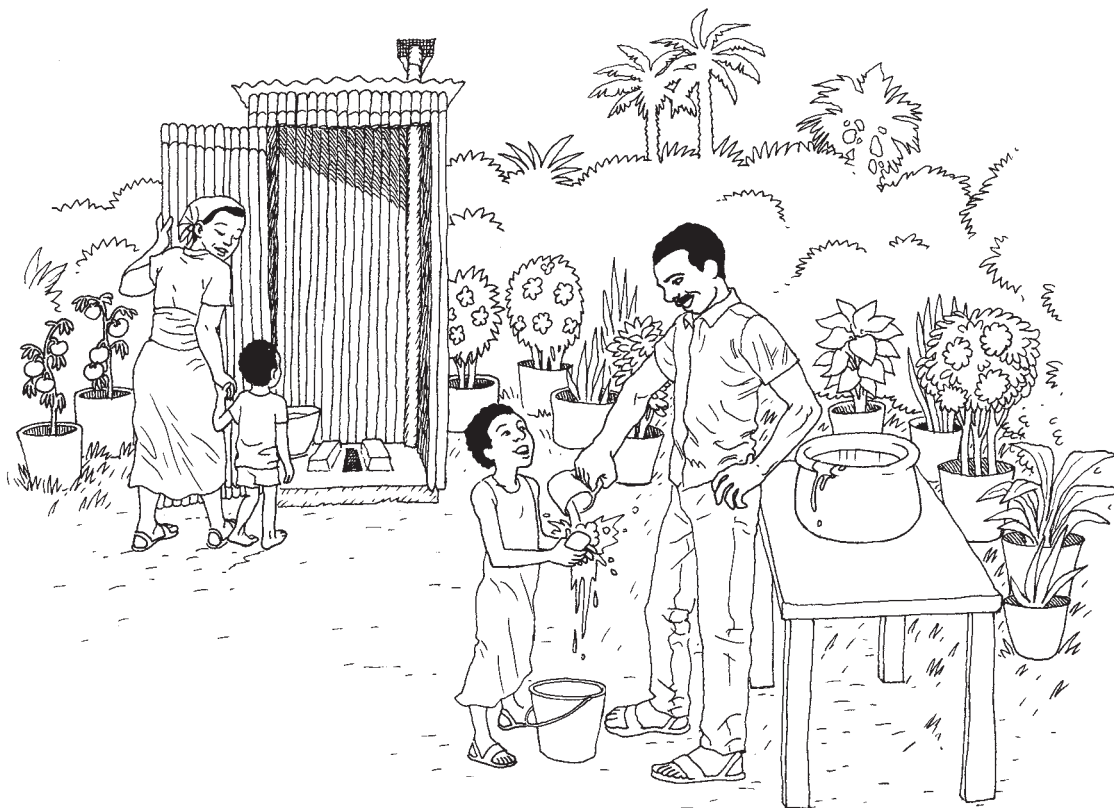


7 Building Toilets

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Building Toilets



Human waste (feces and urine) can pollute water, food, and soil with germs and worms, leading to serious health problems (see pages 51 to 58). The safe disposal of human waste (sanitation) by building and maintaining toilets and washing hands prevents the spread of germs and is necessary for good health.

Whether your community uses pit toilets, toilets that turn human waste into fertilizer (**ecological sanitation**), toilets that flush human wastes and water (**sewage**), or another type of toilet, the main goal is to prevent human waste from contaminating drinking water, food, and our hands. Just as important as a safe and comfortable toilet is a way to wash hands after using it. Safe toilets and hand washing together can prevent most of the illnesses that come from germs in human waste.

Poorly built toilets and sewage systems are a major cause of illness and groundwater contamination. As clean water becomes more scarce, disposing of human waste in ways that do not cause more water contamination becomes increasingly important.

Promoting Sanitation

Some health workers believe health problems and death from poor sanitation can be prevented only if people change their personal habits, or “change their behaviors,” for staying clean. But promoting behavior change often fails because the conditions people face in their daily lives, such as poverty, or a lack of clean water or decent toilets, do not change. And when their behavior does not change, the people themselves are blamed for their own poor health.



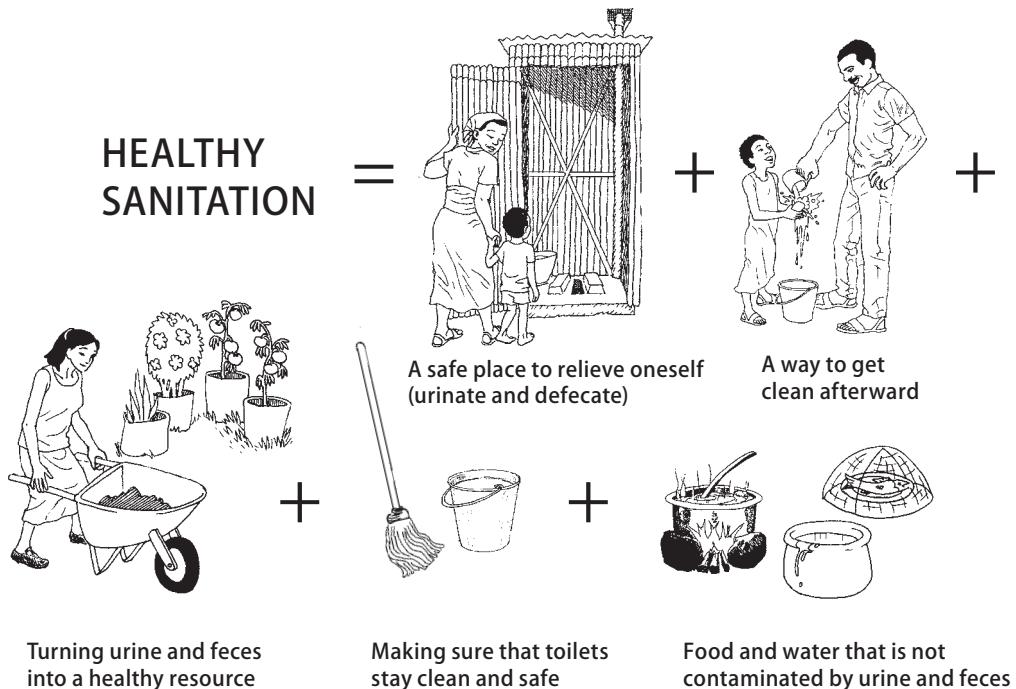
Experts may offer technical solutions, such as modern toilets that use no water, or costly sewage treatment systems. But just because these technical solutions may work elsewhere does not mean they will respond to the traditions or conditions of the community. Some of the toilets in this book may not be right for some communities. Offering technical solutions without understanding people’s cultures, living conditions, and real needs can create more problems than it solves.

Diseases caused by poor sanitation will continue if people are blamed for their own poor health or if technical solutions that ignore local conditions are promoted. To improve health in a lasting way, health promoters must listen carefully and work with people in the community to develop solutions based on their needs, abilities, and desire for change.

What People Want from Toilets

Health is not always the main reason why people want improved sanitation. People also want:

- **privacy:** A toilet can be as simple as a deep hole in the ground. But the need for privacy makes it important for a toilet to have a good shelter with a door. The best shelters are simple and are built from local materials.
- **safety:** For a toilet to be safe it must be built well and in a safe place. If a toilet is badly built it can be dangerous to use. And if the toilet is far from the home, or in an isolated place, women may be in danger of sexual violence when they use it.
- **comfort:** People will more likely use a toilet with a comfortable place to sit or squat, and a shelter large enough to stand up in. They will also be more likely to use a toilet that is close to the house and is sheltered from wind, rain, or snow.
- **cleanliness:** If a toilet is dirty and smelly, no one will want to use it. Traditionally the job of low status people in the community, sharing the task of cleaning will help make sure that toilets are properly used and cared for.
- **respect:** A well-kept toilet brings status and respect to its owner. This can be an important reason people spend the money and effort to build one.



Planning for Toilets

Every person and every community has a way of managing human waste, even if it just means that people go into the bush or forest to urinate and defecate. Not all people in a village use the same method, and not every person disposes of their waste the same way all the time. Some people may want to change, while others may not. Whether it means building a new kind of toilet, improving access to safe toilets, or some other kind of change, almost every sanitation method can be improved.



A plan that leaves women or anyone else without toilets will not prevent illness in the community.

Small, step by step changes are easier than big changes all at once. Examples of small changes that can have a big impact on health, safety, and comfort are:

- keeping wash water and soap near the toilet.
- adding a screened vent to a pit toilet to let air flow and also trap flies.
- adding a durable platform to an open pit.

When planning or making changes in the way human waste is disposed of in your community, keep in mind that every method should:

- **prevent disease** — it should keep disease carrying waste and insects away from people and food, both at the site of the toilet and in nearby homes.
- **protect water supplies** — it should not pollute drinking water, surface water, or groundwater.
- **protect the environment** — toilets that turn human waste into fertilizer (ecological sanitation) can conserve and protect water, prevent pollution, and return nutrients to the soil. (See pages 124 to 135.)
- **be simple and affordable** — it should be easy for people to clean and maintain, and to build for themselves with local materials.
- **be culturally acceptable** — it should fit local customs, beliefs, and needs.
- **work for everyone** — it should address the health needs of children, women, and men, as well as those who are elderly or disabled.

Sanitation decisions are community decisions

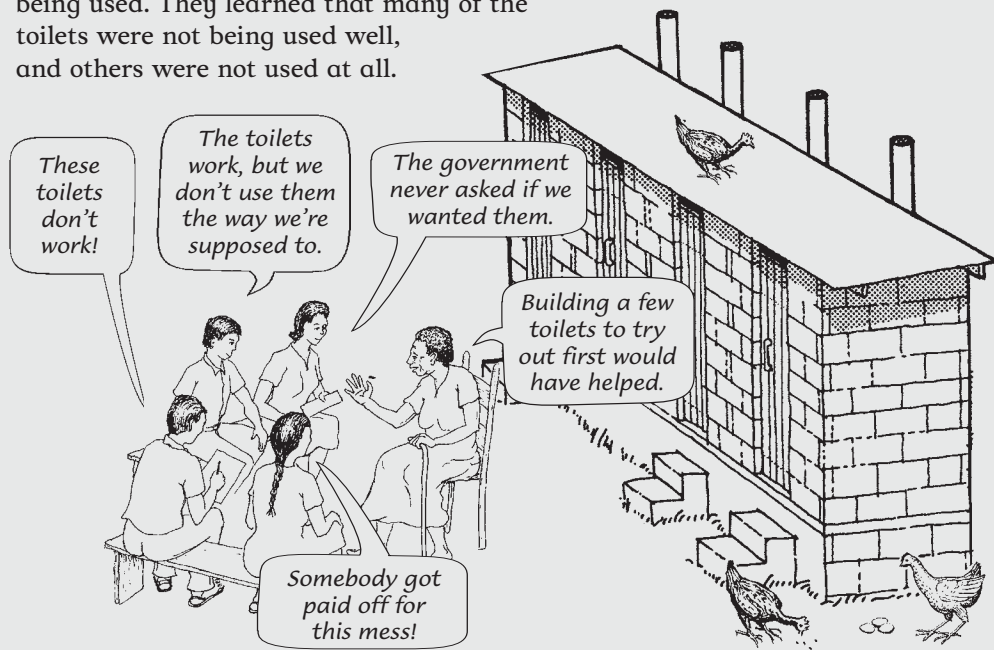
When decisions about toilets are made by the people who will use them, it is more likely that people's different sanitation needs will be met. And because household, neighborhood, and village sanitation decisions can affect people downstream, when neighboring communities work together, health can improve for everyone.

