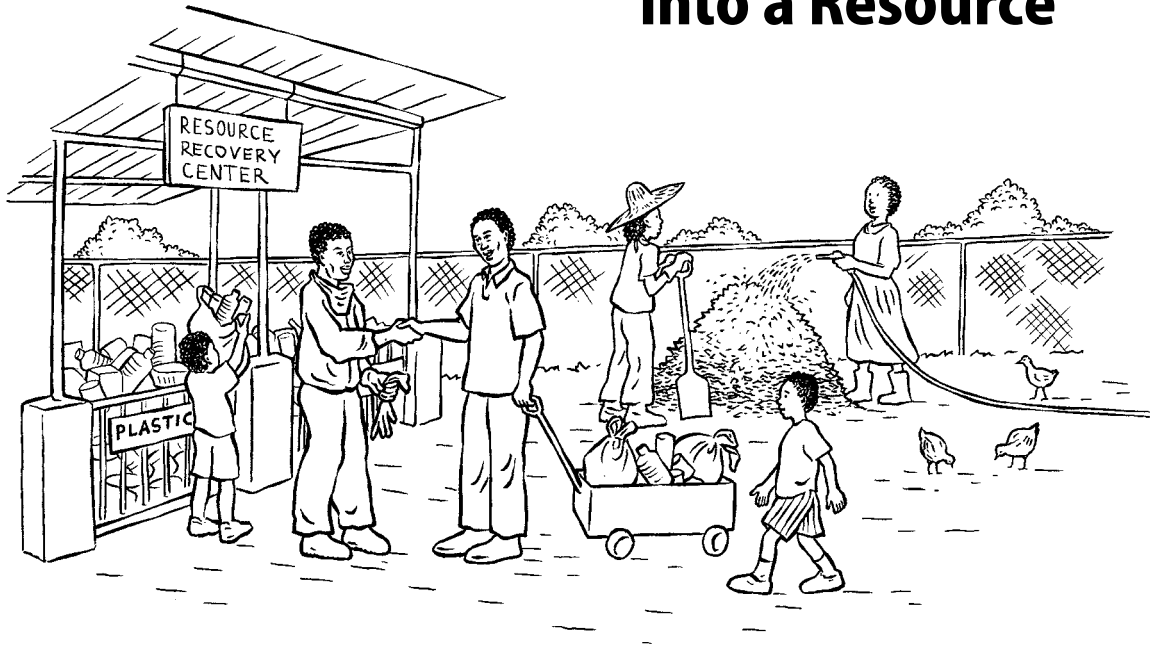


18 Solid Waste: Turning a Health Risk into a Resource

In this chapter:	page
Story: How Eseng gained better health and respect	388
Some waste does not go away	389
Poorly managed and mixed waste	390
Community clean-up and resource recovery	391
Activity: A community trash walk	391
Story: A community trades trash for cash	395
A community solid waste program	396
Reducing waste	396
Story: Banning plastic bags	397
Separate wastes at the source	398
Making compost: Changing organic waste to fertilizer	400
Story: Community composting and recycling	401
Reuse what you can	404
Recycling turns waste into a resource	404
Waste collection, transport, and storage	406
Starting a community resource recovery center	407
Story: Resource recovery centers	408
Getting rid of trash safely	409
Toxic wastes	410
Sanitary landfills	412
Getting to zero waste	416
Story: A town struggles with solid waste and wins	416
Waste and the law	417
Story: Philippines outlaws incineration and toughens waste laws	417

Solid Waste: Turning a Health Risk into a Resource



Solid waste is called trash, garbage, rubbish, and many other names. Solid waste does not have to cause health problems. It can even become a source of income and of resources for making new products. But when solid waste is not safely collected, separated, reused, recycled, or properly disposed of, it can be ugly, smelly, and cause serious health problems.

Many of us throw things away assuming that someone else will somehow take care of our trash. Too often, it is the poorest people who are forced to live in, on, and with the waste created by the rest of society. And it is the poorest people who usually do the work of collecting, sorting, cleaning, and recycling waste into usable resources (**resource recovery**). While everyone agrees this is important and necessary work to protect our health and environment, rarely are the people who do it paid well or treated with respect.

To manage waste so it does not harm people or the environment, we need to reduce the amount of waste we create and turn what we can back into useful materials and resources. Everyone, but especially industries and governments, must take responsibility for the wastes they create and for preventing waste in the first place.

How Eseng gained better health and respect

Every day, Eseng went around the city of Bandung, Indonesia, to collect trash. Because his house was far from the neighborhoods with the best trash, he spent almost all his time walking back and forth carrying heavy bags.

Each night, Eseng sorted the trash to sell to dealers the next morning. Some dealers bought glass, others bought scrap metal, and others bought paper. But the things no dealer would buy piled up around Eseng's house. His yard became a messy, dangerous garbage dump, but there was nowhere for Eseng to get rid of the trash. Sometimes he got infections that lasted for months and made it difficult to work. Now and again he got a bad fever and chills from malaria because mosquitoes bred in the tires in his yard. And, despite his hard work, the police often bothered him when they found him sorting through trash in front of shops or in the street.

Eseng and some other waste collectors decided to organize a center to help them sell what they collected, and to provide other benefits by sharing knowledge, tools, and information. They visited a local organization that worked for the environment and workers' rights, and together they came up with the idea to develop a more complete resource recovery program.

People from the environmental organization asked the city government to support the resource recovery program, and to make the police and shop owners treat the waste collectors better. The city government agreed, and a center was set up where Eseng and the others could sort the waste they collected. Each of the waste collectors was given a cart with wheels, making it easier to collect waste and bring it to the center for sorting or take it directly to junk dealers.

The resource recovery center provided gloves and boots to protect the workers from sharp objects and contaminated trash. When the people from the environmental organization learned that Eseng had malaria, they helped him get care and medicine at a health clinic.

Eseng still works hard collecting waste, but his health has improved and his house no longer looks like a garbage dump. The police and shop owners give him and the other waste collectors the respect they deserve for helping to keep the community clean. And the city is proud of the resource recovery center and their cleaner city.



Some Waste Does Not Go Away

Waste is a problem almost everywhere because we make so much of it. And, as we see all around us, waste made from plastics, glass, and metal does not go away.

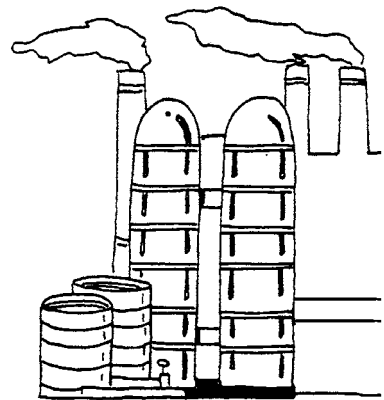
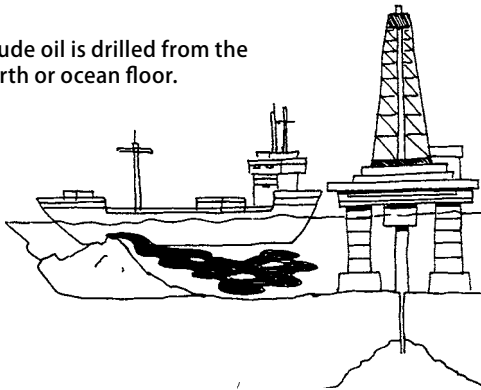
Food and other goods were once wrapped in natural or reusable materials, such as banana leaves or newspaper. Containers and other useful things were made from clay, wood, or other materials taken directly from the earth. When they were discarded, these materials did not become trash, because they quickly decayed and returned to the earth.

