

A simple

Guide

for
Solid and Liquid
Waste
Management



Acknowledgement

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Content

What is Waste?	2
Solid Waste	5
Liquid Waste	6
Safe disposal of Solid Waste	7
Collection	7
Transportation	8
Small scale or localized solid waste disposal options	
Garbage Bin	9
Compost Pit	9
Improvement in Existing Compost Pit Design	9
Elevated or On-Ground Compost Tank	11
Vermi Composting	12
Recycling	13
Dung Cake	15
Solid Waste Disposal	16
Liquid Waste Disposal Options	
Source Segregation	17
Kitchen Garden	18
Soak Pit	19
Soak Pit Construction and Technical Details	19
Drainage and Treatment	20
Low Cost Waste Water Treatment Unit	21
Roles and Responsibilities of Communities	23

What is Waste?

Any unwanted solid or liquid material thrown out by the households, community, institutions or business establishments is called waste. The waste can be categorized as solid, liquid or gaseous waste.

Safe disposal or management of solid and liquid waste is an integral component of “Sustainable Sanitation”.

Proper waste management is essential to reduce its ill effects on eco, environmental and human health. Also, proper management helps to keep up the aesthetic value of villages, towns and cities. The proper solid and liquid waste management helps to achieve:

- Prevent or reduce environmental pollution.
- Keep rural villages, towns and cities very clean and aesthetic.
- Protect human health from various solid and liquid waste related diseases.
- Reuse of non-bio waste through proper recycling techniques. Bio waste can be further converted into energy fuels like bio-gas.
- Solid and Liquid waste management projects generate income opportunities for local communities. Segregation of waste, transportation, recycling or disposal generates employment.

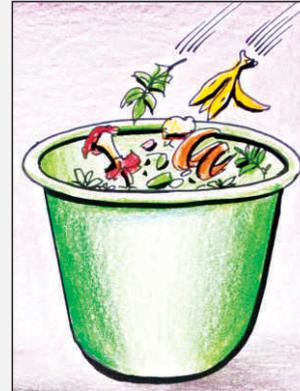
Solid and Liquid waste management includes segregating the waste right at source, safe transportation from the source to recycling or disposal sites for further processing.



Solid Waste

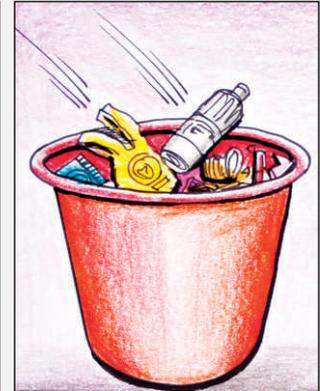
Waste materials discarded by the users (households, communities, institutions, commercial establishments etc.) solid or semi-solid in nature (other than human excreta) are termed as "Solid Waste". This form of waste includes paper, broken glass, kitchen waste, cattle or cattle shed waste, plastic, cloths, rubber, agriculture waste etc. The solid waste can be classified into

Biodegradable



Waste that is completely decomposed through biological process in the presence or absence of air is called biodegradable (example cattle waste).

Non-biodegradable

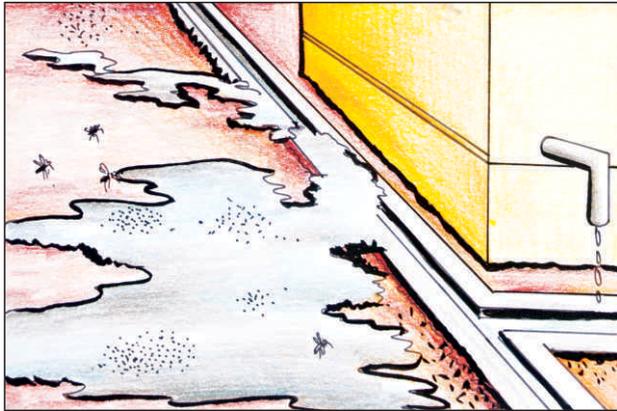


Non-biodegradable wastes are not possible to decompose through biological process, while some of it can be put to reuse by proper recycling, some waste materials cannot be recycled for further use.

