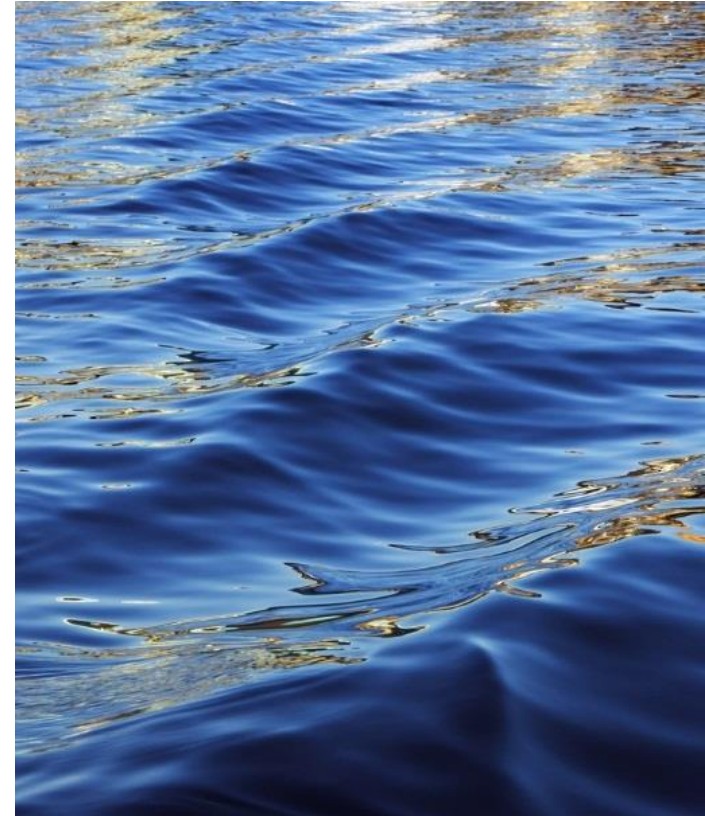


# ENV 101: Environmental Issues in Real Estate

## Topic 4: Sanitation System

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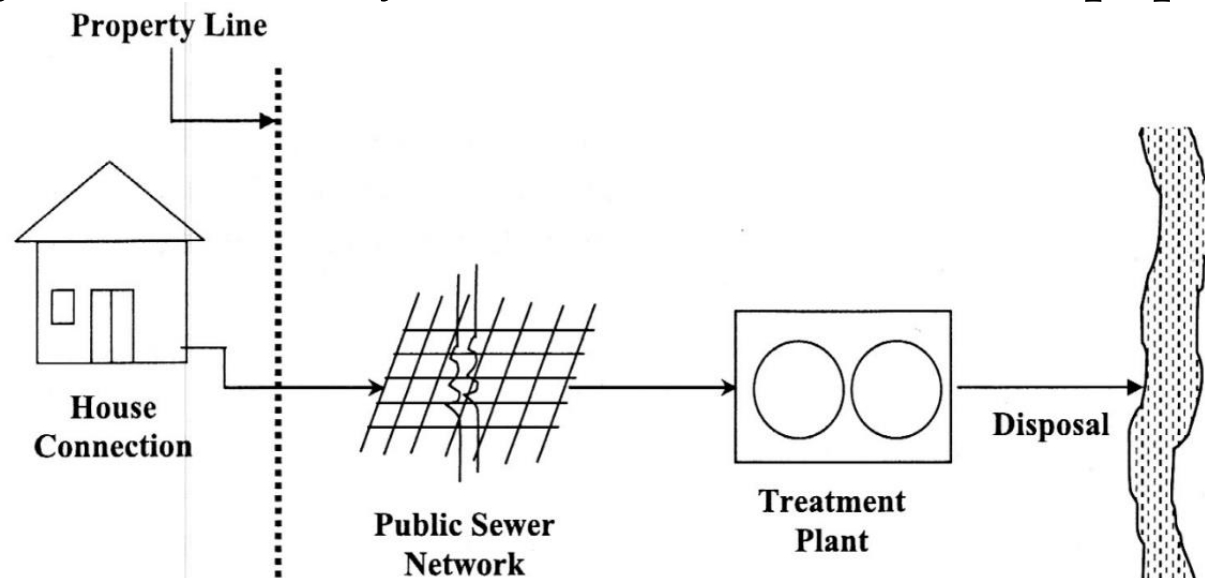
# Sanitation System

Sanitation involves the following hygienic measures:

- Safe and reliable water supply
- Proper disposal of all “human waste”
- Proper drainage of wastewater
- Prompt removal of solid waste

# Classification of Sanitation System

- **On-site Sanitation System:** When the wastes are collected at or close to the point of generation. The collected waste is either treated in situ (within site) or transported to a Fecal Sludge Treatment Plant (FSTP) for treatment and disposal.
- Example: Pit latrines (rural area, urban slums); and Septic tank system (urban)
- **Off-site Sanitation System/ Sewerage System:** When the wastes are collected and transported to somewhere else for treatment and disposal. In Bangladesh, it is provided only in Dhaka city, and covers around 20% population.



