



GUIDELINES FOR FAECAL SLUDGE MANAGEMENT FOR RURAL SANITATION AND HYGIENE PROGRAMME



Water For
Women



Developed by Public Health Engineering Division,
Department of Public Health, Ministry of Health, Bhutan
in partnership with SNV and UNICEF

November 2019

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ACKNOWLEDGMENT

Public Health Engineering Division (PHED), Department of Public Health, Ministry of Health wishes to express its appreciation to all whose efforts made the production of this document possible. In particular, PHED gratefully acknowledge the contributions of the following officials, who contributed to and developed this guideline.

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Thanks are also due to all those who had provided valuable comments and reviewed this document.

The development of this publication was made possible in partnership with SNV and UNICEF.

FOREWORD

Bhutan has made remarkable progress in achieving rural household's access to sanitation & hygiene services in the recent past. However, the current focus of Rural Sanitation & Hygiene Programme (RSAHP) since its inception in 2008 has been primarily on access to basic sanitation facilities and less so on what happens afterwards in terms of safe management of the excreta. However, with the adoption of Sustainable Development Goal in 2015 by UN General Assembly, dedicated goal on water and sanitation has been allotted unlike in the MDG era where it was just a subset of Goal 7. Subsequently ambitious targets around sanitation has been set one of which is "universal access to safe faecal waste management".

To contribute towards achieving the 2030 global agenda, Public Health Engineering Division in consultation with other relevant agencies has successfully aligned the KPIs of the National Key Result Area (NKRA) & Agency Key Result Areas (AKRA) on water & sanitation of 12th Five Year Plan with that of SDG 6.1 & 6.2.

This guideline is therefore developed with the intention to provide basic technical guidance to the relevant agencies and community responsible for implementing projects in rural communities, schools, nunneries, healthcare facilities, monastic institutions and public gatherings including during emergencies in the country towards ensuring safe management of human excreta and environmentally safe and technologically appropriate management systems.

It is envisaged that this guideline will immensely contribute to achieving the goal of universal access to safe faecal waste management for improving the wellbeing and lives of Bhutanese citizens.

I wish to extend warm Tashi Delek to all the stakeholders involved in formulating this document. This guiding document is a testimony to your unwavering commitment and hard work for the betterment of our people's lives.

(Dr. Karma Lhazeen)

Director

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Acronyms

AKRA	Agency Key Result Area
BHU	Basic Health Unit
B-WASH	Bhutan Water Sanitation and Hygiene
CDH	Community Development for Health
DIY	Do it yourself
ECOSAN	Ecological Sanitation
FSM	Faecal sludge Management
FWM	Faecal waste management
FYP	Five Year Plan
LPC	Litres per capita
MDG	Millenium Development Goal
MoH	Ministry of Health
NKRA	National Key Result Area
OD	Open Defecation
ODF	Open Defecation Free
PHED	Public Health Engineering Division
PPE	Personal Protective Equipments
RGoB	Royal Government of Bhutan
RSAHP	Rural Sanitation and Hygiene Programme
SDG	Sustainable Development Goal
SNV	Netherlands Development Organisation
UDDT	Urine Diversion Dehydrating Toilet
UNICEF	United Nations Childrens Emergency Fund
VIP	Ventilated Improved Pit
WASH	Water Sanitation and Hygiene

1. Background and Introduction

The Rural Sanitation and Hygiene Programme (RSAHP) started with a pilot phase in 2008 and have successfully been up-scaled nationally by the PHED with support from SNV, UNICEF and Swiss Red Cross. Currently, the programme has reached 10 Dzongkhags¹ and will be up-scaled in the remaining 10 Dzongkhags during the 12th FYP (2018-2023).

The RSAHP approach is evolving based on the phase of programme implementation as shown in the figure below. It now consists of Phase 1 and Phase 2 approaches.

Phase 1 (Pre-ODF) approach is applied in the areas where open defecation and unimproved sanitation facilities are prevalent (new programme districts). The approach integrates four inter-related components (sanitation demand creation, sanitation supply chain linking markets and services to the demand created in the rural areas, behaviour change communications and inclusive governance to create an enabling environment together with continuous monitoring and evaluation).