Community participation can make the difference between success and failure when a government or outside agency tries to improve sanitation.

The wrong toilets?

In 1992, the government of El Salvador spent over US \$10 million to build thousands of toilets. These toilets were meant to turn waste into fertilizer, but they needed more care and cleaning than the old toilets people were used to. The government did not involve anyone in the communities to help build them, and there was no training in how to use them. So people did not learn how they worked.

After the project was finished, the government studied how the toilets were being used. They learned that many of the toilets were not being used well, and others were not used at all.



When people participate in planning, the result is more likely to fit their needs.

Someone must clean the toilet

No one likes to clean the toilet. But someone has to do it.

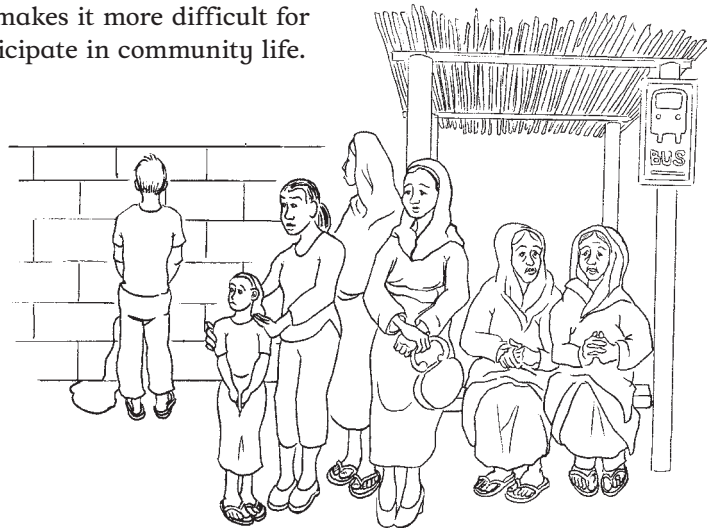
Often, the job of planning, building, and fixing toilets is considered men's work or work for specialists. The less pleasant and more constant task of cleaning toilets often falls to women or people of lower social classes. It is unfair if tasks that are unpleasant always fall to women and poor people who usually do not make the decisions in the first place.

Sharing unpleasant tasks is a way to make sure the work gets done, though it often creates social conflicts.



Women and Men Have Different Needs

Women and men have different needs and customs when it comes to using the toilet. Men may be more comfortable than women relieving themselves in public or in open spaces. A lack of safe, private toilets makes it more difficult for women to participate in community life.



It is generally easier for men to relieve themselves than it is for women.

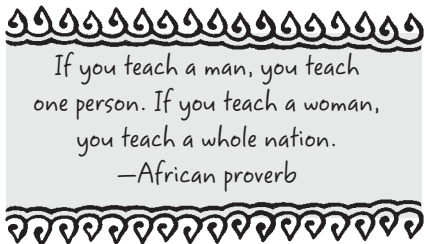
Planning toilets with women's needs in mind

Leaving women out of sanitation planning puts them at a greater risk for health problems because it is less likely that their needs will be met. Men must also keep women's needs in mind when changes are made in community sanitation if they are to improve health for everyone.

To make it easier for women to participate in community sanitation planning in a way that does not simply give them more work to do:

- Organize meetings at times when women can participate.
- Make sure that women are invited and feel comfortable speaking out.
- Have separate meetings for women if they make it easier for women to speak up.
- Share decision making power.

Women usually teach and care for children. When women's needs are not met, the needs of children may be unmet as well. When women are not included in planning household and community sanitation, the whole community suffers.



Removing barriers to toilets for women

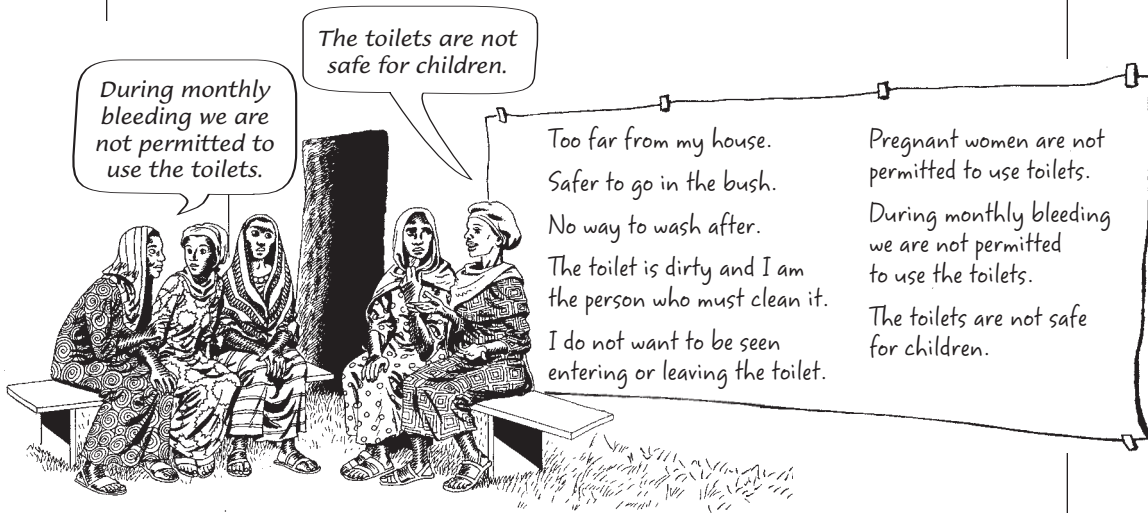
This activity helps people talk about issues that may prevent women from having access to safe and healthy toilets. The goal is to decide what changes might be necessary to improve health for everyone. After the activity has been done with just women, a session can be organized with men and women.

Time: 1 to 1½ hours

Materials: Large drawing paper, pens, sticky tape

- 1 Write statements about toilets on a large piece of paper. Then read each statement to the group, and ask each person to decide whether she agrees or disagrees. (Ask people to raise a hand if they agree, or to leave their hand down if they do not.) For every 'yes' answer, make a mark next to the phrase.

Here are some statements that might be used:



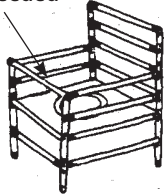
- 2 Count the marks beside each statement. Choose the problems that were mentioned most often and begin a discussion about them. What is the cause of the problem? What illnesses may result from this problem? What can be done to improve the situation? What are the barriers to improving the situation?
- 3 End with the group deciding on some actions that can be taken by both men and women to make sure everyone's needs are met.

Making toilets easier to use

There are many ways to make toilets easier for children and adults with disabilities to use. People need different adaptations depending on their abilities, so it is best to involve disabled people in the planning. Be creative in finding solutions that fit everyone's needs.



Removable front bar can be added if needed



If a person has **difficulty squatting**, make a simple hand support or a raised seat. Or, if the toilet is set in the ground, make a hole in the seat of a chair or stool and place it over the toilet.

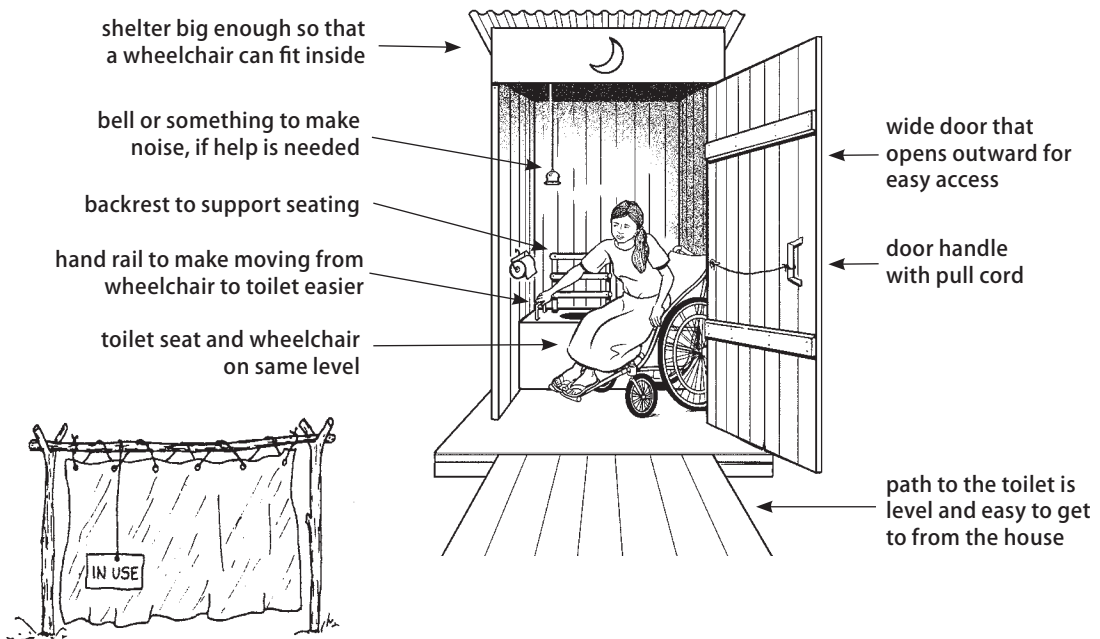
If a person has **difficulty controlling her body**, make supports for her back, sides, and legs, and a seat belt or bar.

Use a rope or fence to guide **blind** people from the house to the toilet.

If a person has **difficulty adjusting clothing**, adapt the clothing to make it loose or elastic. Make a clean, dry place to lie down and dress.

If a person has **difficulty sitting** you can make moveable handrails and steps.

Toilet adapted for wheelchairs



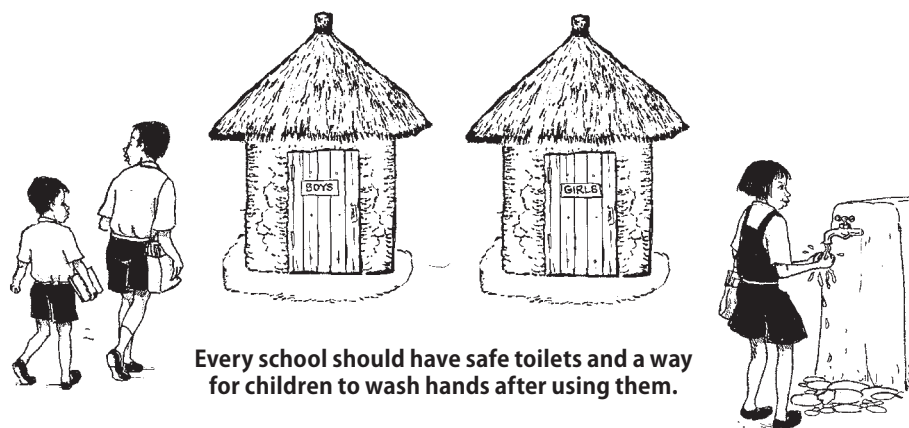
Remember, a person with a disability feels the same need for privacy as anyone else and should get the privacy he or she needs.

Toilets for Children

Children have a high risk of illness from poor sanitation. And while adults may live with diarrhea diseases and worms, children can die from these illnesses (see page 51).

When children have toilets they feel safe using and have an easy way to stay clean, they get sick less. Pit toilets can be dangerous and frightening for small children because of the darkness and the large hole. Many children, especially girls, leave school because schools lack safe toilets.