Now, with industry using materials such as plastics, metals, and chemicals, most manufactured products become trash when we are done using them. Everything from bottles, buckets, and bags, to cars and computers is made of materials that are strong and light, but that take a long time to decay. Packaging things in cans, bottles, and plastic bags makes them easy to transport and sell, but it also creates much more waste.

The life cycle of a plastic bag

People used to use baskets and cloth bags to carry things. Now we use plastic bags, making them one of the most commonly used plastic products. Millions of them are made and thrown away every year.

Crude oil is drilled from the earth or ocean floor.



Crude oil is refined and mixed with other chemicals to make plastic. Raw plastic is then made into many products, including plastic bags.



Plastic bags end up in roads, fields, and waste dumps. They clog waterways and drains, and choke animals to death. Burning them releases toxic gases. Buried, no one knows how long they take to break down completely.

Because oil was cheap and plastic is convenient, plastic bags are used all over the world. Often they are used for just a few minutes before they are thrown out.



Poorly Managed and Mixed Waste

When waste piles up or is scattered around our communities, it is ugly, smelly, unpleasant and bad for health. When wastes are not separated, the amount of waste and the problems it causes are bigger than they need to be. When harmful wastes, such as old batteries and health care wastes, are mixed with wastes like paper and food scraps, the mixture becomes even more difficult and dangerous to deal with.

When it is not properly disposed of, waste causes health problems.

- Open piles of trash breed rats, flies, mosquitoes, cockroaches, and other insects that carry diseases such as malaria, dengue fever, hepatitis, typhus, and others.
- Dump sites and trash heaps breed germs. These can infect children who play there and people who pick through the waste for things to use or sell. Germs in trash can cause health problems such as diarrhea and cholera, scabies, tetanus, fungus, and other skin and eye infections.
- Trash clogs waterways and drainage channels causing water to back up. This can create stagnant pools that allow insects to breed and cause floods when it rains. Flooded drainage channels that carry human or animal feces also contaminate drinking water supplies and soil.
- When large piles of waste collapse they harm people who work with the waste or live nearby.
- Toxic chemicals in waste seep into water sources and soil, poisoning people for many years. Sometimes waste piles containing toxic materials explode or catch fire.
- When plastics and other toxic wastes are burned in the open or in incinerators, harmful chemicals are released into the air, and toxic ash pollutes soil and water. In the short term, these toxic chemicals cause chest infections, cough, nausea, vomiting, and eye infections. Over time, they cause **chronic** illnesses such as cancer and birth defects. (For more about incineration, see page 423.)

To treat the health problems caused by waste, see *Where There Is No Doctor* or another general health care book. Wearing gloves, face masks, and boots or closed shoes can prevent many of the health problems caused by working with solid waste. (For protection while working with waste, see page 406 and Appendix A.)



Some waste can be reused or recycled. Some kinds of waste take a long time to decay. Other kinds never go away!

Community Clean-up and Resource Recovery

Protecting our communities from harmful waste and turning waste into a resource improves community health, the environment, and also saves money. For example, a group of waste collectors in Argentina found that if all the waste paper in the city of Buenos Aires was collected and recycled, it would save \$10 million US dollars a year. If this money was used to pay all of the waste collectors in the city, each person would earn over US \$150 per month.

Every person and every community can take responsibility for reducing and safely disposing of waste. But, while communities can do a lot on their own, waste is a political problem that can only be solved when government, industry, and communities work together, with improving people's health as the goal. Governments must act to reduce the burden of waste on people and the environment by requiring industry to manufacture products with as little waste as possible (see page 458). Government support of programs to encourage people to reuse, recycle, and safely dispose of waste saves money, creates jobs, and helps solve community problems (see pages 395, 401, 408, and 416).

A Community Trash Walk

A community trash walk provides an opportunity for people to look at and discuss trash problems. People can voice their concerns about trash and their hopes for a cleaner and healthier community. During and after the walk, the group can discuss what steps are necessary to clean up the community and to plan for resource recovery.

Organize a trash walk

1 Invite people to participate in a trash walk

To make a trash walk most effective, involve not only people from the neighborhood, but also people who work with waste and those who have the power to change how waste is collected, transported, and managed. Include:

- workers in small industries.
- second-hand dealers and waste transporters.
- buyers who collect or purchase waste directly from households or businesses.
- waste collectors who recover materials from the streets or dumping sites.
- government officials who can support a community clean-up.

continues on next page...

Organize a trash walk (continued)**2 Hold a meeting before the trash walk**

It is helpful to have a meeting to talk about the reasons for the walk, what to look for, and what each person hopes to achieve by joining the trash walk. It is helpful to understand what motivates each of them. Some people may earn their livelihood collecting resources that others throw away. Others may want to improve the health and beauty of the community.

Thirty years ago we grew all of our food. Now we buy most of our food at the store.

Everything comes wrapped in plastic that we throw in the street.



Now there is garbage everywhere!

3 Plan your walk

Decide where to walk and together make a list of things to look for, such as:

- trash clogging drainage ditches, other waterways, and streets.
- human feces and animal waste along streets and waterways.
- toxic wastes.
- animals eating from trash piles.

Ask older members of the community to describe how it was 20 or 30 years ago. Was there more or less or different kinds of trash? What did people do with their trash then? Think about this during the walk.

Organize a trash walk (continued)

4 Walk!

Break into teams to walk around different parts of the community. Because different groups will notice different problems, you might form teams of only men or only women, or have a youth group walk separately from adults. Or you may have all mixed teams.

Notice where trash collects and the most common ways trash is disposed of. Are there public trash bins? Do people burn trash or dump it in the open? Bring it to a landfill or incinerator? Are some things collected and reused or recycled, such as glass bottles or newspapers? What about waste from businesses?

Have someone in each team keep a list or make a drawing of the problems you find on the walk, including what kinds of waste you see.

5 Look at waste in people's homes. How much and what kinds are there?

As a part of the walk, go to some volunteers' homes to see what kinds of waste and resources are there. Take a full trash can and dump its contents on the ground. Separate the waste into 5 piles:

- food scraps and other wet, organic waste
- plastics
- paper
- metal
- other wastes



Which pile is biggest and which is smallest? What is done with each of these kinds of waste, and what could be done rather than throwing them in the trash? Take some of the waste from several households to the group discussion that follows.

Remember to put the rest back in the trash cans!

6 Come together to discuss what people saw

Later the same day (or the next day), bring all the teams back together to discuss what was learned.

Ask everyone to share what they saw during the walk. Have each person show a piece of household waste and say if she noticed the same kind of waste elsewhere in the community creating a problem or being reused or recycled. Did people see any possible or current health problems due to poor waste disposal? What were the better ideas about waste disposal that some families were using?