Phase 1 (Pre-ODF) Area-wide access and usage for all

Phase 2 (Post-ODF) will be applied in the ODF areas (programme implemented districts). This approach responds to the Phase 1 of the programmes in order

¹ Lhuntse, Pemagatshel, Mongar, Samdrupjongkhar, Samtse, Wanduephodrang, Trashigang, T/yangtse, Trongsa & Tsirang

to develop a sustainable service delivery model and integrates four inter-related components (WASH governance and regulation, demand creation and behavioural change, sanitation service and provision, environmental health surveillance and response).



Phase 2 Post-ODF

Although Bhutan has achieved tremendous progress in the last couple of years with 39 Gewogs achieving 100% improved sanitation coverage as of November 2017, the current focus of RSAHP has been on ensuring access to sanitation facilities and less so on what happens afterwards in terms of safe management of the faecal waste. Thus, this guideline is expected to guide all the relevant stakeholders for Rural Sanitation and Hygiene in Bhutan in their efforts towards ensuring safe management of human excreta.

As per SDG, Safely managed sanitation services is defined as the use of improved sanitation facility which is not shared with other households and where excreta are safely disposed in situ or transported and treated offsite.²

2. Objective:

The objective of this document is to guide stakeholders to implement safe management of the faecal waste in rural areas to reduce mortality and morbidity specifically among children U5 due to WASH related diseases.

² Sustainable Development Goal 6 Synthesis Report on Water and Sanitation 2018

3. Scope:

This guideline is targeted towards ensuring safely managed sanitation facilities at the household level, in healthcare facilities, schools, monastic institutions, public places and gatherings (including during emergencies) in rural areas where there is no access to sewer networks and treatment plants.

When is Faecal Waste NOT Safe?³

While it is difficult to determine when faecal waste is safe, there are some simple indicators to ascertain when faecal waste is NOT safe. Faecal waste is most efficiently digested by anaerobic (no air) + aerobic (with air) processes with:

- Aerobic digestion: being more efficient in reducing pathogens (i.e. faecal bacteria, parasites & viruses) → Public Health
- Anaerobic digestion: being more efficient in reducing solids (incl. BoD, nitrogen & phosphorous) → Environmental Health

Faecal waste is comprised of sludge (solids) and effluent (liquids). The public health risk from faecal waste is primarily determined by the effectiveness of the aerobic processes in neutralizing pathogens. The efficiency of the aerobic processes is however often determined by the effectiveness of the anaerobic processes in removing the solids from the liquids, and the liquids from the solids. That is, the aerobic bacteria cannot neutralize the pathogens in faecal waste unless the effluent is clear, and the sludge is dry.

Faecal Waste CANNOT be safe if:

- **the faecal sludge is NOT dry, or**
- **the faecal effluent is NOT clear.**

³ SNV Bhutan Safely Managed Learning Brief2018

Sludge Accumulation Rates

Tabulating the fill times (table below for different sized aerobic (dry pits) and anaerobic (wet) pits and tanks are subject to different inputs (i.e. compost or no compost, black or grey water) from a varying number of users under different effluent dispersion conditions (i.e. leaching or no leaching) enables the operational boundary conditions to be established and compared against actual fill times. In establishing the boundary conditions, a safety factor of 150% has been applied to give a design sludge accumulation rate of 40-60 lpc/year.

For a household of four users:

- pits of 1.2 m internal diameter and 1.5 m deep, have a fill time that will range from 7 years for dry pits to
- 10.5 years for wet pits. This means that designing a second offset pit for pour-flush latrines to fill after
- 2 years could significantly reduce the size (and cost).

Table 1: Pit fill time with different faecal waste digestion options

Faecal waste digestion options		Loading (lpc/yr)	Users (#)	Depth (m)	Width/Dia (m)	Length (m)	Volume (m ³)	Fill time (yrs)
Dry pit	With compost	60	4	1.5	1.2		1.7	7.1
	No compost	40	4	1.5	1.2		1.7	10.6
Wet pit	Holding pit (black water)	1865	4	1.5	1.2		1.7	0.2
	1st leach pit (black water)	40	4	1.5	1.2		1.7	10.6
	2nd leach pit (black water)	40	4	0.4	1		0.3	2
Septic tank	Holding tank (black water)	1865	4	0.7	1	2	1.4	0.2
	w/leach pit (black+grey water)	60	4	0.7	1	2	1.4	5.8
	w/leach pit (black water)	40	4	0.7	1	2	1.4	8.8

