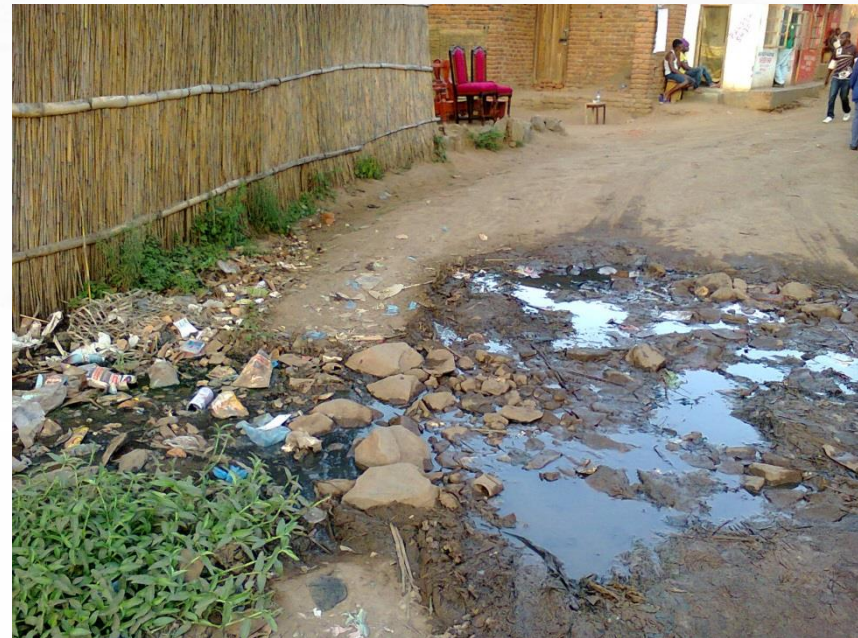




University of Malawi

# **SANITATION**

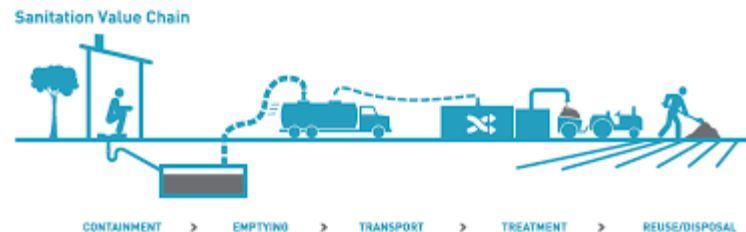
2020





# Sanitation

- Refers to disposal of solid and liquid waste. At the household level, this includes excreta, kitchen rubbish, waste water from cooking, bathing and clothes washing, and any other discarded items.







# Ctd ...

**Draft National sanitation policy defines it as:**

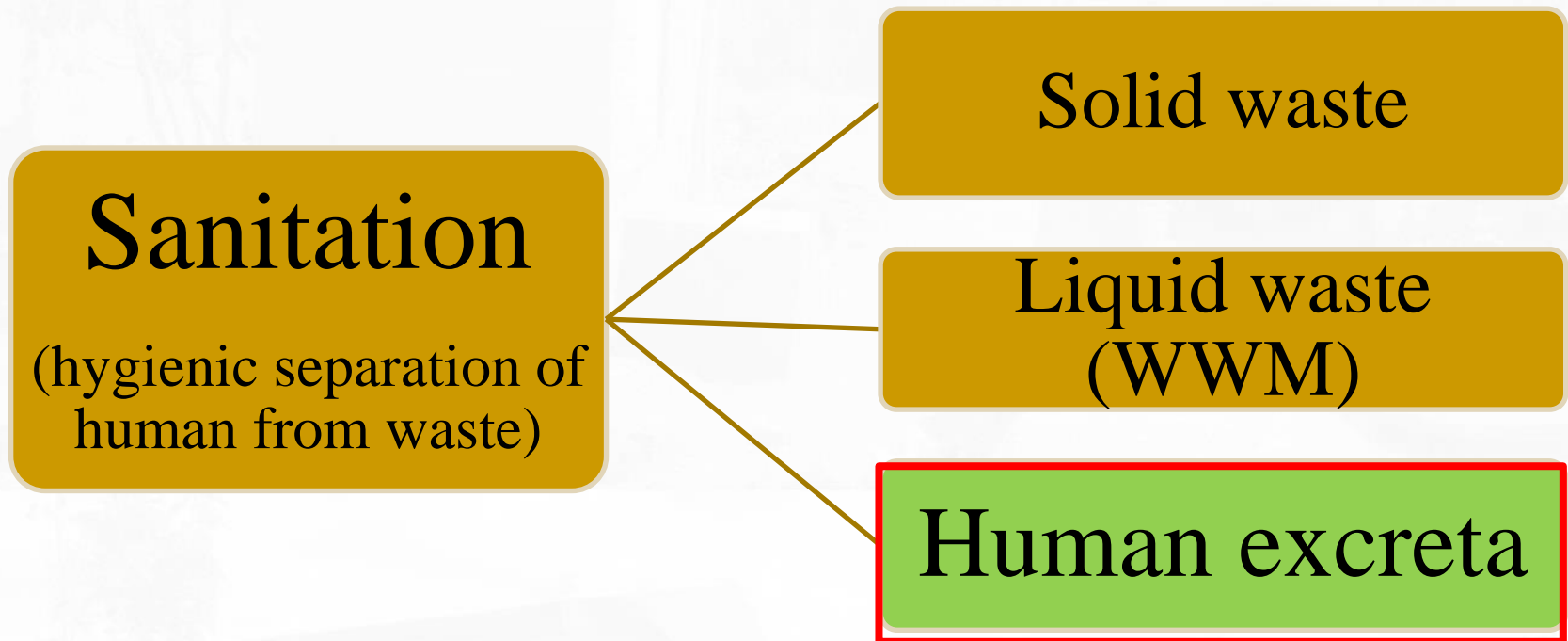
- a) The safe disposal of faeces into a pit or other receptacle where it may be safely stored, composted or removed and disposed of safely elsewhere.*
- b) Should offer privacy for the user.*



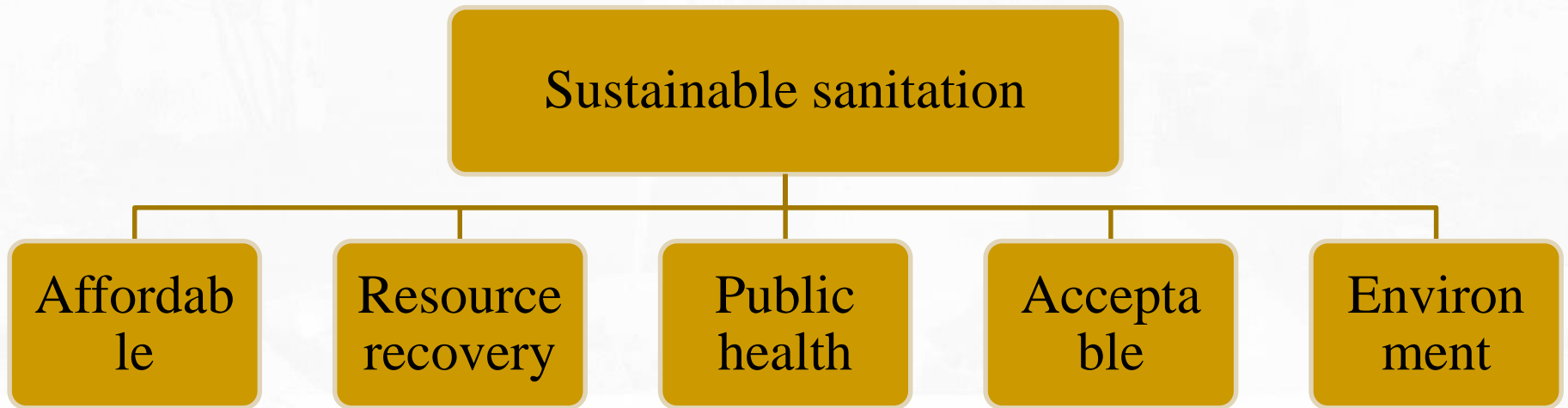
Ctd ...

