



Ecological Sanitation

A Series of Educational Manuals on Ecological Sanitation and Hygiene

Ecological Sanitation



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What is Sanitation?

World Health Organization (WHO) defines sanitation as a group of methods to collect human excreta and urine as well as community wastewaters in a hygienic way, so that human and community health is not endangered. Wastewater and human excreta have to be treated in a safe way to prevent spreading of diseases such as diarrhoea, cholera, worms and bladder infections.

Improved sanitation helps maintain a healthy life and environment. Its purpose is also to assure people enough clean water for washing and drinking purposes. Health and hygiene education is a vital part of talking about sanitation. Through hygiene education people recognise the importance of good sanitation and the link between proper sanitation and health.

The following methods are considered as improved sanitation services:

- Public sewer
- Septic tank
- Pour-flush latrine
- Pit latrine with slab
- Ventilated improved pit
- Ecological sanitation (EcoSan) / Composting toilet.

The following sanitation facilities are considered as unimproved:

- Open latrine
- Excretion to environment / Open defecation (OD)
- Hanging latrine
- Pit latrine without slab or platform
- Service or bucket latrine, in which excreta is manually removed.



Figure 1. Examples of EcoSan toilets in Europe and in Africa.

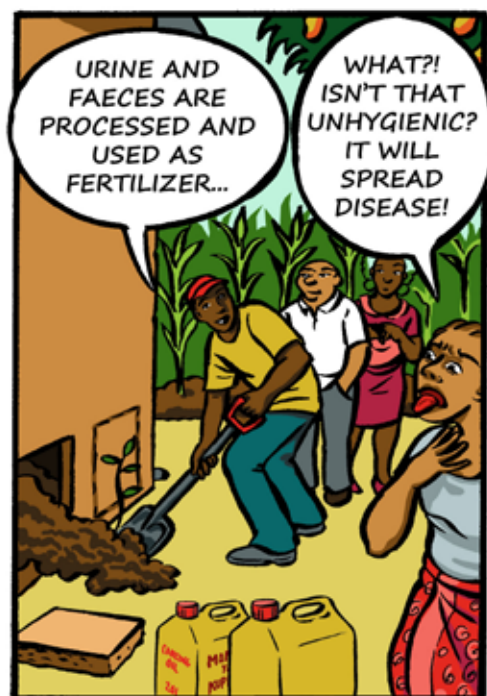
What is Ecological Sanitation?

Ecological sanitation (EcoSan) considers human excreta (urine and faeces) as a resource instead of waste. Through EcoSan, nutrients from excreta are recovered and the end product is utilized as fertilizer and soil enrichment material. Human excrements are treated, e.g. composted, nearby the users. No or very little water is used in the transportation of excreta and the system is closed so no pathogens will spread to the environment, like from pit latrines or open sewers.

Ecological sanitation is based on the closed human nutrient cycle, which is described in Figure 2. It aims to recover the nutrient value of human excreta by creating systems where human excreta can be collected and utilized as fertilizers for agriculture.



Figure 2. The principle of closed human nutrient cycle.



