

PART II

Technical aspects



6. Shelter and emergency settlements

6.1 Introduction

The environmental health conditions faced by people are largely affected by the location and organization of the site where they are obliged to live in the days, weeks or months after a disaster. Security, the presence of a suitable water supply and the conditions necessary for adequate sanitation are probably the three most essential factors to consider when choosing and equipping, or improving a site for disaster-affected people. The quality of shelter available has a great impact on health and well-being. Environmental health managers and sector specialists such as water engineers should therefore be directly involved in decisions about selecting, equipping or upgrading emergency settlements and, in some cases, they may have to lobby hard to ensure that suitable sites are chosen. Once decisions have been taken and people settle, it becomes very difficult to move them to a better site.

When locating or planning emergency settlements, their long-term economic, social and environmental impacts on the surrounding area should be carefully considered.

Shelter needs may vary, depending on the nature of the disaster and the emergency situation created. This chapter considers the examples of: people who seek and organize their own temporary shelter; those who are obliged to take shelter in public buildings, offices etc; and those who are displaced to an unbuilt site where all shelter, water supply and sanitation facilities need to be provided.

6.2 Assistance to self-sheltering populations

After sudden disasters within limited areas, or where relatively few people are displaced by conflict, people generally house themselves. They find accommodation with neighbours or family members, or make temporary shelters within the ruins of their former homes. They will usually have found accommodation long before relief teams have begun to provide tents or other help. People are generally very reluctant to move away from their neighbourhoods following such a disaster. However, in extreme situations (e.g. very cold weather; the threat of explosion or toxic gas; possible secondary flooding or mass movement of debris) survivors should be evacuated.

In general, it is probably best to support the efforts of survivors to house themselves, through the following actions:

- Advising people attempting to house themselves in the ruins of their previous home on the structural integrity of what remains.
- Discouraging people from staying in homes that are definitely unsafe (e.g. in danger of collapse due to earthquake aftershocks); they should be informed of the danger and encouraged to move to a safer location.
- Providing as much assistance as possible when the ruins can be strengthened by reinforcement and temporary repairs. Timber, jacks, nails, tools and plastic sheeting and tarpaulins for temporary roofs or walls should be made available.
- Informing people who prefer not to evacuate a devastated neighbourhood about the nearest safe water supply or the measures that they can take to ensure the

safety of drinking-water (filtering, boiling, disinfecting, storing in closed containers, etc.). Also, instructing them in the safe disposal of waste, including where and where not to defecate, and in the importance of oral rehydration therapy for children with diarrhoea, even if the available water is moderately contaminated.

- Informing people that water supplies may be contaminated. Surface water may be contaminated by sewage and debris in the wake of floods. Water from roof catchments may be contaminated by ash and dust that will have to be filtered out. Information about simple household methods of filtration, sedimentation, storage and disinfection should be provided (see Chapter 7).
- Distributing a stock solution of bleach or water chlorination tablets (e.g. sodium hypochlorite) at central pick-up points in each neighbourhood for home water disinfection. Careful instruction is required on the proper use of chlorine solutions and tablets, and this may be possible only where communities are well organized and there is a history of good relations with the health authorities. Water purification tablets are an expensive option.
- Providing buckets for collecting water from a safe supply and containers with lids for storing it.
- Providing blankets and kerosene lanterns for illumination at night.
- Advising people on the status of sanitation systems, and providing temporary alternative sanitation facilities if existing systems can no longer be used.

6.3 Short-term shelter in existing buildings

In many situations, such as in northern Iraq and several countries of Eastern Europe and the former Soviet Union during the 1990s, people may independently seek shelter in buildings such as schools, community centers, offices, sports facilities, and even railway carriages and wagons. Such buildings are often also used for organized short-term evacuation centers.

The evacuation centre should be as close as possible to the neighbourhood or rural community concerned, but far enough from the disaster site to avoid secondary hazards. This avoids the additional stress and health dangers of a long journey, and enables survivors to have access to their former dwellings, which is psychologically important.

Buildings used as short-term reception areas should be thoroughly inspected by a suitably qualified person, to ensure that they are not structurally damaged, or sited near potential secondary hazards.

Such buildings will probably have at least some running water and toilets, and some may even have kitchens. For large numbers of people, however, these will have to be supplemented. Military barracks or youth camps are usually better equipped for large numbers of people, but have the disadvantage of often being sited further away from population centres.