- c) Should be safe for the user to use, for example not in a dangerous state, liable to imminent collapse or dangerously unhygienic state.*
- d) The latrine pit or receptacle should be functional i.e. not full or overflowing.*
- e) The latrine should be at least 30 meters from a ground water source or surface water course. (Draft National Sanitation policy, May 2006)*

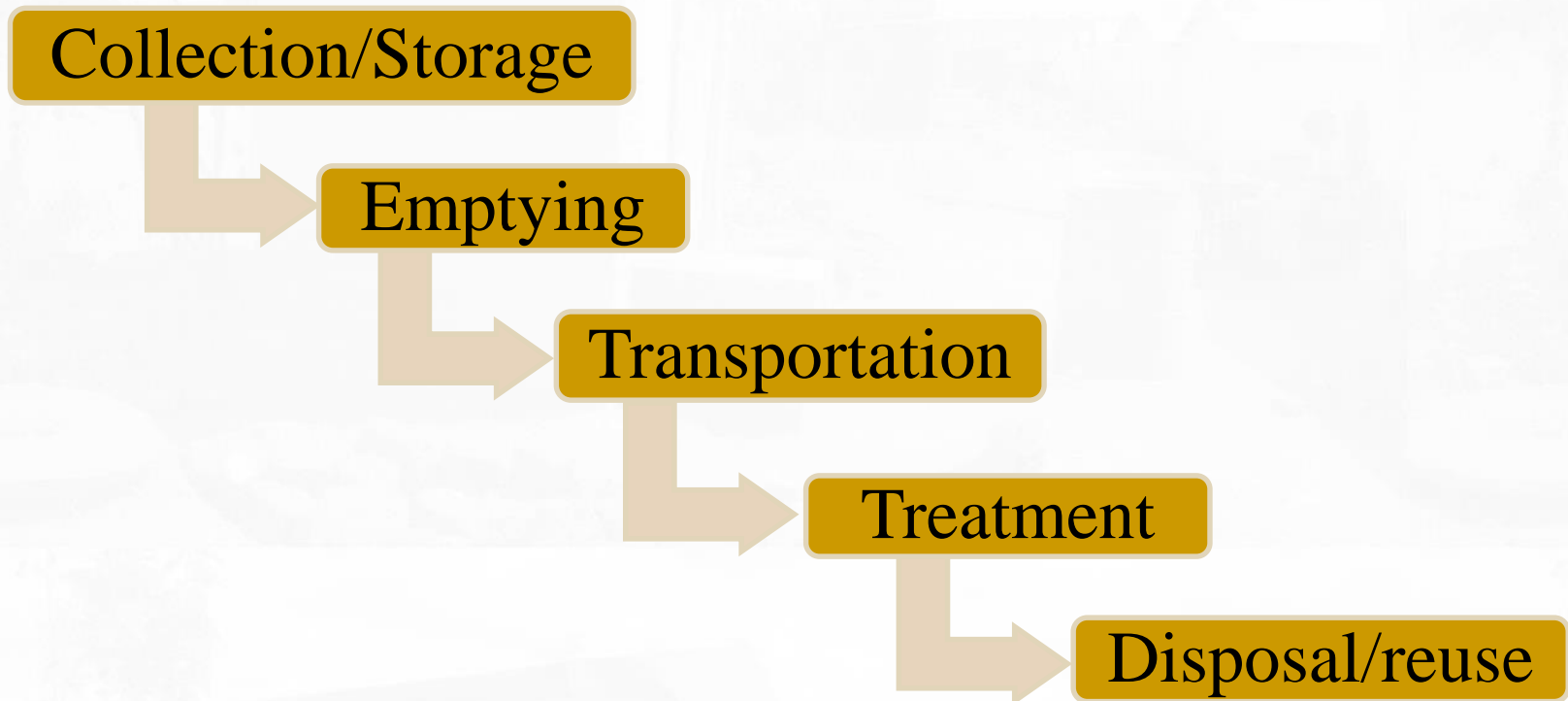
# Definition of sanitation



# Sustainable sanitation

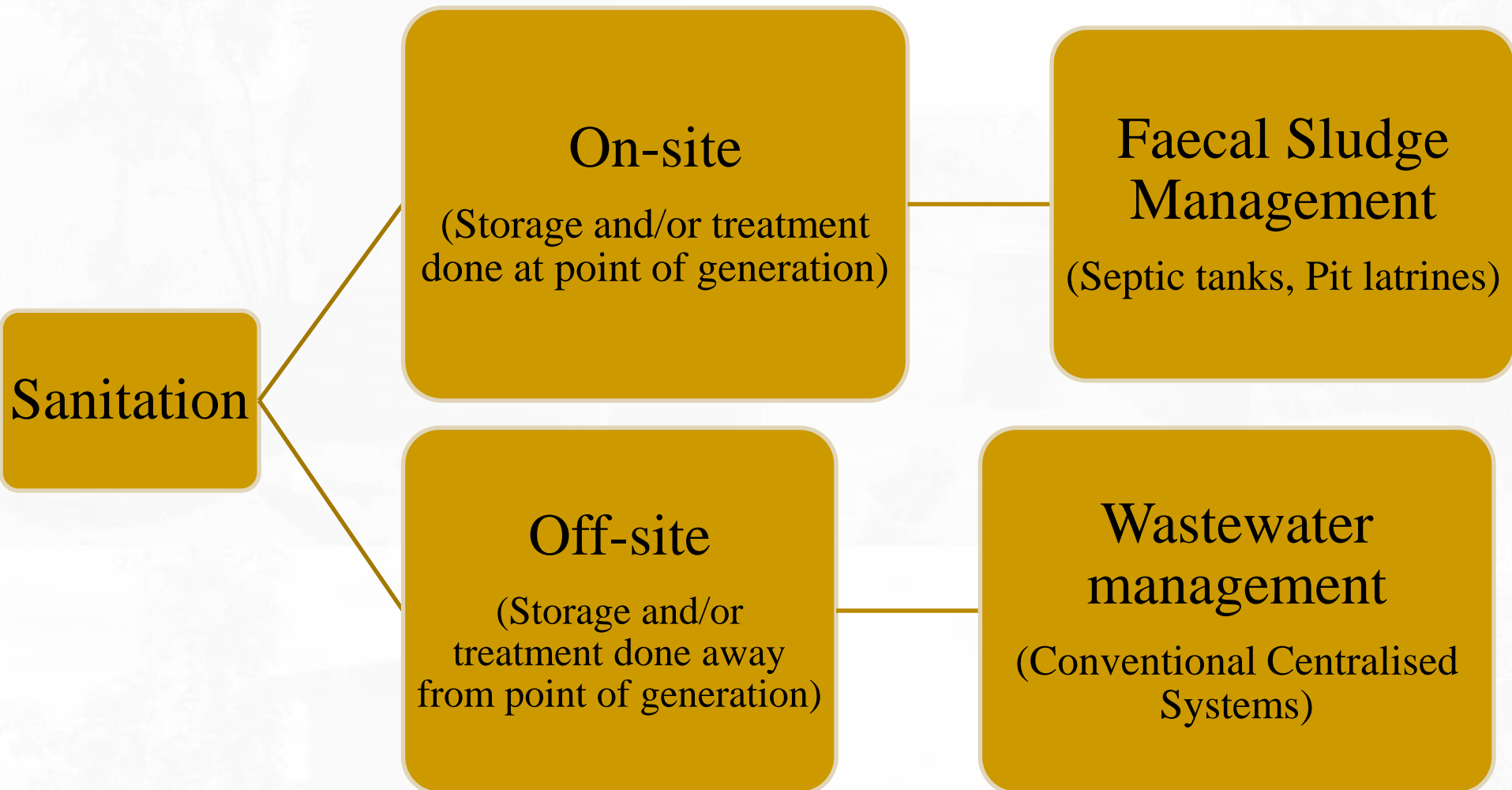


# Typical sanitation chain

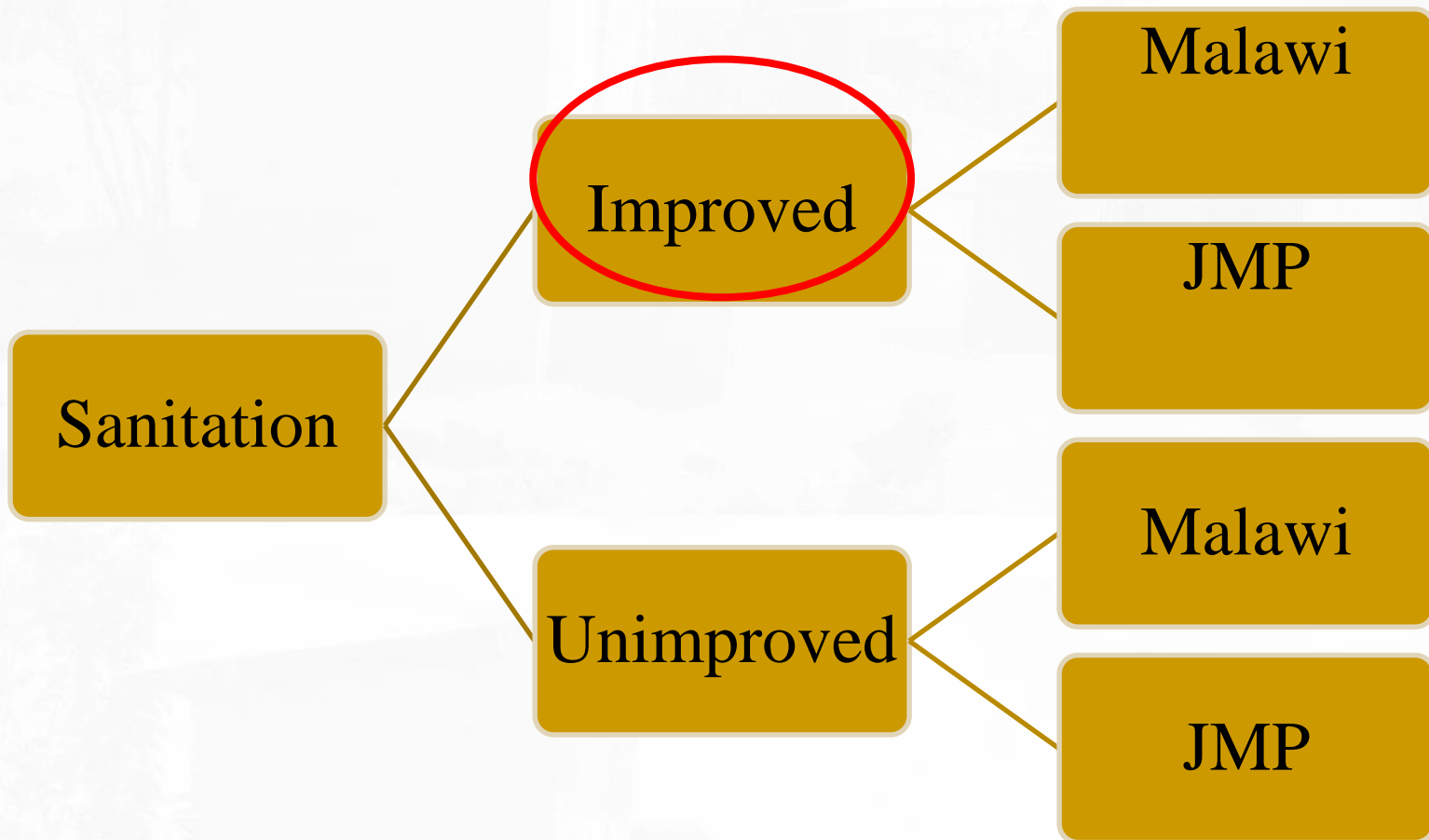