Allowing children to help build toilets and teaching them about illnesses caused by poor sanitation helps them develop healthy behaviors.



Helping small children stay clean

All feces carry harmful germs, and handling them can cause serious illness in children and adults. In rural areas, parents can help children too small to use a toilet by making a hole near the house and adding a handful of soil after each use. It is also important to:

- Wash babies and young children after they defecate.
- Wash your hands after handling babies' feces.
- Bury the feces or put them in a safe toilet.
- Wash soiled clothes away from drinking water sources.

Teach boys and girls to wipe or wash carefully, and to wash their hands after using the toilet. Girls especially should be taught to wipe from front to back. Wiping forward can spread germs into the urinary opening and the vagina, causing bladder infections and other health problems.



Sanitation for Emergencies

More and more, large numbers of people are forced to live in emergency situations due to wars, natural disasters, and other reasons for displacement. In emergency settlements such as refugee camps, sanitation is a first priority.

Simple trench latrine

Simple trenches can be made quickly using local materials. One enclosed trench for each family, or for a small group of families, will allow for the most comfort.

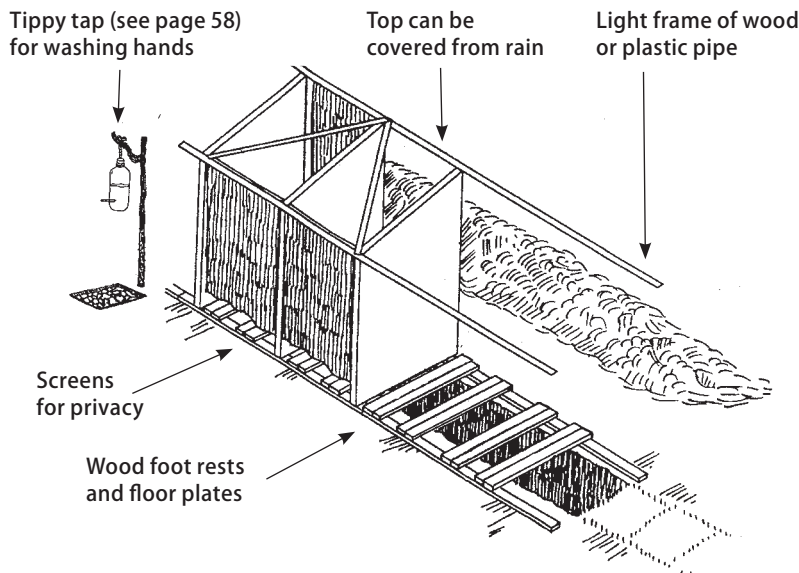


Trench latrines should be built downhill and away from water sources, but close enough to family settlements so people do not have to walk long distances to use them.

A trench latrine has shelves for the feet to make it easier to use than a simple trench. The trench latrine should be as deep as possible (up to 2 meters), but can be shallow if little labor is available for digging. Each user covers his or her feces with a small amount of soil. When the trench is close to full, fill it completely with soil. Plants and trees will benefit from the rich soil.

A portable shelter can be built over the trench to give privacy and to protect users from rain. Screens can be made from cloth, reeds, or whatever materials are available. Special care should be taken to make sure latrines are private and safe for women and children.

A partially built trench latrine shelter



Sanitation for Cities and Towns

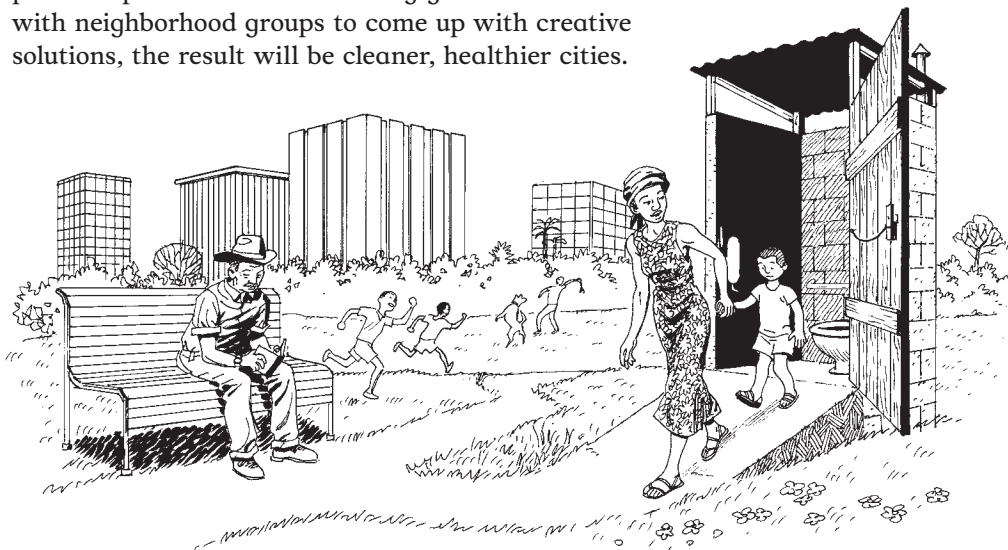
In cities and towns, health problems can spread very quickly. It is difficult to improve sanitation services in crowded cities and towns without a lot of help from governments, NGOs, and other partners. This book can offer only some guidelines to help think about possible solutions.

The main barriers to good sanitation services in cities are:

- **physical.** Often, sanitation is considered only after neighborhoods and settlements have roads, electricity, and water. Yet once a city is built, it is much harder to plan for and build toilets and sewage systems.
- **economic.** Sewage systems and public toilets are costly to build and maintain. If there is little government support, it is difficult to afford sanitation.
- **political.** Local governments may not want to deliver services to informal settlements and poorer neighborhoods. And there may be laws that prevent people from planning and building their own toilets and sewage systems.
- **cultural.** People and officials in cities often want flush toilets and costly sewer systems, making it difficult to agree on more sustainable and affordable alternatives.

Creative solutions for healthier cities

Any kind of toilet, including the ones in this guide, can be built and used in cities. And if sanitation services are combined with parks, urban farming (see page 310), resource recovery and recycling (see Chapter 18), and clean energy (see Chapter 23), cities can become healthier and more pleasant places to live. When city governments work with neighborhood groups to come up with creative solutions, the result will be cleaner, healthier cities.



Urban community sanitation



Not long ago, Yoff was a typical West African fishing village outside of Dakar, the capital city of Senegal. Families lived in compounds connected by walking paths and open spaces. But as Dakar grew and swallowed Yoff, it became part of a large urban area with an international airport and a lot of automobiles.

As the town grew, many houses installed flush toilets connected to open pits where the sewage sat and bred disease. Other people, too poor to afford toilets, used open sandy areas. But with many people living close together, this quickly became a health problem.

A town development committee came together to solve the sanitation problem. They began by looking at the resources they had: strong community networks, skilled builders, and people committed to keeping village life. They also had some new ideas about **ecological sanitation**.

In the village, houses were grouped around open common areas where people could gather and talk. After talking to many villagers, the committee made a plan to use this open area for a sanitation system that would make the area more attractive, rather than uglier. Instead of promoting household toilets and underground sewage tanks, they would promote community ecological sanitation.

The committee worked with residents to build urine-diverting dry toilets. Each set of toilets would be shared by the whole compound. The urine would run through pipes into beds of reeds. The feces, after being dried out, would be used to fertilize trees. All of this would help to keep the village green. Local masons and builders were hired to construct the toilets and to maintain the common areas.

This urban sanitation project not only prevented health problems, it helped to preserve the way the people of Yoff wanted to live.

The Problem of Sewage

Sewage systems use water to carry waste away in pipes. They can improve community health, especially in crowded urban areas. But to prevent health problems, sewage must be treated to make the water safe to return into waterways and for reuse.

Sewage treatment is costly, and more often than not, sewage is dumped without being treated. This spreads waste and all the germs, worms, and toxic chemicals it may contain, causing health problems such as hepatitis, cholera, and typhoid in places where sewage is dumped.

Even with costly sewage treatment, using water to carry away waste is often not sustainable and can lead to problems such as:

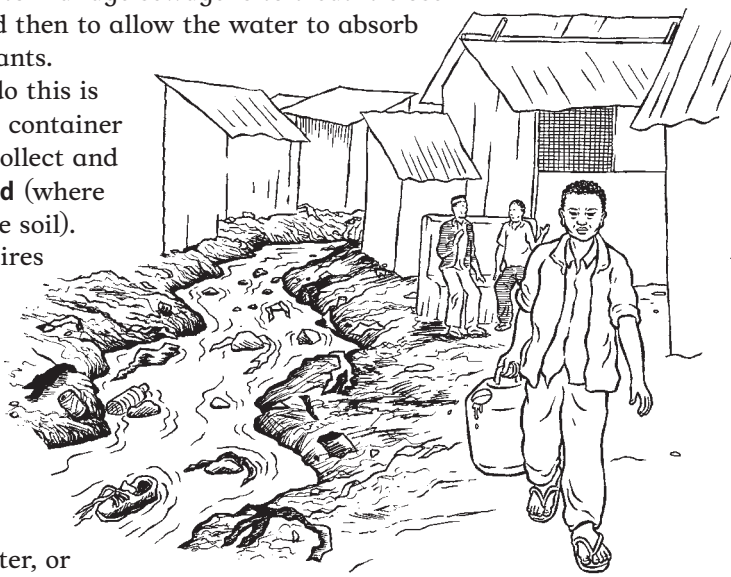
- contamination of drinking water sources downstream.
- contamination of land where people live and farm.
- loss of nutrient resources (fertilizer) for farming.
- contamination of water sources used for drinking, bathing, and farming.
- bad smells.

Sewage systems also cause health problems when different kinds of waste are mixed together, such as when factories dump toxic chemicals into sewers. This contamination makes the treatment and safe reuse of wastewater very difficult.

The safest low cost way to manage sewage is to treat it close to where it is produced, and then to allow the water to absorb into the soil and nourish plants.

The most common way to do this is to use a **septic tank** (a large container underground where solids collect and decompose) and a **leach field** (where liquid flows out and into the soil). This method, however, requires technical planning beyond the scope of this guide. (For more information, see Resources.)

Sewage systems use a lot of water to do a job that can often be done with very little or no water. Communities with little water, or that cannot afford a sewage system, will benefit from other types of toilets.



The people most affected by untreated sewage are those who live where it is dumped.

People build their own sewers

Orangi Township is a settlement of 900,000 people in Karachi, Pakistan. For many years, Orangi had no safe water or sanitation services. Sewage and wastewater ran in open ditches, breeding flies and mosquitoes, and causing illness. In 1980, Dr. Akhtar Hameed Khan began the Orangi Pilot Project, or OPP, to help people identify their health problems and come up with solutions.

Orangi residents decided an underground sewage system would most improve their lives. At first they expected the government to build it, but Dr. Khan knew that the Karachi government would not give them money to build a sewage system. After much discussion, the people of Orangi decided that even though they had no money, they could build the sewers themselves.

The first step was to develop community organizations. Each lane consisting of 20 to 30 houses was organized to build a sewer and applied to the OPP for assistance. The OPP surveyed the lane and prepared plans. The lane organization then collected money from the people to build their sewer.

At first, many people did not know how to mix concrete or to dig sewer pits that were flat and level, so some of the work was not done well. After 2 years, many faulty sewers had been built and others were still not built. The OPP organizers realized they had not trained people well enough, so more training sessions were held. This time, women and children were included. The work improved, and design changes were made to better serve the community, reduce costs, and finish the system more quickly.

