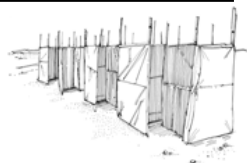


Technical Briefing for Emergency Response: *Sanitation*



Sanitation in Rural Flood Settings

This Technical Brief looks at the key sanitation issues affecting populations in rural flood settings, including excreta disposal, vector control, waste management (including clean-ups), drainage and the disposal of dead bodies

People affected by floods in rural areas can be susceptible to illness and death from disease related to inadequate water supplies, sanitation and poor hygiene. The most significant diseases are infectious diseases transmitted by the faecal-oral route (such as diarrhoea). Other water and sanitation-related diseases include those carried by vectors associated with solid waste and water. The main objective of any WASH programmes in a rural flood setting is to reduce the transmission of faecal-oral and vector borne diseases by promoting good hygiene practices, providing safe drinking water and by reducing environmental health risks through the **provision of sanitation services**.

It will be necessary to establish the conditions that allow people to live with good health, dignity, comfort and security. The term 'sanitation'¹, refers to excreta disposal, vector control, solid waste disposal and drainage. However, in flood situations, the factor of dead bodies (human + animal) must also be considered.

Understanding the Context & Planning the Response

Floods may last from a few days to many months, and it is important to identify the type of flooding situation affecting the population.

The type of intervention will not be the same for all flood situations, and it may be necessary to work in a phased approach.

The phases are:

- **Immediate action after the flood**, typified by instability and a rapidly changing situation (1 – 2 months)
- **Short to medium-term actions**, typified by a stabilisation of the situation (from 2 – 6 months)
- **Medium to long-term actions**, typified by the recovery & resettlement of the affected communities (6 – 12 months or longer)

Sufficient WASH facilities on their own will not guarantee an optimal impact on people's health. To achieve maximum benefit, it is imperative to ensure that those affected by floods have the tools, knowledge and understanding to prevent WASH related disease by involving them in the design and maintenance of the facilities.

In situations of displacement, women and adolescent girls may be vulnerable to sexual violence or exploitation. To minimise such risks, and to ensure a quality response, the participation of men, women and children in the planning, decision-making and management processes is critical.

The importance of hygiene behaviour

The links between sanitation, water supply, and health are directly affected by hygiene behaviour. It is important to bear this in mind when considering technical options, so that sanitation facilities provided in emergencies are acceptable to the users and can be used and maintained hygienically.

1. Excreta Disposal in a Rural Flood Setting

The priority in any flood situation is the speed of response. It is essential that any 1st phase technology can be installed quickly and that it is effective in containing excreta. Traditional excreta disposal technology, such as pit latrines, pour-flush toilets and raised UD toilets, are often used in 2nd phase responses and may be difficult to implement quickly in a sudden onset flood. Such technology may not be well adapted to the physical conditions found in the flood areas, particularly when the terrain is under water or water logged. It may also be difficult to install enough units in quick and cost-effective manner, particularly when those affected have been displaced into temporary camps.

Immediate Excreta Disposal Options

In the 1st phase of the emergency, the immediate excreta disposal options include:

- **Excreta clean up campaigns**
- **Chemical "Portaloo" toilets**
- **Packet latrines (with or without enzymes)**
- **Bucket latrines with close fitting lids**
- **Storage tank latrines**
- **Latrine kits/hardware (IKEA type)**

The choice of the option will depend on the situation, in particular whether the flood has displaced communities or whether they have decided to sit the flood out?

Criteria for Selection

In an emergency setting, a number of factors must be fully considered before introducing the chosen solution. The choice of technology

should be based on a solid assessment of the situation². Consultation with the affected community is an essential part of the assessment, and a number of parameters should also be considered, including:

- 1) The physical constraints (rocky ground, high water table, flood plain, etc.) existing in the target community?
- 2) Fully understanding the community's preferences regarding excreta disposal practices and facilities? Are there any strongly held beliefs or taboos about urine or faeces?
- 3) Understanding existing local knowledge & local organisations involved in promoting sanitation, the availability & of hardware?
- 4) Understanding the different requirements of men, women, children and those with special needs?