4. Type of toilets

The following are the most common type of toilets seen in rural Bhutan:

- Direct pit toilet
- Ventilated improved pit toilet
- Pour flush toilet with septic tank
- Aqua Privy toilet (watertight)
- Pour flush toilet with single or twin leach pits
- Urine Diversion Dehydrating toilet/ECOSAN

The brief description of each toilet types are outlined in the subsequent sub section

4.1 Direct Pit toilet/ Ventilated Improved Pit (VIP) toilet

It is a type of toilet that collects human faeces in a dug pit which is used for controlled decomposition, or waste disposal without sewer system in rural areas. Pit toilets are the cheapest and easiest method of separating faeces from human contact. However, if the toilet is not maintained properly: slab not cleaned regularly, squatting hole not covered, gaps/holes in the slab etc. there is a high risk of faeces coming into contact with humans.

VIP toilet is pit toilet that has vent pipe with a fly screen as an additional component at the rear side to drive out odour and act as a trap for flies.

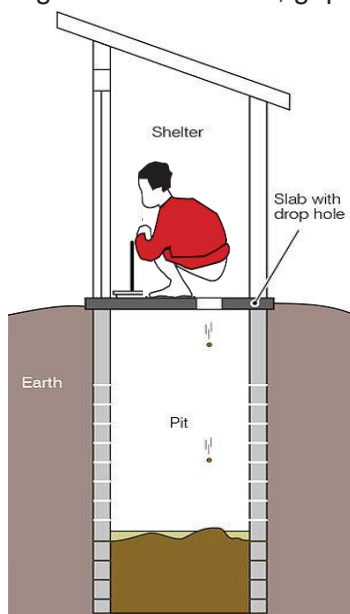


Figure 1: Direct pit toilet

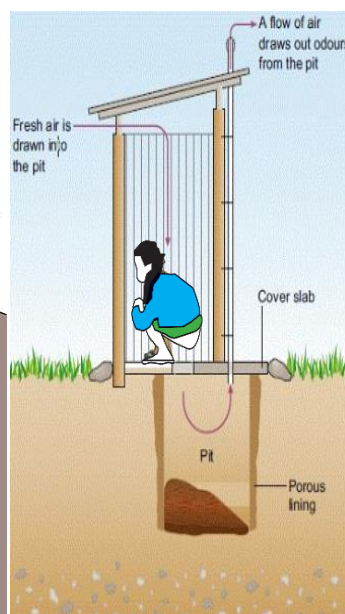
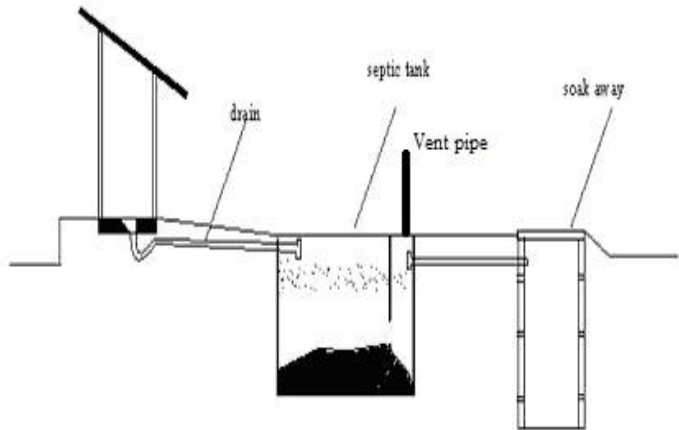


