundering areas and basins. This will also reduce contact with water bodies that have been polluted by excretia, reducing the risk of disease including bilharziasis (schistosomiasis).

Disposal Of The Dead

- ◆ Suitable arrangements for disposal of the dead are required from the start of an emergency;
- ◆ Action should be co-ordinated with the national authorities;
- ◆ Burial is the simplest and best method where acceptable and physically possible. Arrangements should be made to allow traditional rituals;
- ◆ Before burial or cremation, bodies must be identified and the identifications recorded.

82. Suitable arrangements for the disposal of the dead are required from the start of a refugee emergency. The mortality rate may well be higher than under "normal" conditions. The authorities should be contacted from the outset to ensure compliance with national procedures, and for assistance as necessary.

83. Dead bodies present a negligible health risk unless the cause of death was typhus or plague (when they may be infested with infected lice or fleas) or cholera. Funerals for persons dying from cholera should be held quickly, near the place of death. Efforts should always be made to restrict funeral gatherings of persons dying from any of these three diseases, and to restrict feasting and ritual washing of the dead, by intensive health education or by legislation, as appropriate.

84. Health considerations provide no justification for cremation, for which sufficient fuel may often not be available. Whenever possible, the customary method of disposal should be used, and the traditional practices and ritual should be allowed. Material needs, for example for shrouds, should be met. The necessary space for burial will need to be taken into account at the site planning stage, particularly in crowded conditions.

85. Before burial or cremation, bodies must be identified and the identification recorded, and, if possible, cause of death recorded. This is particularly important for the control, registration and tracing of disease. If the whereabouts of relatives are known, the most immediate relation should be notified; and steps must be taken to assure the care of minors who, as the result of a death, are left without an adult to look after them.

86. When handling corpses workers should protect themselves with gloves, face masks, boots and overalls. The workers should wash thoroughly with soap and water afterwards. Although the HIV virus cannot survive for long in a dead body, care should be taken with bodily fluids.

Key References

A Guide to the Development of On-Site Sanitation, WHO, Geneva, 1992.

Chemical Methods for the Control of Arthropod Vectors and Pests of Public Health Importance, WHO, Geneva, 5th edition 1997.

Manuel d'Utilisation des Désinfectants, UNHCR, Geneva, 1994.

Sanitation and Disease: Health Aspects of Excretia and Wastewater Management, Feachem & al, Wiley & Sons, 1983.

Vector and Pest Control in Refugee Situations (also in French), PTSS, UNHCR, Geneva, 1997.

Vector Control: Methods for Use by Individuals and Communities, WHO, Geneva, 1997.

Annex 1: – Environmental Sanitation Survey Form

Country:

Date:/...../.....

Camp/Settlement:

Camp Population:

Prepared by:

I. Living Areas

A. Excretia Disposal					
Ratio of latrine seats to people: 1/.....					
	Total	V.I.P.*	Rudimentary	P.F.**	Other
Private Latrines					
Public Latrines					
Comments: _____					

B. Refuse Disposal			
	Capacity (Litres)	Number	Max Distance from dwelling (m)
- Individual pits:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- Garbage Bins	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Wheel-barrow	Truck	Other
- Transportation:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Landfill	Incineration	Other
- Final Disposal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Dimensions	Number	
Communal refuse pits	long__x Wide__x Deep__x	<input type="checkbox"/>	
Comments: _____			

* V.I.P. = Ventilated Improved Pit			
**P.F. = Pour-Flush			

II. Public Places

C. Existing Facilities				
Schools				
*Latrine Type	P.F.	V.I.P.	Rudimentary	Other
1 seat / _____ boys	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1 seat / _____ girls				
1 urinal / _____ boys				
*Refuse collection	Yes <input type="checkbox"/>	No <input type="checkbox"/>		
Hospitals				
*Latrine Type	P.F.	V.I.P.	Rudimentary	Other
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
*Refuse collection	Buried <input type="checkbox"/>	Burnt <input type="checkbox"/>		
Markets				
*Excretia Disposal	Good	Poor	None	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
*Refuse collection	Good	Poor	None	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Comments: _____				

D. Drainage			
- at water posts	Good <input type="checkbox"/>	Poor <input type="checkbox"/>	None <input type="checkbox"/>
- around latrines	Good <input type="checkbox"/>	Poor <input type="checkbox"/>	None <input type="checkbox"/>
- camp drainage network	Good <input type="checkbox"/>	Poor <input type="checkbox"/>	None <input type="checkbox"/>
Comments: _____			

E. General Characteristics			
- topography	Flat <input type="checkbox"/>	Moderate <input type="checkbox"/>	Steep <input type="checkbox"/>
- soil	Rocky <input type="checkbox"/>	Clay <input type="checkbox"/>	Sandy <input type="checkbox"/>
- water table distance from ground surface	Rainy Season _____ m	Dry Season _____ m	

F. Community water supply			
- sanitation at source	Good <input type="checkbox"/>	Poor <input type="checkbox"/>	None <input type="checkbox"/>
- sanitation at distribution point	Good <input type="checkbox"/>	Poor <input type="checkbox"/>	None <input type="checkbox"/>
- individual water containers	Capacity		_____ litres
- storage at home	Capacity _____ litres	Clean Y – N	Covered Y – N
- chemical used for water disinfection	Chlorine <input type="checkbox"/>	Other <input type="checkbox"/>	None <input type="checkbox"/>
- points of application of above chemicals	Source <input type="checkbox"/>	Storage Tank <input type="checkbox"/>	Home Container <input type="checkbox"/>

Annex 2: – Environmental Sanitation – Resource Inventory Form

Country:

Prepared by:

Camp:

Population:

Date:/...../.....

A. Implementation

Name(s)

Governmental authorities

International organisations

Private sector

NGO's

B. Human Resources

Number of Workers

Is there a spraying team?

Y N

Is there a drainage team?

Y N

Is there a sanitation team?

Y N

Is there an organised workshop?

Y N

Number of sanitarians:

Number of health workers:

(assigned to sanitation tasks)

C. Tools

Description

Specification

Quantity

Axe

Crowbar

Iron bar cutter

Pickaxe

Shovel

Spade

Tape metre

Other (please specify)

D. Equipment

Description

Specification

Quantity

Cement mixer

Mortar bucket

Mould (latrine slab)

Mould (brick)

Wheelbarrow

Sprayer

Spraying equipment

– overall clothing

– masks

– gloves

– boots

Other (please specify)

E. Chemicals

Item

Unit

Quantity (stock in Hand)

Comments

Vector control

–

–

Water Treatment

–