Recyclable: Waste that is designated for disposal due to its recyclable nature and economic value (Example: plastic or paper).

Non-recyclable: Waste that cannot be put to reuse due to its non-recyclable nature and thus has no economic value (Example: Thermo coal).

Liquid Waste



Unwanted or used water led out of house, institutions or commercial establishments is termed as "Liquid Waste". Liquid waste can be classified into:

- Sullage / Grey water
- Storm water
- Black water

Grey Water: Waste water generated in the kitchen, bath room, house washing and laundry falls under the category of Grey water. Grey water usually contains pathogens.

Storm water: Heavy rains leading to accumulation of run-off water falls under this category. Safe drainage is essential to prevent water stagnation as prolonged stagnation leads to water borne diseases.

Black water: Waste water generated or drained out from the toilet is known as "Black water". Black water contains harmful pathogens and needs to be treated before disposal.

Safe Disposal of Solid Waste

Safe handling and safe disposal of waste is critical to prevent or reduce the impact of solid and liquid waste management related diseases. There are number of diseases associated with the improper handling of waste and these diseases includes water borne diseases such as Diarrhoea, Malaria, Polio, Dengue, Cholera, Typhoid etc. Lack of proper clean water & improved sanitation services and improper solid and liquid waste management are major reasons for these diseases. Waste management includes segregating the waste right at source, safe transportation from the source to recycling or disposal sites.

Collection: Collecting solid waste in an organized manner reduces major workload later at the treatment stage. Segregation of solid waste into bio and non-biodegradable categories right at the source saves time, energy and money. Necessary awareness on how to segregate the waste at source is essential to bring down the labour and money related cost components. The users can be motivated to use two different colour bins – one for biodegradable and other for non-biodegradable. The municipal or corporation staff or the entrepreneurs in waste collection business should be



trained on how to collect the waste from the houses or commercial establishments safely. The collection truck or tricycle should have two separate compartments – one for biodegradable and another for non-biodegradable.

Transportation: Transportation of waste to the recycling area or dumping yard should be done with extreme care. Open cart or open truck should not be engaged as the waste materials might contain harmful pathogens, uncovered waste in the truck or cart might spill along the road or might pollute the air. Hence improved tight lid and containers or covered carts are the best vehicles for transportation of solid waste.

Small scale or localized solid waste disposal option

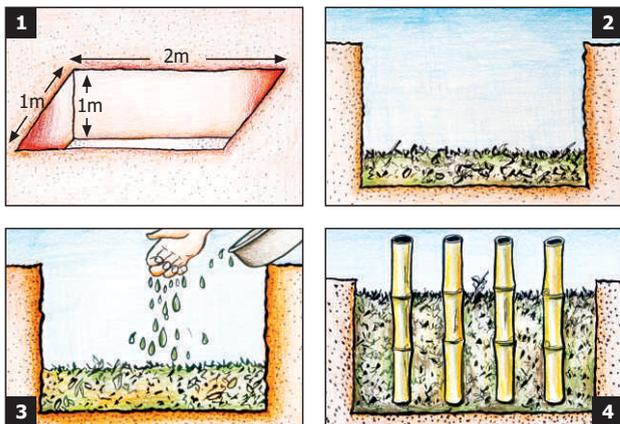
Garbage bin: In addition to collecting waste from household and commercial establishments, it is also important to place garbage bins in the streets and lanes of the villages and cities to



collect waste materials from the community members and other commuters. These bins should also have two compartments. Each compartment of dust bin should have clear indications and guidelines so that an illiterate person can also discard the waste appropriately into bio and non-biodegradable bins.

