(2) Population density
Population density will affect the space available for the excreta disposal system and thus the type of system. If latrines are too close to dwellings, there may be insufficient space for individual units. Overcrowding may cause major health hazards. This must be considered in site planning. The camp layout should be determined, among other things, by the needs of the most suitable sanitation system, not vice-versa. Space must be available for replacement latrines where necessary.

(3) Soil
Soil conditions can vary over a short distance of land, thus requiring a thorough survey of the area. The nature of the soil also may exclude certain options. For example, rocky soil may prevent the digging of pit-type systems. Sandy soil will demand special actions to prevent side wall collapse of pits. Impervious clay soils may exclude any system dependent upon seepage. Account should also be taken of the difference between dry and wet season soil conditions. If the ground freezes in winter, the choice of systems may be limited. Where there is a high water table, even only seasonally, care must be taken to ensure it is not contaminated by seepage from the latrines. Excreta must be contained in flood or swampy conditions.

(4) Available water
The amount of available water will determine whether disposal systems requiring water are a possibility. These systems are generally more expensive than those not requiring water. Since displaced person situations are often characterized by a lack of reliable water sources, the excreta disposal system should not be dependent on water availability. However, whatever the system, water should be available for anal cleaning.

(5) Drainage
Since all camps experience rain from time to time, it is necessary to anticipate where surface run-off will flow and how to divert it by cut-off ditches. The possibility of flooding should also be considered and drainage provided, if necessary. If flood water enters latrines, large areas may be contaminated.

(6) Construction Materials
Construction material will be needed to build some types of disposal systems like those with walls and roofs. Displaced people unaccustomed to latrines generally prefer a large enclosure with no roof. There are however, strong arguments for covering latrines to prevent rainwater filling the latrine, causing contamination around it, or weakening the surroundings. Roofs

should provide proper drainage away from the latrine. Special measures will be necessary to manufacture squatting or sitting slabs, U-pipes, and other material for wet systems, if these are not available locally. Where displaced people have an established method of covering latrines (e.g., with a wooden lattice), this is generally to be preferred, even if it is less easy to clean than a special plate. There are, however, a number of simple techniques for making the latter on site, for example with reinforced cement or fiberglass from mounds. The structure should be made of local materials that are used for reinforcing the pit when necessary. Avoid uncovered wood if possible. *Above all, the latrine must be easy to clean and the surfaces around the hole washable.*

4. Waste Water, Garbage, and Dust

a. Waste Water

Excess water from washing, bathing, and food preparation is considered waste water. It can be a problem if not drained away; waste water will stand in malodorous, stagnant pools that provide breeding places for insects, especially mosquitoes. Waste water should generally not be permitted to enter the latrine, as this will cause the latrine pit or trench to fill very quickly. However, if latrine pits or trenches are sufficiently large and the amount of water used for bathing is relatively small, displaced people should be allowed to use the latrine area for bathing because it provides privacy and drainage. To avoid problems like these, special separate washing areas with duck-boards or stones, and proper drainage should be constructed. Waste water can also be contained by localizing sources of waste water and providing local drainage.

b. Garbage

Since all communities generate garbage, established routines for the control, storage, collection, and disposal of garbage will be required. These needs must be reflected in initial site planning. If uncontrolled, the accumulation of garbage is both unpleasant and unhealthy. Rodent and insect-borne diseases increase with improper garbage disposal. Free range chickens, goats, and pigs will help control garbage; dogs will spread it.

The following suggestions for garbage storage, collection, and disposal concern, in particular, high-density camps where the problem and dangers are greatest.

(1) Storage
To store garbage, garbage containers made of metal or plastic with a minimum capacity of 50 liters should be provided. A 200-liter oil drum cut in half is often used. Storage containers should have lids and drainage holes in the bottom. A ratio of one container per 10 families has proved to be effective. Containers should be placed throughout the camp so that no dwelling is located more than 15 meters away from a garbage container.

(2) Collection
The collection of garbage from containers should take place on a regular, daily basis, if possible. Daily collection arrangements must be made to collect medical waste and waste from feeding centers.