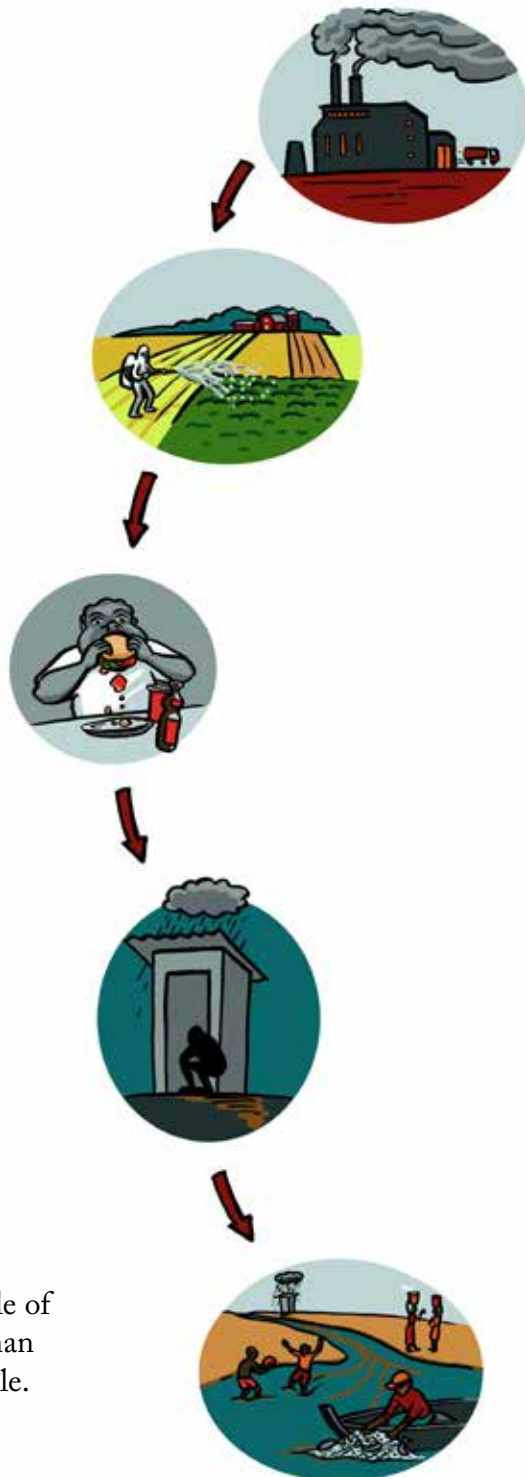
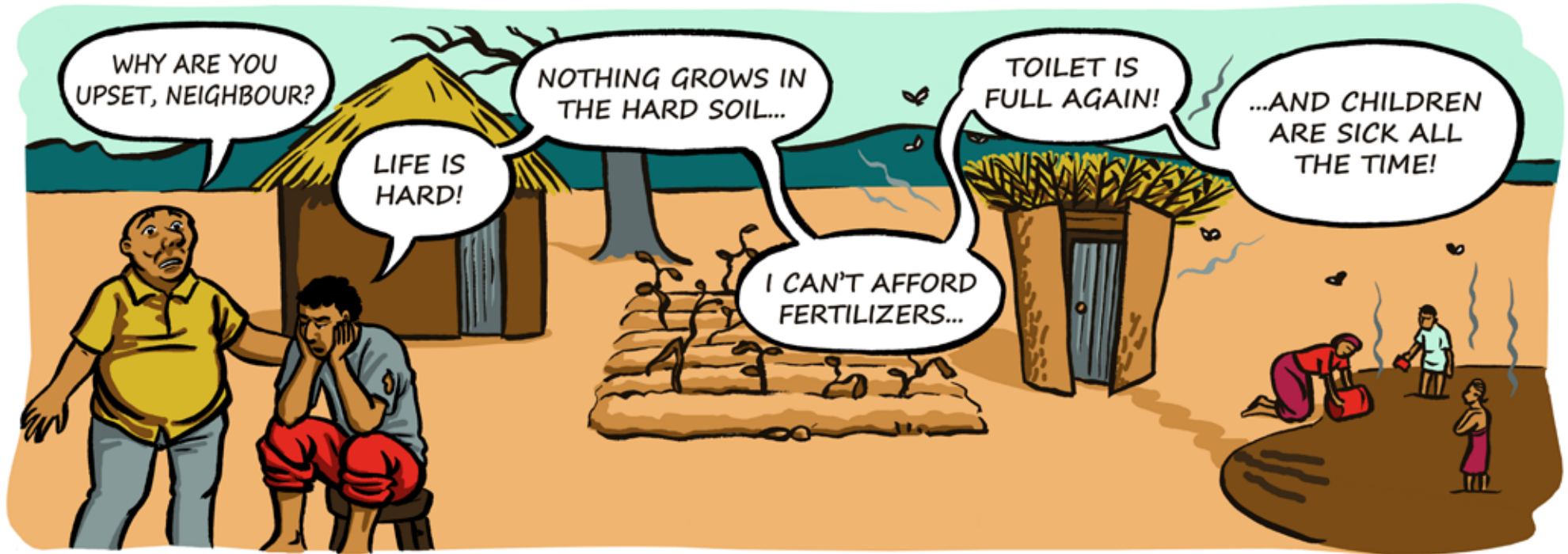


Figure 3.
The principle of
broken human
nutrient cycle.