Setting Minimum Standards

Some **minimum** standards for implementing sanitation in emergencies are:

1. Sanitation should be part of a WASH approach and implemented in line with SPHERE and other environmental protection guidelines.
2. Community participation should be used at all stages during the assessment, site selection, design, construction and the operation & maintenance of excreta disposal facilities.
3. Designs should be culturally appropriate, with separate latrines for men and women and provision should be made for supplying appropriate anal cleansing material.
4. Excreta disposal facilities should be affordable, cost effective, create appeal to users and discourage vectors (e.g. flies)
5. Provision should be made to disposal of children and infants excreta safely, including child friendly latrines and culturally appropriate nappies.
6. Equitable access should be provided for the less-able, children, adult & adolescent

² *Excreta Disposal in Emergencies Manual*

¹ Definition according to SPHERE

women. Space should be provided for those using wheelchairs.

7. Hand washing facilities and soap must be provided on site at all latrines.

8. In Hurricane and cyclone affected areas, roof materials such as Corrugated Galvanized Iron must be secured correctly by clamps or hooks.

In the case that facilities have to be shared, minimum objectives, inspired by SPHERE guidelines, can be established.

	Immediate	Short-term	Medium-term
Quality	Technically basic & barely culturally acceptable	Technically & culturally appropriate	Technically & culturally very appropriate
Quantity	1/100 people 70m distance	1/50 people 50m distance	1/20 people 25m distance
Usage	50% using correctly & regularly	75% using correctly & regularly	95% using correctly & regularly

The Advantages and Disadvantages of the Immediate Excreta Disposal Option

	Description	Advantages/Disadvantages
Excreta clean up	Clean up with a shovel or covering excreta with mud. Involvement of communities in the clean up.	Advantages <ul style="list-style-type: none"> - Low cost - May be appropriate in the short term but only in areas where latrines are not used Disadvantages <ul style="list-style-type: none"> - Labour intensive - Not sustainable
Chemical Toilets	Single, prefabricated plastic units incorporating	Advantages <ul style="list-style-type: none"> - Hygienic and odour is minimised Disadvantages

	g a sit-down toilet, lockable door & effluent tank containing chemicals to aid digestion & reduce odour	<ul style="list-style-type: none"> - High cost, difficult to transport and require regular emptying
Packet latrine	Disposable plastic packets, or plastic bags, in which users defecate. They contain a blend of enzymes, which assists the breakdown of excreta.	Advantages <ul style="list-style-type: none"> - Packets are lightweight and easy to transport - Appropriate for flooded areas or where space is limited Disadvantages <ul style="list-style-type: none"> - May be unacceptable to affected population - Final disposal site must be clearly marked, accessible and used
Bucket latrine	Buckets/containers with tight fitting lids, which can be emptied into sewage systems, landfill sites or stabilisation ponds. Disinfectants may be added to reduce disease transmission risks & odour.	Advantages <ul style="list-style-type: none"> - Defecation containers can be procured easily and transported - Once containers are provided only final disposal system needs to be established Disadvantages <ul style="list-style-type: none"> - May be culturally inappropriate - Large number of containers and disinfectant required
Storage tank latrine	Large storage tanks situated above ground, with wooden platforms and simple superstructure fitted above. Effluent is collected in the tank.	Advantages <ul style="list-style-type: none"> - Large storage tanks are often available in relief shipments - They are rapid to set up/construct - Can be used in flooded or rocky areas Disadvantages <ul style="list-style-type: none"> - Regular emptying required - Large number of tanks may be needed which could be used for other purposes such as water supply

Kit latrines	Consists of flat packed superstructures and slabs, designed specifically for rapid deployment in an emergency	Advantages <ul style="list-style-type: none"> - Rapid to implement on site - Quality hardware designed for easy transport Disadvantages <ul style="list-style-type: none"> - May require pits being dug - Expensive - Delays in procuring & transporting to site - May be culturally inappropriate
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Short to Medium-term Excreta Disposal Options