# Onsite vs offsite sanitation



# Improved vs unimproved sanitation



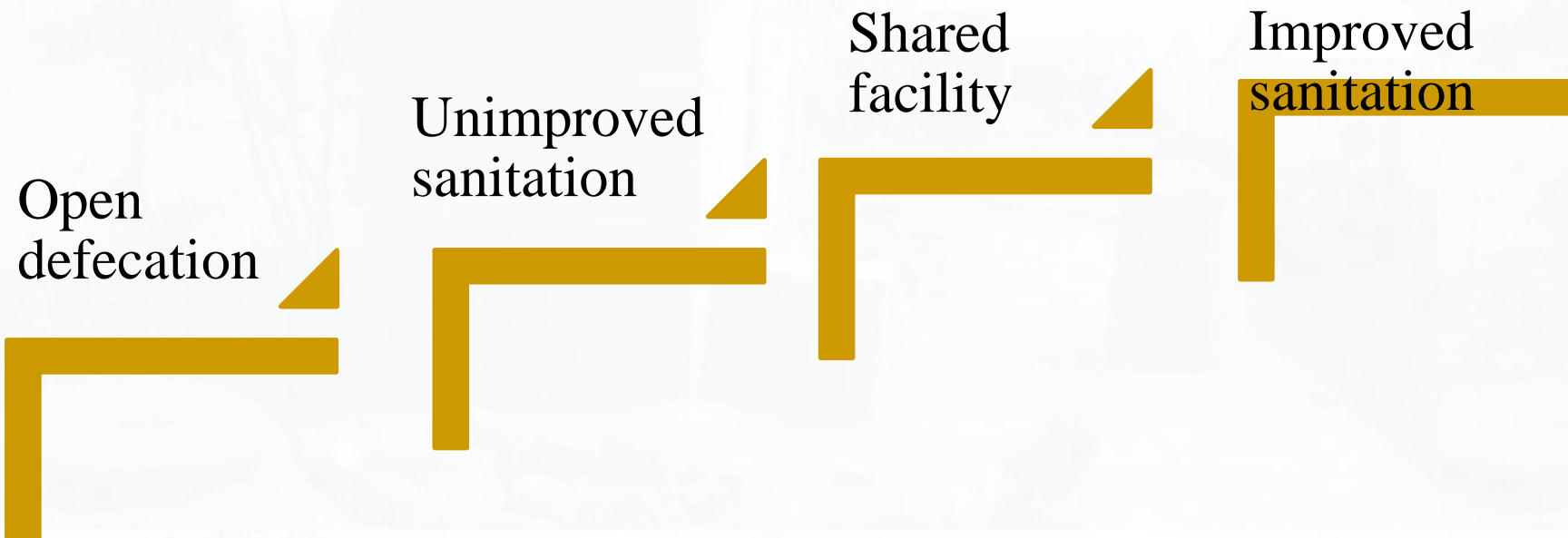
# WHO/UNICEF JMP

- Improved sanitation facility is defined as one that hygienically separates human excreta from human contact

<http://www.wssinfo.org/definitions-methods/watsan-categories/>

Improved sanitation	Unimproved sanitation
✓ Flush toilet	✓ Flush/pour flush to elsewhere
✓ Piped sewer system	✓ Pit latrine without slab
✓ Septic tank	✓ Bucket
✓ Flush/pour flush to pit latrine	✓ Hanging toilet or hanging latrine
✓ Ventilated improved pit latrine (VIP)	✓ Shared sanitation
✓ Pit latrine with slab	✓ No facilities or bush or field
✓ Composting toilet	