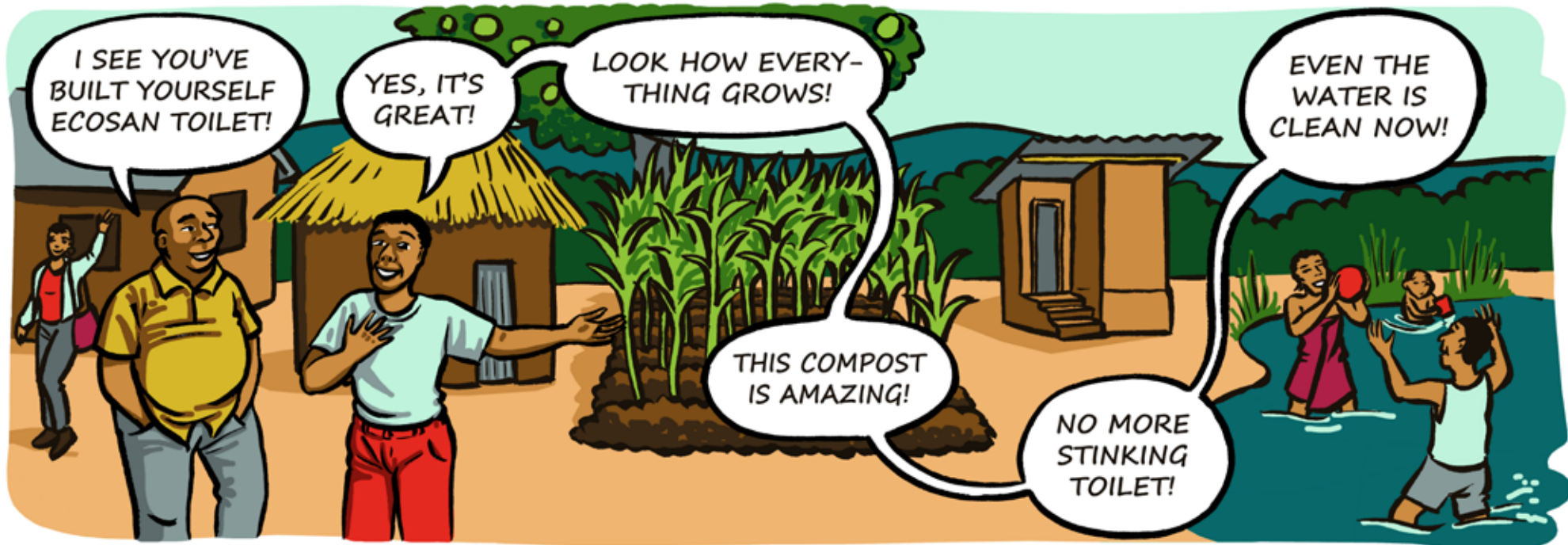
What are the Advantages of Ecological Sanitation?

- Human excreta is collected in a way that prevents pathogens that cause diseases from spreading to the environment
- Ecological sanitation technologies do not require the use of water, which can also significantly reduce the risk of contamination of water sources
- Water is saved for other purposes such as food preparation and hygiene
- Urine is easy to separate and after safety precautions, such as the right kind of storage, it is a very good source of nutrient-rich (e.g. high in nitrogen, phosphorus and potassium) free fertilizer for agriculture
- Yields are increased by using composted excreta and urine and the use of expensive industrial fertilizers can be decreased
- Through the use of compost, rich in organic matter and micro-organisms, soil fertility and long term resilience can be achieved
- Compared to pit latrines ecological sanitation technologies can offer permanent solutions, which do not need to be rebuilt once they are full
- Ecosan toilets are usually built above the ground so they can be built also in areas of high water table, wet areas, rocky areas and unstable sandy soils
- Ecosan toilets can be adjusted to different cultures, traditions and financial situations. The training and sensitization ensures the acceptance and appropriate use and maintenance
- Ecosan toilets are easy to use and with proper maintenance they are hygienic, clean and free from odours.

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Ecological Sanitation Technology – Urine Diversion Dry Toilet (UDDT)

There are many ways and technologies to practise ecological sanitation. The most common types of toilets are urine diversion dry toilets (UDDT's) and composting toilets.