# On-Site Sanitation System

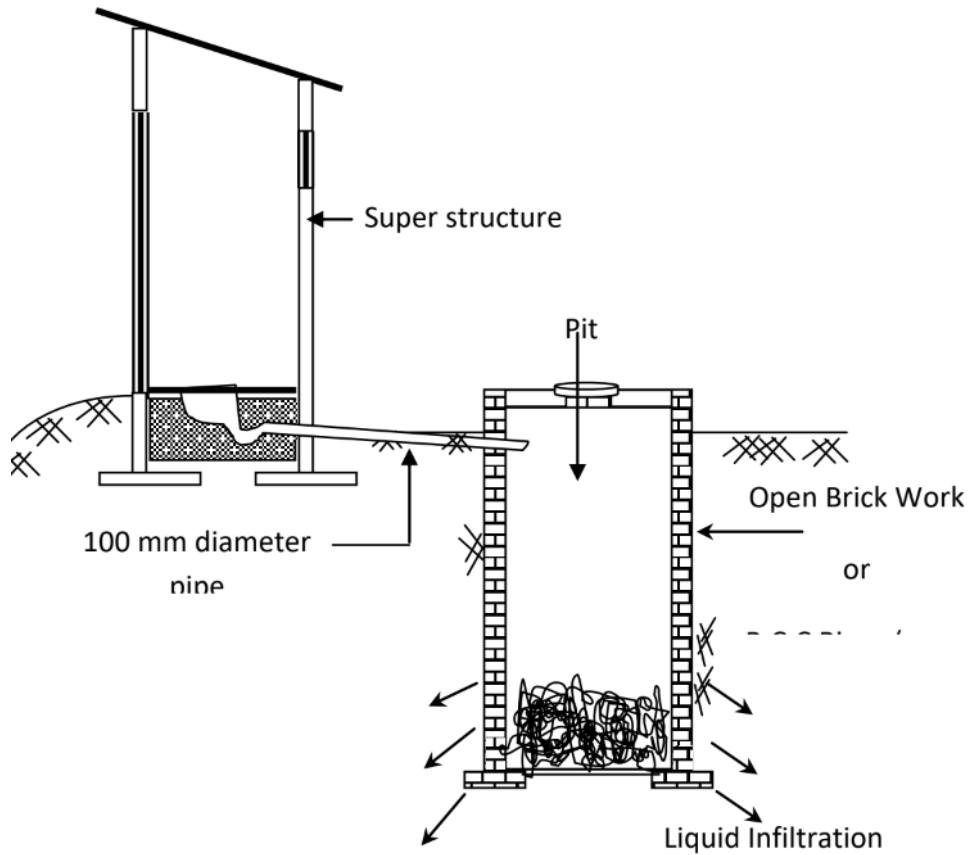


Fig 1: Pit latrine

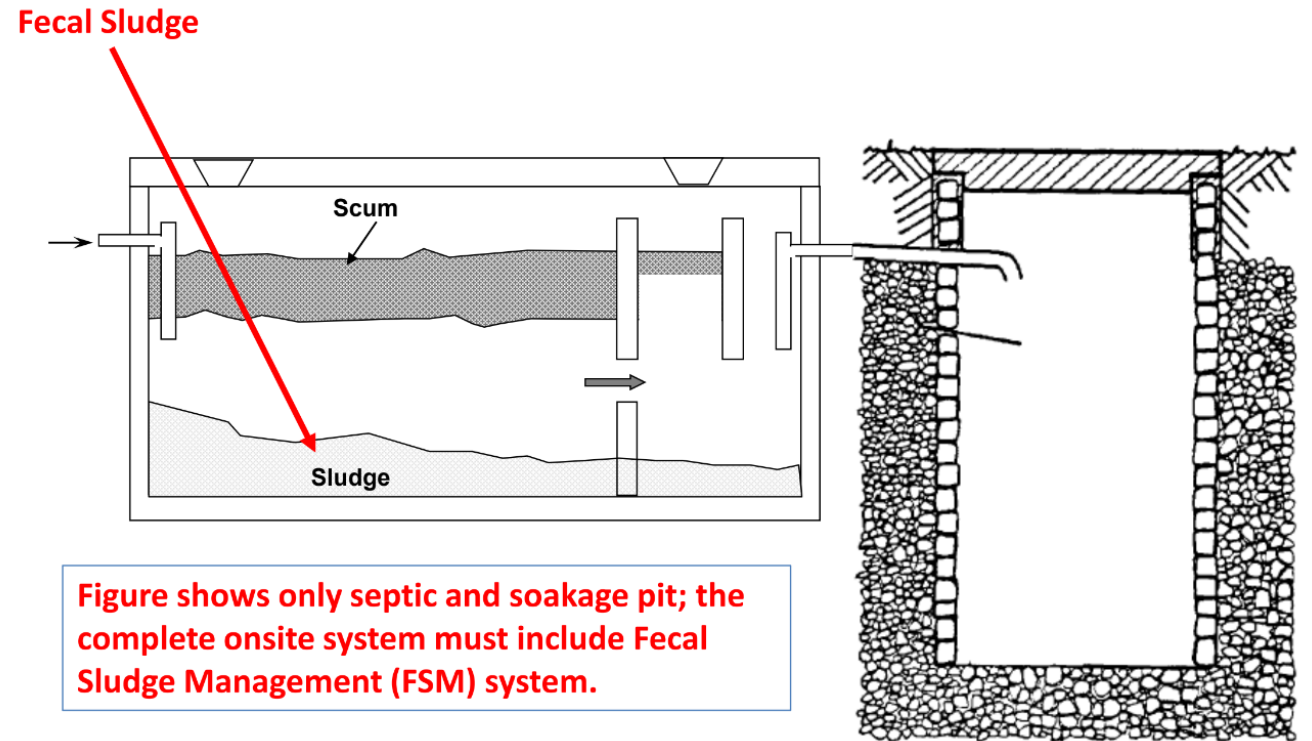


Figure shows only septic and soakage pit; the complete onsite system must include Fecal Sludge Management (FSM) system.

Fig 2: Septic tank system

# On-Site Sanitation System

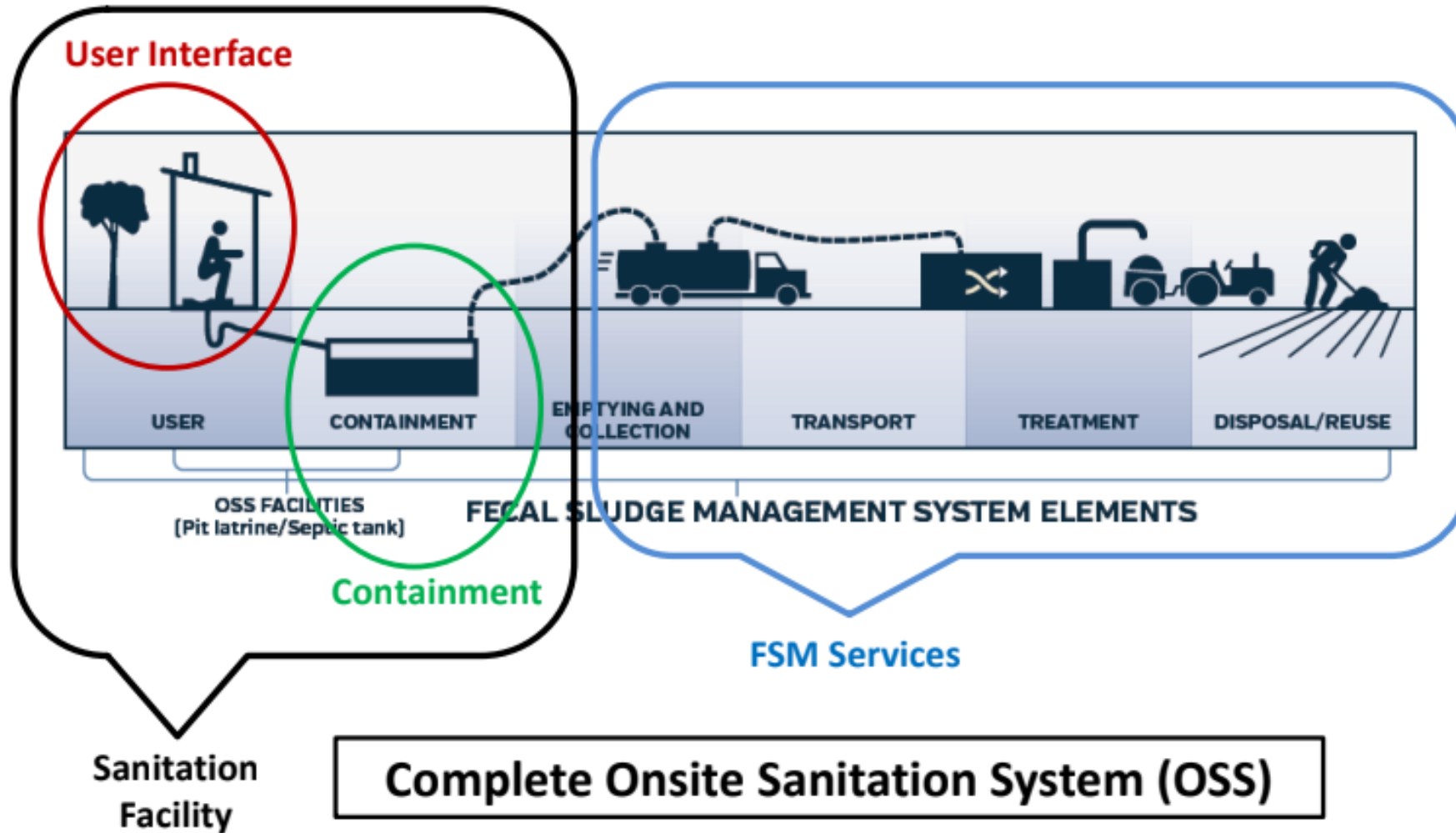
## Basic Principle:

- Liquids **infiltrate into the soil** (infiltration capacity of soil, and location of groundwater table are important issues)
- Solids are **retained (confined) and digested** in-situ or
- Transported to a facility (**Fecal Sludge Treatment Plant- FSTP**) for treatment

## Features:

- Designed to dispose of **human waste only**
- Wastewater from other sources (kitchen, washing, bathing) has to be disposed of separately
- Suitable for **sparsely settled rural areas** with **low population density**, and **low water consumption**
- Not feasible in areas with (a) high population density, (b) low infiltration capacity of soil

# On-Site Sanitation System with Fecal Sludge Management (FSM)



# Off-Site Sanitation System

## Features:

- Collection and transportation of waste through a **sewer system** requires the waste to be **diluted by water**.
- Hence **piped water supply** is essential
- Most satisfactory system of waste disposal
- Because of the **high cost**, it is preferable to introduce gradually; where possible the existing sanitation system (e.g., septic tank system) should be upgraded and improved

# Suitability of Sanitation System

**Two important factors affect the suitability of the sanitation system:**

## **Level of Water Supply:**

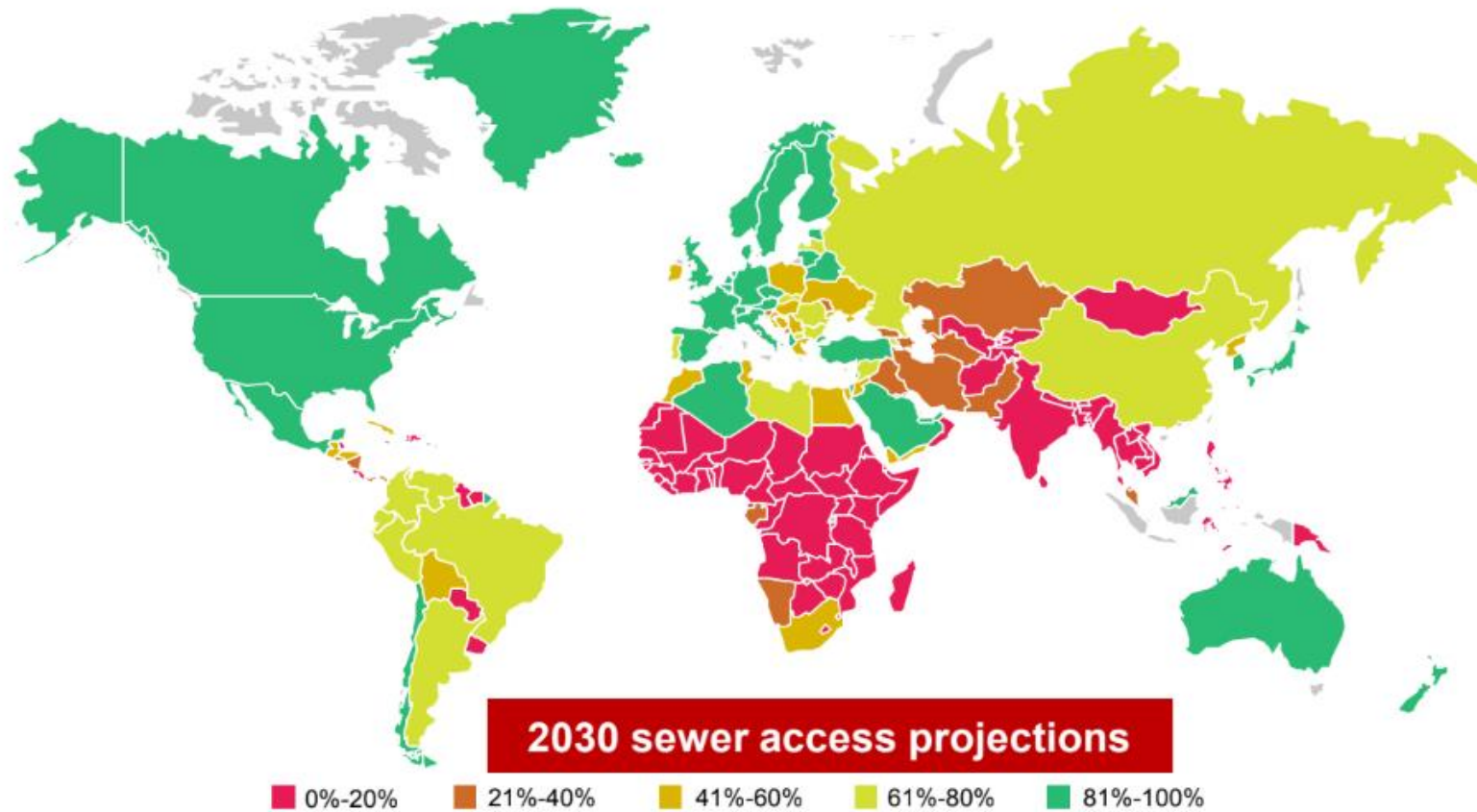
- Pit latrines would not be appropriate with piped water supply
- Conventional sewerage system is not feasible with bucket-carried or hand pump water supply

## **Population Density:**

- On site systems are more appropriate for low-density rural settings, and low-density urban areas
- Off-site systems are suitable for high-density urban centers



## Global Context: Many parts of the world will continue to lack access to sewers



Note: countries in gray do not have data reported  
Source: JMP 2017 Report; BCG analysis