Organize a trash walk (continued)**7 List the causes and effects of the problems**

A facilitator can write the problems people raised on a chalkboard or large paper. Ask everyone to think about the causes of the community's waste problems and write these in a column next to the problems list. Then ask how each problem affects the health of the community. Write or draw a different health effect related to each problem in another column.

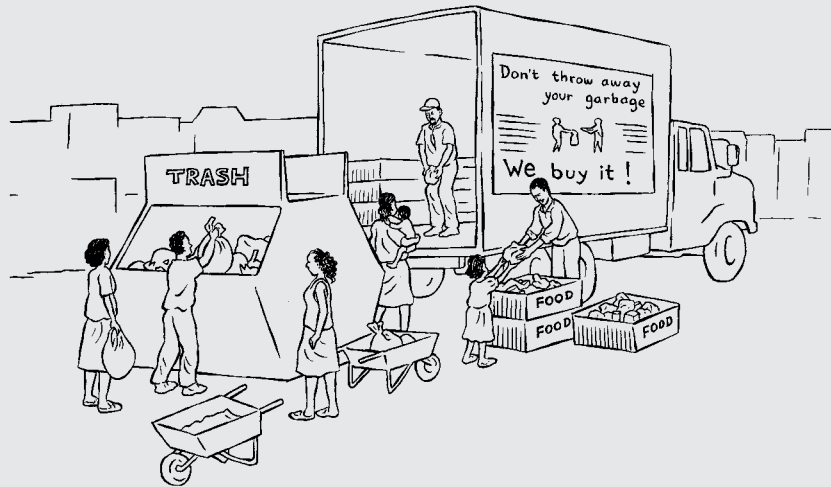
8 Plan next steps

Ask the group to review the problems and think about possible actions they can take to resolve them. Next steps can start with ways to reduce the health effects of a problem, or try to get rid of a problem completely. Ask questions such as:

- How can each household reduce the amount of trash it produces?
- How can we promote more composting and separating wastes?
- Can a community group or business be formed to collect and reuse waste?
- Is there land to build a compost site or resource recovery center?
- Where is the nearest recycling plant?
- How can local government, community leaders, factories, and businesses each take responsibility to solve problems caused by waste?

A community trades trash for cash

The shantytowns of Curitiba, Brazil, had many open waste pits. They were breeding grounds for disease-carrying rodents. To deal with this problem, the Curitiba city council launched a program called “Don’t Throw Away Your Garbage—We Buy It.” The city council figured out how much it would cost to clean up the open dumps. Then, instead of hiring an outside company to do the job, they figured out what the cost would be for each bag of trash, and offered this amount to the residents.



Besides earning money for the trash they collected, every person was given a free public transit ticket for each bag they delivered to a municipal collection truck. Because these neighborhoods are located far from the city center, these tickets were highly prized. The city also donated money for each bag collected to develop community gardens and other projects. Areas that were once piled high with garbage were transformed into urban gardens or parks with trees. Community health improved.

Recent immigrants, people with disabilities, or others who needed work were given safe jobs sorting waste at a resource recovery center. Food scraps and garden waste were composted for use in city parks and local farms and gardens. Plastic and metal were sold to local industries. Plastic foam was shredded and used to fill blankets.

A few years after the program began, the city made the project even better. They began buying food directly from farmers close to the city at a fair price, and offered people a bag of fresh food in exchange for a bag of garbage. This helped the farmers sell their produce, improved the nutrition of the families in the shantytowns, and cleaned up the city.

A Community Solid Waste Program

Once a community has a shared understanding of the problems caused by waste, it can take steps to solve these problems, starting with projects that best meet the community's needs and abilities.

A complete community solid waste program would include all of these steps (find more about each step on the next few pages):

- **Reduce** the amount of waste created, especially toxic products and products that cannot be recycled.
- **Separate wastes** where they are made to make them easier and safer to handle.
- **Compost** food scraps and other organic wastes.
- **Reuse** materials whenever possible.
- **Recycle** materials and organize for government and industry to develop community recycling programs.
- **Collect, transport, and store** wastes safely. Respect and pay fair wages to the people who do this work.
- **Safely dispose** of all wastes that cannot be reused or recycled.

Not all communities will be able to take all of these steps, especially at the beginning.



Consider people's needs and abilities, and begin with what you can achieve together in the short term.



Reducing waste

Waste that ends up in our streets, homes, and fields begins with the industrial manufacturing of products that cannot be reused or recycled. One goal of a community waste program is to reduce waste over the long term by helping people use less of the materials that become waste in the first place. Some ways to reduce waste are:

- not buying products wrapped in a lot of packaging materials.
- choosing glass and cardboard over plastic and metal.
- using your own shopping bag or basket, and refusing plastic bags at the store.
- buying food in larger quantities to reduce the amount of packaging you bring home.



Communities can work with shop owners and local governments to prevent materials that cause disposal or health problems from entering the community in the first place. Community organizing can pressure governments to make laws that force businesses to take responsibility for the wastes they create.

Banning plastic bags

Outside the village of Emmonak in Alaska, plastic shopping bags often escaped from the town landfill and were carried by the wind. In the nearby town of Galena, they got stuck in trees or drifted into the nearby Yukon River. By Kotlik, where the river runs into the sea, plastic bags were found wrapped around dead seals and salmon.

Since the 3 villages banned plastic bags in 1998, this no longer happens. Following these villages, 30 other communities around the state of Alaska banned plastic bags, and the ban is growing. In towns and villages, people are encouraged to use paper bags or to carry cloth bags that can be used over and over, for years.

As part of the campaign against plastic waste in Alaska, the State Department of Environmental Conservation and the Yukon River Inter-tribal Watershed Council began a program

to teach people how to reuse the plastic bags by making them into other things. Now people cut the bags in strips and weave them into backpacks, handbags, doormats, baskets, and other useful items. They even sell them, making money from things that once clogged the sewers and littered the roads.



Separate wastes at the source

Keeping food wastes from mixing with paper wastes or glass, and so on, makes it easier to reuse, recycle, and get rid of materials, and helps prevent the health problems caused by mixed waste (see page 390). Separating waste is the first step in better waste management, though it only solves the problem if there is a good way to deal with waste after it has been separated. Waste separation is part of a system that includes reuse, composting, regular collection, recycling, and safe disposal.

Ways to separate wastes

The biggest part of the waste produced in both urban and rural areas is **organic or wet waste** (food scraps and garden wastes such as dead plants and leaves). Organic waste is broken down by sunlight and water, or eaten by living things (worms, insects, and bacteria), and turned into compost (see page 400).

There is usually a lot of paper, glass, metals, and plastics in waste. A large part of this waste is discarded packaging. Household waste may also include toxic materials such as paint, batteries, plastic diapers (nappies), motor oil, and old pesticides and cleaning product containers.

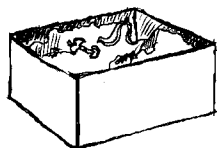
Separation into 2 types of waste

Wet waste becomes compost



Dry wastes are sorted and reused, recycled, or sent to a landfill

Separation into 3 or more types of waste



Wet waste becomes compost



Dry, reusable, and recyclable materials are sorted and reused, recycled, or sent to a landfill



Toxic waste needs special handling and disposal (see page 410)

Who is responsible for separating waste?