(3) Disposal
Garbage can be disposed by burying it at designated locations on the site or removing it off the site. Open burning of garbage on site should be avoided. If garbage has to be burned, it should be burned far from the displaced people. The ashes should be covered with a layer of soil after each burning.

The safe disposal of all medical waste requires particular attention. Needles and scalpels are especially dangerous. Medical waste must be tightly controlled. It should be collected, transported, and disposed of separately. Medical waste should always be burned without delay. This should be done in an incinerator to ensure a hot, complete burning. Designated areas where medical garbage and/or ashes are to be buried should be located far from dwellings and fenced to restrict access.

(4) Dust
Large amounts of dust carried through the air can contaminate food and be harmful to human health by irritating eyes, the respiratory system, and skin. Dust can also harm some types of equipment used on site. The best preventive measure is to stop the destruction of vegetation on the site. Dust control can be achieved by spraying roads with water or oil, especially around health facilities and feeding centers, as well as limiting or banning traffic from certain areas.

5. Insect and Rodent Control

The environment in a displaced person emergency is conducive to the proliferation of disease-carrying insects and rodents (vectors), that can also destroy or spoil large quantities of food. Flies tend to

breed in areas where food or human excreta are present, and mosquitoes thrive in stagnant water. Since the proliferation rate for both is very high (the life-cycle from egg to adult can take less than 2 weeks), the control of flies and mosquitoes is critical. Rats are also a problem as they live 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.

Reducing the numbers of flies, mosquitoes, and rodents quickly in an emergency may be difficult, but physical screens can be used to control the immediate problem. The most effective long-term method of controlling insects and rodents is to make the environment less favorable for the vectors. This is done by improving personal hygiene, sanitation, drainage, garbage disposal, and food storage and handling practices. Practical measures include removing stagnant waste water, collecting garbage on a regular basis, using oil in latrines, and providing soap and sufficient water for washing. These measures should be integrated into a program with other health measures that is regularly inspected.

Vector control methods using insecticides and poisons can be dangerous. Like all methods using chemicals, they should be closely followed, monitored by specialists and supervised. All major efforts to control insects and rodents must be closely coordinated with national programs and practices, especially with the national malaria control program. Although several different methods may be used, insect breeding grounds and the displaced people's dwellings may be sprayed. Since insects may already have, and can quickly develop, a resistance to chemicals, a rotation system using different sprays may be necessary. Local knowledge of existing resistances is required. Poison and traps may be used against rats in food storage and handling areas. Particular care must be taken in disposing of dead rats, which may carry plague-bearing fleas. *Chemical spraying and rodent poisons can be dangerous to humans.*

The body louse, usually found on inner clothing seams is the only proven vector of louse-borne (epidemic) typhus and epidemic relapsing fever. If there is a serious increase in body louse infestation, quick action is required by properly trained personnel. This generally includes the dusting of individuals' inner clothing and bedding with an insecticide or fumigating clothing. There is widespread resistance of lice to some insecticides, especially DDT, and expert local advice must be sought. Mass washing of clothing is not recommended as a water temperature of at least 52 °C must be maintained to kill the lice.

The following lists vectors and their potential health risks:

Vector	Risks
Flies	Eye infections (particularly among infants and children); diarrheal 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

6. Fires

Displaced person camps are often overcrowded, use light and highly combustible shelter materials, and have many individual cooking fires. For these reasons, they are very vulnerable to major fires. Measures to prevent and control fires must be considered from the start of emergency assistance at displaced person camps.

a. Prevention

The most basic and effective measure to prevent a major fire is the proper spacing and arrangement of all buildings to provide fire breaks. Other measures include allowing individual fires for cooking only and building fires only outdoors, if possible. If cooking must take place indoors, and especially in wooden or wattle-and-daub buildings, the cooking area should be protected with asbestos sheeting if possible. If large-scale cooking takes place indoors (e.g., in a supplementary feeding center), an asbestos ceiling and walls or their equivalent is mandatory. Fire retardants can be applied to thatched roofs in dwellings. Proper precaution must be taken when storing and using fuels. Highly inflammable synthetic materials should be avoided.

b. Control

When fighting a large fire with scarce resources, the first priority is to contain it, rather than put it out. Fires can be controlled in the first few minutes with modest resources, providing quick action is taken. To control fires, an alarm system, fire fighting teams, and beaters must be organized in advance and plans prepared. Since

water is generally not available in sufficient quantities or at adequate pressure for the control of major fires, sand can be an effective method of control. The creation of a new firebreak should be done by taking structures down manually or with a bulldozer if available.