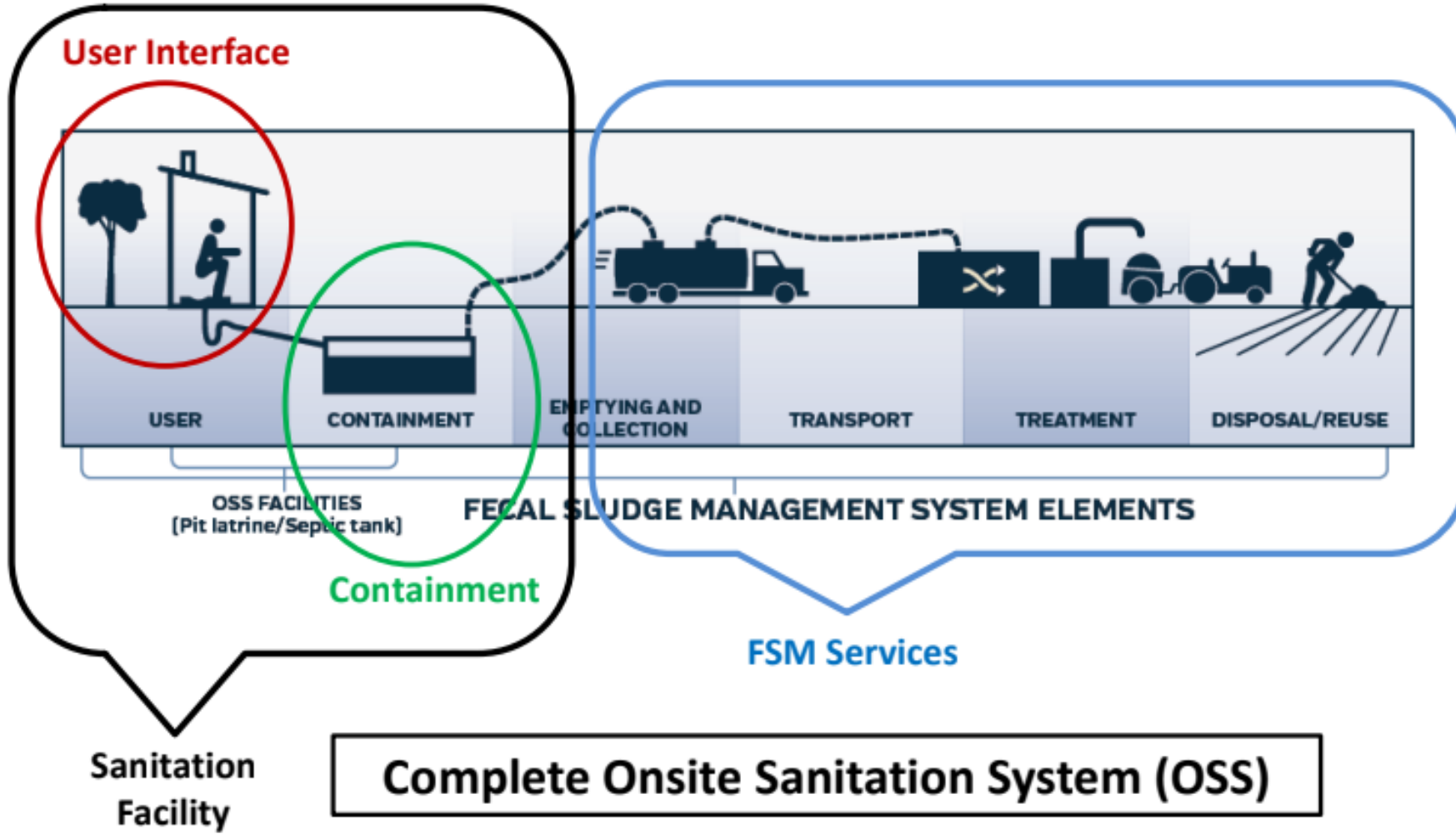
# What is Hygienic Latrine?

- A “hygienic latrine” is defined as a sanitation facility, which effectively **breaks the cycle of disease transmission**.
- A hygienic latrine would include all of the following:
  1. **Confinement** of waste
  2. A **barrier (e.g. water seal)** in the passage between the squat hole and the pit to effectively block pathways for insect vectors, thereby breaking the cycle of disease transmission, and
  3. **Venting out of foul gases** generated in the pit through a vent pipe to keep the latrine odor-free

# Typical Sanitation Facility in Rural Area



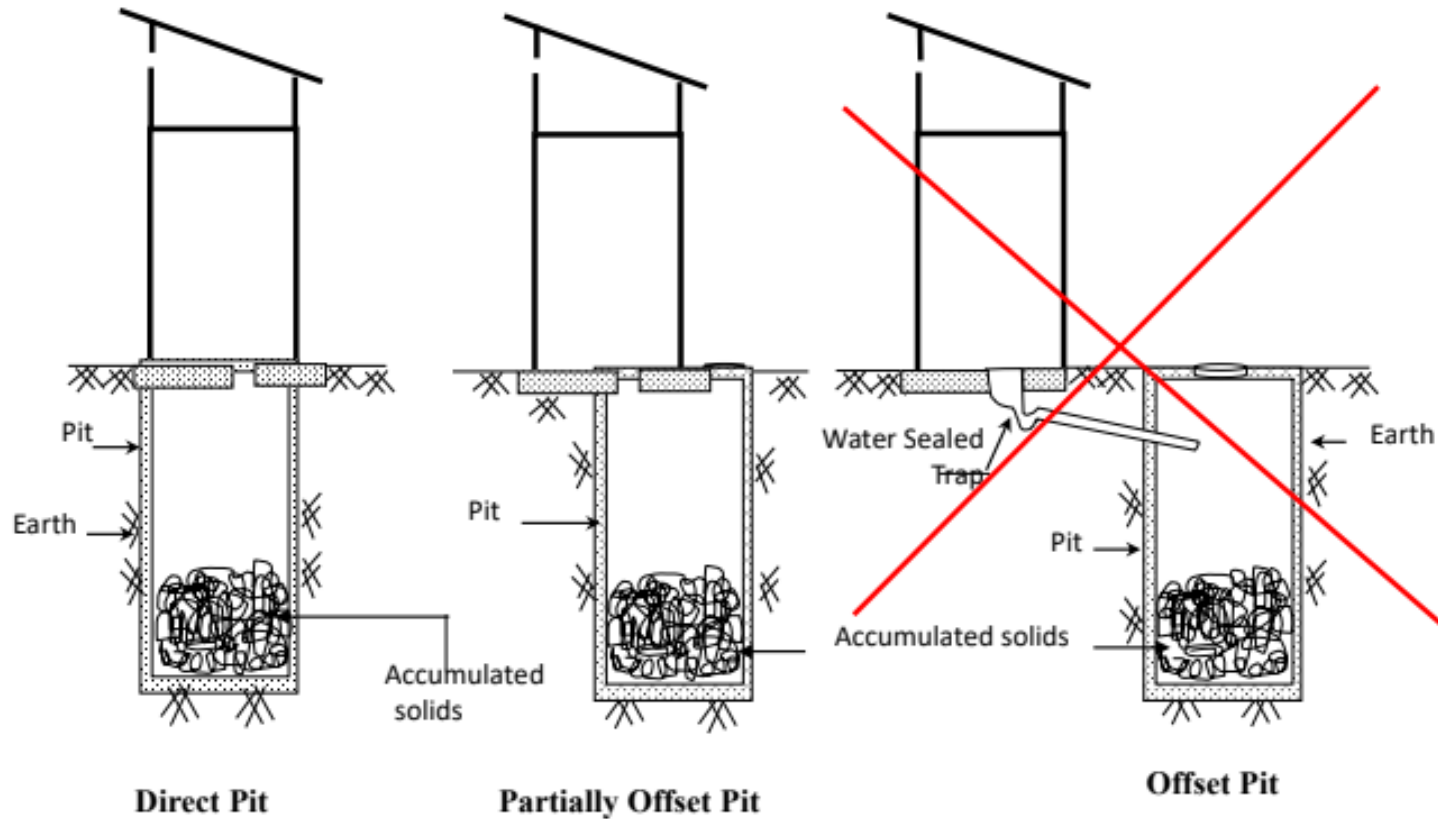
# On-Site Sanitation System



2 commonly used options for On-site sanitation:

1. Pit Latrine (for areas with limited water supply)
2. Pour Flush Latrine

# Types of Simple Pit Latrine



## Advantages

- Least costly
- Easily constructed
- Better solution than open defecation

## Disadvantages

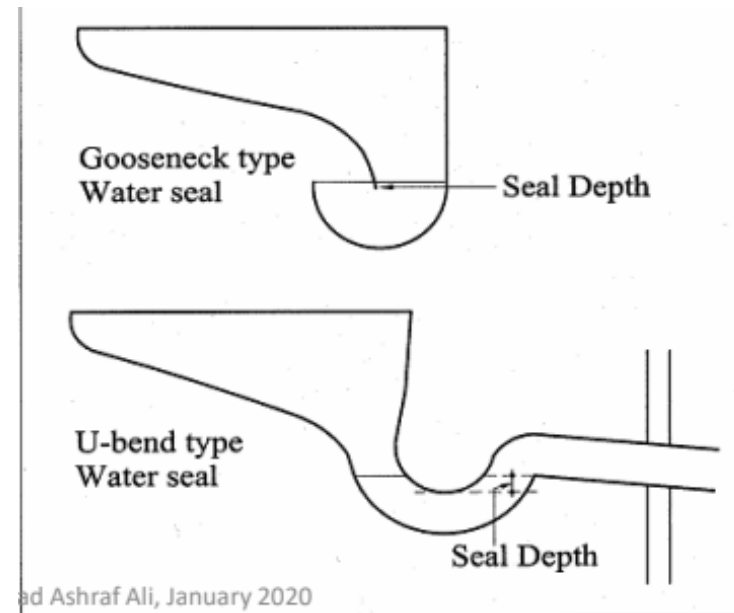
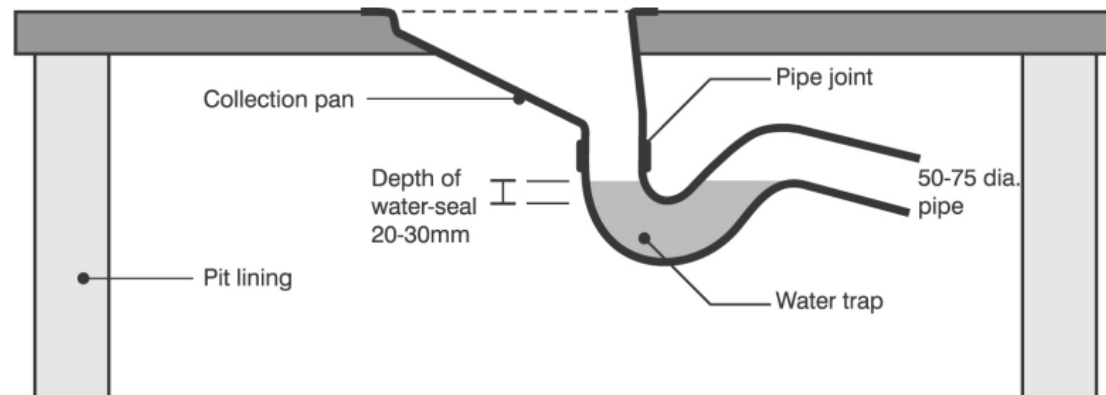
- Not hygienic, spreading disease
- Odor nuisance
- Aesthetically less attractive

**Off-set pit would  
required flushing  
(feasible with  
pour-flush system)**

# Pour Flush Latrine

- Improvement over “pit latrines”, through incorporating a manual “pour flush” system.
- An important precondition for such latrines is the availability of some water (**about 2 to 5 liters per use**) for cleansing and flushing
- The most vital part is the “**water seal**” incorporated in the latrine pan/ slab, which eliminates odor and insect problems

## Water seal



- Two types of water seals:
1. Gooseneck type / U type
  2. P-type/ U-bend type

# Water Seal in Pour Flush Latrine

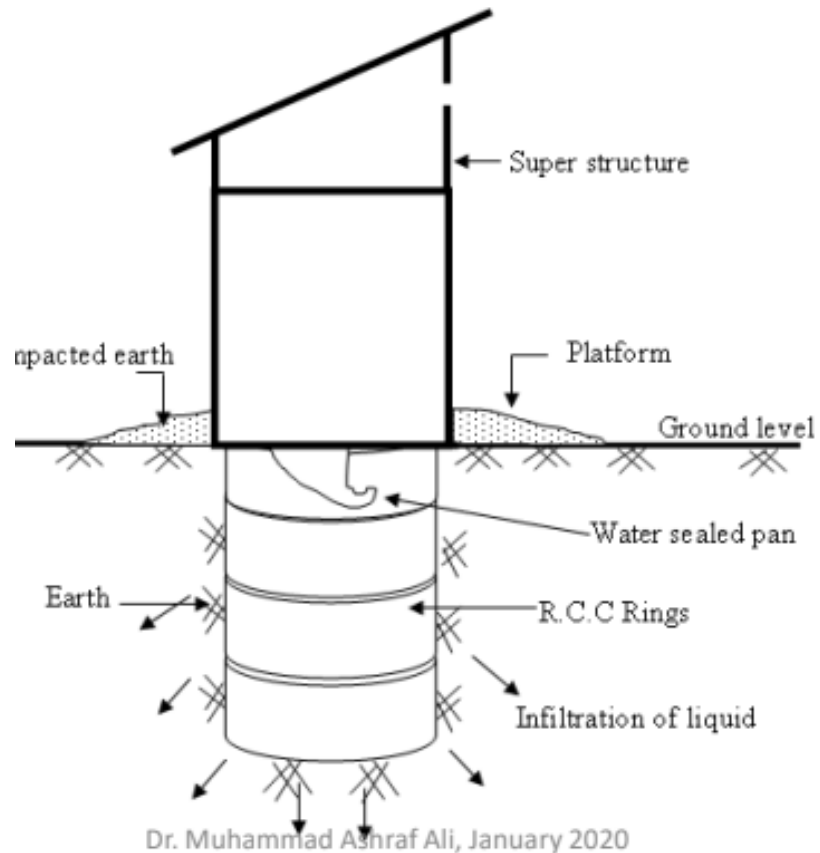
- For “Direct pit pour flush latrine” (pit directly below the latrine), Gooseneck trap is used.
- For “Offset-pit pour flush latrine” a P-trap is used. It requires more water to flush.
- 15-25 mm is the optimum depth of the water seal.