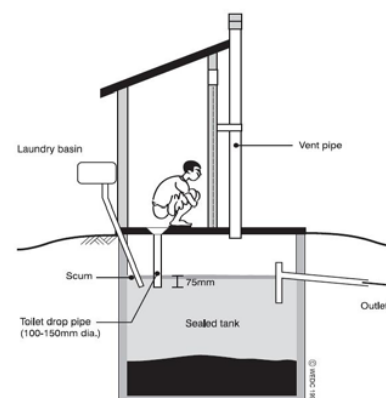
Following the stabilisation of the flood situation, short-to medium term options and the use of semi-permanent facilities, need to be considered.

In the 2nd phase of the emergency, the key 2nd phase options include:

- Simple pit/trench latrines
- Pour-flush toilets (with off set pits)
- Aqua privies
- Raised pour-flush units with septic tank
- Raised urine diversion (UD) toilets
- Simple composting toilets

The ideal solution is to provide every family with their own latrine, but this might not always be possible, and communal or shared latrines may have to be used

Figure X: Example of an aqua privy



In the majority of cases, traditional excreta disposal technology, (pit latrines, pour-flush toilets, etc.), will have to be adapted for use in high water table areas.

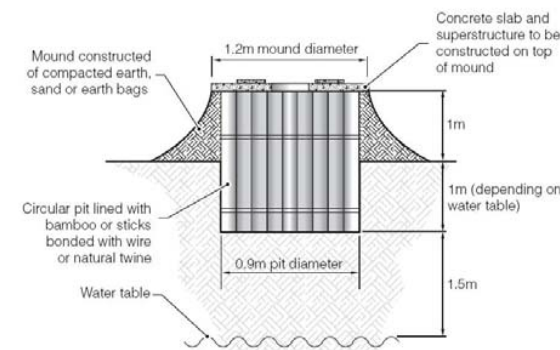
Excreta Disposal in High Water Tables

Generally, the latrine pit bottom should be 1.5 m above the wet-season water table to prevent contamination of the water table. In flood situations, this may not be feasible? To protect water sources, it may be more cost-effective to develop alternative water sources than to provide alternative excreta disposal facilities. Where groundwater is less than 1m from the surface, greater attention should be given to ensuring people do not use water from wells in the vicinity of excreta disposal facilities.

The risk of pollution through sub-surface movement of pathogens depends on a number of factors and risks need to be assessed carefully. Generally, a distance of 10 metres minimum from a latrine to a water source is adequate to prevent linear contamination.

When a pit is dug, digging below the water table increases the available pit volume. There is evidence that wet pits take longer to fill. The main risk is pit collapse, hence pits should be lined with appropriate, locally available materials such as fired clay bricks, block work, wicker baskets, large stones/rocks, or pre-cast concrete rings. It is also possible to use a 200-litre oil drum as a liner, if readily available; this however makes a pit with a very low volume and therefore a short life. Pit linings can be extended above ground level to provide the required pit volume, as shown below.

Figure X: Techniques for pits in high water tables (WEDC)



Excavated material can be used to build a mound or embankment around the latrine. This mound can be used for liquid infiltration from the pit if it is:

- Formed with permeable soil
- Well compacted with a stable side slope of 1:1.5
- Thick enough to ensure that filtrate does not seep out of the sides of the mound

The slab should be constructed at least half a metre above the highest water level.

Raised UD Toilets

Normally, UD toilets are used to separate faeces and urine for re-use (ecological sanitation). In a flood environment, re-use of the by products may not be the main priority.

UD toilets are suited to rocky ground or areas with high water tables, and more resistant to cyclic flooding. They can also be used for many years, making them an attractive and sustainable option. The impermeable bottom of the chamber prevents contamination of both the soil and ground water. Normally, one chamber is in use, while in the other, faeces breaks down into compost. The seat or squat slab is connected to a hose or piping to separate the urine, which can be either be collected in a container or drained to a soak away.