Figure 2: Ventilated improved pit toilet

4.2 Pour Flush toilet with Septic tank:

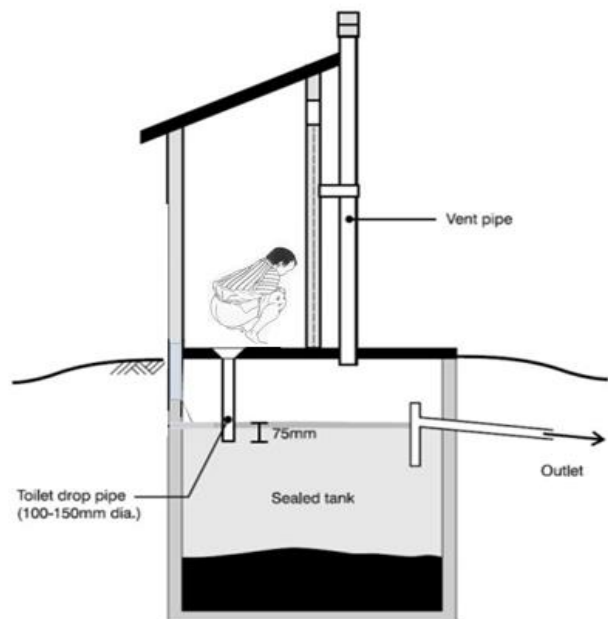
It is a toilet where water (minimum of 2.5 litres) is poured into the pan to flush excreta into the septic tank through a water seal that prevents odour and flies coming back up the pipe. The S or P trap beneath the pan serves as a water barrier between the pan and the sewers to prevent sewer gases from entering the house. In addition there should be a vent pipe to ensure that no excessive pressure builds up in the septic tank that can adversely affect the system.



4.3 Aqua privy toilet (water tight):

It is a Low-water use alternative simple toilet constructed over a water tight septic tank to maintain constant liquid level. Also this type of toilet is promoted in areas where there are space issues. Excreta fall directly from a squatting plate through a submerged pipe into a water tight tank which acts as a water seal. The solid settles into the septic tank and the effluent is discharged into a soak-pit.

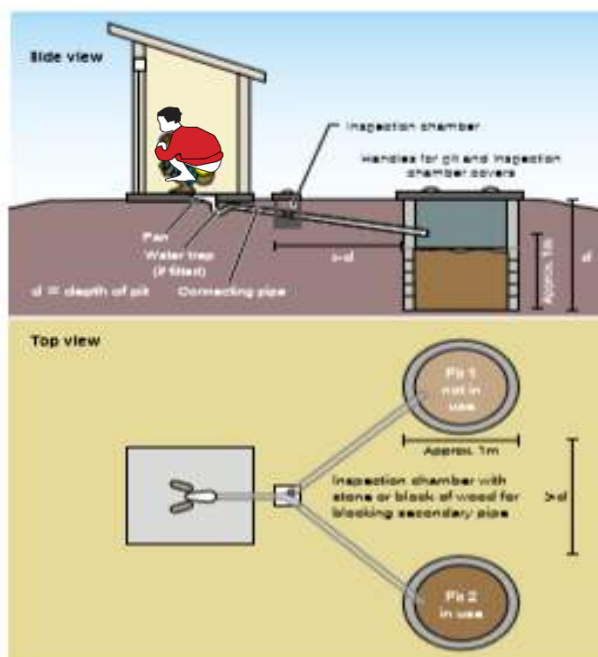
However, if there are leakages in the septic tank, it can lead to environmental pollution, health hazards and undesirable odour.



4.4 Pour Flush toilet with single or twin leach pits:

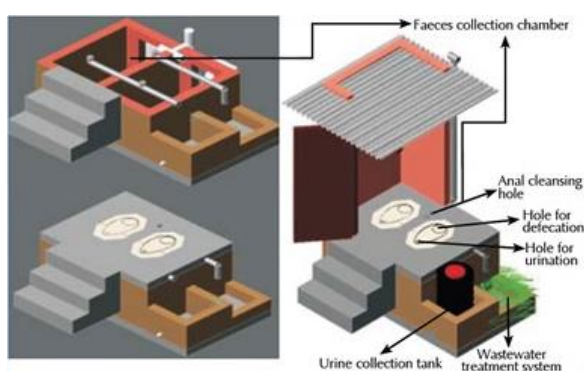
It is a toilet where water (minimum of 2.5 litres) is poured into the pan to flush excreta into the leach pit through a water seal that prevents odours and flies coming back up the pipe. Leach pit is a porous wall that is lined with dry masonry wall which permits its liquid contents to seep into the ground but retains the sludge.

When the pit that is being used gets filled up, the household has an option to either switch over to the second alternating pit or construct a new one if there is only one pit built initially.



4.5 Urine Diversion Dehydrating Toilet (UDDT)/EcoSan Toilet⁴

It is a composting and dehydrating dry toilet that operates without water that has a double vault ventilated compartment which separates urine and faeces. It is best suited in areas of water scarcity, high ground water table and difficulty in digging a pit due to presence of boulders. In addition, the collected urine and decomposed faeces can be used as fertilizer and soil conditioner respectively.