# Types of Pour Flush Latrine

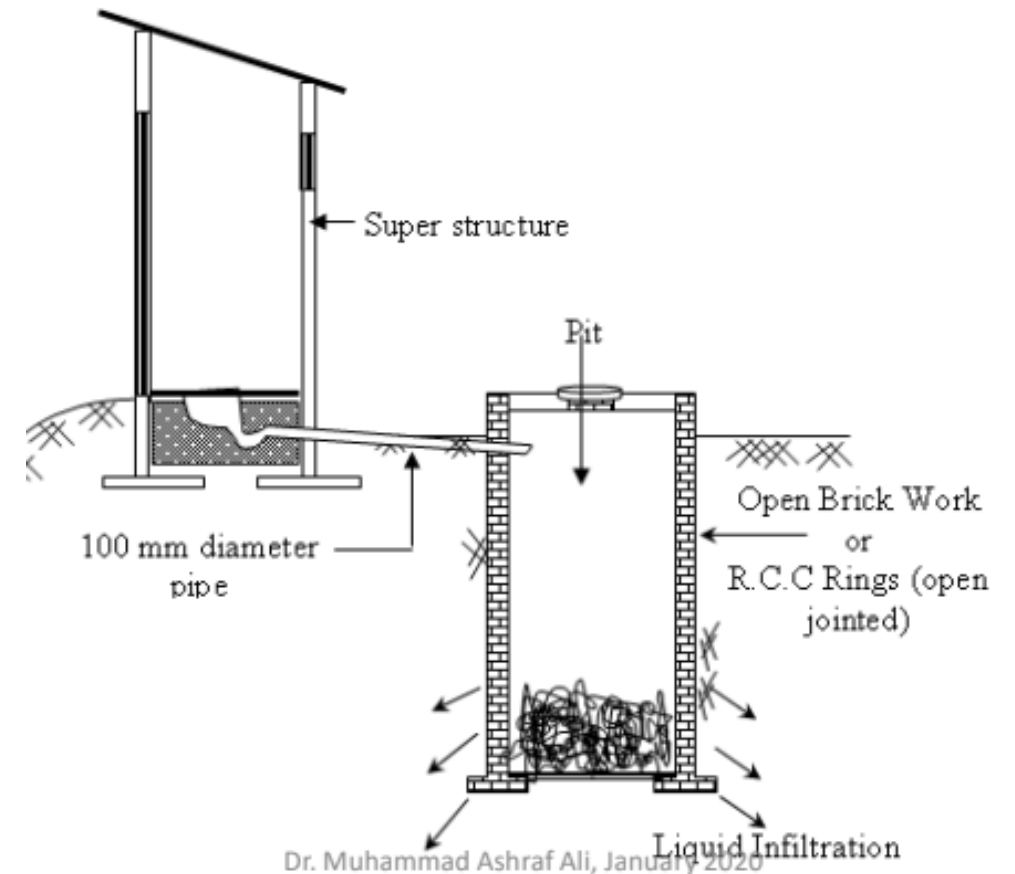
## 1. Direct Pit Pour Flush Latrine:

- Pit directly below the latrine
- Gooseneck trap is more used



## 2 (a). Offset Pit Pour Flush Latrine (Single pit):

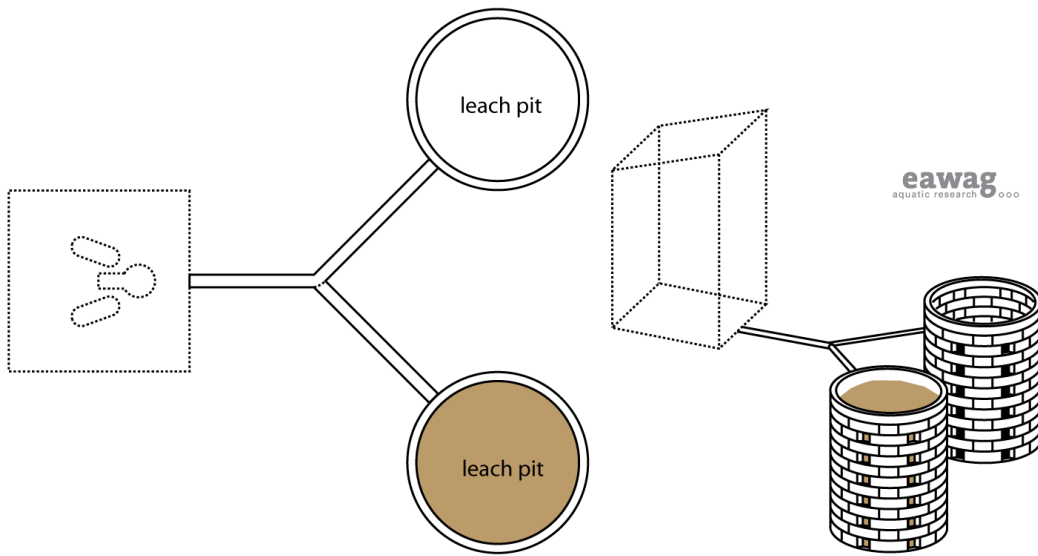
- Pit fully offset from the latrine
- P-trap is more used





# Types of Pour Flush Latrine: 2 (b). Offset Pit Pour Flush Latrine (Twin pit)

- In this system, two pits are used alternatively.
- When one pit becomes full, the flow of waste is diverted to the second pit through a Y junction.
- Contents of the first pit decomposes to safe humus within 18-24 months. Then the first pit can be cleaned and becomes ready for reuse.



# Advantages of Pour Flush Latrine

- A properly designed pour-flush latrine is a “hygienic latrine”. It reduces odor through a vent pipe, and the water seal ensures a barrier for insects.
- Require low volume of water (2-5 L per flush). So tubewell-based water supply is sufficient.
- The latrine can be located inside the house (if the pit is offset)
- The digested sludge (especially in twin pits) can be used as a soil fertilizer.

# Challenges of Pour Flush Latrine

- For single pit latrine, desludging is difficult.
- Risk of groundwater pollution (especially in high water table areas). According to BNBC, the minimum distance of a water source from a pit is 15m.