Waste can be separated by the households and businesses that produce it, or by the people who collect it. Whatever system your community uses to separate and collect waste for reuse, recycling, or disposal, it is important for those who do the work to be respected and paid for their efforts.

Collectors may earn money by separating out and selling the more valuable items and by bringing the rest of the separated waste to a recycling center. Some collectors pay householders a small amount for separated waste, or charge a small fee for collecting waste that is not separated.

If waste is separated at home, dry material may be kept in containers indoors until they are collected. Containers for wet waste can be kept outside and made into garden compost at home, or can be collected by a neighborhood compost project (see pages 400 to 403).



Separating wastes after they go to a dump is dangerous and less effective than sorting them at the household or business.

Making compost: Changing organic waste to fertilizer

Because organic matter is usually the largest part of most waste, separating and composting food scraps helps reduce waste a great deal. Adding compost to the soil is a way of adding crop **nutrients** back to the earth.

The best way to make compost depends on the amount of space available. Small amounts of compost can be made in containers in each household or business. Larger composting sites can be set up in towns and cities and on farms where there is space for larger waste piles. (To use compost, see page 287.)



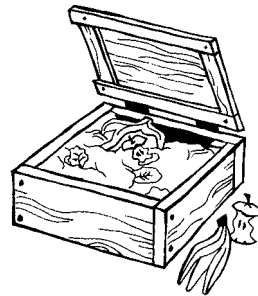
Good, finished compost smells good and feels soft like dark, rich forest soil.

How to compost with earthworms

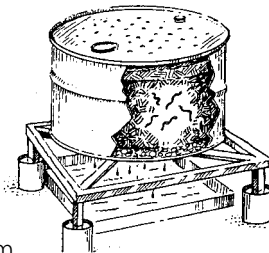
Earthworms are one of nature's best composters. A small box with healthy earthworms will eat household food wastes and turn the waste into rich soil for your garden. A worm box provides a way to compost food scraps when you have no land for a compost pile.

- 1 Make holes in the bottom of a wooden or plastic box to let air in, and water and soil out.
- 2 Place a second box or tray under the box with holes. This will collect the rich soil the worms make.
- 3 Fill the top box with shredded paper, straw, and food scraps. Get a good shovelful of worms from a gardening center or a farmer, and put them in this box.
- 4 Add food scraps often and keep the box damp but not too wet. Cover the top to protect the worms from sunlight.

As the worms eat what you put in the box, they make rich soil, and the worm colony grows. Some worms may drop down into the lower box or tray. Just put them back into the top, or add them to your garden with the new soil.



A worm box can be very simple...



...or more complicated.

Community composting and recycling

Porto Novo, the capital of Benin, once had heaps of trash as tall as 4-story buildings rotting in the streets. As you can imagine, this caused many health problems. And the terrible smell made it an unpleasant place to live. Some people decided to start a composting center to change the waste into useful fertilizer.

With funding from a social service organization, they found a large site to set up a recycling and compost plant. A French organization provided the Porto Novo group with a tractor and 2 trailers. They parked the trailers near the train station and a football stadium, and encouraged people to put their trash in them. Now, every evening the tractor tows the trailers full of waste to the recycling center where young people sort the trash.

Organic waste is thrown in pits and covered with palm leaves to make compost. The compost “cooks” check the humidity, air flow, and heat regularly to make sure the waste decays quickly. After 2 months, the compost is ready for use.

Some young people from the project began to use the compost for market gardening. With funds from the United Nations Development Programme, the center bought seeds and land to grow crops. In this region of Benin, the soil has never been rich and has become poorer due to overuse. But with their compost to enrich the soil, the young gardeners are able to grow nutritious, fresh vegetables. Villagers also buy the compost to fertilize their own gardens.

The money the compost center earns from selling vegetables and compost is used to buy more equipment and hire more unemployed youth to work as waste sorters and market gardeners. In this way, the project supports itself and continues to grow.

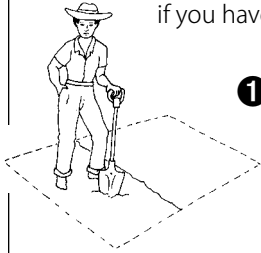
How to make slow compost

This way of making compost requires little space and little work, and produces compost in about 6 months.

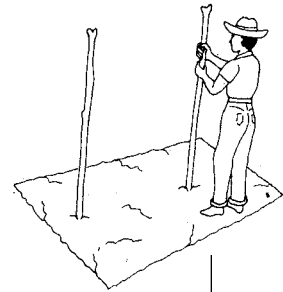
- 1 Dig a hole in the ground 60 cm by 60 cm wide and 1 meter deep.
- 2 Put a mix of dry and wet organic waste in the hole.
- 3 Cover every 20 cm depth of organic material with 3 cm soil and add water to keep it damp (just moist, not soaked).
- 4 Cover the hole to keep the rain out. After a week, the compost should start to break down. The pile of waste will heat up and shrink as it breaks down.

How to make fast compost

This is a way to produce a lot of compost in 1 to 4 months, if you have a large open space.

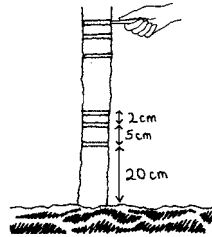


- 1 Choose a flat area 1½ meters wide by 4 meters long. Mark the area with stakes. Loosen the soil to a depth of 30 cm. This will help the compost pile drain, and help worms enter the pile and break down wastes. If the soil is very dry, water it.



- 2 Find 2 big sticks about as tall as a tall man. Put them upright in the middle of the loosened earth. Do not sink them too far down, because later you will take them out.

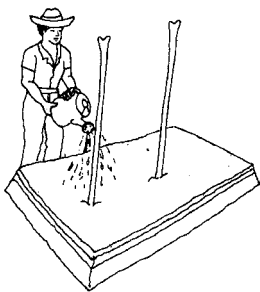
- 3 Mark lines on the posts at 20 cm from the ground, then 5 cm above that, then 2 cm above that. Repeat these marks 7 or 8 times until the whole post is marked with measuring lines.



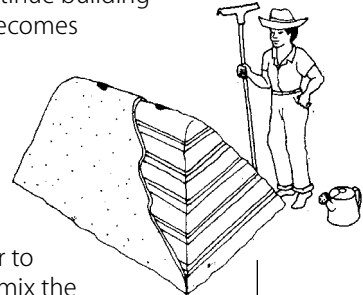
- 4 Make a pile of food and plant wastes (a mix of dry and wet materials is best) up to the 20 cm mark on the sticks. The pile should cover the entire area of loosened earth and be of an even height. If it is very dry add water until it is moist, but not soaked.



- 5 Put a layer of animal manure up to the next line (5 cm). Fresh manure is best because it is hot and will help the compost break down quickly. On top of the manure, add a layer of soil up to the next mark (2 cm). Continue building up layers in this order as organic material becomes available. Add a little water to each layer so the entire pile will be damp. Over time you can build the pile up to a height of 2 meters or so. Then cover the entire pile with a layer of soil, and wet it more.