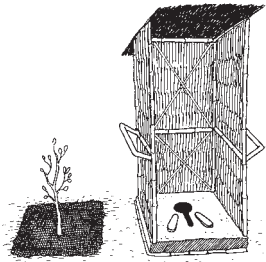


After a few years, every lane had sewers to take waste away from people's homes. Health conditions improved and Orangi became a more pleasant place to live. But there was still a problem. The people of Orangi could build sewers, but they needed government support and money to build a sewage treatment plant. The government would not give the money. Many years later, the government found and funded a lower cost solution. They connected the sewers to a filter system that cleaned the sewage as it moved downstream. By working together to build their own sewers, the community took an important first step. The OPP helped the government and many experts to see that community health could be greatly improved by building a local sewage system to fit both the needs and the abilities of the community.

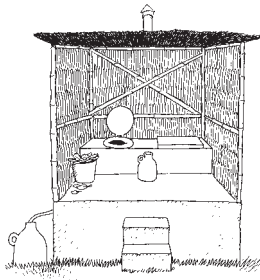
Toilet Choices

No kind of toilet is right for every community or household, so it is important to understand the benefits of each toilet. Toilets connected to sewer systems are complicated to build, so this book describes only toilets that use little or no water. (The activity on page 138 can help decide which toilet may be best for your community's needs.)

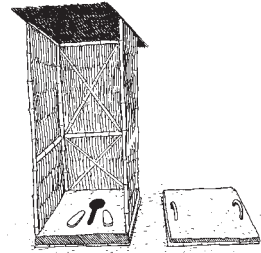
Toilets that use little or no water



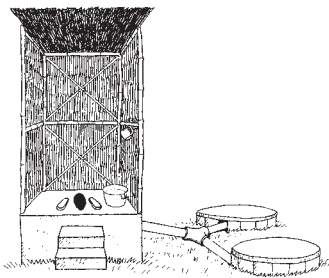
Simple compost toilet for tree planting
Best in places where people wish to plant trees and can manage a movable toilet (see page 126).



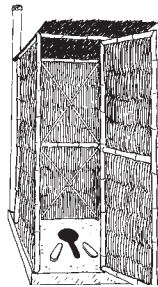
Urine diverting dry toilet
Best in places where people will use treated human waste as fertilizer, and where the groundwater is high or there is risk of flooding (see page 129).



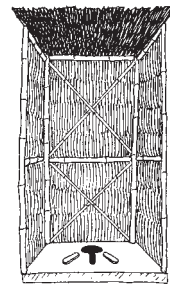
2 pit compost toilet
Best in places where people will use treated human waste as fertilizer (see page 128).



Pour flush toilet
Best in places with deep groundwater and where people use water for anal washing (see page 136).



Ventilated improved pit (VIP) toilet
Best in places with deep groundwater and no risk of flooding (see page 123).



Closed pit toilet
Best in places with deep groundwater and no risk of flooding (see page 120).

Note: These drawings show toilets with no doors and no covers over the toilet hole, so you can see what they look like inside. All toilets should have doors, and toilet holes should be covered when not in use. Also, toilets should be made so that everyone in the community can use them (see page 111).

Where to build a toilet

When deciding where to build a toilet, make sure you will not pollute wells or groundwater. The risk of groundwater pollution depends on local conditions such as the type of soil, the amount of moisture in the area, and the depth of the groundwater.

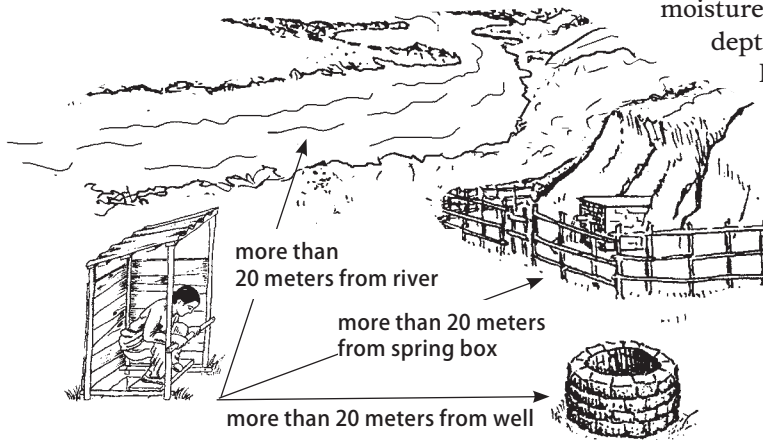
But some general rules can make sure conditions are safe.

The bottom of the pit (if it is a pit toilet) or the chamber (if it is a dry or compost toilet) should be at least 2½ meters above the groundwater. If you dig a pit for a toilet and the soil is very wet, or if the pit fills

with water, this is a bad place to put a toilet. Keep in mind that water levels are much higher in the wet season than in the dry season. Do not build pit toilets on ground that gets flooded.

When there is a risk of groundwater pollution from pit toilets, consider building an above ground toilet (such as the dry toilet on page 129).

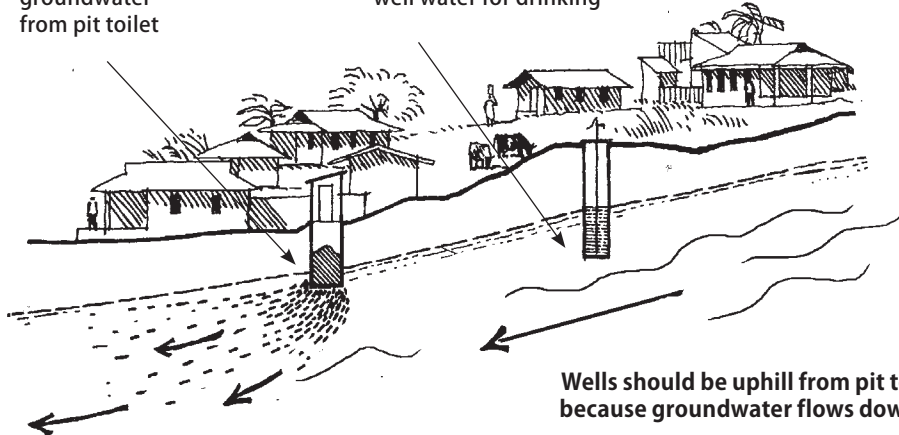
Groundwater flows downhill. So, if there is no choice but to build a toilet in a place where there is a risk of groundwater pollution, place the toilet downhill from nearby wells.



A toilet should be at least 20 meters from water sources.

waste entering
groundwater
from pit toilet

well water for drinking



Wells should be uphill from pit toilets because groundwater flows downhill.

Closed pit toilets

A closed pit toilet has a platform with a hole in it and a lid to cover the hole when it is not in use. The platform can be made of wood, concrete, or logs covered with earth. Concrete platforms keep water out and last many years. A closed pit toilet should also have a lining or concrete ring beam to prevent the platform or the pit itself from collapsing. (To make a concrete platform and ring beam, see pages 121 and 122.)

The ventilated improved pit (VIP) toilet shown on page 123 uses a vent pipe to reduce smells and flies.

A problem with pit toilets is that once the pit is full, the toilet can no longer be used. To take advantage of the waste in full pits, plant a tree on the site. To do this, remove the platform, ring beam, and shelter, and cover the waste with 30 centimeters (2 handwidths) of soil mixed with dry plant matter. Allow several months for the waste to settle, fill it with more soil, and plant a tree.

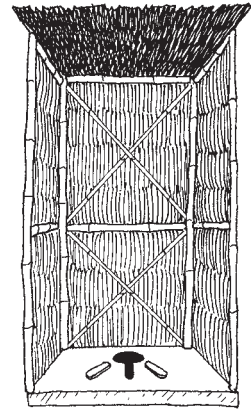
Another option is to add soil frequently while the toilet is in use and let it sit for 2 years to allow the waste to decompose. Then dig it out, use the waste as fertilizer, and use the pit again. Always wash hands after handling and digging the soil around toilets.

To make a closed pit toilet

1. Dig a hole less than 1 meter across and at least 2 meters deep.
2. Line the top of the pit with stones, brick, concrete or other material that will support a platform and prevent the pit from collapsing.

A concrete ring beam works well (see page 122).

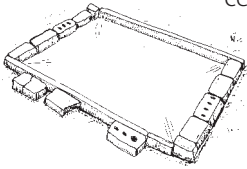
3. Make a platform and a shelter to put over the pit. A concrete platform works best, but local materials like logs or bamboo and mud can work too. If you make a platform from logs, use wood that does not rot easily.



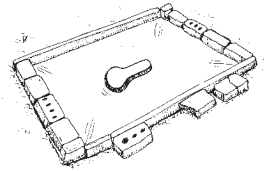
How to make a concrete toilet platform

A well made concrete platform will last many years. One 50 kilo bag of cement will make 4 platforms, or 2 platforms and 2 ring beams (see next page). You will also need reinforcing wires, bricks, and boards to form the mold, and wood cut to the shape of a keyhole to mold the hole. Platforms can be square or round.

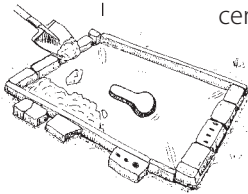
- 1** Lay down a plastic sheet or used cement bags on flat ground. On top of this, make a mold of bricks or boards about 120 cm long, 90 cm wide and 6 cm deep.



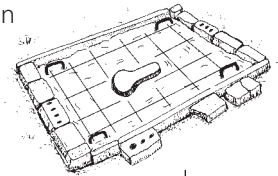
- 2** Place a wooden keyhole mold in the center, to shape the toilet hole. You can also use bricks to block out the hole, and shape the hole after you pour the concrete.



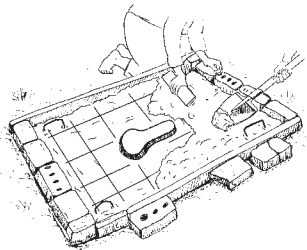
- 3** Make a concrete mix of 1 part cement, 2 parts gravel, 3 parts sand, and enough water so that it is wet but holds together well. Pour the concrete into the mold until it is halfway to the top.



- 4** Place reinforcing wires 3 mm thick on top of the wet concrete. Use 4 to 6 wires going in each direction. Make handles of wire 8 to 10 mm thick, and set them in the concrete near the corners.



- 5** Pour the rest of the concrete, and level it with a block of wood.



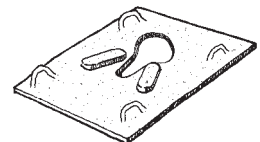
- 6** Remove the keyhole mold when the concrete begins to harden (after 3 hours). If you used a brick mold, remove the bricks and form the hole into a keyhole shape. Cover the slab with wet sacks, damp cloth or a plastic sheet overnight. Wet it several times a day to keep it damp for 7 days. Keeping it wet lets the concrete harden slowly and become strong.

- 7** When the concrete has hardened, place the platform over the pit. To make the pit more secure, also use a ring beam.

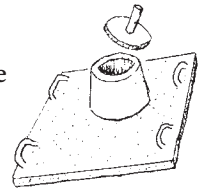
- 8** Make a cover for the hole out of concrete or wood. It can have a handle, or make it to be moved by foot to keep germs off the hands.

Platform improvements

Because germs and worms can collect near the hole, foot rests will reduce the risk of health problems. If people prefer to sit, make a round hole and a concrete seat (see next page).