# Sanitation ladder

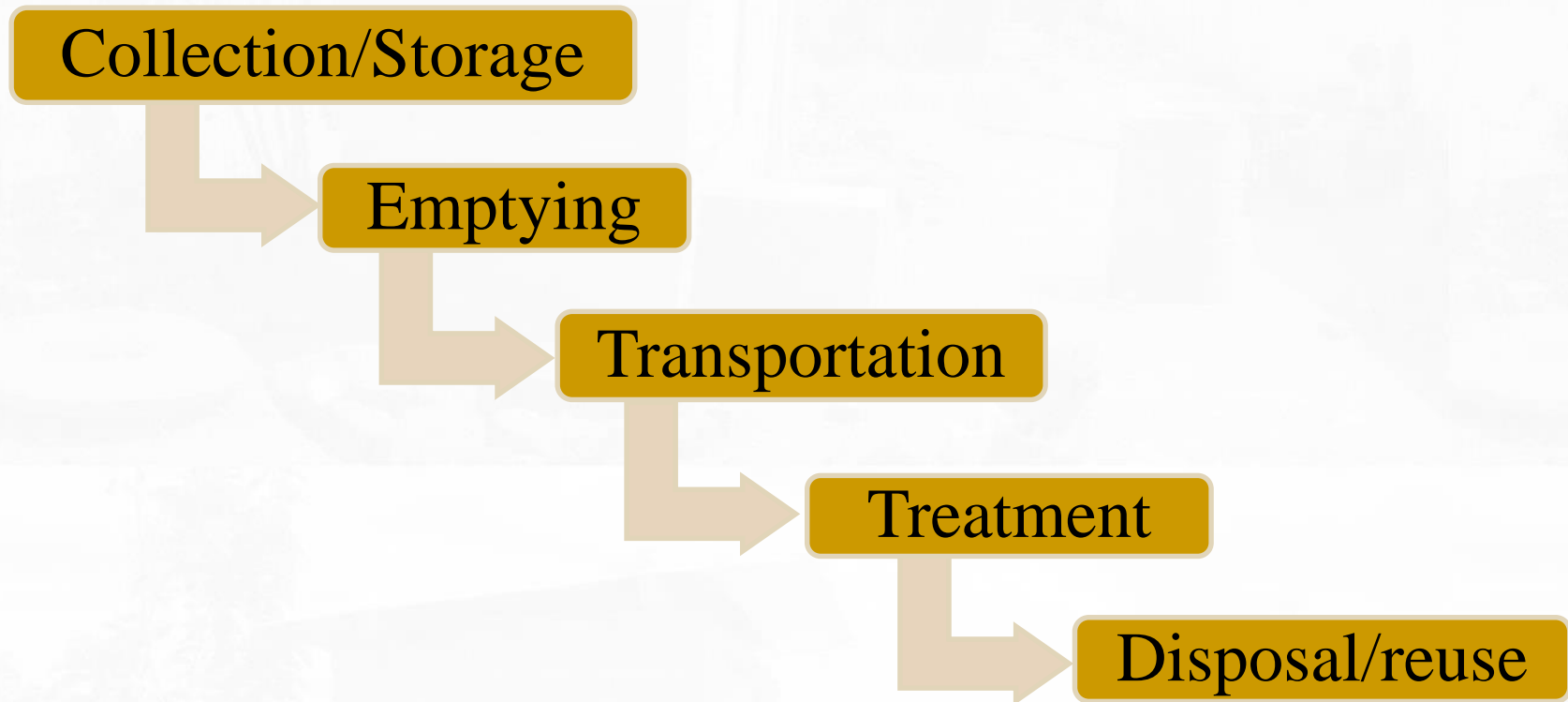


# Treatment objectives

- Pathogens
- Environmental stabilisation
- Nutrients
- Dewatering



# Sanitation chain-Task





# CONSIDERATIONS FOR SANITATION

- The haves and have nots
- Definition of adequate sanitation
- Differences access between urban and rural areas, the poor and the rich in line with post 2015 agenda



# Ctd ...

- MDHS 2016: Improved, not shared = 55.1%
- MDG-To reduce by half proportion without access to proper sanitation by 2015
- Vision 2020- universal access to proper sanitation by 2020
- **SDG Goal 6. By 2030, universal access to WASH**



# Sustainable Development Goals

# What is new and different about the 17 SDGs?

First, and most important, these Goals apply to *every* nation ... and every sector. Cities, businesses, schools, organizations, *all* are challenged to act. This is called

# Universality



Second, it is recognized that the Goals are all inter-connected, in a system. We cannot aim to achieve just one Goal. We must achieve them all. This is called

# Integration

And finally, it is widely recognized that achieving these Goals involves making very big, fundamental changes in how we live on Earth. This is called

# Transformation



**#1: End poverty  
in all its forms  
everywhere**







**#2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture**



**#3: Ensure healthy lives and promote well-being for all at all ages**





**#4: Ensure inclusive and quality education for all and promote lifelong learning**

A young woman with dark hair tied back, wearing a white long-sleeved blouse with a decorative lace collar, is seated and reading a book. The scene is dimly lit, with a soft light source from the left illuminating her face and the book. The background is dark and out of focus.