Urine diversion dry toilet (UDDT)

UDDT consists of eight basic functional elements:

1. A urine diversion toilet seat or squatting pan
2. One or two vaults, usually above ground, or one shallow pit for faeces collection and storage
3. Piping to lead urine from the user interface to an infiltration or collection system
4. A ventilation pipe to exhaust moisture and odours from the vault or pit
5. If required, an anal cleansing area for the separate collection and drainage of anal wash water
6. A toilet superstructure, unless the toilet is installed inside an existing house
7. A bucket with dry cover material (e.g. dry grass, sawdust, dry leaves)
8. A hand washing facility with soap and water.

The advantages of urine separation:

- reduces odour (a mix of urine and faeces causes substantial odour)
- enables fast drying of faeces which makes handling of faeces more simple and hygienic
- reduces environmental impacts
- source-separated urine can be used as a fertilizer on plants or crops.

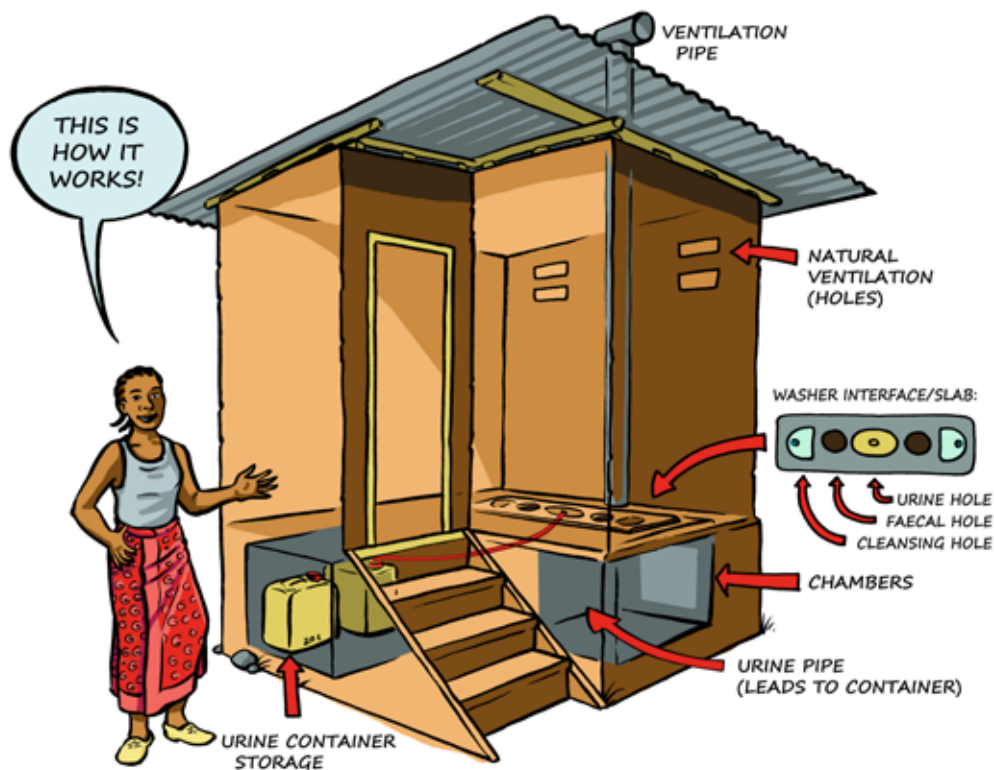


Figure 4.
The principle of urine diversion dry toilet (UDDT).