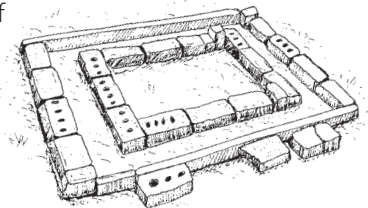
To make a mold for a seat, use 2 buckets of different sizes, one inside the other. There must be several inches between the sides of the inner bucket and the outer bucket. Weight the inner bucket with rocks so it stays on the bottom. Pour concrete into the space between buckets.



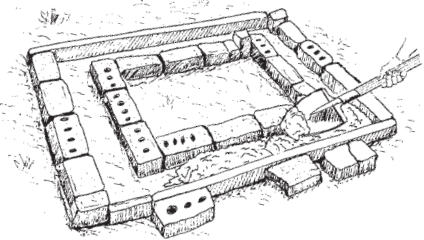
How to make a concrete ring beam

A ring beam is a square or round piece of cast concrete with an open center that supports the toilet platform and shelter, and keeps the pit walls from collapsing. The ring beam described here can be used along with the platform on page 121 for all pit toilets. The size of the ring beam you make depends on the width of the pit.

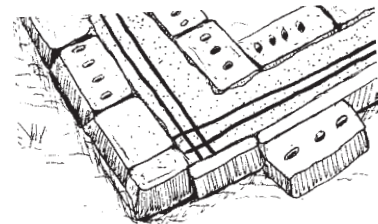
- 1 Lay down a plastic sheet or cement bags on level ground.
- 2 Make a mold of bricks, wooden boards, or both. For a platform that is 120 cm by 90 cm, the ring beam will be 130 cm by 1 m on the outside, and 1 m by 70 cm on the inside.
- 3 Make a concrete mix of 1 part cement, 2 parts gravel, 3 parts sand, and enough water so that it is wet but holds together well. Pour the concrete into the mold until it is halfway to the top.
- 4 Place 2 pieces of reinforcing wire 3 mm thick on top of the wet concrete on each side of the ring beam. If you want, you can make handles of wire 8 to 10 mm thick, and set them in the concrete near the corners.
- 5 Pour the rest of the concrete, and smooth it with a block of wood.
- 6 Cover the concrete with wet cement sacks, wet cloth, or a plastic sheet, and leave it overnight. Wet it several times a day to keep it damp for 7 days.
- 7 When the ring beam is solid, carry it to the site of the toilet. Level the ground, place the ring beam, and dig a pit inside of it. Pack soil around the outside of the ring beam to set it in place.
- 8 Place the toilet platform on top, then build a shelter.



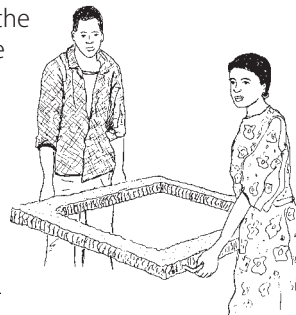
A mold for the ring beam



Pouring the concrete



Reinforcing wire

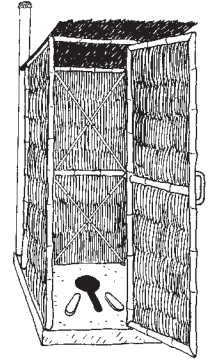


Ventilated improved pit toilets (VIP)

The VIP toilet is an enclosed pit toilet that reduces smells and flies.

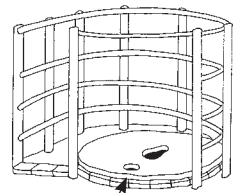
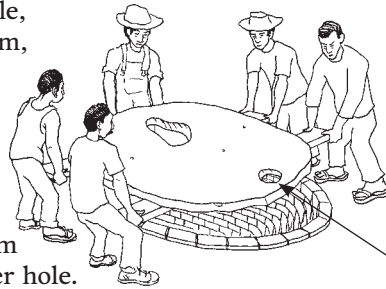
How the VIP works

Wind blows across the top of the vent pipe and carries away smells. The shelter keeps the toilet dark so the flies in the pit will go toward the light at the top of the pipe, get trapped by a wire screen, and die.



To make the VIP toilet

1. Dig the pit 2 m deep and 1½ m wide. Line the top with bricks or a concrete ring beam sized to fit the pit (see page 122). If the shelter will be very heavy (brick, concrete, or heavy wood), line the whole pit, except the bottom. Leave gaps in the brickwork to let liquids out.
2. Make a platform (see page 121) 1½ m by 1 m, with 2 holes in it. The second hole, near an edge of the platform, is for the vent pipe. Make the vent pipe hole no less than 11 cm wide.
3. Build a shelter over the pit and platform.
4. Fit a vent pipe at least 11 cm wide tightly into the smaller hole. Paint the vent pipe black to absorb heat and improve ventilation. Cover the top of the vent pipe with a mosquito screen (aluminum or stainless steel will last longest). Make the vent pipe rise at least 50 cm above the roof so the wind can pull out bad smells.



Make the vent pipe hole the same size around as the vent pipe.

To use and maintain a VIP toilet

- Keep the hole covered when not in use.
- Keep the shelter dark inside.
- Keep the toilet clean and wash the platform often.



If the wire screen breaks or comes off the pipe, replace it at once.

If the vent pipe gets blocked by spiderwebs, pour water down it.

VIP toilets can have these problems :

If the shelter is not dark enough, or if the hole is left uncovered, flies will not fly up into the pipe. And if the shelter has no roof, or if the screen breaks or comes off the vent pipe, there is little fly control.



Ecological Toilets

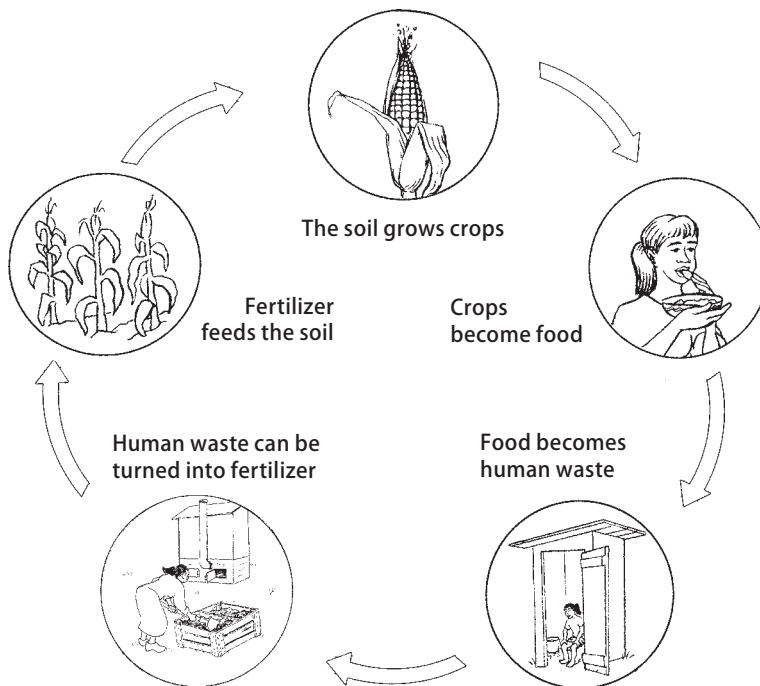
Ecological toilets turn feces and urine into soil conditioner and fertilizer. This improves people's health and the environment by preventing the spread of germs and turning harmful waste into a valuable resource.

Ecological toilets also protect and conserve water because no water is needed for their use, except for washing. They are safer for groundwater than other toilets because they sit above ground or use shallow pits.

Ecological toilets can be built and used in cities, towns, or villages. They need more maintenance than pit toilets (but not as much as pour-flush toilets), so it is important for people to understand how they work.

Turning waste into fertilizer

Rich, healthy soil needs **organic matter** (what is left when plants and other living things die and decompose). This natural process of organic matter breaking down into soil is called **composting** (see page 287).



Ecological sanitation turns waste into a resource.

Farmers make compost from food scraps and animal manure and add it to the soil. This keeps the soil full of **nutrients** for growing crops. Just as people need nutrients from food to grow strong and healthy, plants need nutrients in soil to grow strong and bear fruit.

Fertilizer can also be made from human waste. Human waste contains nutrients that can be used to improve soil. But it also carries germs that cause disease. For this reason, making fertilizer from human waste takes more care than composting animal manure and food scraps.

Feces should never be used fresh. But once made into fertilizer, feces safely help grow food, trees, and other crops without chemical fertilizers.

Urine carries fewer germs than feces and has more nutrients than feces. This makes it safer to handle and very valuable as fertilizer. But urine is too strong to use directly on plants, and also needs special treatment first (see page 134).

Compost toilets and urine diverting dry toilets

There are 2 main types of ecological toilets: ‘compost toilets’ and ‘urine-diverting’ or ‘dry’ toilets. Both of these can create safe fertilizer. Many people call both of these toilets ‘compost toilets.’ But there are some important differences.

In compost toilets:

- Feces and urine go into a container, like a shallow pit or a large concrete box that will not leak into the groundwater.
- The user adds a mix of dry matter such as straw, leaves, sawdust, soil and ash after each use. This reduces smells and helps the waste break down and become compost.
- Time will kill most germs, including roundworm eggs (the hardest to kill).
- After the mix has had a long time to kill germs in the feces (usually 1 year), the dry matter is removed for use as fertilizer.

In dry toilets:

- Urine is kept separate from feces (see page 129). It is collected, processed, and used as fertilizer.
- Feces go into a container, like a large concrete box or a hard plastic movable container that will not leak into groundwater.
- The user adds soil mixed with dry plant matter and ash to the feces after each use. This reduces smells and helps the waste dry out.
- The feces never get mixed with water. A dry mix will kill most germs, including roundworm eggs.
- The feces are stored for up to 1 year, until it has the texture of dry soil.

For both of these toilets, the aged feces mixture is ready after a year to be mixed into a compost pile, emptied into a shallow pit for planting a tree, or added directly into the soil for planting.

Dry toilets help local economy

In several towns in Morelos, Mexico, many people use ecological dry toilets. One neighborhood called La Cienega has a special need for dry toilets because it is in a wet, lowland area where pit toilets get flooded. To solve the problem, members of the community bought a special kind of toilet bowl that separates urine from feces. These toilet bowls are built locally in small workshops with several local workers. The workers train community groups how to use these new toilet bowls.



Many people in La Cienega make a living by growing and selling fruit trees and other plants. The first people in the neighborhood to use dry toilets discovered they could use the urine and compost from their toilets as fertilizer for the trees. When their neighbors saw the trees grow big and healthy, they too wanted to try these new toilets that give free fertilizer.

Now, almost everyone in La Cienega uses these toilets. The local workshop is busy making them, and the community has grown both healthier and wealthier.

Simple compost toilet for tree planting

This toilet makes fertilizer for planting trees. It is simple to build, and is made so the shelter can be moved when the pit is full.

This toilet is best where there is space and a desire to plant trees. It is also good for places with high groundwater, because the pit is shallow. Covering the toilet pit with soil and planting a tree there helps to decompose the waste.

This is a great way to start an orchard of fruit trees or other useful trees. If you do not plan to plant trees, use a different type of toilet.