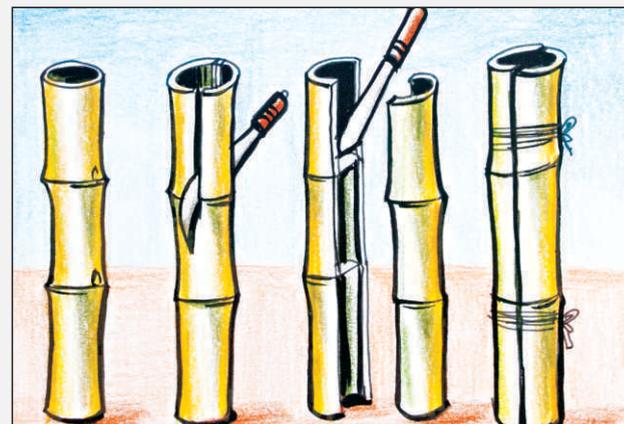
Compost pit: Traditionally the rural communities in India have been practising and also having rich knowledge on compost pit recycling techniques. Bio waste collected from humans and cattle is dumped into compost pit and kept for 6-8 months. Later the stocked waste /compost applied in the agriculture field as manure. The composting techniques of rural communities can be further improved by creating awareness among them to adopt better and improved techniques.

Improvement in existing Compost pit design: In general the rural households use the roadside depression/pit or low laying area to dump their waste. Once a while the community empty these composed or semi composed waste from the borrow pits and use it in their agriculture field as manure or sell the compost to farmers in the locality for

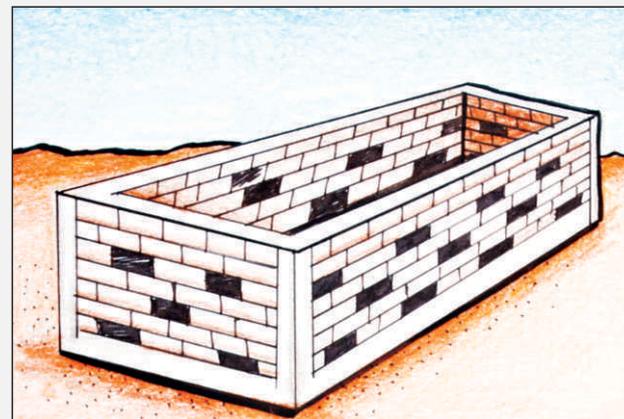


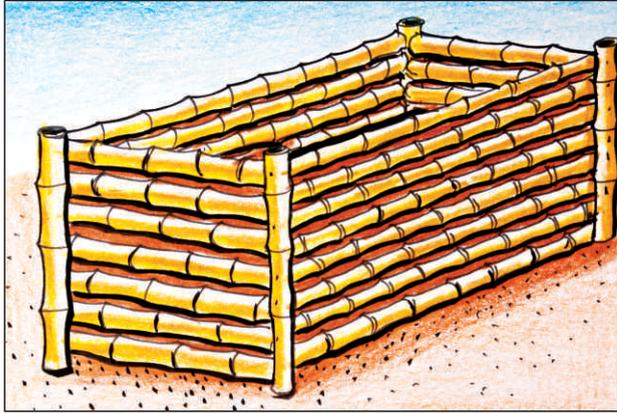
nominal amount. Generally, compost pits used by the rural communities do not follow a systematic design or construction. Layer based approach is a vital aspect in constructing a compost pit. Improvising this existing practice through systematic design would be more beneficial into bringing down the total cost and also improve the quality of end product.

It is suggested that 2 m x 1 m x 1 m pit can be excavated. The household can be motivated to dump their waste in the pit layer by layer. The thickness of these layers should not be more than 6 to 9 inches. After laying a 9 inch thick layer of waste, cattle dung mixed with water can be sprinkled. Second layer with a thickness 6 to 9 inches can be arranged & sprinkle cow dung slurry. This process can be repeated until the compost pit attains full capacity. 3-4 bamboo poles of about 1.2 meter height can be used to improve air circulation as illustrated in the picture.