7. Disposal of the Dead

Dead bodies present a negligible health risk unless the cause of death is typhus, the plague, or the bodies are infested with infected lice or fleas. Nevertheless, suitable arrangements for the disposal of the dead are required from the start of a displaced person emergency. This is important as the mortality rate after a new displaced person influx may be higher than under "normal" conditions. Also, bodies must be protected from rodents, animals, and birds. Authorities should be contacted immediately to ensure compliance with national procedures and provide assistance, as necessary. The necessary space for burial should also be considered at the site planning stage, particularly in crowded conditions.

Burial is the simplest and best method of disposal if acceptable to the community. Health considerations provide no justification for cremation, for which sufficient fuel may often not be available. When possible, traditional practices and customary methods of disposal should be used. Material needs such as cloth for shrouds should also be met.

Before burial or cremation, bodies must be identified and, if possible, the cause of death recorded. This is of particular importance for disease control, registration, and tracing. Local government officials may also insist on the issuance of death certificates. If the whereabouts of relatives are known, the most immediate relation should be notified.

Consideration should also be given to the need to relocate bodies from burial sites after the emergency situation is over and the displaced people are able to return to their homes. This may require further involvement with the local government. A burial location map should be kept from the start of the emergency to aid in locating bodies for removal.

Table 1

WATER NEEDS FOR DISPLACED PEOPLE
Water in 1,000,000 liter increments

Population	Time (days) 1	30	60	90	120	180	365
500	0.0075	0.225	0.450	0.675	0.900	1.350	2.7375
1,000	0.015	0.450	0.900	1.350	1.800	2.700	5.475
5,000	0.750	2.250	4.500	6.750	9.000	13.5	27.375
10,000	0.15	4.5	9.0	13.5	18.0	27.0	54.75
20,000	0.3	9.0	18.0	27.0	36.0	54.0	108.6
50,000	0.75	22.5	45.0	67.5	90.0	135.0	273.75
100,000	1.5	45.0	90.0	135.0	180.0	270.0	547.5
500,000	7.5	225.0	450.0	675.0	900.0	1,350.0	2,737.5
1,000,000	15.0	450.0	900.0	1,350.0	1,800.0	2,700.0	5,475.0

Formula: 15 liters x no. people x days = liter/day

Table 2

Weight for Height

Young children, 52-108 cm in height (sexes combined)

Height (cm)	Weight (kg.) Std	90 % Std	80 % Std	70 % Std	60 % Std
52	3.8	3.4	3.0	2.7	2.3
53	4.0	3.6	3.2	2.8	2.4
54	4.3	3.9	3.4	3.0	2.6
55	4.6	4.1	3.6	3.2	2.7
56	4.8	4.3	3.8	3.4	2.9
57	5.0	4.5	3.9	3.5	3.0
58	5.2	4.7	4.2	3.6	3.1
59	5.5	4.9	4.4	3.8	3.3
60	5.7	5.1	4.6	4.0	3.4
61	6.0	5.4	4.8	4.2	3.6
62	6.3	5.7	5.0	4.4	3.8
63	6.6	5.9	5.3	4.6	3.9
64	6.9	6.2	5.5	4.8	4.1
65	7.2	6.5	5.8	5.0	4.3
66	7.5	6.8	6.0	5.3	4.5
67	7.8	7.0	6.2	5.5	4.7
68	8.1	7.3	6.5	5.7	4.9
69	8.4	7.6	6.7	5.9	5.0
70	8.7	7.8	7.0	6.1	5.2
71	9.0	8.1	7.2	6.2	5.3

Table 2 (continued)

Weight for Height

Young children, 52-108 cm in height (sexes combined)