**#5: Achieve gender equality and  
empower women and girls**

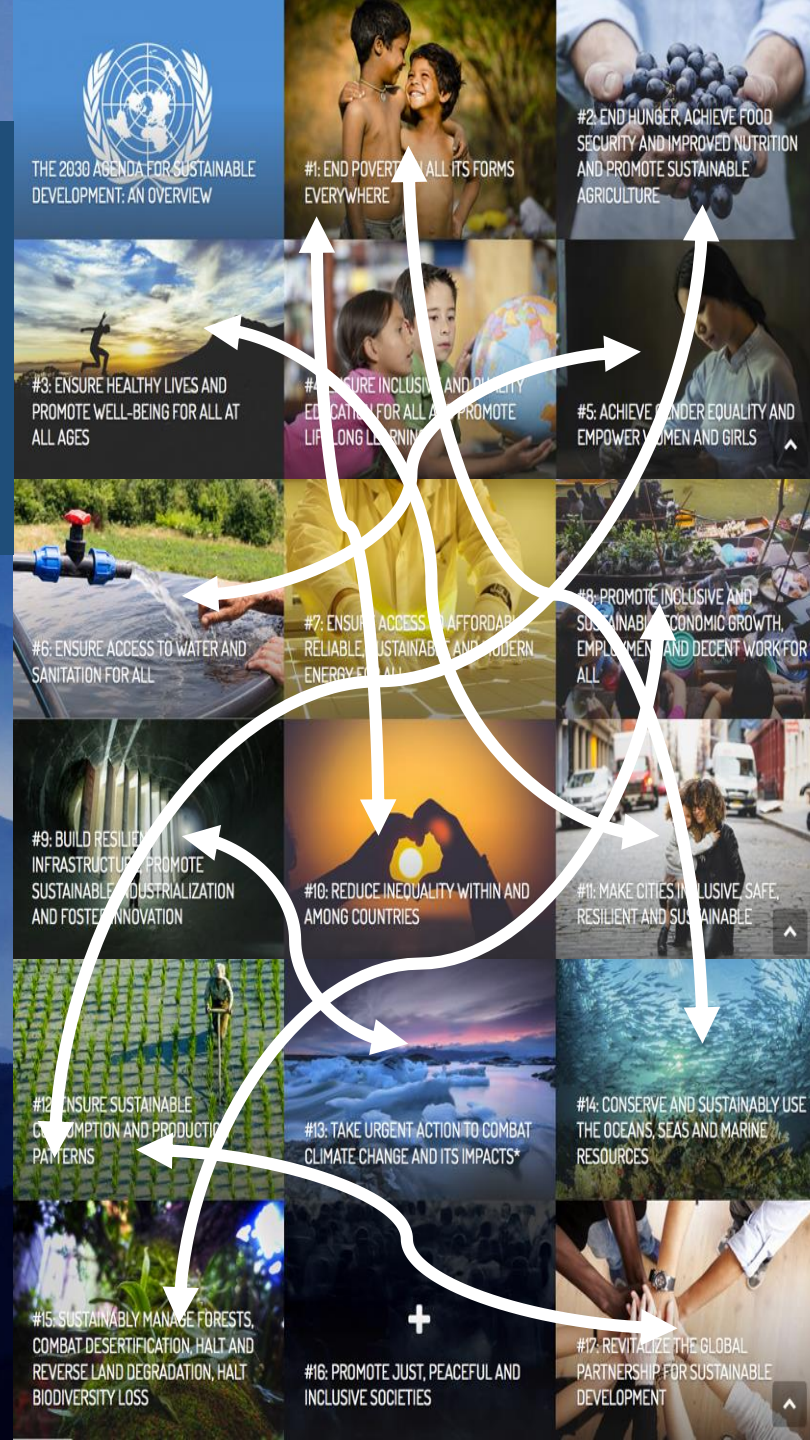


**#6: Ensure access to water  
and sanitation for all**





Each goal  
is  
important  
in itself ...



And they  
are all  
connected

17  
GOALS



# GLOBAL SANITATION COVERAGE

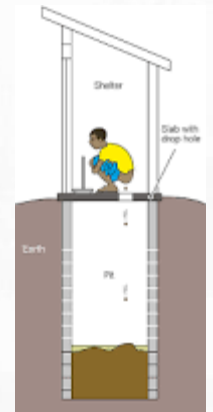
- In 2017, 45% of the global population (3.4 billion people) used a safely managed sanitation service which was defined as use of a toilet or improved latrine, not shared with other households, with a system in place to ensure that excreta are treated or disposed of safely (WHO, 2019).
- This is a 17% increase from 2.9 billion people in 2015.





# Rural and urban sanitation

- Need appropriate sanitation technology which fits the circumstances i.e. in terms of:
  - Cost and benefit
  - Performance
  - Operation and maintenance
- Need to guide engineers on the appropriate sanitation technology



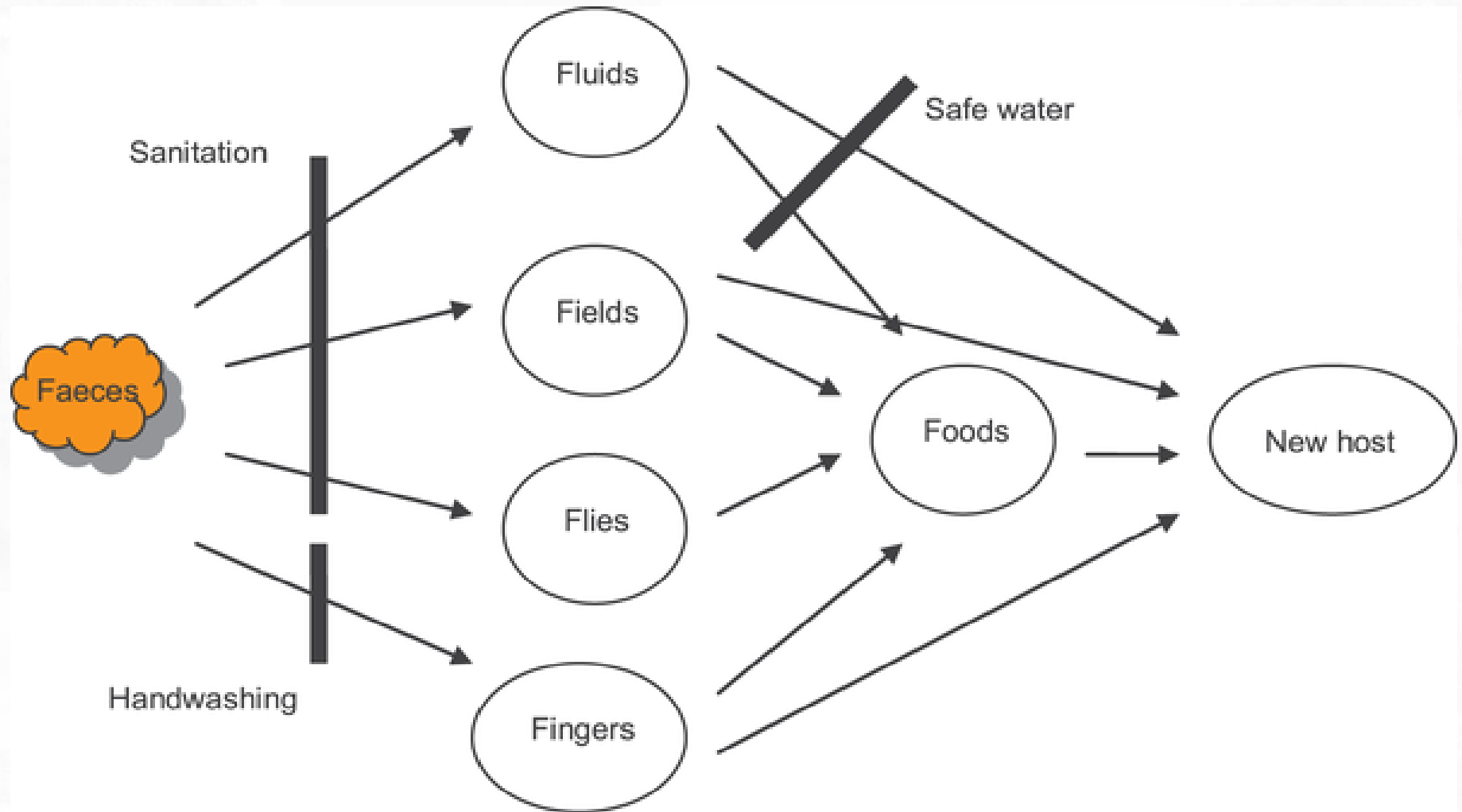
# **SANITATION AND HEALTH**

- Sanitation is one of the fundamentals of health and social and economic development
- Health is defined by WHO as the state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.
- Improving sanitation reduces morbidity in a society