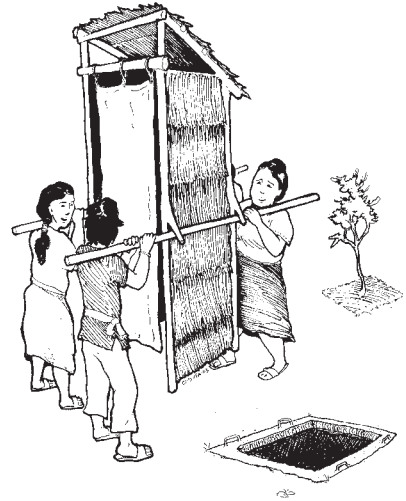


Build a simple toilet for tree planting

Level the ground and place a concrete ring beam (see page 122) where you want the toilet. Inside the ring beam, dig a pit 1 meter deep. Secure the ring beam in place. Make a platform to put over the pit and ring beam. Build a light shelter for privacy that will be easy to move.

To use and maintain this toilet

- Before using, put dry leaves or straw in the pit. This will help feces decompose.
- Add a handful of soil mixed with ashes or dry leaves after every use.
- When the pile gets too high, stir it down with a stick.
- Sweep and wash the platform often. Be careful not to get much water in the pit.
- When the hole is nearly full, remove the shelter, platform, and ring beam.
- Fill the hole with 15 cm of soil mixed with plant matter. After several weeks, the waste will settle. Add more soil and plant matter, water, and plant a tree. Fruit trees grow well and bear safe and abundant fruit.
- Move the shelter, platform, and ring beam to another place, dig another hole, and do it again.

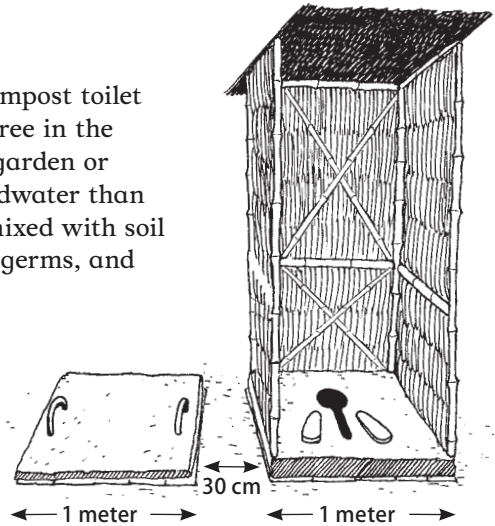


2 pit compost toilet

The 2 pit compost toilet is like the simple compost toilet for tree planting, but instead of planting a tree in the pit, the compost is dug out and used in the garden or fields. This toilet tends to be safer for groundwater than traditional pit toilets because the waste is mixed with soil in a shallow pit, allowed to dry out and kill germs, and then removed.

To build a 2 pit compost toilet

Dig 2 pits 1 to 1 1/2 m deep, 1 m wide, and 30 cm apart. Add a lining or ring beam to both pits (see page 122). Place a platform and a simple shelter over one pit, and a concrete or wood cover over the second pit. Use the first

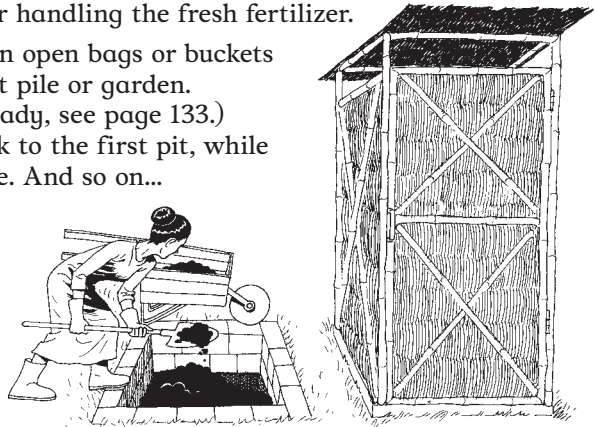


pit until it is nearly full. A family of 6 will fill the pit in about 1 year.

1. When the first pit is almost full, fill it with 30 cm of soil and cover it with a board or concrete slab. Move the platform and shelter to the second pit. Use it until it is nearly full.
2. Leave the first pit alone. Or, after it has settled for 2 months, add more soil and plant a seasonal vegetable like tomatoes right in the pit. Because the waste in the pit is still being processed, it is best to avoid crops that grow under the ground, such as carrots and potatoes.
3. When the second pit is full, empty the first pit with a shovel. Wear gloves, and wash hands after handling the fresh fertilizer.
4. Store the dry matter from the pit in open bags or buckets for later use, or add it to a compost pile or garden. (To know when the contents are ready, see page 133.) Move the platform and shelter back to the first pit, while the contents of the second pit settle. And so on...

To maintain a 2 pit compost toilet

- Keep a bucket of soil mixed with dry plant matter in the shelter. After each use, throw a handful in the pit.
- When the contents of the pit get too high, stir it down with a stick.
- Sweep and wash the platform often. Be careful not to get much water in the pit.



After 1 year, the contents of the 2 pit compost toilet should be safe to mix into garden soil as fertilizer. But it is still best to wear gloves and shoes when handling it.

Urine diverting dry toilets

Dry toilets do not use pits. They are built above ground so it is easier to remove the contents. They also have a toilet bowl with separate compartments that keep urine and feces separate. This helps the contents of the toilet stay dry, which kills germs and reduces smells. This also allows the urine to be used as fertilizer. Because they are built above ground and lined on the bottom, well built dry toilets do not contaminate groundwater.

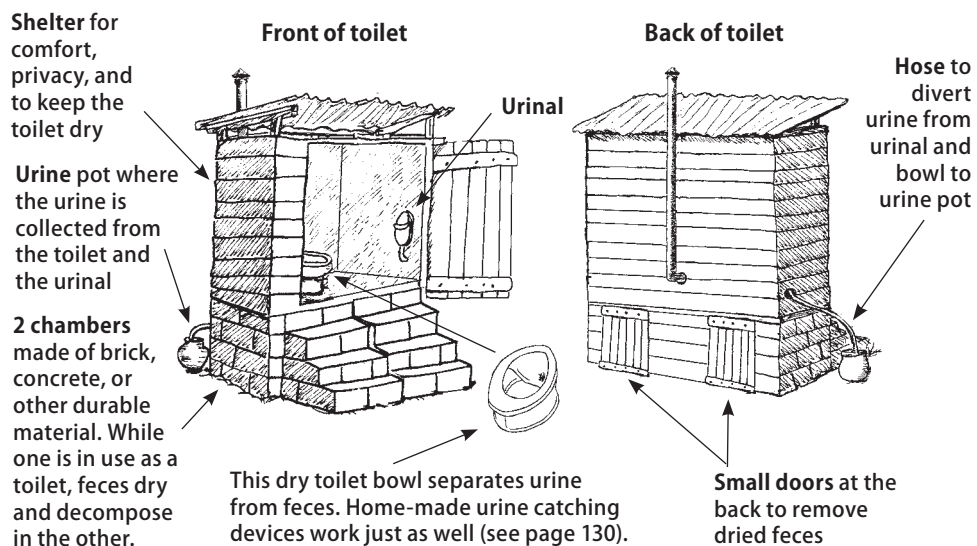
Dry toilets are more costly to build than pit toilets. Their safe use requires training, because they are used differently than pit toilets and flush toilets. And it takes some work to keep them well maintained. But they are very good for people who want to produce fertilizer from their wastes. They are also a good choice in places where:

- The groundwater is too high for pit toilets.
- Flooding is common.
- The ground is too hard to dig.
- People want a permanent toilet in or near their house.

2 chamber dry toilets

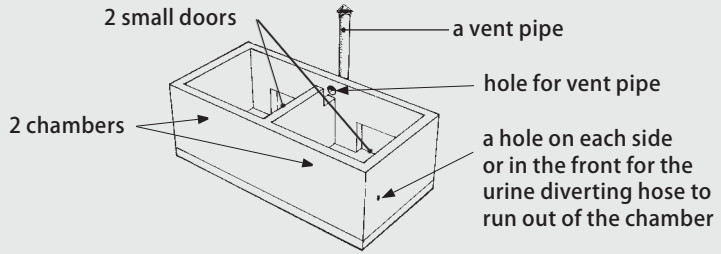
This dry toilet has 2 chambers where feces break down into safe fertilizer. One side is used as the toilet while the feces on the other side dry and break down. A special toilet bowl that works for both men and women separates urine from feces. The urine drains through a tube into a container outside of the toilet. After about a year, the dried feces are removed and added to a compost pile or used on fields or gardens. The collected urine can be mixed with water and used as fertilizer (see page 134).

Parts of the 2 chamber dry toilet

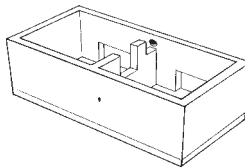


3 ways to build a dry toilet

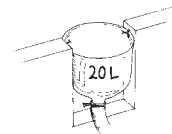
All 3 have a base made of concrete, brick, or any other waterproof material with these parts:



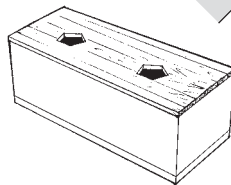
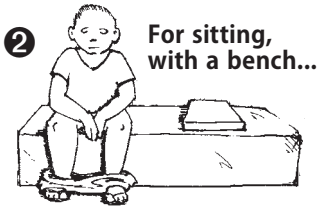
TYPES OF TOILETS



Leave a space in the dividing wall for a urine separating container to serve both chambers.



Cut the bottom off a 20 liter water bottle. Attach it, upside-down, to the space in the wall dividing both chambers. Attach a tube to the spout to divert urine, making sure there are no leaks between the jug and the tube. Put a fine mesh screen in the jug to keep feces and other things from falling in.



Cover the base with a level platform of wood or concrete with a hole over each chamber.



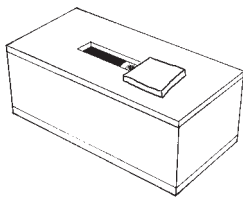
Cut the bottom and side from a plastic jug. Attach a tube to the spout to divert urine. Put a fine mesh screen in the jug to keep feces and other things from falling in.



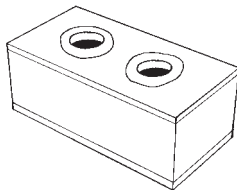
Urine diverting toilet bowls can be built or bought in some places. If they are available, they are very easy to install and use.

For all 3, build a shelter and steps. Attach doors in the back (concrete slabs held in place by lime mortar work well). Run the urine diverting tube out the hole in the toilet base to a container, a drainage pit, or into the garden to fertilize the soil.

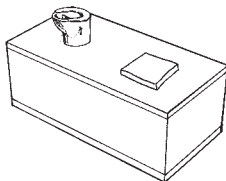
FINISHING THE BASE



Cut a long squatting hole in a platform, with the upside-down bottle in the center. Urine goes into the bottle and feces into the chambers below either end of the hole. Put a cover on half of the hole, over the chamber that is not in use.

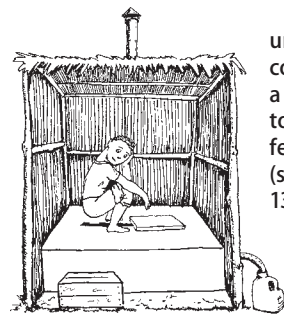


Attach a urine diverter to the front of each hole. Put toilet seats over the holes.

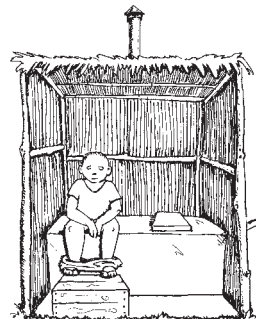


Put the urine diverting toilet bowl over one of the holes and cover the other hole until it is ready to use.