Height (cm)	Weight (kg.) Std	90 % Std	80 % Std	70 % Std	60 % Std
72	9.2	8.3	7.4	6.4	5.5
73	9.5	8.5	7.6	6.6	5.6
74	9.7	8.7	7.8	6.8	5.8
75	9.9	9.0	8.0	6.9	5.9
76	10.2	9.2	8.3	7.1	6.1
77	10.4	9.4	8.3	7.2	6.2
78	10.6	9.5	8.5	7.4	6.4
79	10.8	9.7	8.6	7.5	6.5
80	11.0	9.9	8.8	7.7	6.6
81	11.2	10.1	9.0	7.8	6.7
82	11.4	10.3	9.1	8.0	6.8
83	11.6	10.4	9.2	8.1	6.9
84	11.8	10.6	9.4	8.3	7.1
85	12.0	10.7	9.6	8.4	7.2
86	12.2	11.0	9.8	8.5	7.3
87	12.4	11.1	9.9	8.6	7.4
88	12.6	11.3	10.1	8.8	7.6
89	12.8	11.5	10.2	9.0	7.7
90	13.1	11.8	10.5	9.2	7.9
91	13.4	11.9	10.7	9.3	8.0

Table 2 (continued)

Weight for Height

Young children, 52-108 cm in height (sexes combined)

Height (cm)	Weight (kg.) Std	90 % Std	80 % Std	70 % Std	60 % Std
92	13.6	12.2	10.9	9.5	8.2
93	13.8	12.4	11.0	9.6	8.3
94	14.0	12.6	11.2	9.8	8.4
95	14.3	12.8	11.4	10.0	8.5
96	14.5	13.1	11.6	10.2	8.7
97	14.7	13.3	11.8	10.3	8.8
98	15.0	13.5	12.0	10.5	9.0
99	15.3	13.7	12.3	10.7	9.2
100	15.6	14.0	12.5	10.9	9.4
101	15.8	14.2	12.6	11.1	9.5
102	16.1	14.5	12.9	11.3	9.7
103	16.4	14.7	13.2	11.5	9.8
104	16.7	15.0	13.4	11.7	10.0
105	17.0	15.3	13.6	11.9	10.1
106	17.3	15.6	13.8	12.1	10.4
107	17.6	15.9	14.0	12.3	10.5
108	18.0	16.2	14.4	12.6	10.8

Values derived from **A Guide To Food and Health Relief Operations for Disasters,** United Nations, 1977.

Table 3

Weight and Height for Age Birth to 60 months, 6-month intervals (sexes combined)						
	Weight (kg.)			Height (cm)		
Age (mos.)	Std	80 % Std	60 % Std	Std	80 % Std	60 % Std
0	3.4	2.7	2.0	50.4	40.3	30.2
6	7.4	5.9	4.5	65.8	52.6	39.5
12	9.9	7.9	6.0	74.7	59.8	44.8
18	11.3	9.0	6.8	81.4	65.1	48.8
24	12.4	9.9	7.5	87.1	69.6	52.2
30	13.5	10.8	8.1	91.8	73.4	55.1
36	14.5	11.6	8.7	96.0	76.8	57.6
42	15.5	12.4	9.3	99.7	79.7	59.8
48	16.5	13.2	9.9	103.3	82.6	62.0
54	17.4	14.0	10.5	106.8	85.4	64.1
60	18.4	14.7	11.0	109.0	87.1	65.3

Table 4

Examples of 1900 KCAL Rations
(per person per day)

Rations (quantity in grams)			
Items	**Option 1**	**Option 2**	**Option 3**
Wheat flour/maize meal/rice	400	400	400
Pulses	60	20	40
Oils/fats	25	25	25
Fortified cereal blend*	-	30	-
Canned fish/meat	-	-	20
Sugar	15	20	20
Salt	5	5	5
Total In Grams:	505	500	510
Approximate Food Value:			
energy (kcal)	1930	1930	1930
protein (g)	45	45	45
fat (g)	45	45	45

* Such as corn-soy-blend and wheat-soy-blend

NOTE: All rations (1, 2, and 3) provide at least minimum quantities of energy, protein, and fat.