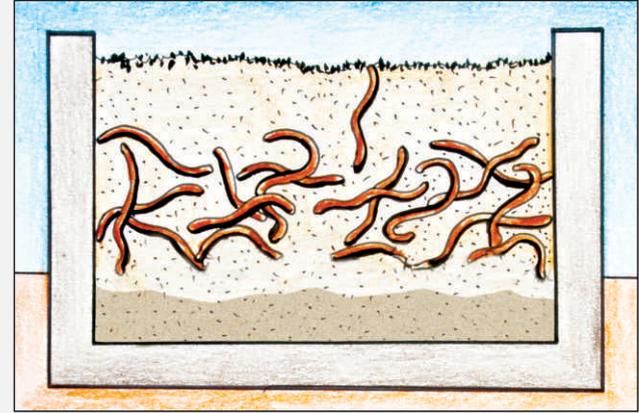
Elevated or On-Ground Compost tank: Compost tanks can also be constructed above the ground level. 2 m x 1 m x 1 m tank can be constructed above ground level using brick, rough stone or hollow blocks. While constructing the tank, honey home construction techniques can be followed. The weep hole provided in the structure facilitates better air





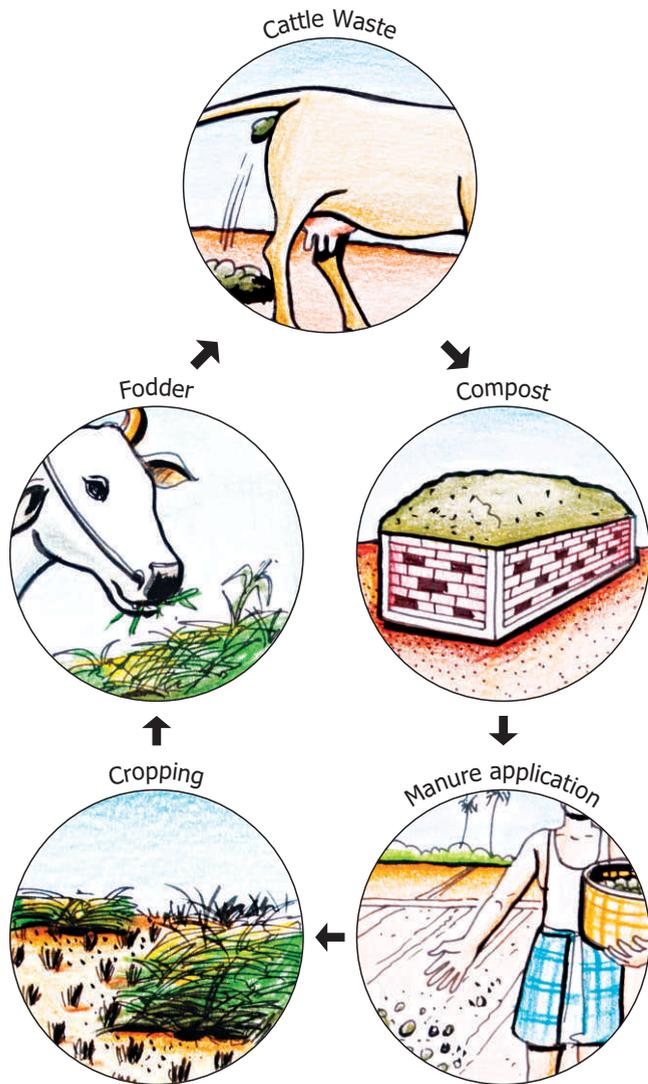
circulation inside the chamber resulting into faster composting. Even bamboo poles or casuarinas poles can also be used to construct compost tank as shown in the picture. The process of dumping the waste in the chamber is same as normal compost pit explained in the earlier page .i.e dumping waste layer by layer, sprinkling of cow dung mixed water. There is no need to insert bamboo stick for air circulation as the tank has weep holes for the same purpose.