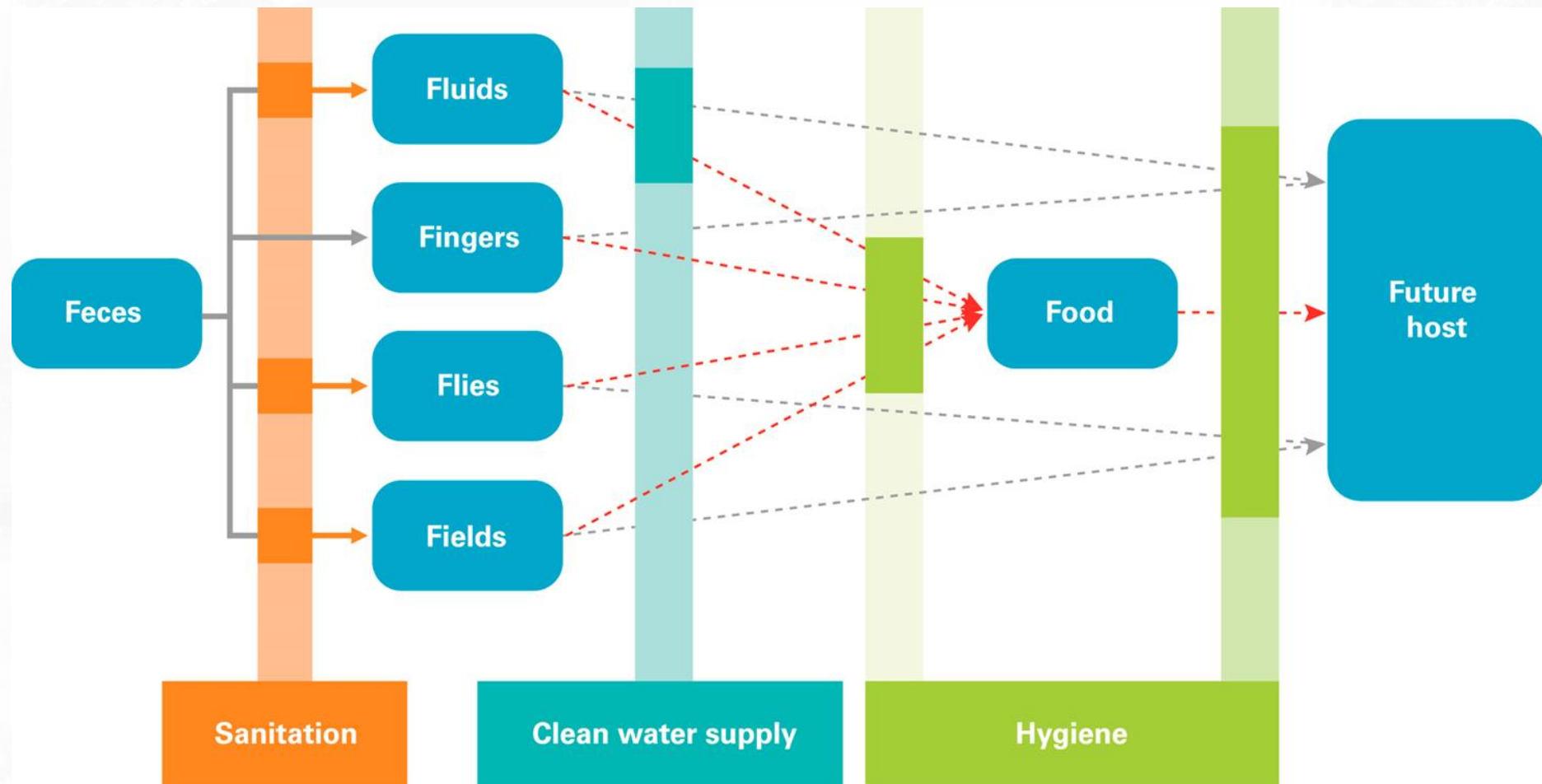
# SANITATION AND HEALTH

- Diseases associated with poor sanitation are particularly correlated with poverty and infancy and alone account for about 10% of the global burden of disease (Mara D. et al, 2010)
- One gram of fresh faeces from an infected person can contain around  $10^6$  viral pathogens,  $10^6$ – $10^8$  bacterial pathogens,  $10^4$  protozoan cysts or oocysts, and  $10$ – $10^4$  helminth eggs

**Figure 1. Faeco-oral disease transmission pathways and interventions to break them.**



Elizabeth Tilley 2014



# Excreta related infections

- Include all in the faecal-oral category, water based and others
- Caused by pathogens transmitted in excreta
- To fully understand these, see table below:

# Introduction to Low Cost Sanitation Technologies



# Introduction

- This section describes various sanitation technologies applied to Malawi (mainly improved)
- Improved sanitation: WHO, 2000
  - Connection to public sewer
  - Connection to septic system
  - Pour flash latrine
  - Simple pit latrine with San-Plat and roof
  - VIP
  - Composting latrine

# On-site excreta disposal

- On-site dry system
  - ✓ Traditional pit latrine
  - ✓ Traditional latrine with San-Plat (Sanitation Platform), shapes of San-plats
  - ✓ VIP, Ecosan Latrine
- On-site wet system
  - ✓ Pour flash
  - ✓ Septic tank

# On-site, dry systems

- Traditional Pit Latrines (volume  $0.06\text{m}^3$  per person per year)



# Problems

- Rocky ground
- Sandy soil
- High water table
- Water contamination – minimum 30m from a well and not uphill(ref. Cairncross S, Feachem R), Min. of water puts at around 50m, studies suggest 75



# PROBLEMS







## **Some latrines collapse due to weak soil and water logging**





# VIP latrines

- Ventilated improved pit
  - Reduces odour
  - Reduces flies
  - Reduce mosquito breeding

# VENTILATED IMPROVED PIT LATRINE (VIP)





# SIMPLE HAND WASHING FACILITIES

- be an integral part of any sanitation



# FOOT OPERATED HAND WASHING FACILITY





# San-Plats (doomed & rect.)



CONSIDER SIZE TO ELIMINATE USE OF LOGS



# Improper use of san plat





## Latrines with san plat



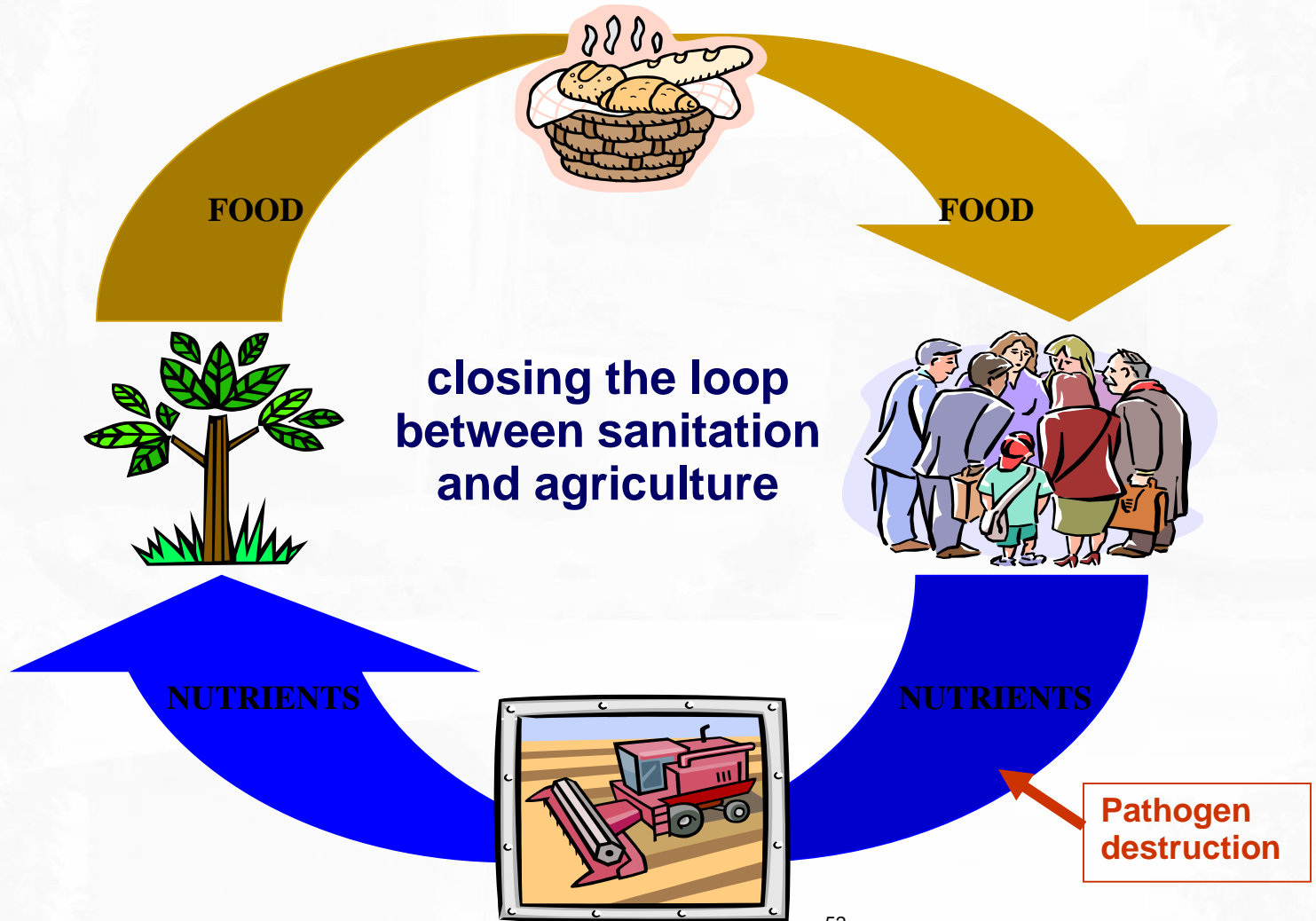
# Pit latrines with San-Plats

- Squatting slab provides:-
  - Structurally safe and feels safe
  - Easy to clean
  - Footrests allow easy positioning to reduce fouling
  - hole too small for child to fall in
  - Cement floor prevents hookworm transmission
  - Allows some fly control if tight fitting lid is used