Whatever the buildings used as temporary accommodation, it is very important that they are only used for a short period, and that they are cleaned and maintained intensively, to avoid a rapid deterioration in environmental health conditions.

The following points should be taken into consideration in relation to buildings used for temporary shelter (Assar, 1971; United Nations High Commissioner for Refugees, 1999; Sphere Project, 2000):

- People sleeping on beds or mats should have a minimum of 3.5 m² of floor area or 10 m³ of air space. In rooms with high ceilings, double bunk beds may be used.
- Beds or mats should be separated by a minimum distance of 0.75 metres.
- Adequate ventilation is required. The amount of fresh air needed is approximately 20–30 m³ per person per hour. It may be necessary to provide mechanical venti-

lation. Whenever possible, smoking and the use of cooking fires in the shelter should be strongly discouraged.

- An ambient temperature of 15–19°C is desirable, but lower temperatures can be tolerated with warm clothing. In cold climates, buildings may need extensive repairs and modifications for winter conditions, particularly in conflict situations where windows and insulation material may have been removed or destroyed.
- To avoid very high temperatures in hot climates, buildings can be modified to increase shade, ventilation and thermal capacity.
- Buildings should have emergency exits and fire escapes; the flues of stoves used for space heating should extend outside the building; overloading of electrical circuits should be avoided; lanterns and lamps should be placed or suspended so as to avoid dangers; and liquid fuels should be stored outside the building. Clear instructions on fire hazards and safety practices should be displayed in conspicuous places and drawn to the attention of residents; fire-fighting equipment should be available and properly maintained. A group of volunteers from among the survivors should be taught about the possible fire hazards and trained in the use of fire-fighting equipment.
- Access to sufficient water for drinking, cooking, and personal and domestic hygiene should be provided.
- One wash basin should be provided for every 10 people, or 4–5 metres of wash-bench for every 100 people; there should be separate benches for men and women, and waste receptacles at each bench. One shower head is needed for every 50 people in temperate climates and one for every 30 people in hot climates. Floors must be disinfected daily.
- Arrangements must be made for human waste disposal. Water-flushed toilets may be available in existing buildings if the water supply has not been interrupted. Outside latrines should be located within 50 metres of the building, but at least 20 metres away from the kitchen, dining hall and water supply.
- One refuse bin of capacity 50–100 litres should be provided for every 12–15 people. The bins should have tightly fitting lids. Special arrangements for the collection of refuse may be needed if the normal collection service is interrupted.

6.4 Site selection and arrangement of emergency settlements

When existing buildings are not available, one possibility is to use tents or makeshift shelters made of plastic sheets, tarpaulins, or local materials, such as palm thatch, in a secure location where water, sanitation and food can be provided. Emergency settlements for refugees and displaced people need to be established rapidly. However, they may be in service for months or even years, and it is usually impossible to know at the outset of an emergency how long the emergency settlement will exist. Therefore, the measures listed below are designed to provide healthy living conditions for disaster-affected people in both the short term and the long term. Specific long-term issues are discussed in Section 6.5.

The requirements that ensure that temporary camps are healthy environments are considered below (Assar, 1971; United Nations High Commissioner for Refugees, 1999; Sphere Project, 2000).

- The site should be free of major water-related hazards such as malaria, onchocerciasis (river blindness), schistosomiasis (bilharzia) and trypanosomiasis (sleeping sickness). If these diseases are endemic, care should be taken to avoid or control vector habitats and provide personal protection against mosquitoes, blackflies, tsetse flies, etc.
- The topography of the land should permit easy drainage and the site should be located above flood level. Rocky, impermeable soil should be avoided. Land

covered with grass will prevent dust, but bushes and excessive vegetation can harbour insects, rodents, reptiles, etc., and should be avoided or cleared. Wherever possible, steep slopes, narrow valleys, and ravines should be avoided. Ideally, the site should have a slope of 2–4% for good drainage, and not more than 10% to avoid erosion and the need for expensive earth-moving for roads and building construction.