# Construction of Pit

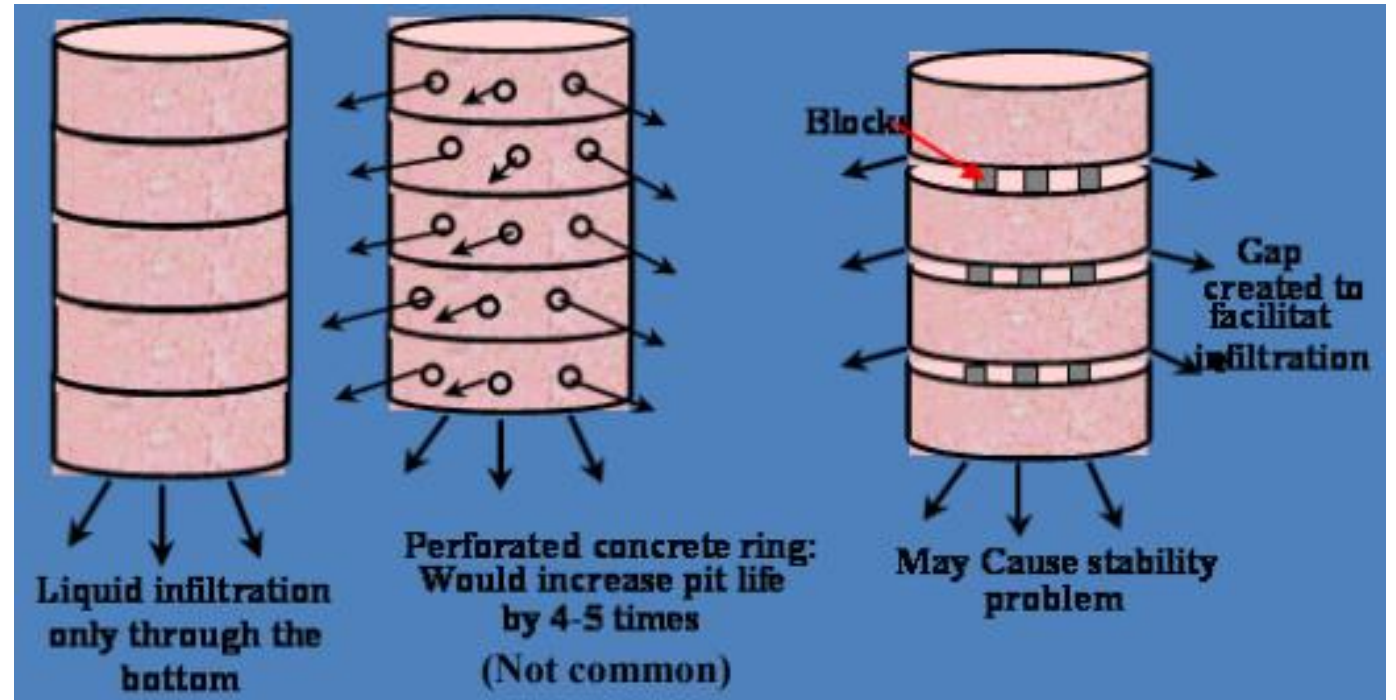
Dimension of each ring:

- Diameter: 3 feet
- Height: 1 feet
- Wall thickness: 1.5 inches

Depth of Pit:

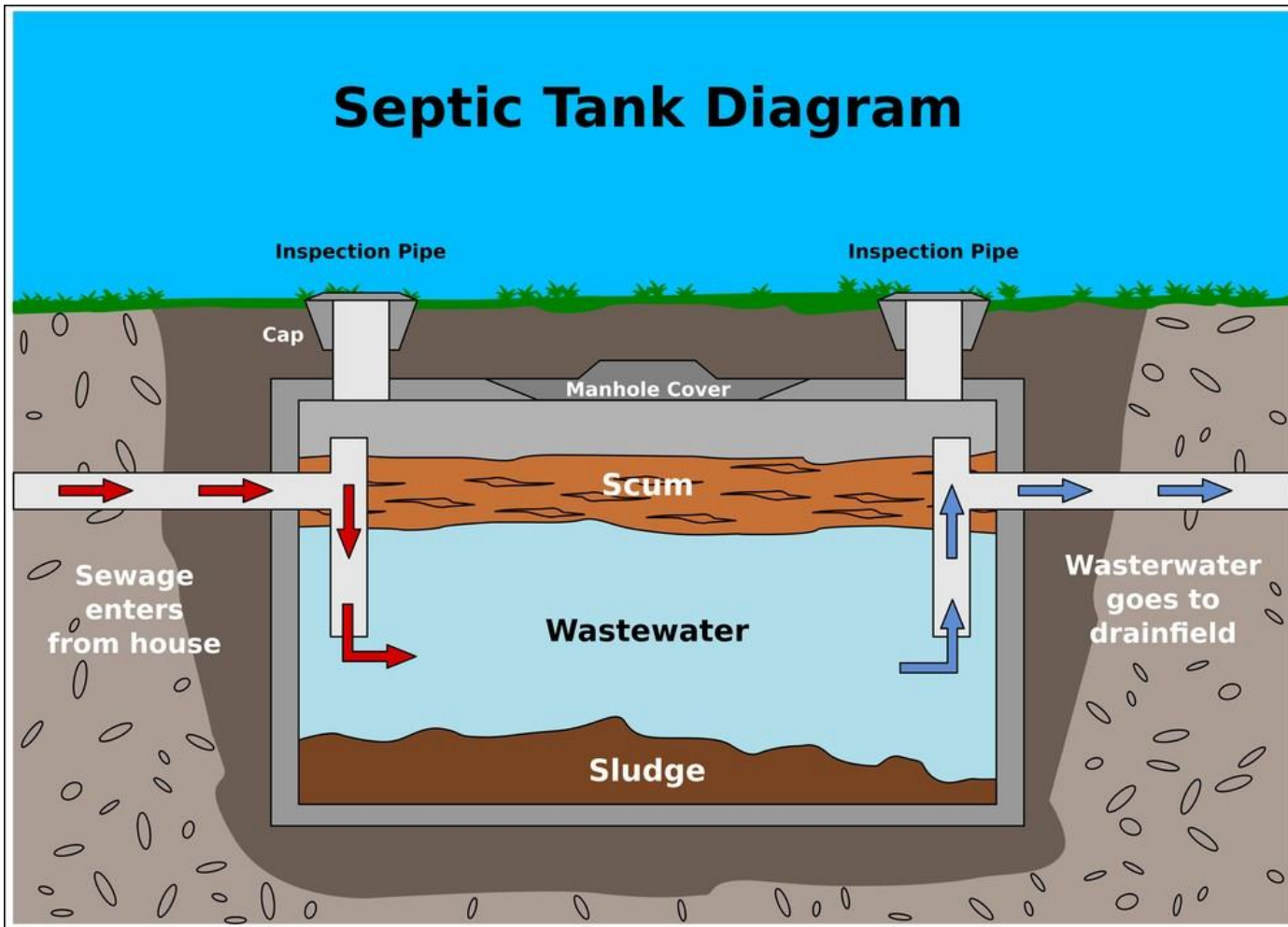
- 5-6 rings (5-6 feet)