⁴ Introduction to Ecological Sanitation (ECOSAN) Toilets in Bhutan

5. Desludging/Pit Emptying

Neglecting pit emptying requirements can have serious health and environment consequences. Faecal waste management (FWM) requires safe and hygienic septic tank and pit toilet emptying services, along with effective treatment of solid and liquid waste and the reuse of treated produce where possible. It may include a range of options including onsite and offsite treatment, and the disposal or capture and further processing of the products of the treatment process into such as biogas, compost and energy.

Choosing the suitable method of emptying excreta is determined by:

- Type of toilet to be emptied
- Relative cost of building a new toilet Vs cost of emptying the existing one
- Availability of land to construct a new toilet
- Health impact on workers
- How the excreta will be disposed off

6. Suitable methods of pit emptying/transportation/disposal and reuse:

6.1 Direct Pit toilet and Ventilated Improved Pit toilet

When the pit gets filled, the household(s) and institutions can follow the options below:

Option 1: Construct a new pit the old pit should be covered safely with soil, the new pit should be constructed at least 4' (feet) away from the old one to avoid seepage and collapsing of the pit.

Option 2: In case if the household/institutions chooses to empty the old pit to use decomposed faeces after two years as a fertilizer, the following are the precautionary measures that has to be followed:

- A person entering into the pit for manual emptying should be equipped with safety gear (protective mask/gloves, boots, hats etc) to avoid health hazards.
- The pit should be left to 'vent' for some time before anyone enters it and fans can be used to improve the circulation of air in the pit.

- Once the decomposed faeces have been removed from the pit, it can be applied on parched land as a soil conditioner, or as a fertilizer in agriculture.
- It can be transported and reuse/disposed carefully.
- In case the household/institutions chooses to dispose the decomposed faeces, the site should be away from any water source and areas that are liable to flooding. As a possible route for faecal contamination is through rainfall runoff, surface water must be directed away from any disposal site, using ditches or low soil embankments. Sludge should not be emptied into storm water drains.

Note: If households/institutions chooses to empty the pit immediately after it gets filled or reuse of the same pit ensure safe burial of the faeces in the new pit.

6.2 Pour Flush Toilet with Septic Tank

To prevent overflow of septic tank, check the sludge depth of the septic tank every year and empty when it is two thirds full. If the septic tank needs to be emptied, follow the actions below:

- A person entering into the septic tank for manual emptying should be equipped with safety gear (protective mask/gloves, boots, hats etc) to avoid health hazards.
- The chamber should be left to 'vent' for some time before anyone enters it and fans can be used to improve the circulation of air in the tank.
- If there is an opportunity to avail cess pool truck to de-sludge, the content from the septic tank should be disposed preferably directly into the waste treatment plant or into a safe disposal pit.
- If there is no service provided, smaller volumes of sludge can be buried directly in a trench. The sludge is placed in layers (e.g. 100 mm thick) that are then covered with 200 mm of soil before the next layer of sludge is added. The final layer should always be soil. After a couple of years, the contents can be dugout and used as fertilizer (refer the description (number pit toilet).

In the event of over flow/leakage from the septic tank, one needs to immediately take the following actions:

- Temporarily the households/institutions to avoid using toilet.
- Consult competent personal (caretakers, technicians, skilled masons etc) to identify the problem.
- In case if the problem cannot be solved, the management/households should divert the connection directly to temporary leach pit.
- Once the connection has been diverted to a temporary leach pit, the management /household(s) can engage in emptying the septic tank. The person engaged in emptying should follow the following precautionary measures:
 - A person entering into the septic tank for manual emptying should be equipped with safety gear (protective mask/gloves, boots, hats etc) to avoid health hazards.
 - The chamber should be left to 'vent' for some time before anyone enters it and fans can be used to improve the circulation of air in the tank.

Alternatively, if there is an opportunity to avail cess pool truck to de-sludge, the content from the septic tank should be disposed preferably directly into the waste treatment plant or into a safe disposal pit.

In the event of soak pit getting choked, one should construct a new soak pit.