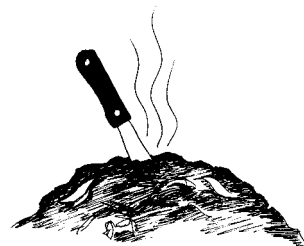
- 6 After 2 days, remove the sticks. This will leave wide holes for air to enter the pile and help it break down. After 3 weeks, turn and mix the pile with a shovel. Do this again every week or so. The more you turn it, the faster it will break down. The pile will heat up and shrink as it breaks down. After 1 to 4 months, the pile should turn into sweet smelling, dark, fertile soil.



To know if the compost is working

No matter which method you use, there are ways to know if your waste is becoming good compost and not just a big, stinky mess.

- To break down, compost needs both wet waste like food scraps and dry waste like straw, brown leaves, husks, or shredded paper. If the pile remains a pile of rotting food rather than heating up and turning to soil, it may need more dry, brown plant matter.
- If the pile smells bad or does not shrink, it needs more air. Turn the pile with a shovel or open holes by poking sticks into it.
- If the pile does not heat up, it could be from too much or too little water. Turn the pile with a shovel. If it is very dry, add more water. If it is very wet, add less water. Covering the pile with a black plastic sheet will also help it stay warm.
- If the compost has ants, add water.
- If it attracts flies, it needs to be covered better with soil.



A working compost pile heats up as the waste breaks down.

After a while the compost should turn into sweet smelling, rich black soil. (To learn how to use compost on plants, see page 287.)

What cannot go into the compost?

People have different ideas about what makes good compost and what does not. For example, some people keep meat scraps or paper out. Many people agree that manure from horses and cattle is good for compost, but feces from dogs and cats are not.

Large branches or very thick leaves will break down too slowly. If paper or cardboard are added, it is best if they are shredded and kept damp so they break down more easily. Meat, bones, and greasy kitchen waste attract pests and break down very slowly.

Some things are never good for compost. Plastic, metal, glass, and anything else that is not directly from the earth will not break down. Plants that poison people or other plants, like castor bean and eucalyptus, will not make good fertilizer.



Do not put these things in the compost.

Reuse what you can

One person's trash is often useful to someone else. All over the world, people save money and protect the environment by inventing methods to safely reuse discarded materials.

From **tires**, make sandals, buckets, and planters.

From **tin cans**, make lamps, planters, and candle holders.

From **waxed food containers**, make shopping bags.

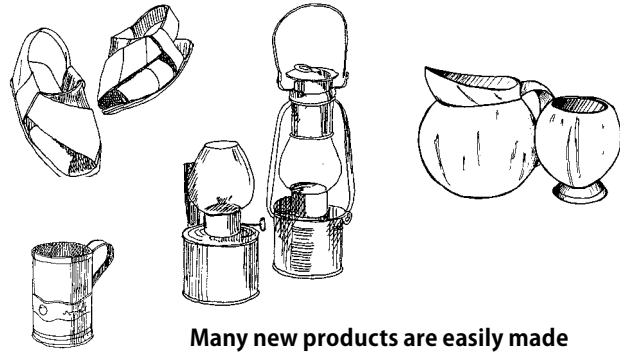
From **coconut shells**, make cups, forks, and spoons.

From **banana tree leaves**, make plates and bowls.

From **scrap metal**, make stoves, lamps, and art.

Paper can be shredded and compacted for home insulation or to make briquettes for burning.

Sawdust can be used in composting, in dry toilets, or pressed into briquettes with manure and other dry organic matter and burned as fuel.



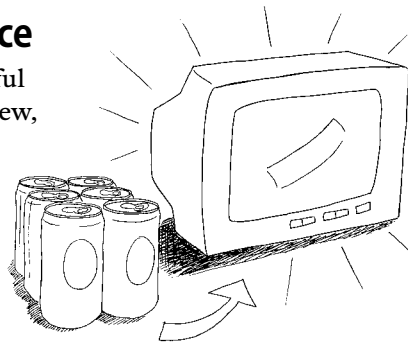
Many new products are easily made by reusing discarded wastes.

Recycling turns waste into a resource

Recycling takes products that are no longer useful and turns them into source materials to make new, useful products. Recycling some materials (such as metals and rubber) must be done in factories. Other materials, such as paper and glass, require less equipment and space and can be recycled in small workshops or people's homes.

Recycling is an important way to reduce waste. But recycling requires support from government and industry, as well as a commitment by communities and people. If there is no market for recycled products, or if they are not recycled safely, recycling is no solution at all.

Recycling reduces waste by changing it into new products, and also saves energy used in manufacturing. For example, it takes $\frac{2}{3}$ less energy to recycle paper than to make new paper, or to make steel from scrap metal rather than raw ore. Making aluminum from scrap takes a tiny amount of the energy it takes to make aluminum from raw bauxite ore.



Recycling just one 6-pack of aluminum cans saves enough energy to power a TV for 18 hours!

Recycling:

- reduces the amount of solid waste polluting our environment.
- reduces the amount of solid waste in need of disposal, saving space and money.
- reduces resource use by using the resources more than once.
- helps the local and national economy because fewer raw materials need to be imported.
- provides jobs.

*Recycling
preserves
resources
you and I
need to live!*

**What materials can be recycled?**

The materials that can be recycled depend on the local recycling industry.

Glass is made from sand, soda ash, and lime. When disposed of, it wears down but does not break down into its source materials again. To recycle glass, it is sorted by color, melted into a liquid, and shaped into new containers. Some glass is also recycled into materials used in roads or buildings.

Aluminum is made from a metal ore called bauxite that is mined from the earth. It does not break down to its original ore, but gets worn down like glass. Aluminum is recycled by melting and reshaping it into new cans and other things.

Tin coated steel cans, such as soup and fruit cans, are recycled by separating the tin from the steel. The steel and tin are then washed and sold to make more cans or other products.

Rubber is made from natural tree resin and petroleum. Rubber is sometimes recycled by melting or chipping it and remolding it into new things.

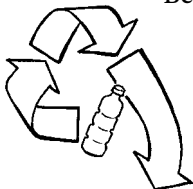
Paper is made from wood, cotton, and other plants with strong fibers. Paper is one of the few materials that can be recycled into itself again. Commercial paper is often recycled in industrial plants. Paper can also be recycled by hand to produce beautiful paper products for the home and for sale.

Products that contain toxic materials, such as computers, batteries, electronics, paints, solvents and pesticides, and the containers that store them, need careful handling so recycling workers are not exposed to toxic chemicals (see pages 410 to 411, and 459 to 462). Some of these products cannot be recycled at all, which is why it is better to produce fewer of them in the first place.

The problem with recycling plastics

When plastic is recycled, its quality decreases. A plastic bottle is not recycled to become another plastic bottle, but is made into something of lesser quality.

Because of this, plastic can be recycled only a few times before it can no longer be used.



Recycling some plastics releases toxic gas that is harmful to workers and communities (see pages 409 to 423). And a lot of plastic intended for recycling ends up being dumped in landfills. This is why it is best to use as little plastic as possible.

Waste collection, transport, and storage

If your community does not have a reliable waste collection service, you can organize one with the help of local government and businesses. As you make plans, keep in mind what will be collected and whether it will be taken for resale to larger recycling businesses or to a community recycling program.

The less distance your waste travels the better. But many communities are not able to recycle waste locally, so other solutions must be found.