Figure X: Twin vault UD latrine, Sri Lanka (courtesy ACF)



Raised latrines may not be socially acceptable if people feel 'exposed' going in and out of the unit. They may also restrict access for disabled people, the elderly, pregnant women and others. Choosing hardware to meet the needs and cultural preferences of users (i.e. seated, squatting, wet or dry anal cleansing) is key for acceptance.



Figure X: Urinal and container (courtesy GTZ)

The adoption of urinals for men, who prefer to stand when urinating, is one way of improving the performance and effectiveness of UD toilets.

Simple composting latrines

Space permitting, a household may choose to dig a shallow, unlined pit latrine above the water table that will have a short life. The simplest and best-known composting toilet is the "Arborloo". This toilet uses an unlined shallow pit (1 – 1.5m deep), fitted with a ring beam, slab and portable superstructure. When the pit is nearly full, a new pit is dug close by, and the ring beam, slab and superstructure are moved to the new site. The old pit is covered with soil, allowing contents to compost down. When fully composted, a tree can be planted.

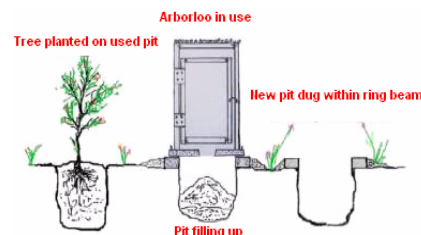


Figure X: An "Arborloo" system in use

2. Vector Control in a Rural Flood Setting

Vectors can carry disease-producing parasites from one host to another. These potential disease carriers are capable of rapidly reproducing and dispersing within favourable environments. Floods often provide conditions for proliferation, with flies and mosquitoes posing the greatest risk. Vectors of significance include mosquitoes, flies, rats and mice, cockroaches, ticks, fleas, lice and mites. The principal vector transmitted diseases include:

Vector	Disease/Condition
Mosquitoes	Dengue, Malaria, Yellow Fever, West Nile Fever, Filariasis, etc.
Rats	Leptospirosis, Hanta virus, Bubonic plague, Typhus, etc.
Flies & Cockroaches	Diarrhoeal diseases
Ticks, Fleas, Lice	Typhus

Floods do not cause new diseases or automatically result in outbreaks of vector-borne diseases, but alter the environment, and encourage the proliferation of vectors. Some flood-associated diseases may appear several weeks or months after the event.

Potential Rural Flood Related Problems

- The creation of new breeding sites due to poor drainage
- The creation of poor sanitary conditions in camps and overcrowded areas
- An increase in the number of vector host species present
- Displacements from one location to another and an increase in vector and human contact

In the post-flood period, the first priority is to assess the risk of vector-borne disease transmission, as quickly as possible. If an intervention is required, major vector control activity should take place as soon as possible.

The necessary resources must be mobilized rapidly, and an operational management framework put in place swiftly to allow vector-control activities to be implemented. Key vector control measures include:

- Identifying assessment teams with expertise in vector control and quickly mobilising the teams.
- Developing systems for the collection and review of all relevant background information.
- Developing vector profiles of the flood prone areas and ensure an assessment programme, to evaluate the potential risks, is in place.
- Identify equipment, supplies and resources for vector control and ensure mechanisms are in place for their mobilization.
- Ensuring appropriate waste management strategies are put in place in the flood area.
- Developing public advisory & education material and identify mechanisms for their dissemination.

Vector control responses

In a post-flood situation, flood-affected people need to have the knowledge and the means to protect themselves from disease and nuisance vectors that are likely to represent a significant risk to health and/or well being. Risks must be kept to an acceptable level.

The control of a vector-borne disease can be achieved by various means in emergencies. These include:

- Medical diagnosis and treatment.
- Vector control using chemical/biological means
- Environmental sanitation.
- Promoting personal protection.

Medical diagnosis and treatment are outside the scope of this paper, and should be undertaken by the competent authorities.