Ration 2 provides additional quantities of various micronutrients through the inclusion of a fortified blended cereal. Fresh foods (e.g., vegetables and fruits), condiments, and spices should be available whenever possible.

Fortified cereal blends are good sources of micronutrients; and when provided in the ration, should be used for the whole family.

Table 5

Examples of Enhanced Rations (per person per day)		
Rations (quantity in grams)		
ITEMS	**Option 1**	**Option 2**
Maize meal/wheat flour	400	450
Pulses	40	50
Oils/fats	25	25
Fortified cereal blend*	30	50
Canned fish/dried fish	60/40	30
Sugar	20	20
Salt	5	5
Vegetables/fruit	150	-
Condiments/spices	as av.	as av.
Total In Grams:	710-730	630
Approximate Food Value:		
energy (kcal)	2250	2325
protein (g)	65	80
fat (g)	55	55

* Such as corn-soy-blend and wheat-soy-blend.

Table 6

Food Needs for Displaced Persons

food in MT, based on 500 g/person/day need (1 MT = 1,000 kg)

Population	Time (days) 1	30	60	90	120	180	365
250	.13	3.8	7	11.3	15	22.5	45.6
500	.25	7.5	15	22.5	30	45	91.25
1,000	.5	15	30	45	60	90	182.5
5,000	2.5	75	150	225	300	450	912.5
10,000	5	150	300	450	600	900	1,825
20,000	10	300	600	900	1,200	1,800	3,650
50,000	25	750	1,500	2,250	3,000	4,500	9,125
100,000	50	1,500	3,000	4,500	6,000	9,000	18,250
500,000	250	7,500	15,000	22,500	30,000	45,000	91,250
1,000,000	500	15,000	30,000	45,000	60,000	90,000	182,500

Table 7

Approximate Nutritional Values of Commodities Per 100-Gram Edible Portion

Commodity		Energy (kcal)	Protein (g)	Fat (g)
Cereals	Wheat	330	12.3	1 5
	Wheat flour	350	11.5	1.5
	Bulgur wheat	350	11.0	1.5
	Maize	350	10.0	4.0
	Maize meal	360	9.0	3.5
	Sorghum	335	11.0	3.0
	Rice	360	7.0	0.5
	Rolled oats	380	13 0	7 0
Blended Foods	Instant corn soya blend	365	12.2	4 0
	Corn soya blend	380	18.0	6 0
	Wheat soya blend	370	20.0	6 0
	Soya fortified bulgur wheat	350	17.0	1.5
	Soya fortifiifed corn meal	360	13.0	1.5
	Soya fortified rolled oats	375	21.0	6.0
	Soya fortified wheat flour	360	16.0	1.3
Pulses	Dried peas and beans	335	22 0	1 5
	Ground nuts	330	15 0	25 0
Milk, Cheese and Eggs	Dried skim milk	360	36 0	1.0
	Dried whole milk	500	26 0	27 0
	Cheese	355	22.5	28 0
	Dried eggs	575	45.5	43 5
Meat and Fish	Canned meat	220	21.0	15 0
	Dried salted fish	270	47.0	7 5
	Canned fish in oil	305	22.0	24.0
	Fish protein concentrate	390	75 0	10.0
Oils and Fats	Vegetable oil	885	0	100
	Butter oil	860	0	98.0
	Margarine	735	0	82 0
	Edible fat	900	0	100
Fruits and Beverages	Dried fruit	270	4.0	0 5
	Dates	245	2.0	0 5
	Jam	265	0	0
	Tea	0	0	0
	Coffee	0	0	0
Miscellaneous	Sugar	400	0	0
	Iodized salt	0	0	0
	Pasta	365	12 5	1.2
	Freeze-dried meat	480	65.0	25 0
	Minestrone	500	22.5	27 0
	Protein-enriched ration	450	16 7	15.5
	Milk biscuits (whole milk)	470	23 4	10 4
	Milk biscuits (skim milk)	375	24 0	1 5
	High-protein biscuits	450	50 0	20.0