Ways to prepare waste

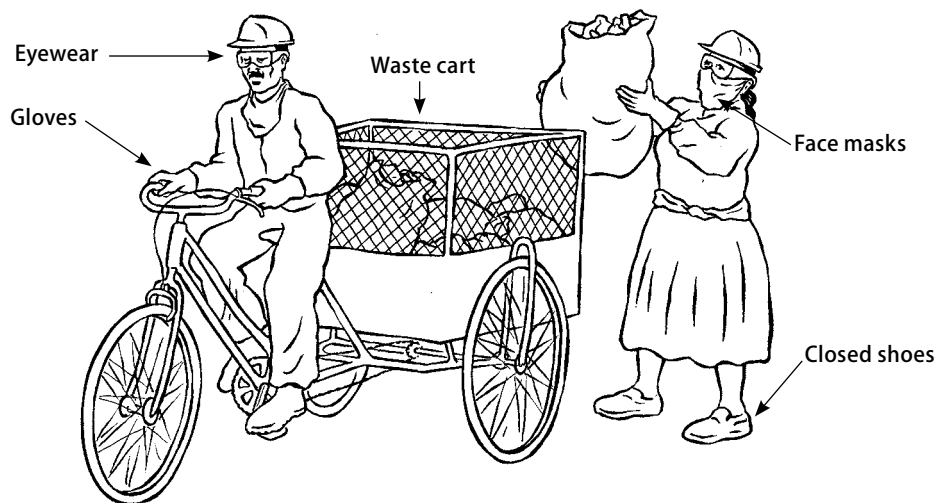
The way waste is prepared for collection, transport, and storage depends on how much space you have, who will do the work, who will buy the discards, and what they will be used for. To prevent bad smells and spreading germs, materials should be cleaned, dried, and flattened or stacked to take up as little space as possible and to reduce the possibility of accidents.

Computers, radios, and televisions contain many sellable and recyclable parts, but much of what they contain is toxic. These materials are best taken apart after receiving training for each product, and using protective safety gear (see Appendix A) and good ventilation. All toxic materials' containers need special handling (see pages 410 to 411).

Health and safety for waste collectors

Waste collectors are at risk for all the health problems that come with waste. To prevent harm, waste collectors need training in how to prevent health problems and where to go for treatment if problems do arise.

If waste collectors organize into cooperatives or small businesses, it may be easier to pool resources, provide training, and gain government or other community support to purchase safety equipment and make the work as safe as possible.



Starting a community resource recovery center

A resource recovery center is a place where reusable and recyclable materials are collected for sale or reuse.

It can also be a place to start a community composting project and market garden, make new products from old materials, and exchange goods such as clothing, curtains, appliances, furniture, shoes, glass bottles, pots, utensils, building materials, and so forth.

Some of this trash is useful... but I don't know who could use it!



People working together make a community a beautiful place to live.

Resource recovery centers

Several communities in the Philippines have resource recovery centers set up by local governments and an organization called Mother Earth Foundation. These resource recovery centers have inspired community solid waste programs throughout the country, and have helped change the entire system of waste management.

Households are encouraged to separate their wastes and to clean the materials that can be reused and recycled. Some communities passed a law to reduce bad smells by preventing people from piling wastes outside.

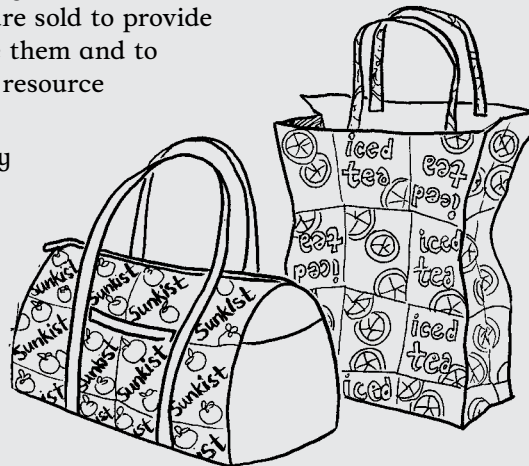
People keep organic wastes in closed containers in the house or carry them to compost bins set up throughout the community. Every day, workers from the resource recovery center travel through the communities on 3-wheeled carts to collect organic wastes, recyclables, and wastes to be discarded. Sometimes people are paid for their recyclables. Everything is brought to the resource recovery center, which has 2 main parts:

- an ecology garden, where organic matter is composted and used to grow vegetables for sale to the community.
- an eco-shed or warehouse, where clean recyclables are stored before being sold to junk shops, recycling companies, or factories.

Some centers also provide work areas where people make new products out of old materials. Juice cartons are flattened and sewn together to make carrying bags. Glass bottles are shaped into drinking glasses.

Old newspapers are shredded and woven together to make baskets and bags that are covered with clear glue or resin to make them stiff and durable. These things are sold to provide income for the people who made them and to pay for the costs of running the resource recovery centers.

The centers have dramatically reduced the amount of trash in their communities. Rather than living with smelly piles of waste, people now earn extra income from reused and recycled materials, and produce more vegetables using composted food waste.



Getting Rid of Trash Safely

Whatever cannot be reused, recycled, or composted should be gotten rid of safely. Some people say burning trash is best. Others prefer to bury it, to avoid the smoke produced by burning trash. The fact is, both of these ways of disposing of trash have problems.

In places where paper and cardboard cannot be reused, recycled, or composted, they can be shredded and burned in fires for cooking and heating. But burning even small amounts of plastic or rubber releases toxic chemicals such as dioxins, furans, and PCBs that cause many health problems (see Chapter 16 and page 423).



Waste that cannot be handled in any other way can be buried in small pits or in a sanitary landfill (see page 412.) For small pit burial, simply dig a pit in an area away from water sources, put waste in the pit, and cover with soil.

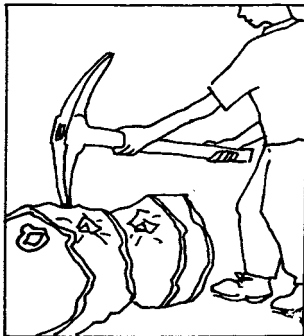
When trash that contains harmful chemicals is buried, these chemicals can leak into the ground and contaminate drinking water. If there is no safe way to get rid of toxic trash (for example, by returning it to its manufacturer or treating it so it is no longer toxic), it is best to put it in a safely-lined sanitary landfill.

Toxic wastes

Toxic wastes are wastes containing chemicals that are very harmful to our health and the environment. (See Chapter 16 for how toxics harm us.)

The best way to prevent harm from toxic waste is to stop it from being produced. Governments should ban toxic products and production processes. Communities can promote the use of alternatives to toxic household products and labor unions can promote alternatives in industry. Making collection or drop off centers for toxics convenient can keep them from polluting land and community water systems.

(For safer substitutes to commonly used household toxics, see page 373. To learn more about toxics, see Chapters 14, 16, and 20.)



Destroy toxic materials containers so they cannot be used to store other things, especially food or water.