6.3 Pour Flush Toilet with Single Leach Pit

- Before the pit gets filled, construct an alternating leach pits of the same size if space permits or a smaller one of sizes 6 dia x 3' depth;
- Close the filled pit and connect to the newly constructed pit through the Y-Junction provided;
- The closed pit should be kept untouched for a minimum period of 2 years or until the second pit is about to be full;

For pit Emptying refer the section above (pit toilet section 4.1)

6.4 Pour Flush with alternating twin leach pits

- Emptying alternating pits makes use of the same pit on a rotational basis where manual emptying is not necessary;

- Two circular pits are dug, each sized 6x6 feet with a removable cover slab, providing access to the pit;
- Close the filled pit and provide access to the empty pit;
- The stored excreta should be handled carefully to minimize health risks associated with any incorrect use of the toilet;
- After a minimum of period of 2 years or before the second pit gets filled the contents from the second pit can be safely removed
- For pit Emptying refer the section above (pit toilet section 4.1)

6.4 Urine Diversion Dehydrating Toilet (UDDT)/Ecosan Toilet

Ecosan toilet is composting and dehydrating toilets which is designed to speed up excreta decomposition and makes emptying easier. In dehydrating toilets, urine is diverted away from the pit in use into separate collecting container. Chambers are used alternatively with only one chamber in use at a time. When the first chamber is filled, it is sealed and left for decomposition for a minimum period of six months during which the second chamber is used. The removed faeces can be used, with care, as a soil conditioner for certain crops prior to sowing or planting. Urine should be diluted with water of ratio between 3:1 to 10:1 (water:urine)

The use of decomposed faeces and urine are safe, however, the person engaged in emptying is advised to use safety gear to avoid any health hazards.

- For pit Emptying refer the section above (pit toilet section...put a number)

7. Safety measures

Safety measures during emptying, transportation, treatment and reuse or safe disposal by households, institutions and service providers who are engaged should be made aware of personal safety, health issues and on how faecal-related diseases are transmitted to humans.

The specific safety measures include:

7.1 Before Emptying

1. Check any overflowing sewage from the pit/manhole and damaged pipe regularly and repair if observed.

2. Do not wait until your system shows signs of failure to have your leach pit or septic tank emptied which can completely clog the pit/tank, resulting in heavy repair charges.
3. Measure the depth of sludge every 5 years for leach pits, 1 year for septic tank, and empty the pit when the sludge reaches a depth of 2/3 full.

7.2 During Emptying, Transportation and Disposal

1. A person who is engaged in the desludging process should always wear safety gear (protective mask/gloves, boots, hats etc.).
2. Avoid entering the pit but if necessary give certain time for gases to flow out and use ladders when needed.
3. Consumption of alcohol/controlled substance should also be avoided during the pit emptying to prevent possible accidents.
4. The structural stability of leach pit walls must be monitored before/during the emptying process.
5. Ensure safe burying/disposal when emptying the pit manually. Avoid disposing faecal waste into a nearby drainage, water source or onto ground water.
6. Ensure faecal waste is safely emptied, transported and disposed off carefully if there is access to cesspool service

7.3 After Desludging

1. Clean the surrounding area to ensure safe environment
2. Clothes worn during the desludging process should be removed and washed thoroughly.
3. Ensure personal hygiene and wash hands using soap after completion.

8. Isolated Issues and Challenges

There can be isolated issues and challenges that impede the households/institutions to construct a leach pit and septic tank. Some of those can be due to type of soil and nature of settlements in the community.

8.1 Clay Swelling

The rate of seepage of effluent will depend on the soil type and hydrological condition where the pit/leach pit has been dug. In addition, clogging may result

from blockage of soil pores by solids that have been dumped into the toilet pit and in particular swelling of clayey soil.

Whereas, solids that have been accumulated into the pit can be managed by regular cleaning, however the issue of clayey soil can pose challenge to the household(s) or the community (ies) with leach pits filling up quickly. Therefore, it is important to consider the soil type and adapt to appropriate technology options. If leach pits are chosen, it should be at least 30 meters from water bodies to prevent contamination⁵.

8.2 Clustered Households

For clustered settlements where houses are constructed close to each other with limited space for constructing leach pit or septic tank, it is recommended for two or more households agreeing to construct a combined leaching pit considering the availability of the land within the village; else opt for a communal septic tank with different households toilet connected by a piped system.