Vermi-compositing: Using various worms such as white worm, earth worm etc to decompose house waste, food waste, agricultural materials in an enclosed pit is called vermi composting. In the process, the organic matter in the waste is broken down by the worms. It reduces the contamination and increases the nutrition value of fertilizer. It also improves the conditioning of the soil. In the temperature range of 15 to 25°C, the worms grow well and can survive the temperature range from minimum of 10°C



to maximum of 30°C, The temperature range beyond this limit might harm the worms in the vermi composting bed, therefore setting up a vermi composting bed under the shade /covered place would help in maintaining a favourable temperature conditions for worms in the vermi composting bed.

Recycling: Recycling is a practice of resource recovery from the waste products and the recovered resources from the waste can be reused. Some of the waste materials are easy to recycle into a new product. The segregation of recyclable waste such as paper, plastic, metals etc. right at the source is an essential aspect. It is experienced that the solid waste can be segregated to over 140 items depending on their recycling and disposal nature. For example, food waste collected from a restaurant might be a nutritious food source for the cattle whereas paper and plastic can go for recycling. Timely management of waste is an important aspect that can influence its reuse value. Any delay in the process might



hamper the whole operation of waste management, for example, restaurant waste should be collected, segregated and disposed within 6 to 8 hours otherwise it would become stale. Proper collection, separation and transportation fetch good money for the entrepreneurs. Across the country in many locations small scale entrepreneurs or SHGs are running waste management projects profitably. Cattle waste is a perfect example of recycling of waste as shown in the diagram. Dung cake, waste materials such as paper, plastic, iron is best suited for recycling.

Dung cake: Traditionally, cow or buffalo dung is used to make dung cake, which used as fuel in a domestic hearth called Chulha. People have been making dung cakes for domestic use but now it is done for trade purposes as well.



Solid Waste Disposal Options

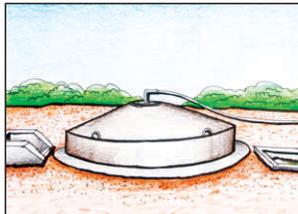
Land fill: Landfill is one of the inexpensive methods of solid waste disposal. Landfill involves burying of waste into the ground. It is the most common practice of waste disposal in most countries. Abandoned sites, mines, quarries or low lying regions are often used for land filling. In case of urban towns and small cities, the unwanted waste is dumped in the low lying areas to level the ground for various uses.

Incineration: Converting the organic waste into gaseous end product through combustion is called Incineration. Incineration can be employed both at small and large scale. In the cases where there is severe land scarcity, incineration can be a better option. While employing incineration techniques for waste disposal, one should ensure that gases emitting out of incineration process should not harm the environment.

Incinerators are best suited to dispose the harmful waste components. Example: Medical waste where it is not advisable to practice landfill to avoid potential harm it can cause on humans, environment and eco systems.

Energy production (biogas):

Recovering energy from organic waste is also an effective way of waste management. In the absence of oxygen, organic waste is broken down into biogas which can be used as renewable source of energy. Biodegradable waste such as sewage, cattle waste, agri or green waste etc. is digested



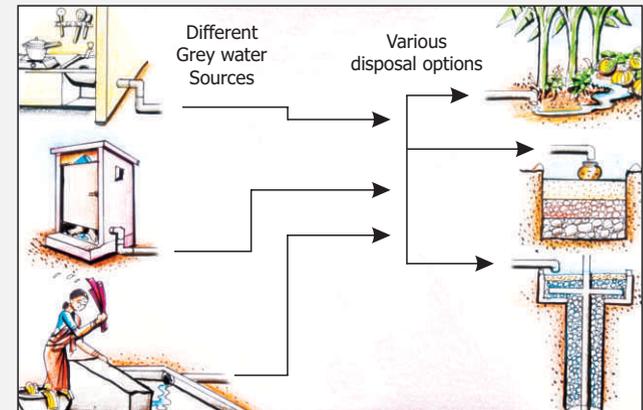
through anaerobic process to produce biogas. Biogas contains Methane (CH₄) and Carbon dioxide (CO₂) and also have small amount of Hydrogen Sulphide (H₂S). Biogas can be used for cooking or to produce electricity.