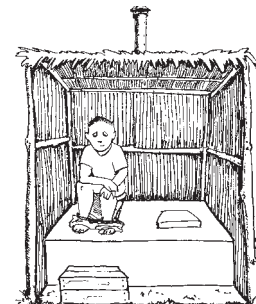
BUILDING A SHELTER



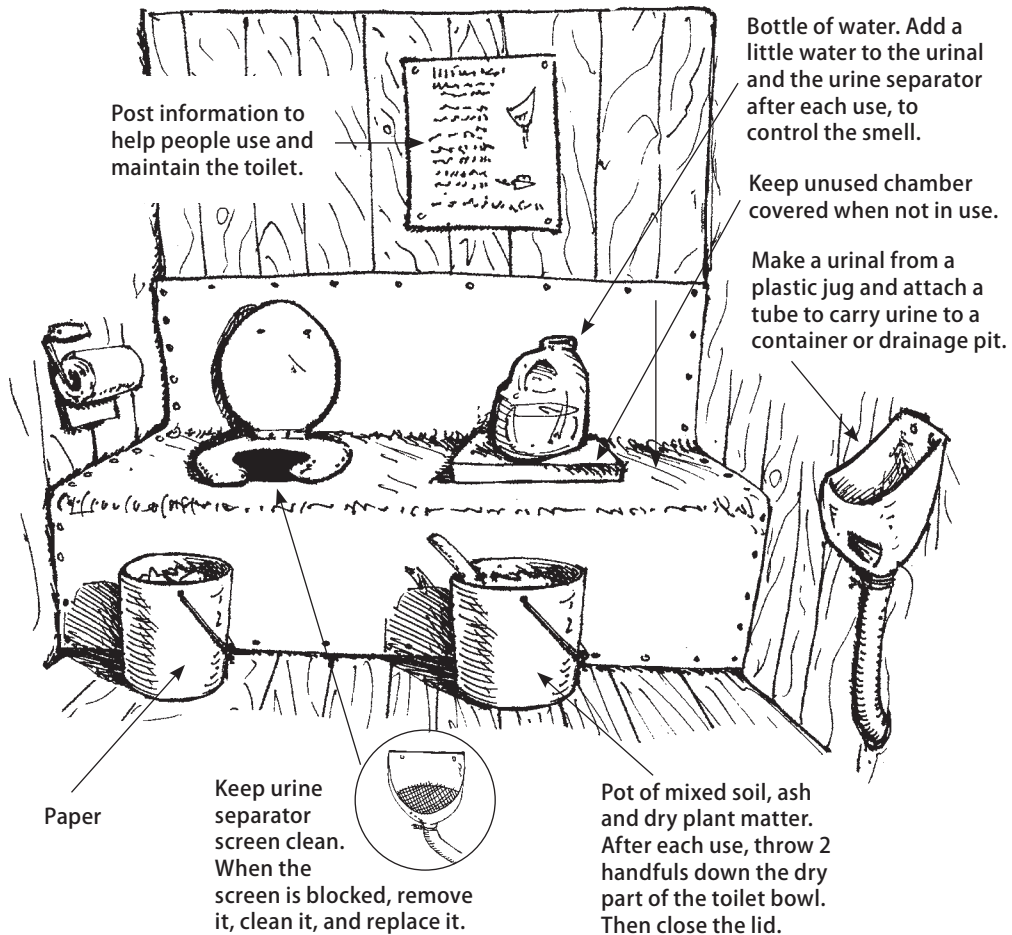
urine is collected in a container to use as fertilizer (see page 134)...



... or sent through a hose into a soakaway pit (see page 82)



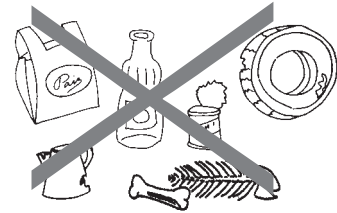
To use and maintain a 2 chamber dry toilet



- Make sure no water gets in the feces holding part of the toilet chamber.
- If the contents of the toilet get wet, add more dry matter.
- If the toilet smells bad, add more dry matter, and make sure the vent pipe is clear.
- If the pile of feces builds up too high, use a stick to push it down.
- When the urine pot is full, empty it and make fertilizer (see page 134).
- When one chamber is full, use the other chamber. Be sure to cover the chamber that is not being used.
- It is best to let the feces sit for a full year before emptying the chamber. After a year, or when the second chamber is full, empty the first chamber and repeat the process.

Do not put garbage in the toilet

For ecological toilets to work, they must be used only for human waste. Women having monthly bleeding may safely use ecological toilets. But sanitary pads and other products should not be put in the toilet.



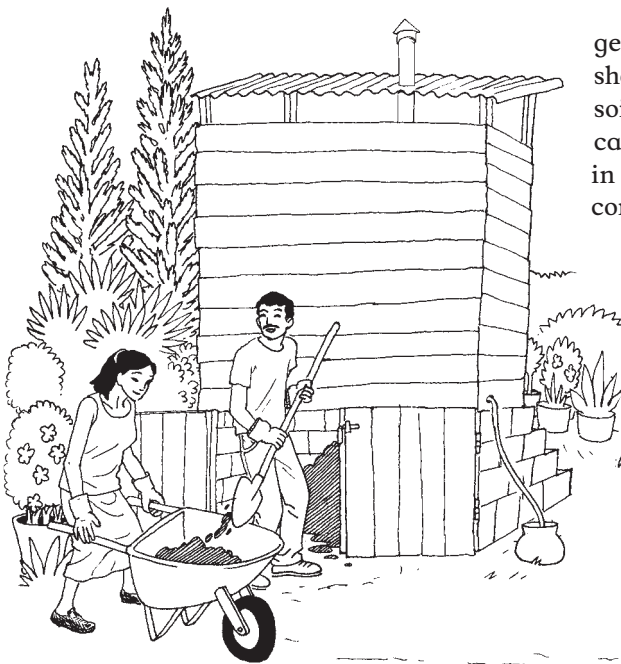
Do not put garbage in the toilet.

Ecological toilets cannot be used to dispose of things that will not break down, such as cans, bottles, plastic, tampons, or large amounts of paper. It is OK to use small amounts of paper, leaves, sawdust, and other plant matter because these things break down into soil.

When solid fertilizer is safe to use

The contents of a dry toilet are ready to remove when they are dry and have little or no smell. For this to happen, they should be kept dry inside the toilet chamber for 1 year.

When you think the contents are ready to remove, open the chamber. If the pile is wet, add dry plant matter or soil mixed with ash and let it sit for several more weeks. If the pile is dry and does not have a strong smell, it is ready. Remove it with a shovel.



Remove dry material for use as fertilizer.

After drying out for 1 year, most germs will be dead and the material should be safe to add directly to garden soil. But if there is any doubt, the waste can be stored in open bags or buckets in a dry, sunny area or added to a compost pile.



It is important to wear gloves and shoes when handling human waste, and to wash well after emptying the toilet.

Urine fertilizer

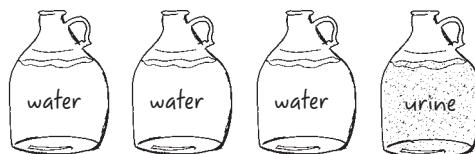
Some farmers use urine mixed with water as a fertilizer because urine carries valuable nutrients such as nitrogen and phosphorous that can help plants grow. Urine is much safer to handle than feces. However, the same nutrients that make it a good fertilizer can pollute water sources. Also, urine can carry blood flukes (see page 56). Because of this, it is important not to put urine into water sources, or near where people drink or bathe.

To make simple urine fertilizer

Store urine for a few days in a closed container. This will kill any germs the urine contains, and will also prevent nutrients from escaping into the air.

To make fertilizer, mix 3 containers of water for every 1 of urine. You can fertilize plants with watered down urine as often as 3 times a week.

Plants fertilized with urine can grow as well as plants grown with chemical fertilizers, and need less water. Plants that have leaves you can eat, like spinach or other dark green leafy vegetables, grow best. Always wash your hands after handling urine.



3 jugs of water plus 1 jug of urine = safe fertilizer

To make fermented urine fertilizer

Adding compost to urine, and letting this mixture rot and turn sour (ferment), can create new soil for planting.

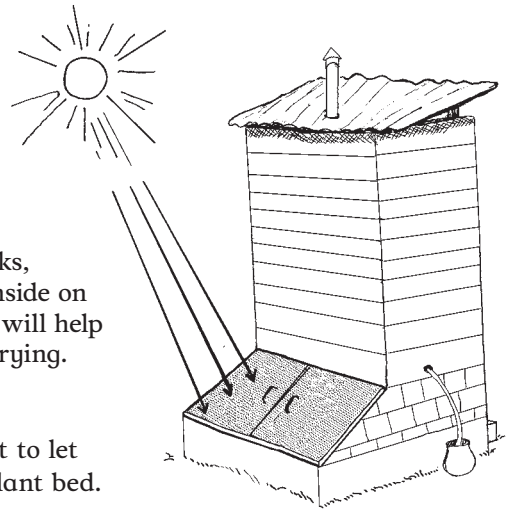
1. Collect urine from dry toilets. For each liter of urine, add 1 tablespoon of rich soil or compost.
2. Let the mix sit uncovered for 4 weeks. This will smell bad, so do it in a place away from people. The urine mixture will ferment and turn brown.
3. Fill a large container with dry leaves, straw, or other dry plant matter. Line the container with thick plastic to prevent water leakage through the hole in the bottom.
4. Add fermented urine. The best mix is 7 parts plant matter to 1 part urine (about 3 liters of urine for every 30 cubic centimeters of plant matter).
5. Cover with a thin layer of soil (no more than 10 cm). Plant seeds or seedlings.
6. Water every 2 days with a mix of 1 part urine to 10 parts water. (This is a weaker mix than we suggest above, because it will be used in closed containers rather than in open gardens or fields.) The dry plant matter will turn to rich soil in 10 to 12 months.

The new soil can be used for planting.

Improved and adapted dry toilets

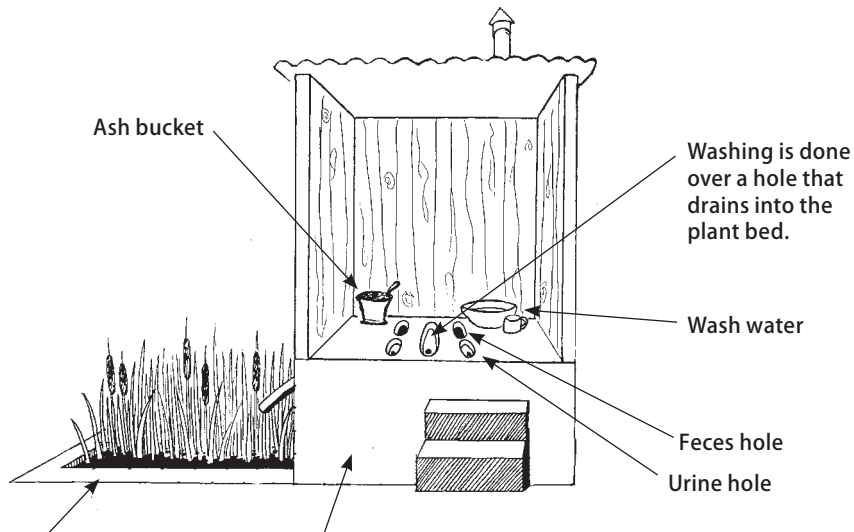
The toilets in this book are only some of the choices for ecological sanitation. They can be improved and adapted to meet the needs of different communities. Some things that will make a dry toilet work better are:

- **Heat from the sun** will help the waste decompose. Build the toilet so the chamber doors face the sun, and paint the door panels black. This will make the chambers heat up, improve air flow, and kill germs faster.
- **More air flow** will also help the waste decompose. Laying bamboo, corn stalks, branches, or other dry plant matter inside on the bottom of the chamber before use will help air flow through the feces for faster drying.