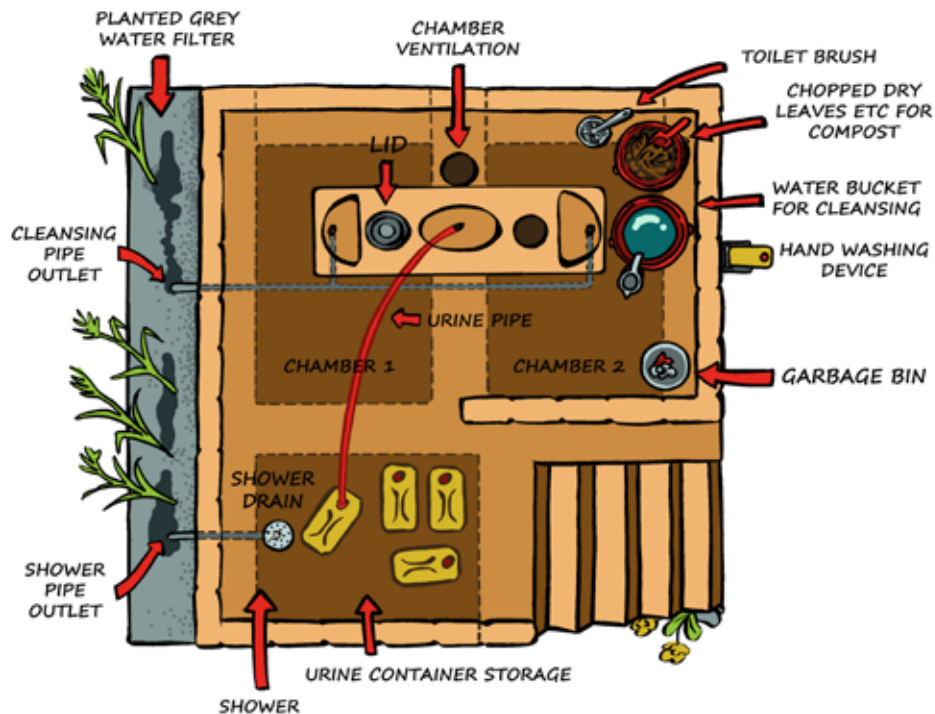


Figure 5. Layout of urine diversion dry toilet (UDDT).

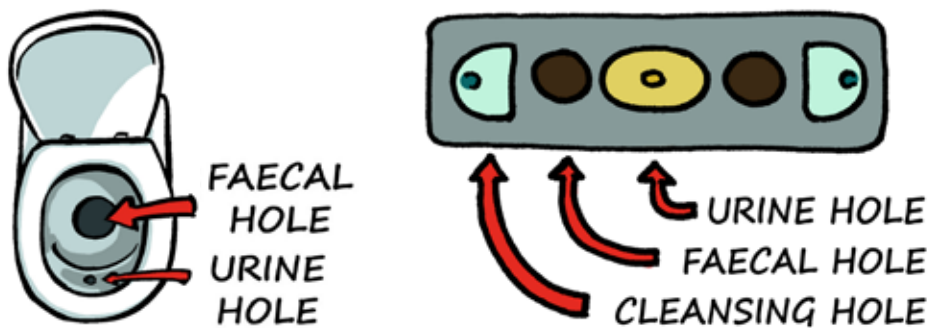


Figure 6.
Urine diversion toilet seat.

Figure 7.
Urine diversion squatting pan.

How the Urine Diversion Dry Toilet (UDDT) works?

Urine-diverting dry toilets (UDDTs) allow for the source separation of urine and faeces through the use of a specially designed toilet seat or squatting pan, as shown in Figures 6 and 7. Urine is diverted via small hole through a urine pipe to a urine container. Faecal material goes through a bigger hole to a chamber below. There may be a third hole for washing.

The faeces drop into a pit, vault or container. There can be either single or double vault collection systems, as shown in Figure 8. In single vault systems, interchangeable containers can be used or the container can be emptied and compost stored and treated elsewhere. In the double vault toilet, the material is stored in the vault. When the first vault is full, it is closed and left to rest, while the other vault is used. When the second vault is full, the first vault is emptied with a shovel through an access door located at the rear of the vault. The second full vault is then sealed and left to rest while the first vault refills. Properly designed faecal vaults will fill in 6 to 12 months and then rest for an equal period of time. During the storage, the moisture in the faeces slowly evaporates and is released through the vault's ventilation system, or is absorbed by the dry cover material. This process is called dehydration. The resulting dry and odourless material can be used as an agricultural soil conditioner.

Urine diversion serves a number of important functions including reducing odour and simplifying the excreta management process. Dry or 'waterless' operation indicates that no water is used for flushing faecal material, though water must be present for hand washing and other hygiene practices following defecation and urination.