- Whenever possible, the area should be naturally protected from adverse weather conditions.
- Areas adjacent to commercial and industrial zones, exposed to noise, odours, air pollution and other nuisances should be avoided.
- Areas sufficiently close to blocks or rows of shelters should be identified for sanitation and waste management. The residential area of the camp should face the prevailing wind to avoid odours from latrines.
- There should be ample space for the people to be sheltered and for all the necessary public facilities such as roads, firebreaks (areas without buildings and with little or no flammable vegetation) and service areas (30m² per person, or 45m² per person allowing for small gardens, but not for full-scale agricultural activities). Areas for public spaces, markets, etc. should be defined from the beginning.
- Food distribution areas should be organized so as to create safe conditions for people collecting food, as well as for those distributing it.
- To facilitate the management and control of communicable diseases, camps should hold no more than 10 000–12 000 people, or should be subdivided into independent units of no more than 1000 people.
- Drainage ditches should be dug around the tents or other shelters and along the sides of roads, especially if there is a danger of flooding. Care should be taken to lead water away from shelters, latrines, health centres, and stores. Persistent areas of stagnant water that are difficult to drain can be backfilled, or covered with polystyrene balls or a thin layer of oil, to control insects. Water points should also have adequate drainage to avoid mud.
- The site should be provided with at least two access roads for reasons of security and to reduce the risk of the site being cut off due to floods or other problems with roads.
- The surface of roads can be sprinkled with water to keep dust down. Sullage wastewater can sometimes be used to keep down dust on dirt or gravel roads. Restricting traffic and imposing speed limits can also help to reduce dust.
- Shelters should be arranged in rows or in clusters of 10–12 on both sides of a road at least 10 metres wide to permit easy traffic flow and access by ambulances or fire-fighting vehicles. In tented areas, there should be at least 2 metres between the edge of the road and the tent pegs.
- Built-up areas should be divided by 30 metres wide firebreaks approximately every 300 metres. Firebreaks can be used for locating roads and recreation areas.
- Shelters should be spaced 8 metres apart so that people can pass freely between them without being obstructed by pegs and ropes. This spacing also helps to prevent the spread of fire. If this is not possible owing to a lack of space, the distance between shelters should preferably be at least twice the overall height of each shelter, and should never be less than 2 metres. A separation greater than 8 metres may lead to open defecation and should be avoided.
- There should be a minimum of 3.5m² per person inside the shelter in warm climates where cooking is done outside, and 4.5–5.5m² per person in cold climates where cooking is done inside the shelter.
- Shelters may be tents or prefabricated units, or may be built out of plastic sheeting together with timber, stone and thatch. Where plastic sheeting is used, it is common to provide one piece, 4 metres by 6–7 metres, per household.

- Small shelters with few occupants are preferable to large shelters with many occupants.
- In cold weather, kerosene stoves or other heating appliances should be provided and people should be instructed in their use; every precaution must be taken to prevent fires and explosions.
- In the absence of electric lighting, wind-proof kerosene or oil lamps, or battery-operated lanterns, should be provided for lighting shelters, toilets and roads.
- Natural ventilation should normally be adequate for temporary shelters such as tents.
- The site chosen should be within reasonable distance of an ample source of good water and, ideally, near some high ground from which water can be distributed by gravity; water sources should gradually be improved and protected once basic needs are satisfied. No one should have to walk more than 500 metres to a water point, and there should be at least one water point for every 250 people.
- Where there is no piped water, water tanks should be installed on both sides of the road (see also Chapter 7).
- Refuse bins should be provided (see also section 8.5).
- Latrines or other facilities for excreta disposal should be provided (at least one toilet per 20 people), and gradually improved as time and resources allow. The dangers of indiscriminate defecation should be emphasized in health education. See Chapter 8 for information on emergency excreta disposal. Maintenance of toilets must be given priority in health education and camp organization (see also section 8.3).
- Bathing, laundry and disinfection facilities should be provided, and health education should emphasize the importance of frequent hand-washing. One double-sided ablution bench (3 metres long) should be provided for every 50 people (see Chapter 7).
- The camp site should be cleaned regularly according to a prearranged schedule. Participation by camp residents in the cleaning of the camp should be encouraged. Young residents can be organized into teams responsible for cleaning and reporting possible health and environment problems.
- Separate accommodation is necessary for unaccompanied children, with provision for adults (welfare staff and/or community volunteers) to stay with them; there should be at least one adult per shelter or room. These children may be very disoriented and frightened, and may also have special nutritional needs (United Nations Children's Fund, 1986). The shelters should be situated near the nutritional rehabilitation centre and field hospital, and as far from sources of secondary hazards, noise and contamination as possible.
- In conflict- and famine-related disasters, many people may be suffering from malnutrition and debilitation when they arrive, so specialized services such as intensive or therapeutic feeding may be needed. Intensive feeding or nutrition rehabilitation units should be provided with up to 15–30 litres of potable water per bed per day. Also, special care needs to be given to latrines and other waste-disposal facilities used by parents, children and staff. Means for hand-washing by all staff and parents concerned with child feeding are also important. For the design and management of therapeutic feeding units, see World Health Organization (2000a).