A wash toilet with plant bed

People in India have adapted the dry toilet to let both urine and wash water drain into a plant bed.



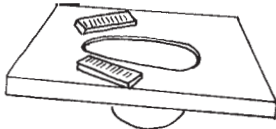
The plant bed where the wash water and urine go is filled with sand and gravel and planted with reeds or other local, non-edible plants. When the plants grow too big, they are cut back and thrown into the toilet.

The chambers under the toilet are lined with straw before use, to absorb moisture and make a good bed for the compost. Every time it is used, 1 or 2 handfuls of soil or ash are thrown in. Every now and then, some dry plant matter is added to help the material dry and decompose. After one year of use, the first chamber is opened and the material is put in a compost pile or into the soil for planting.

Pour Flush Pit Toilets



water seal trap



water seal trap set in concrete platform

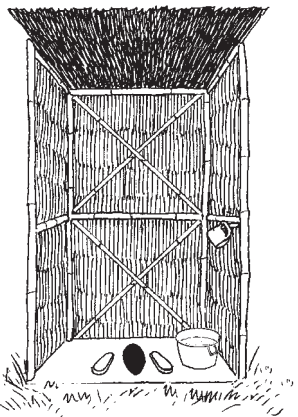
Pour flush toilets use water to flush waste into a pit. These toilets are common in both urban and rural areas where water is used to clean the anus after defecating. They are not much more costly than pit toilets. Because well built pour flush toilets prevent smells, they can be built in or near the home.

Pour flush toilets use a plastic, fiberglass, or cement bowl or squatting pan set into a concrete platform. The bowl or pan often has a 'water seal trap' that prevents smells and insect breeding in the wet pits. The concrete platform is placed directly over a pit. Or it can be connected by pipe to 1 or 2 pits.

How to use a pour flush toilet

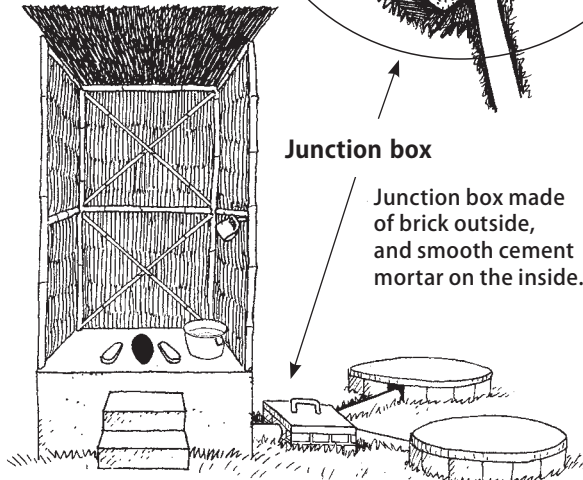
When there is 1 pit, the toilet is used until full, and then it must be emptied before it can continue to be used. When there are 2 pits, there is a junction box that directs waste towards the pit in use. The first pit is used until near full. Then waste is diverted into the second pit.

1 pit pour flush toilet

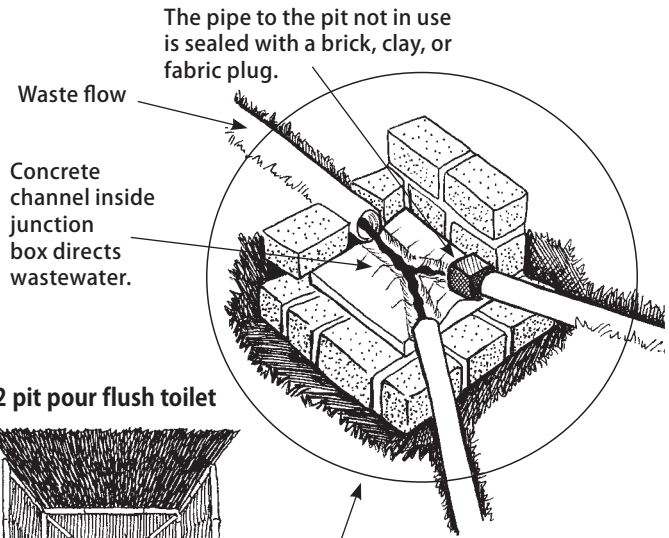


One lined pit underground, 2 meters deep. A family of 5 will fill this pit in about 5 years time.

2 pit pour flush toilet



Above ground chamber allows wastewater to flow down to pits. With regular care, this toilet will last many, many years.

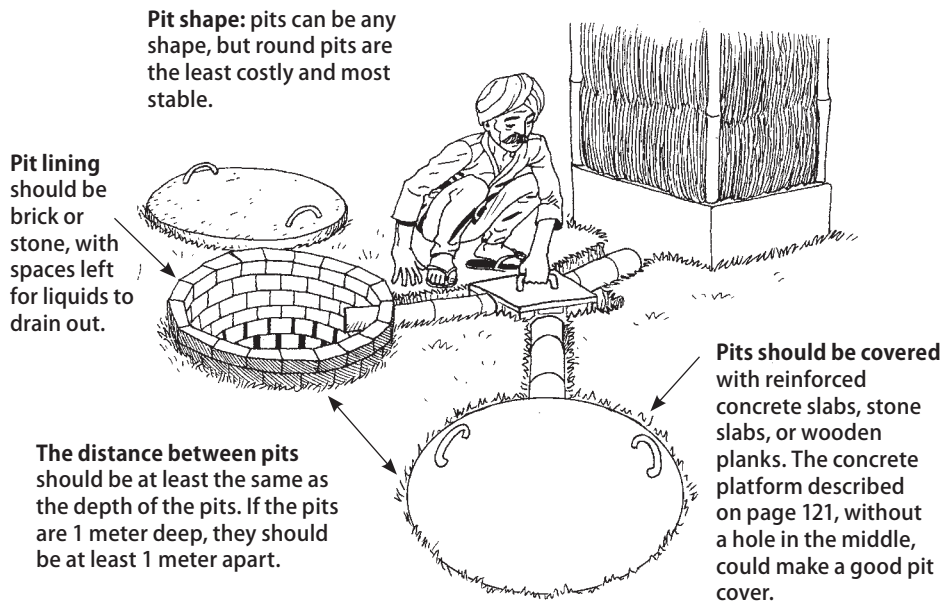


Junction box

Junction box made of brick outside, and smooth cement mortar on the inside.

When building a 2 pit pour flush toilet

Depending on soil conditions and groundwater level, pour flush toilets should never be built less than 3 meters from wells. In wet soil conditions the toilets should be at least 20 meters from wells.



To maintain a pour flush toilet

Water must be poured in after every use. Pouring a little water in before using will also help keep the pan clean. Clean the toilet daily. To clean the squatting pan, use detergent powder and a long handled brush. The pits can overflow if:

- the water seal gets blocked. If this happens, the toilet will not work.
- the groundwater is less than 3 meters deep. When this is true, there is also a risk of groundwater contamination.

Emptying the pit

If the pits are built well and soil conditions and moisture are favorable, the waste will slowly and safely absorb into the surrounding soil, and the pits should not need emptying.

If waste does not decompose and absorb into the soil, the pit will need emptying. Remove the pit cover, add a layer of soil about 30 cm (2 handwidths) deep, and replace the cover. After 2 years, the contents can be removed with a shovel and used as fertilizer.

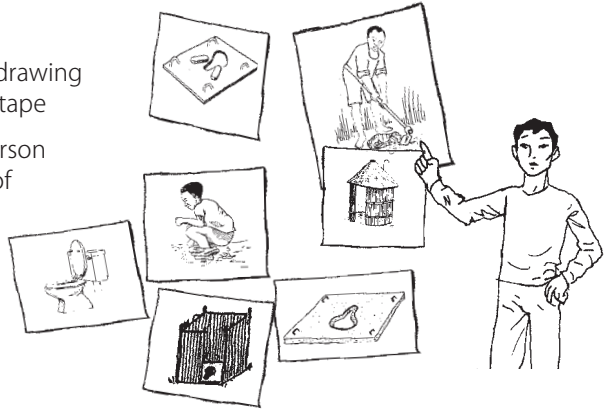
Choosing the right toilet

No toilet is right for all situations, and each sanitation method has room for improvement. This activity helps people think about what toilets are available and decide which one is best for them.

Time: 1 to 2 hours

Materials: small drawing paper, large drawing paper, colored pens or markers, sticky tape

- 1 Make groups of 5 or 6 people. Each person draws a picture of every toilet or way of disposing of human waste that they know. They should draw their own toilets, others they have seen, and even pictures of what people do where there is no toilet. The goal is to draw a range of toilets, from the most simple to the most modern.



- 2 When the pictures are ready, each group arranges their pictures in order, from what they think are the worst methods to the best. These are taped to large sheets of paper.
- 3 Each group shows its drawings and tells the reason for the order they chose. What makes one system better and another worse? Each group member also tells which toilet he or she uses at home, and which he or she would like to have.
- 4 After everyone has shown their drawings, the group talks about the differences between all the methods.

Ask questions such as:

- Does everyone agree about which toilet is the worst and which is the best?
- Is there one toilet that seems best to everyone? Is this because of health reasons, cost, or for some other reason?
- Are there some toilets that no one in the group uses? Why?

This can lead to a discussion of the reasons for people's choices.

- What health benefits are most important?
- What environmental benefits are most important?
- Would any of the improvements people want require changes in local conditions or how people think about sanitation? Are there simple things that can be done to improve what already exists?
- If the group includes both men and women, are their answers different?

5 Introduce other toilets that people may not know about. This may include small changes to their current toilets such as vent pipes, or a new type of toilet. (It may include all the methods in this book, and others you may know of.) The group discusses these new ideas.

To know what changes are **needed**, decide what health benefits and environmental benefits matter most.

To know what changes are **possible**, decide which sanitation systems people want and can afford.



6 Lead a discussion about the different methods, asking the group to think about the questions in the chart below. Each person shares his or her opinion about the benefits and shortcomings of each toilet, using numbers to show how strongly he or she feels. For example, 5 may mean the best and 0 may mean the worst. Mark each person's opinion on the chart and count to see which method is judged best.

	Health benefits?	Environmental benefits?	Cost?	Work to clean and maintain
No toilet	_____	_____	_____	_____
Closed pit toilet	_____	_____	_____	_____
VIP toilet	_____	_____	_____	_____
Compost toilet	_____	_____	_____	_____
Dry toilet	_____	_____	_____	_____
Pour flush toilet	_____	_____	_____	_____

7 The group makes new drawings based on the discussion of benefits and the new methods they have learned about. They tape the new and old drawings to large sheets of paper in order from worst to best. Finally, they compare the new order of the methods to the earlier order they had chosen.

- What differences are there?
- What ideas or information caused people to change their minds about what toilets are worst and best?

Based on this discussion, the group can decide what toilet or improvement is best for them.



Communication between men and women is an important part of choosing safe and healthy toilets.