Composting Toilet



There is no source separation of urine and faeces in the composting toilets. Instead, urine and faeces are led to the same collecting or composting container and composted together in the container or in a separate container elsewhere. Composting is a biological process where micro-organisms decompose organic materials to fertile soil. To be efficient, compost pile should be humid and aerobic, containing enough air.

The main elements of composting toilets:

1. a place to sit or squat and a collecting or composting container
2. a ventilation system that allows good aeration of the composting container, removal of excess moisture and reduction of odour
3. dry material like dry grass, leaves or sawdust which keeps the compost relatively dry and aerobic
4. adequate composting time in a composting toilet container or in a separate (closed) composting container
5. safe use of the compost.

There are four main types of composting toilets:

- Single vault composting toilets
- Multiple vault composting toilets
- Mobile bucket or bin toilets followed by composting of the excreta
- Composting toilets with mechanical devices.

Most of the composting toilet systems are easy to use and maintain, so composting toilets can be used in most parts of the world. They can be self-built or manufactured products. It is important to instruct the users on proper maintenance of the toilet and use of the compost. A strong commitment from the users or operators is needed.

When using the composting toilet, a handful of dry material is added to the container after each use. When the container is full it is either left to compost in the composting container or emptied to a separate (closed) composting container or a separate composting area. The emptying frequency of the composting container depends on the capacity of the container, the number of users and the composting conditions (e.g. heat, humidity and amount of nutrients). Remember that fresh excreta should not be mixed with the compost. Approximately after 12 months of composting the compost can be applied to the land as a fertilizer and soil conditioner. When handling the compost, make sure you use safety measures such as gloves and boots and wash your hands with soap afterwards.

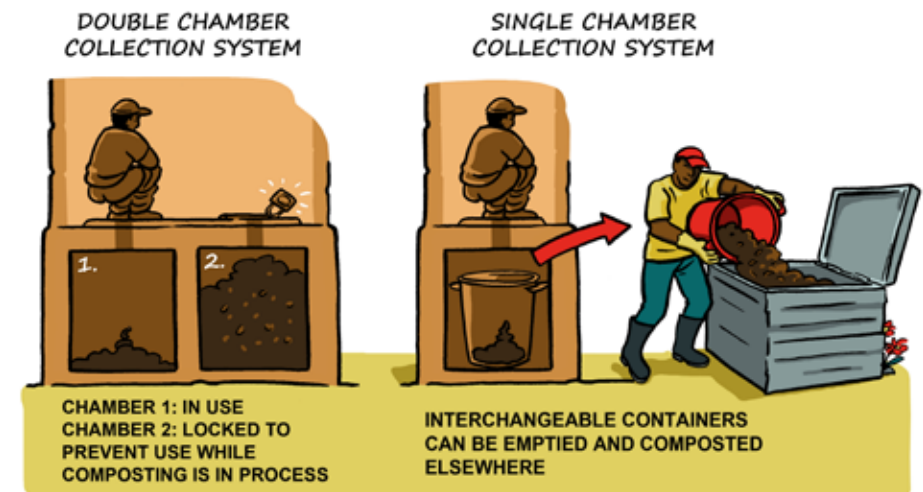
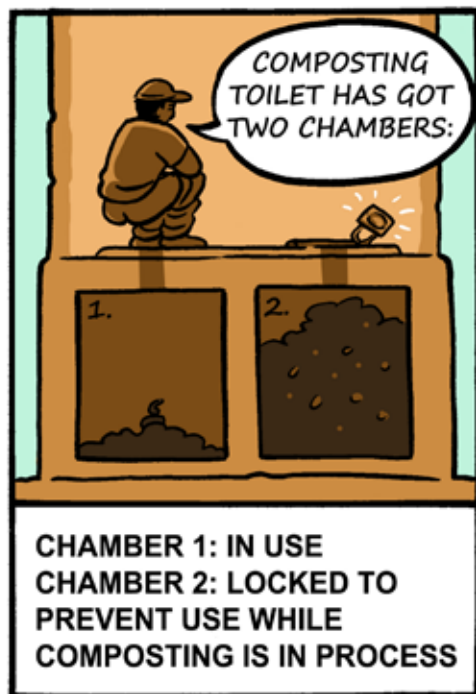


Figure 8. Single and double chamber collection systems.