According to the National Sanitation and Hygiene guidelines 2014, the leach pit should be at a minimum of 6 meters away from the house to avoid structural damage

9. Roles and responsibilities of stakeholders

9.1 Ministry of Health (MOH)

- ✓ Co-ordinate with relevant agencies
- ✓ Integrate, develop, review and disseminate adequate and appropriate policies, strategies and guidelines for Rural Sanitation and Hygiene including FSM in emergencies
- ✓ Innovation, Research and Development on FSM
- ✓ Provide technical support
- ✓ Create awareness using different communication channels

9.2 Dzongkhag/Gewog administration:

- ✓ Enforce all the relevant laws, policies, strategies, rules and regulations to ensure safe faecal sludge management

⁵ Sanitation and Hygiene Guidelines 2014

- ✓ In collaboration with the organizers of public gatherings, ensure proper planning, operation and maintenance of sanitation and hygiene facilities including safe management and disposal after the event.
- ✓ Facilitate and provide training on safe faecal sludge management
- ✓ Facilitate and support households, health care facilities, schools, monastic institutions, public places and public gatherings, temporary settlements in rural areas, emerging new towns and during emergencies and service providers to coordinate and organize safe emptying, transportation and disposal of the faecal sludge;
- ✓ Facilitate and support the safe faecal sludge management of households that may be potentially disadvantaged. .
- ✓ Disposal sites/Treatment plants identified and developed

9.3 Basic Health Units

- ✓ Create awareness on the safe faecal sludge management rules and regulations
- ✓ Facilitate and support households/institutions with adequate and appropriate information on faecal sludge management

9.4 Households, Schools, Monastic schools and other agency dwellings

- ✓ Take responsibility and ownership to operate, maintain and manage safe sanitation facilities
- ✓ Ensure that the faecal sludge are safely contained, emptied, transported and disposed
- ✓ Ensure that people who are engaged in the desludging process should be provided with and always wear personal protective gear

9.6 Service providers:

- ✓ Ensure to follow the standards, rules and regulations of safe emptying, transporting, disposal, treatment and reuse
- ✓ Ensure that all necessary hygiene and safety gear, equipment are used while desludging

9.7 Civil Society Organizations (CSOs) and Private sector organisations:

- ✓ Support awareness on the importance of safe faecal Sludge management
- ✓ Support innovation, Research and Development on FSM

10. Communication

Advocacy and awareness generation activities to sensitize Government, Dzongkhags, Gewogs, service providers/masons and the general public about the health hazards that arise from the indiscriminate disposal of faecal sludge is essential and needs to be carried out. Target specific communication messages and channels need to be considered. The general public also needs to be made aware of the ill-effects of sewage discharge into drainage, water bodies and into open areas and the need for a sound faecal sludge management system.

The following communication channels needs to be considered:

10.1 Advocacy and Awareness:

1. During B-WASH meetings, inception workshops, Dzongkhag/Gewog Review meetings, Dzongkhag Tshogdue, Gewog Tshogde, field visits & CDH workshops)
2. Global days celebration and Sanitation Fair
3. Mason training on safe faecal sludge management
4. Service providers training on the need for periodic inspection and desludging of faecal sludge process (safe collection, transportation, disposal, treatment/ reuse) and disseminate information about the safety norms and standard septic tank design.
5. Through mass media such as Radio, Television, print media and social media

10.2 Communication tools:

- ✓ Animation
- ✓ Pamphlets/ Brochures /DIY
- ✓ Case studies/ lessons
- ✓ Training Manual

11. Conclusions

Bhutan has come a long way in terms of households adopting to improved sanitation. The general trend across the country is that after the CDH workshop the demand for pour flush toilet has significantly increased. However, a substantial number of households across the country built and use only single pit pour flush despite the RSAHP promoted alternating twin pit toilet. The service providers/masons seem to be unaware of such standards for construction of twin pit including the importance of faecal sludge management. For both households and service provider/masons, the environmental and health impacts are least of their concerns. Therefore the nation should be prepared for the repercussions due to issues like unsafe faecal sludge management especially when the pits are full. Thus, this guideline developed is expected to help provide guidance and address the needs of the new emerging issues in the rural communities with clear procedure, safety measure and their roles and responsibilities.

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- Training Manual for Toilet Construction 2012



Phase 1: Area-wide access and usage for all



Phase 2: Professionalising sanitation and hygiene services