# Ecological sanitation (ECOSAN)

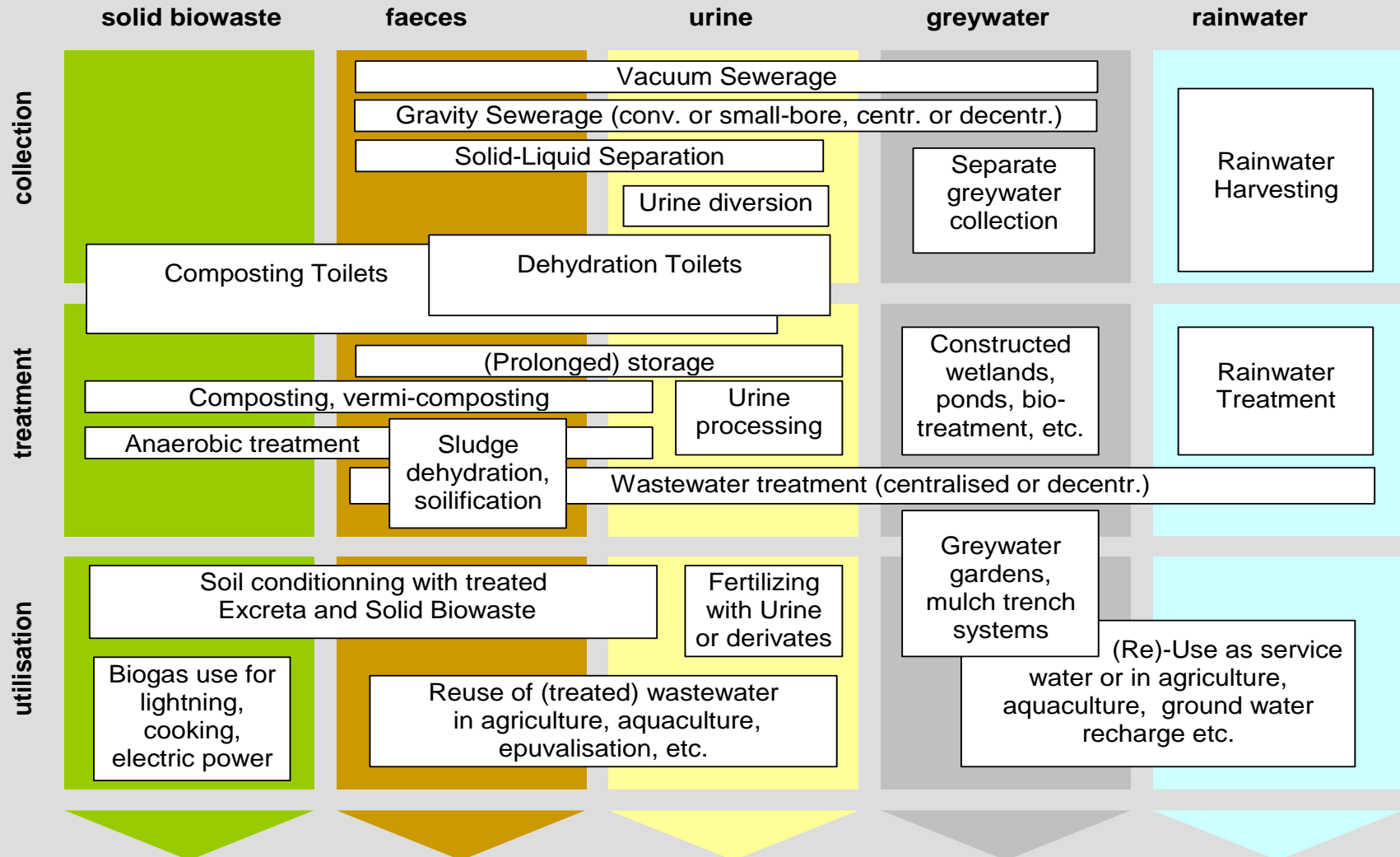
- Reuse of human excreta
- Closing the loop
- Human being produces about 7.5 kg of nitrate, phosphorous and potassium per year enough to produce a 250Kg bag of maize
- Multidisciplinary

# Principles of ecosan



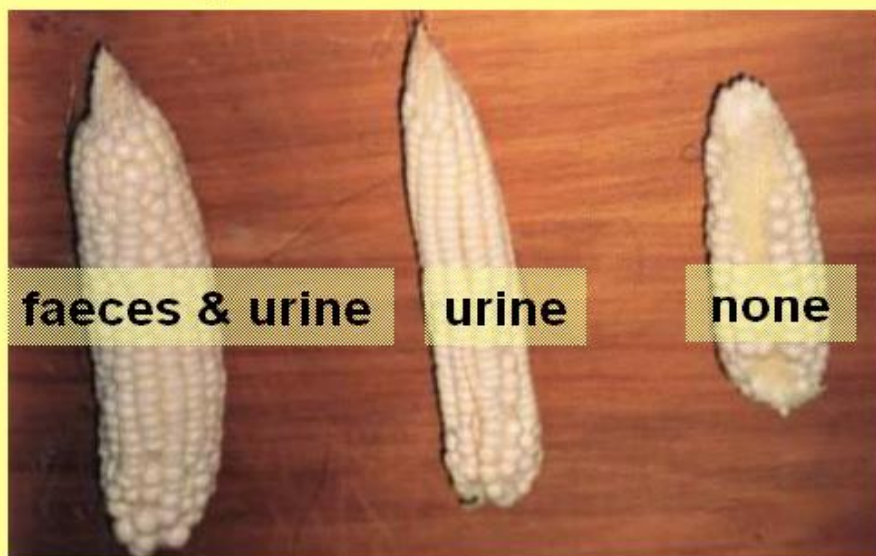


# Overview of ecosan technology-components



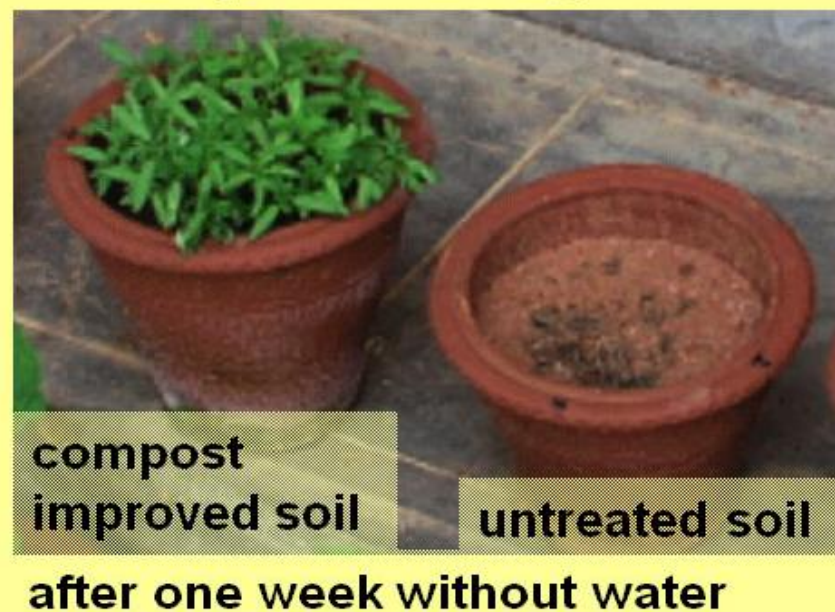
## benefits of ecological sanitation

- restored soil fertility through nutrient reuse



(Vinnerås, 2003)

- improved soil quality through reuse of organics



Source: Petter Jenssen

# TYPES OF ECOSAN

- Aborloo
- Skyloo (UDDT)
- Fossa alterna



# 1. The arbor loo

This is simple pit. Superstructure is transferred when full



## 2. The fossa artelna

Has two holes, when one is full, slab is removed to other hole.