Safe handling and disposal of toxic wastes

Because safe disposal of toxic wastes can be complicated and costly, it is best if governments enforce guidelines for the use, storage, and disposal of toxics. This should include education and training of community members to safely handle and get rid of toxic wastes. Here are some practical guidelines for handling toxic wastes:

- Store toxic products away from food and water, and away from where children can reach them.
- Keep toxic products in their original containers, and never remove the labels. This helps prevent the containers from being reused for water or food storage.
- Keep toxic wastes separate from other household wastes.
- Do not burn toxic wastes! This spreads the chemicals through ash and smoke, and sometimes it creates even more dangerous chemicals.
- Do not put toxic materials down latrines, toilets, drains, drainage channels, in waterways, or onto the ground.

Check with local health authorities and resource recovery centers to learn the best ways to get rid of toxic wastes in your area.

Disposing of common toxics

These common household products create harmful waste if they are not handled with care and gotten rid of safely.

Paint and paint containers. Store closed paint cans in a cool place. Once all the paint is used, flatten paint containers, wrap them in newspaper, put them in plastic bags, and bury them in a sanitary landfill. Latex paint is less toxic than other paints, but needs the same disposal methods as other paint.

Solvents (degreasers, turpentine, paint removers). Store solvents in closed containers in a cool place, so they will not cause a fire. Once all the solvent is used, punch holes in the containers so they cannot be reused. Flatten the containers, wrap them in newspaper, put them in plastic bags, and put them in sanitary landfills or sealed containers.

Used motor oil. Never pour oil onto the ground or into waterways. Store it in closed containers. Used oil can sometimes be recycled by auto servicing stations. Used motor oil can also be used to coat wooden posts for building, to prevent them from rotting in the ground, and can also be burned as heating oil in some heaters.

Batteries. In some places, batteries can be recycled. But recycling batteries by hand is dangerous and should not be done without proper training and protective equipment.

Pesticides. Make holes in or destroy pesticide containers so they cannot be reused. Bury them in a sanitary landfill. To learn how to use fewer pesticides in farming or in the home, see Chapter 15 and page 367.

Waste from health care activities such as bloody bandages, dirty needles and other sharp tools, discarded medicines, and so on. To learn how to reduce, store, and best handle health care waste, see Chapter 19.



These common products are harmful, and make harmful waste, if not handled with care.

Sanitary Landfills

A sanitary landfill is a pit with a protected bottom where trash is buried in layers, compacted (pressed down to make it more solid), and covered. A sanitary landfill can reduce harm from waste that has collected, and is safer than an open dumping site. But even the best sanitary landfill will fill up and, after many years, probably start to leak. To solve our waste problems, we still need to prevent waste in the first place.



Open dumps can be turned into sanitary landfills. Or a community can build a new sanitary landfill and clean up the old site by transporting trash to the new one. A sanitary landfill protects community health when:

- it is built away from where people live.
- it is covered to prevent insects and other disease-carrying animals from breeding.
- it has a lining of hard-packed clay soil or plastic to prevent chemicals and germs from contaminating groundwater.

Because building and maintaining a sanitary landfill is a lot of work, it usually needs to be done in partnership with the community, local government, and other organizations, such as churches or businesses.

A landfill protects community health only if it is well managed. Good management includes training and support for landfill workers, and working together with resource recovery centers, toxic waste collectors, and local government.

Selecting a site

The first step in planning a landfill is choosing a site. In most places, the government requires a site assessment (a close look at the conditions of the site) before construction. This means a study of the type of soil and rocks, the kinds of plants that grow there, and the distance from water sources and homes. For health and safety, a landfill site should be at least:

- 150 meters from coastal waters.
- 250 meters from fresh water, such as streams, ponds or swamps.
- 250 meters from protected forests.
- 500 meters from homes, and from wells or other drinking water.
- 500 meters from earthquake fault lines.

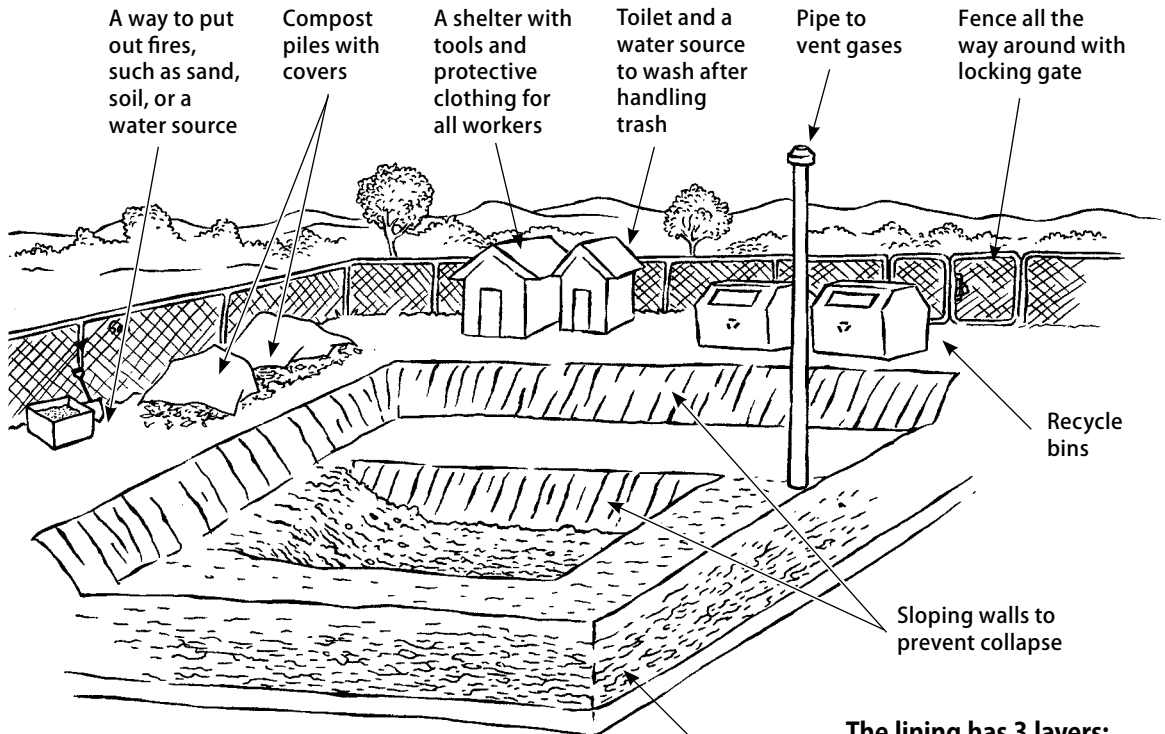
The bottom of the pit must be at least 2 meters above the highest groundwater level.

Making the landfill

The size of the landfill pit depends on the amount of trash that will go into it. All pits should be narrower at the bottom than the top to prevent them from collapsing. This shape also helps compact the trash because there is more weight on top than on the bottom.

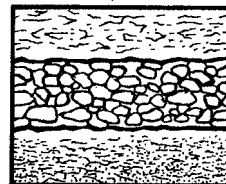
A sign posted by the landfill gate with the hours it is open helps landfill workers better control what is dumped, and when, and how.

A well-built and well-equipped landfill



Lining the pit

To protect groundwater, the landfill needs a protective lining at the bottom. A good lining can be made by compacting layers of clay, gravel, and soil. Building the landfill in an area with hard clay soil will make this easier.