Chemical vector control measures should be undertaken in a way, which ensures the staff, those affected by floods and the local environment, are all adequately protected. The use of chemicals should be done in a way that avoids creating resistance to that particular substance. Application methods include:

Equipment	Application method
Dusting	Hand-held dusters, manually operated or mechanized.
Residual Insecticide Spraying	Knapsack sprayers with special nozzles.
Ultra-low volume spraying	Low-dosage applications to large areas from fixed-wing aircraft or helicopters.
Space spraying	Interior or exterior applications with pesticide aerosols dispersed under pressure from vaporizers
Impregnation	The treatment of materials such as bedding, clothing and mosquito nets with pesticides in emulsion or solution (by dipping and drying, or by spraying with knapsack sprayers).

Table X: Pesticide application methods & equipment

Where possible, the vector control activities should be coordinated with the local authorities and the relevant public health body.

Environmental sanitation measures include; draining standing bodies of water; removing vector breeding sites (such as piles of rubbish, old tyres, water jars, bamboo poles, etc.); setting traps (rats & flies); etc.

Personnel protection measures include; the distribution of insect/mosquito repellent; promoting using long sleeves & trousers; fitting houses/shelters with mosquito/fly netting on windows & doors; distributing insecticide treated bed nets (ITNs); and wearing Wellington boots.

3. Waste Management in a Rural Flood Setting

If large numbers of people have been forced into camp type settings by the floods, it is likely that waste management will become a major

issue. A system of managing the waste, in a safe and environmentally friendly manner, should be put into place. A decision must be taken if the waste will be dealt with on-site (burial), or whether it is necessary to transfer to a remote disposal site? The keys steps in WM are:

- Collection, containment & storage
- Waste transfer
- Final waste disposal

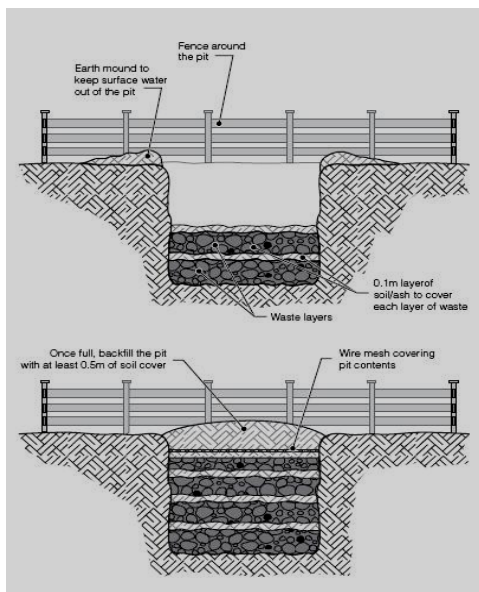


Figure X: Waste pit (courtesy WEDC)

For waste disposal on-site (burial in communal pits), then waste transfer will not be necessary. If disposal is off-site, a means of collection, transportation and a final disposal site must be identified.

The municipal and other relevant authorities should be consulted. The agency in charge may have to provide the vehicles and manpower to operate the service.

All personnel working in the collection and handling of waste should be provided with protective clothing and given training.

The communities themselves should be consulted about the location of communal waste collection points and how they will be managed.

Sphere: Key indicators

- People from the affected population are involved in the design and implementation of the solid waste programme
- Household waste is put in containers daily for regular collection, burnt or buried in a specified refuse pit

Sphere: Key indicators (continued)

- All households have access to a refuse container and/or are no more than 100 meters from a communal refuse pit
- At least one 100-litre container is available per 10 families where domestic refuse is not buried on site
- Refuse is removed from the settlement before it becomes a nuisance or a health risk

4. Clean up Campaigns in a Rural Flood Setting

Floodwaters may be contaminated by sewerage systems or from agricultural by products. Floodwater in contact with the skin does not pose a serious health risk, but there may be some risk of disease by eating or drinking food items contaminated by floodwater. People may become infected with diseases such as leptospirosis if cuts, sores or wounds come directly into contact with floodwater. During the emergency period, it is critical to practice basic hygiene. Hand washing with soap and clean water is one of the most effective ways of protecting against disease. Children should be prevented from playing in floodwater and their toys and possessions should be disinfected.