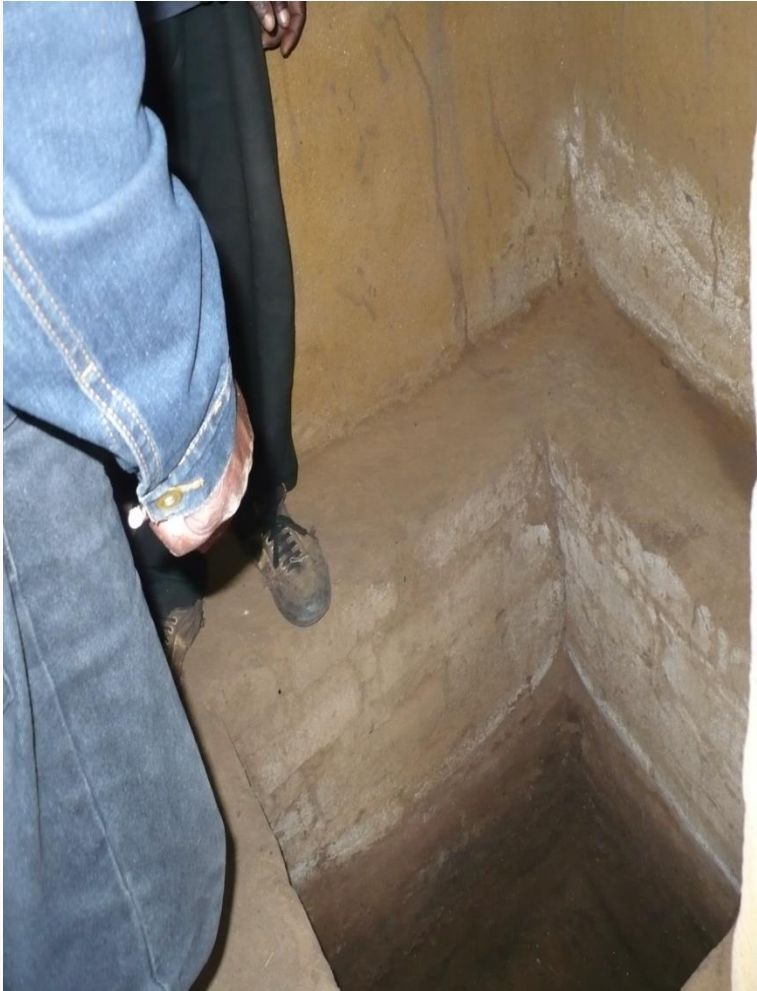


### 3. The skyloo

There is no digging of hole. It is built above ground and is suitable for areas with high water table



# Hole after harvesting and harvested manure





# On-site excreta disposal: Wet system

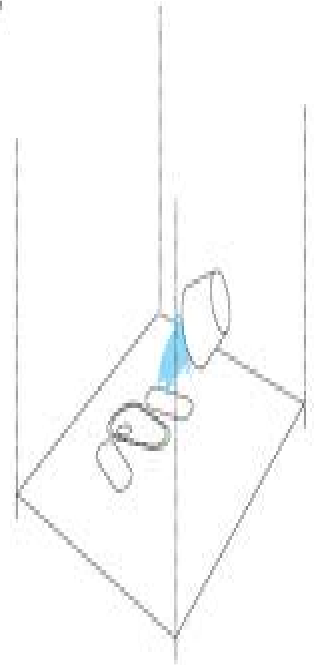
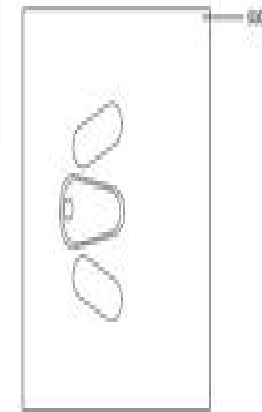
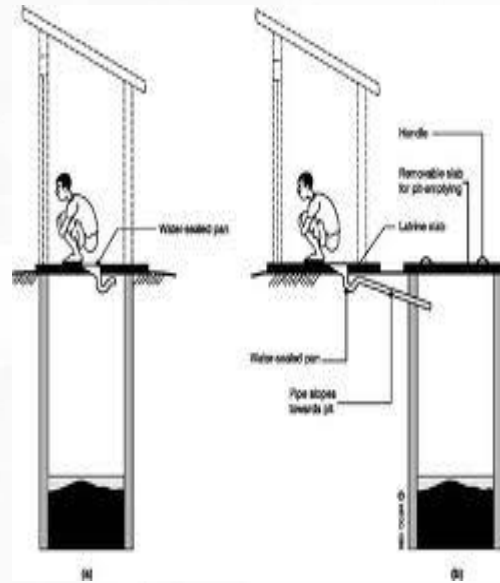
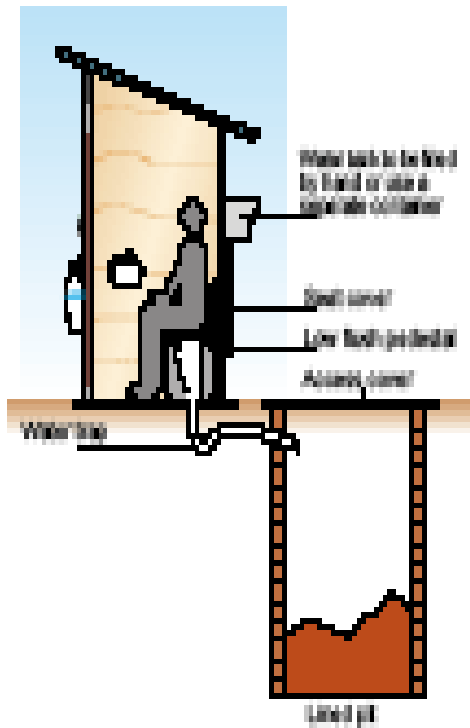
## 1. Pour-flash toilets

- This is an improvement to the pit latrine
- The squatting pan is provided with water seal
- Toilet is flushed by hand and is suitable in areas where water is scarce
- Wastes are carried to soak away pit up to 8m
- Suitable in areas where water is used for anal cleaning

# POUR FLASH



Pour Flash toilet





# Advantages

- Low water requirement (1 to 3 litres per flush)
- Complete odour and fly elimination by seal
- Can be located inside the house
- Do not require water in the house

## 2. Septic tanks

- Water tight settling tank for a short sewer
- It helps separate and digest solid matter
- Liquid waste is disposed of by soak away pit

# Subsurface sewage disposal systems

- Means a sewage disposal system, other than a municipal or community system, which receives either human excreta or liquid waste, or both, from one lot or premises.
- Included within the scope of this definition are septic tank-soil absorption systems.







**THANK YOU**