The lining has 3 layers:

- Top layer – 1 meter of compacted soil
- Middle layer – ½ meter of gravel
- Bottom layer – at least 1 meter of pounded clay soil

If there are resources to provide a better protective lining, layers of thick plastic sheeting and thick fabric will give more protection, and a system of pipes and pumps can be built to remove liquids.

Filling the landfill

The way you fill a landfill depends on the amount of trash, how much time people have to do the work, and the local climate.

In places with high rainfall and little trash, such as towns that practice zero waste (see page 416), each week or month you can dig a new hole lined with clay and gravel (in thinner layers than a larger landfill would need). Someone takes responsibility for bringing trash, filling the hole, compacting the trash, and covering it with soil. Burying trash little by little prevents water from collecting in the pits.

For a community with a large trash load, it is easiest to dig a large pit. Landfill workers add waste to the pit as it is brought in. Each time waste is added it is pressed down to make an even layer, then covered with large leaves (such as palm, banana, or palmetto) and a layer of soil, or soil, ash, and sand. This will prevent bad smells and stop insects from breeding. Making a large roof over the pit will keep rain out.

Capping the landfill

When the pit is full it should be capped with a layer of soil at least 90 cm deep. Wildflowers or grasses can be planted over it, but not plants that will be eaten, such as vegetables or fruit trees. Until the landfill is completely covered by plant life, it is best to keep grazing animals away.



After it has been completely covered over, a well-managed landfill may become a green and pleasant area.

Difficulties with sanitary landfills

A pit where trash is dumped and then covered with soil can be maintained safely with few problems. But it can develop problems if liquid waste and gas (methane) collect in the pit.

Liquid waste (leachate)

If rainwater soaks into the landfill, it creates bad-smelling liquid waste that can carry poisons from trash into the groundwater. This is why it is important to line the landfill well and not to make it near a river, stream, or lake.

The best way to prevent leachate is to keep the landfill covered with a roof, or a canvas or plastic cover, until it is capped.

Dangerous gas

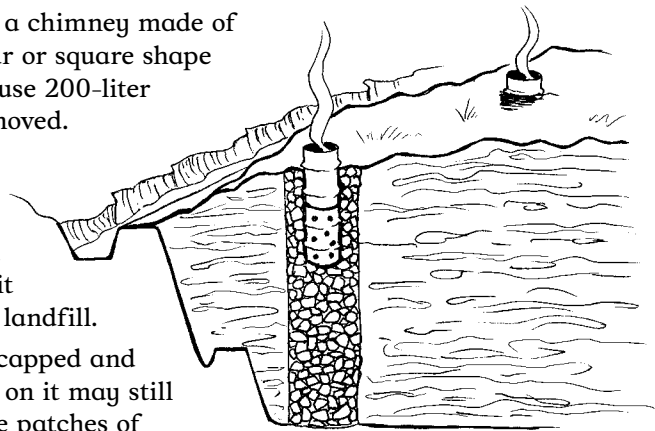
In landfills containing mixed waste, bacteria can grow and create methane gas. Methane can explode or catch fire if not managed carefully, and it adds to global warming (see page 33). In many places, methane from landfills is captured and used to generate electricity. If you have no resources to do this, the best thing to do with methane is to provide vents for it to escape.

A simple vent consists of a chimney made of small rocks held in a circular or square shape by a wire mesh, or you can use 200-liter drums with the bottoms removed.

The height of the vent is raised as the height of the landfill increases.

The number of vents needed depends on the size of the pit and the type of trash in the landfill.

A landfill that has been capped and has grass or plants growing on it may still release methane. If there are patches of dead grass, particularly if they are shaped like a circle, this is a sign that methane is escaping from the landfill. Place signs and warn people to stay at least 10 meters away from the area, because an explosion could be caused accidentally. Trained professionals should examine the landfill to decide how best to prevent an explosion.



Gas vents in a landfill

Getting to Zero Waste

Communities around the world are finding ways to reduce their waste to almost nothing, with the goal of producing zero waste. Zero waste means reducing waste and recycling the rest back into nature or the marketplace in ways that protect health and the environment.

To reach the goal of zero waste, industries must take responsibility to produce less or none of products used only once, such as plastics. Cities and towns can develop solid waste programs that compost, recycle and reduce waste. To be successful, planning must include the people most affected by waste. (To learn more about zero waste, see Resources.)

A town struggles with solid waste and wins

Kovalam, a beautiful beach town in southern India, is a popular place for tourists. But tourism in Kovalam nearly ended because of too much trash.

During 30 years of tourism, Kovalam never had a safe way to get rid of waste. No trash bins, no recycling program, little use of compost, and thousands of visitors year after year left Kovalam buried in garbage. Plastic bags clogged the town's water pipes, mosquitoes bred in piles of trash, and the town grew ugly and unhealthy.

Local government officials decided to start a waste collection program and to install an incinerator to burn the waste. But many people argued that burning would only turn the waste into toxic smoke and ash that would fill the air. After much debate, the incinerator was not built, and the government asked the groups that opposed it to suggest an alternative.

Led by an organization called Thanal Conservation Group, the community proposed a zero waste system. People from other communities visited to share ideas about their zero waste programs. One woman, Murali, showed how she made and sold bowls, cups, spoons, bags and other useful items from discarded coconut shells, palm leaves, and scrap paper. By promoting composting and new ways of reusing discards, Zero Waste Kovalam was born.

Within a few years, Kovalam was clean and beautiful, and more prosperous than ever. It now has a new tourist attraction: the Zero Waste Center. Many local restaurants now use coconut shell cups and plates made from leaves. The women of the Zero Waste Center grow vegetables and bananas in soil enriched with compost, and the town built a plant that uses human and animal waste to make electricity.

Kovalam has become an example for all of India and the world by showing how zero waste can restore and improve a community's health and natural beauty and protect the environment for future generations.

Waste and the Law

Most governments have policies and guidelines for managing waste. One of the goals of community action is to make sure these policies protect people's health and the environment. Another is to change the policies if they do not.

Philippines outlaws incineration and toughens waste laws

For many years, waste in the Philippines piled up in open dumps or was burned. But as pollution got worse from more and more waste, many communities began to pressure the government to ban waste burning, to establish a recycling program, and to prevent open dumping.

The campaign began in 1985 with an education program. Activists traveled across the country teaching communities about better ways to prevent wastes from being created. They showed people how to reduce waste and how to separate wastes to be composted, reused or recycled. They invited people from all walks of life, from peasants to politicians to priests, to work together to reduce waste in their communities.

At the same time, they educated communities and government officials about the toxic contamination released by burning waste. The campaigners showed how toxins from burning wastes turned up in eggs and other common foods.

Their pressure on the government paid off when incineration was banned in 1999 by a new law called the Clean Air Act. In 2000, the government began a recycling program and also passed a law to turn all open dumps into sanitary landfills. In 2001, the government passed the Ecological Waste Management Act to establish resource recovery centers in many towns and cities. The campaigners continue to work to make sure the laws benefit those most affected: the people who collect, sort, and recycle waste.

Laws like these are important in setting the standard for how waste is handled. When people take responsibility for their own wastes, and pressure lawmakers to make and enforce laws fairly, everyone benefits.