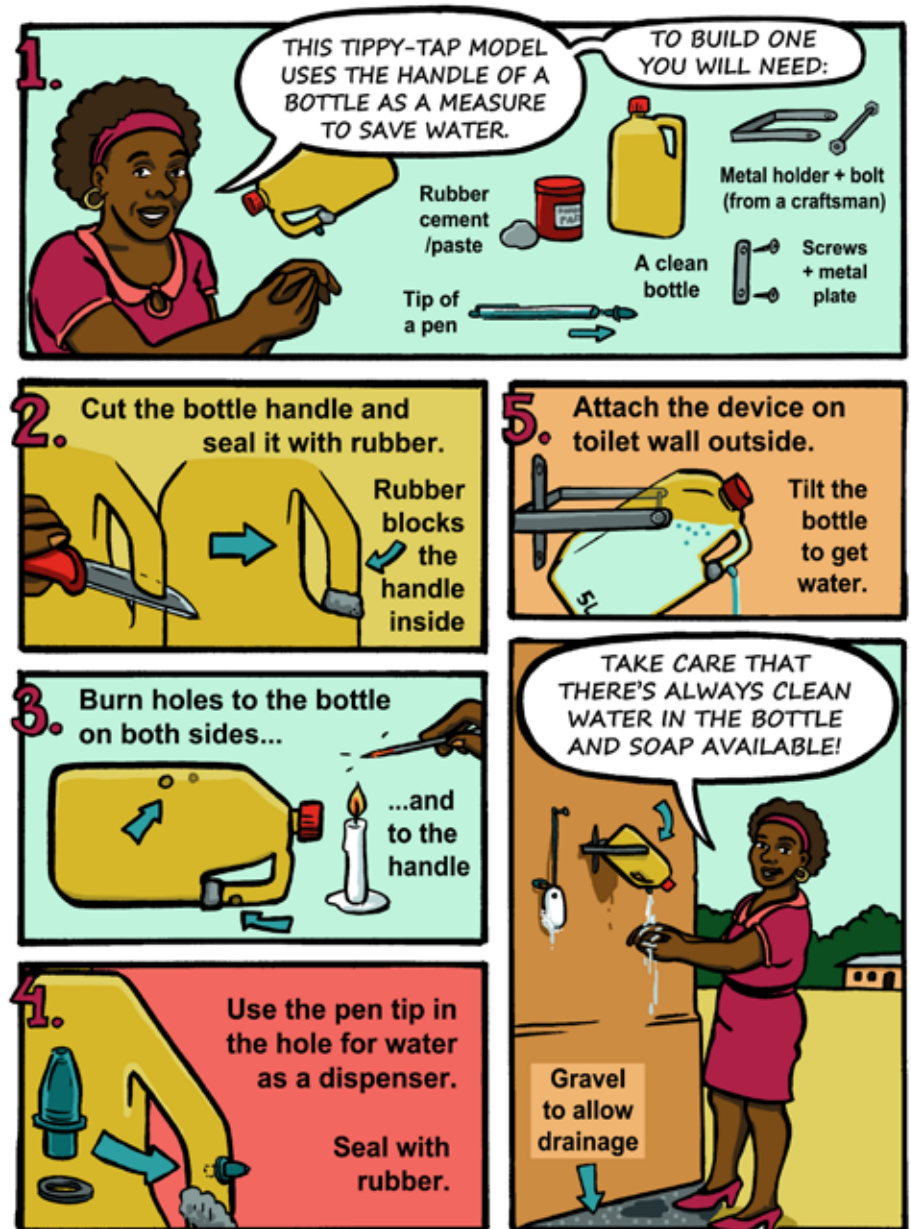


Hand Washing Facilities

To prevent diseases from spreading, it is very important to wash your hands after using and maintaining the toilets and handling compost and/or urine. All toilets should have a hand washing facility with soap nearby. If water connection is available, piped hand wash stations are advisable. If not, then hand washing devices can be made from e.g. cans, plastic bottles or containers. A tippy-tap is a simple hand washing device where a jug is hung by a rope to pour a small amount of water over the hands. There can be a foot operated lever.



Build a Tippy-Tap



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