Re-entering a flooded home

Flooded homes may have been contaminated with sewerage or other biological matter, and if the house has been closed for several days, there may be a risk of mould. In both cases, ensure doors and windows are fully open when entering the house for the first time. Open doors and windows at least 30 minutes before starting cleaning activities, and stop Floodwater outside the house from re-entering. Good practice includes:

- Wearing Wellington boots, gloves & goggles
- Cleaning all hard surfaces with clean water and a disinfectant
- Washing hands with soap & clean water after the clean up activities.
- Disinfecting cuts & wounds coming into contact with floodwater. Seek medical help if people become ill.
- Washing and disinfecting clothes worn for clean up campaigns. Clothes salvaged from the flooded home should also be washed & disinfected.
- Items such as mattresses, cushions and other such items that cannot be cleaned should be disposed of.
- Ensuring the house is fully dried before resettling

Cleaning up floodwater

Houses that have been filled with flood related debris, such as sediment and silt, may need to be cleaned by organising mass clean up campaigns. The use of a "Cash-for-Work", approach is an appropriate way of mobilising the affected communities. Tools, such as picks, shovels and wheelbarrows will be essential. It may be necessary to organise trucks and mechanical diggers to evacuate the debris, depending on the volume deposited. Protective clothing such as Wellington boots, overalls and gloves should be provided to all those involved in clean up campaigns.

Cleaning and disinfecting with bleach

An unscented proprietary liquid bleach (Sodium Hypochlorite), between 4 – 6 % should be used. The safety instructions on the container must be carefully read and closely followed. Wellington boots, gloves and goggles should be used to handle the solution and it should never be used in a closed space.

Activity	Application method
Cleaning water storage containers	<ul style="list-style-type: none"> - Mix soap and clean water in container - Shake to clean inside of container - Rinse container - Mix 20ml bleach per litre water and pour into container - Shake the container so solution touches all surfaces - Cover and leave for 30 minutes - Rinse with clean water
Food contact surfaces	<ul style="list-style-type: none"> - Wash with soap and clean water - Rinse with clean water - Mix 5ml bleach per litre water and clean the surface - Allow to air dry
Hard surfaces and other household items	<ul style="list-style-type: none"> - Wash with soap and clean water - Mix 5ml bleach per litre water and clean the surface - Allow to air dry
Cleaning mould growth	<ul style="list-style-type: none"> - Mix 50ml bleach per litre water and clean/wash the item/surface with the solution - Scrub rough surfaces with a brush - Rinse with clean water - Dry the item/surface or leave it to air dry

5. Drainage in a Rural Flood Setting

Standing water in or near emergency settlements may be contaminated with wastewater from septic tanks, toilets and/or latrines. The main health risks are; the contamination of water supplies, damage to dwellings, vector breeding and drowning. People should live in an environment where health and other risks are minimised.

To reduce potential health risks, a proper drainage plan may be necessary to deal with storm water drainage. Small-scale, on-site drainage can be provided to dispose of domestic wastewater. In the event that houses have been filled with floodwater, communities should be mobilised to clear drainage channels and repair small breaches in flood defences using a "Cash-for-Work" approach. Key CFW activities include:

- Removing standing water near dwellings by improving drainage to reduce vector breeding sites
- Protecting shelters, paths and water and sanitation facilities from erosion and from flood water
- Providing sufficient appropriate tools for small drainage works and maintenance where necessary
- Protecting existing surface or groundwater sources from erosion or from contamination

Large-scale drainage is generally determined by site selection and the development of drainage plans is outside the scope of this paper.

6. Disposal of Dead Bodies in a Rural Flood Setting

Health risks

There is a widespread belief that corpses (both animal and human) pose a risk of communicable diseases after a flood. Such beliefs are frequently mistaken, especially if death has been caused by trauma or drowning. Dead bodies are unlikely to cause outbreaks of diseases such as typhoid fever, cholera or plague, though there may be a risk that water sources become contaminated.