**\*\*All the dimensions are approximate**



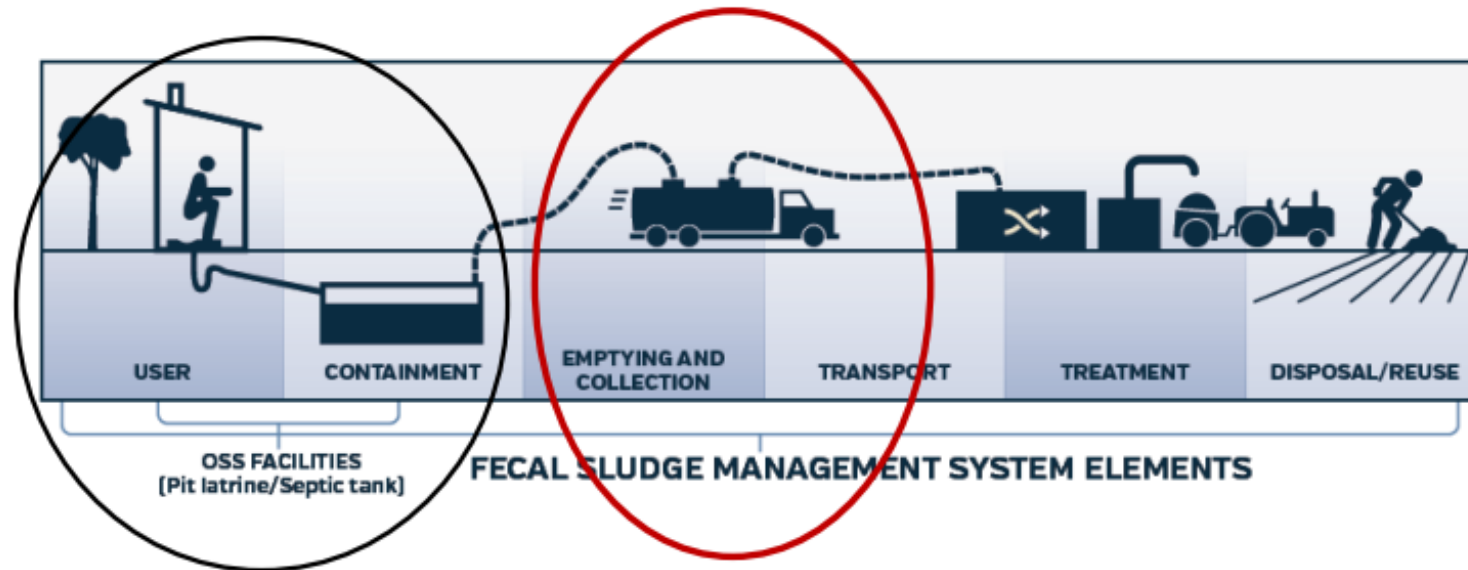
# Septic Tank System

- Commonly rectangular tanks are used with lengths three times the width.
- Depth is usually 1-1.5m.



# Fecal Sludge Management System

- **Fecal Sludge Management (FSM)** refers to a system that includes mechanisms for **emptying, collection, transportation, treatment, and disposal** of sludge produced in onsite sanitation systems such as septic tanks and pit/pour-flush latrines.



Already  
Covered

Let us look  
at “this  
element”

# Emptying/ Collection of Fecal Sludge

- Mechanical emptying service was first introduced in Dhaka in the year 2000, with support from DWASA and Water Aid using **vacuum tanker (vacutugs)**.



# Transportation of Fecal Sludge



Transport by manually driven vehicle



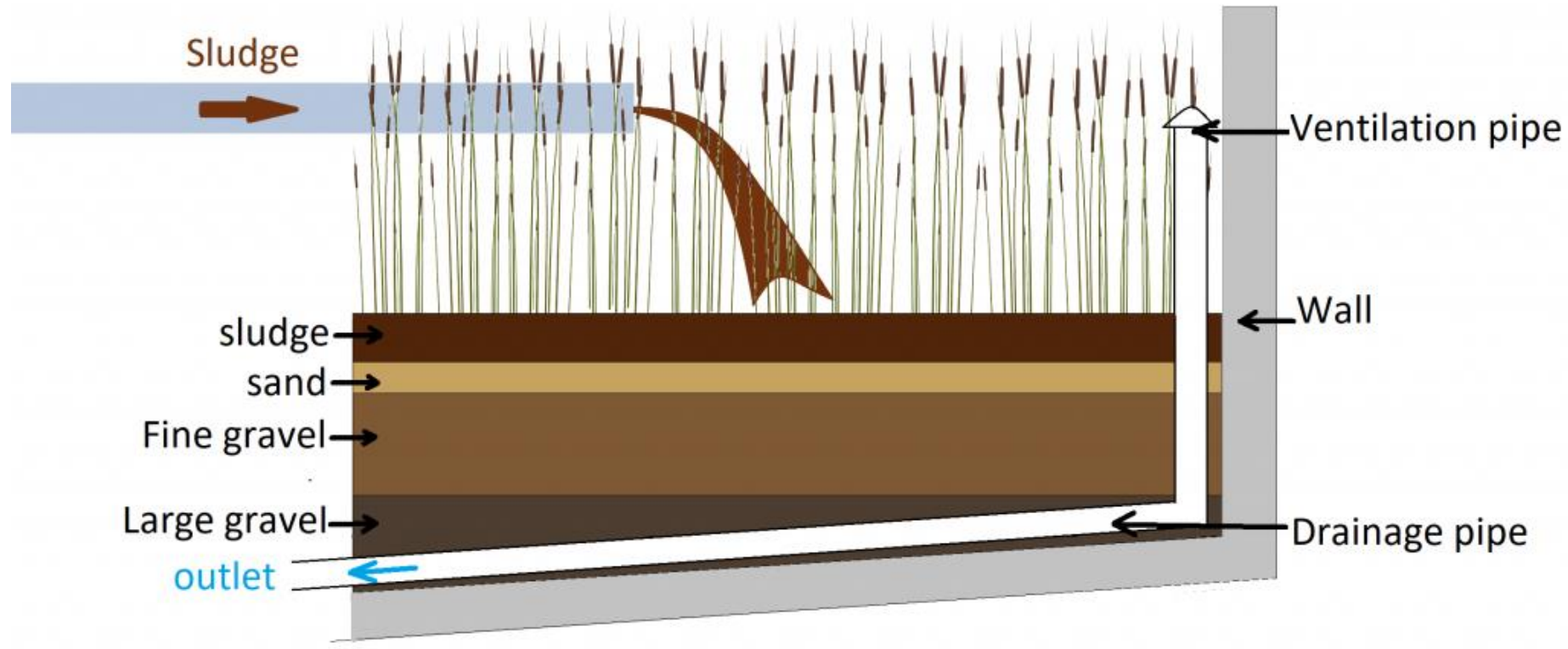
Mechanized Transporter (Mounted on Tri-Wheeler Diesel Engine Driven Vehicle); Capacity: 1000 Liters



Mechanized transport of fecal sludge

# Fecal Sludge Treatment and Disposal

- Solid Liquid Separation through **drying beds**
- The dried sludge is stored or processed (ex: composting)
- The liquid is treated in many steps and disposed in the surface water channel





# Fecal Sludge Treatment and Disposal



Drying bed in Faridpur Paurashava



Composting of dried sludge



# THANK YOU!

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