6.5 Longer-term issues for emergency settlements

When emergency settlements exist for more than a few weeks, a number of social, environmental and health issues need to be considered to ensure that the health and well-being of the settlement population are sustained and that long-term costs of maintaining

the settlement infrastructure and services are kept under control. Some of the short-term risks to health may be managed during the emergency phase, but when communities are obliged to remain in emergency settlements for a long time, a number of psychosocial and other health problems associated with alienation, overcrowding, and loss of control and purpose, demand special attention.

Longer-term settlements need more sustainable and durable water-supply and waste-disposal systems, laundries and wastewater facilities. As far as possible, these facilities should be designed and constructed so that local authorities and local residents can maintain them with a minimum of external resources. Regular monitoring and repair schedules need to be established and managed.

The need for recreational facilities may become greater. The safety of areas where children play must be ensured. If a stream or lake offers the opportunity for swimming or water sports, community volunteers should act as lifeguards.

Children should be prevented from entering dangerous parts of the camp or its environment, and encouraged to use recreational areas with swings, seesaws and other amenities that can be easily made from locally available materials. Fences should exclude all camp residents from dangerous areas, e.g. those where fuel and pesticides are stored.

In longer-term camps, schools, places of worship, workshops, bakeries, etc., may be planned or grow up spontaneously. Care should be taken to provide them with appropriate and adequate water-supply, sanitation and drainage systems.

Where camp inhabitants spontaneously set up workshops or carry out commercial activities—a sign of social and emotional health and much to be encouraged—care should be taken to ensure that there are no health hazards, such as smoke or fire from a bakery or pottery, liquid effluent, and flies from an abattoir or butchery. It may be best to zone the camp so that such activities are confined to an industrial quarter.

6.6 Community participation in environmental health management

Community participation is the key to success in camp management and in preparedness planning and health education. Enabling people to participate in the decision-making process and implementation of environmental health measures is an important part of empowerment and building resilience.

Committees, including representatives of camp inhabitants and camp authorities, should be set up to involve residents in issues such as camp management, land use, health, water supply and sanitation. In this way, the needs and views of those living in the camp can be voiced in an organized forum. Difficulties in such matters as the distribution of water, or the taste of treated water, can quickly be brought to the attention of the health authorities, and the committee can suggest solutions. This participatory approach is much more likely to be effective in finding solutions than a centralized, top-down approach.

Participation also empowers the inhabitants, who are in danger of becoming passive, dependent and depressed in a camp environment. The camp will, in effect, become their home for some time. Participation in decisions about the layout of the camp and the gradual improvement of the facilities can increase residents' sense of being at home.

It is very important to ensure that the women in the camp are adequately represented on the camp health committee. Special arrangements may have to be made to involve women in decision-making, even where they are not normally seen in public or involved in public affairs.

Basic sanitation regulations (e.g. those concerning the disposal of wastes, the times and places for various uses of streams or other water sources, etc.) should be discussed with the health and land-use committee. In this way, it is more likely that people will cooperate and that conflict will be minimized.

6.7 Further information

For further information on:

- site selection and layout, see: United Nations Children’s Fund (1986), Delmas & Courvallet (1994), Shook & Englande (1992), Good (1996b), Jensen (1996), Chalinder (1998), Adams (1999), United Nations High Commissioner for Refugees (1999), Sphere Project (2000), Davis & Lambert (2002);
- shelter, see: Davis (1981), Howard & Spice (1981), United Nations Office of the Disaster Relief Co-ordinator (1982b), Médecins Sans Frontières (1997b), United Nations High Commissioner for Refugees (1999), Sphere Project (2000), Davis & Lambert (2002).