Recovering dead bodies

In the event of human deaths in a flood, the main risk is of mental trauma caused to survivors of the event. In this situation, it is important to organise the collection of corpses to minimise distress, and to allow the communities to grieve and bury/cremate their dead in line with their cultural practices and traditions.

Medical epidemics

In the case of a medical epidemic caused by diseases such as cholera, Ebola or typhus and plague, it will be necessary to seek assistance from specialised medical personnel to help with body recovery and disposal.

Disposal of dead animal carcasses

The risk to humans from animal carcasses is low if proper precautions are taken. Animal carcasses should be disposed of quickly and safely to avoid attracting rats. The disposal of dead animal carcasses should be undertaken with the relevant government/local authorities, if possible? Protective clothing, including rubber gloves, Wellington boots, & goggles should be worn, and any open wounds should be covered. After disposal of the carcasses, hands should be thoroughly washed with soap. Clothing should be disinfected and washed separately from other clothing items.

The Global WASH Cluster Technical Learning Project, led by ACF-UK

<http://www.humanitarianreform.org/g/Default.aspx?tabid=347>

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Re-entering your flooded home – CDC (Emergency Preparedness & Response) <http://www.bt.cdc.gov/disasters/mold/reenter.asp>

Cleaning & sanitizing with bleach after an emergency – CDC (Emergency Preparedness & Response) <http://www.bt.cdc.gov/disasters/bleach.asp>

Technical Excreta Disposal Options in Bangladesh

Location Context	Immediate Options	2 nd Phase Options
Embankment-	<ul style="list-style-type: none"> Trench latrine with fence, lower slope of embankment Temporary raised direct latrine using 5-rings, & mortar seals Bucket latrine Offset pour-flush toilet connected to pit at bottom of embankment by drainpipe. 	<ul style="list-style-type: none"> Normally, no digging is allowed on embankment
Roadside	<ul style="list-style-type: none"> Trench latrine with a fence Temporary raised direct latrine using 5-rings, & mortar seals Bucket latrine, large clay pot, etc Containment by using an empty drum 	<ul style="list-style-type: none"> Unlikely to continue, but if so, continue the immediate options
Shelters Communal, schools, public buildings	<ul style="list-style-type: none"> Improvement of existing latrines Trench latrine with fence (away or outside main premises) Temporary raised direct latrine using 5-rings, & mortar seals Bucket latrine (drum, clay-pot, plastic bag and other type of containment) 	<ul style="list-style-type: none"> Construct more permanent direct or offset latrines that are raised if necessary
Char	<ul style="list-style-type: none"> Clay pot, Drum Bamboo mat containment with plastic lining 	<ul style="list-style-type: none"> Direct or offset latrine raised to the level of house plinth Bucket latrine
Raised HH	<ul style="list-style-type: none"> Raised direct or offset latrine with sealed rings, stabilized by bamboo frames. In flood prone levels raise to plinth level Bucket latrine (drum, clay-pot, plastic bag and other type of containment) Bamboo mat containment (plastic lining if necessary) under the raised squatting. 	<ul style="list-style-type: none"> Raised direct or offset latrine, in flood prone levels raise to plinth level Bucket latrine
Haor	<ul style="list-style-type: none"> Clay pot Drum Large containment. Boat latrine 	<ul style="list-style-type: none"> Raised direct or offset latrine using 7-8 rings-steps or pathways. Latrine raised to level of house plinth Bucket latrine
Hill tracts areas	<ul style="list-style-type: none"> Clay pots Direct or offset pit latrine with plastic pan, one ring and slab. Stilt-offset-direct pipe to covered pit-a traditional tribal practice (avoid water seal-use flap) Bucket latrine 	<ul style="list-style-type: none"> Direct or offset pit latrine with plastic pan, one ring and slab (avoid water seal & use flap) Bucket latrine
Displaced people's camp	<ul style="list-style-type: none"> Controlled defecation zones Trench latrine with a fence Bucket latrine (drum, clay-pot, plastic bag and other type of containment) 	<ul style="list-style-type: none"> Community off-set latrines with twin pits (avoid water seal & use flap)

Table X Excreta Disposal Options for Emergencies in Bangladesh