Liquid waste Disposal

As grey water is likely to contain harmful pathogens, care should be taken while collecting, transporting and disposing the liquid waste. Following are the ways and means for safe disposal of grey water.

Liquid Waste: Source Segregation

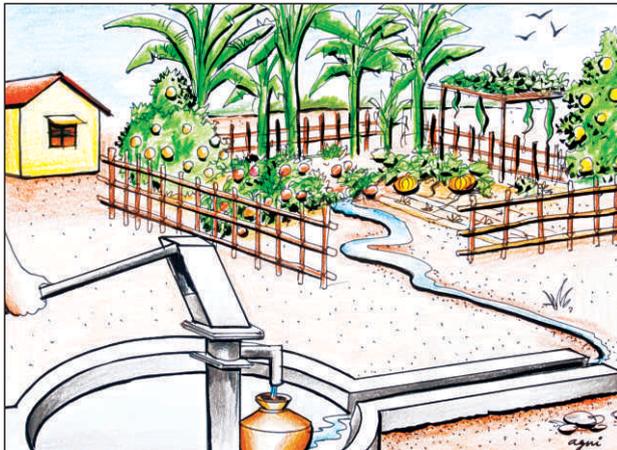
Like source segregation principle in solid waste management system, even the wastewater can also be segregated at source (example: household level). As mixing of black water and grey water makes the treatment a little complex, it is advisable to segregate grey and black water right at the source by proper planning of house plumbing to dispose the waste as shown in the diagram below.



Kitchen Garden: The wastewater from the kitchen and bath room can be diverted to back yard of a house and a small garden can be flourished by using waste water. This kitchen garden is an ideal way to produce nutritious vegetables at house for free. Bigger size gardens might boost the economy of the family by selling these vegetables.



The mini garden can also be promoted near the community water points such as bore well hand pump or a stand post. The spilled water from the community water point can be used to grow vegetables or fruit trees. The income generated from the community garden can be used for the operation and maintenance of drinking water points in the village.

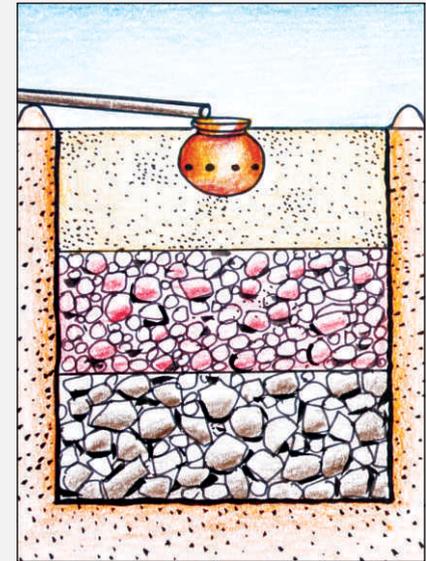


Soak Pit

In case there is not enough space to promote kitchen garden, another easy way to dispose the waste from the kitchen or community water points is by constructing soak pits. The soak pit construction is detailed below with a technical drawing.

Soak pit Construction and technical details

- Close to the water point or house, dig a 1m long, 1 m high and 1 m deep pit. Fill first 30 cms (from the bottom of the pit) with rough or broken stones.
- Next 30 cm as second layer, use the broken bricks.
- Rest of 40 cm at the top, fill with coarse sand.
- Make the small embankment of 20 cm height around the soak pit to avoid rain water entry into the pit.
- Take a small pot and make perforation on the side as shown in the picture. Till the height of perforation fill the

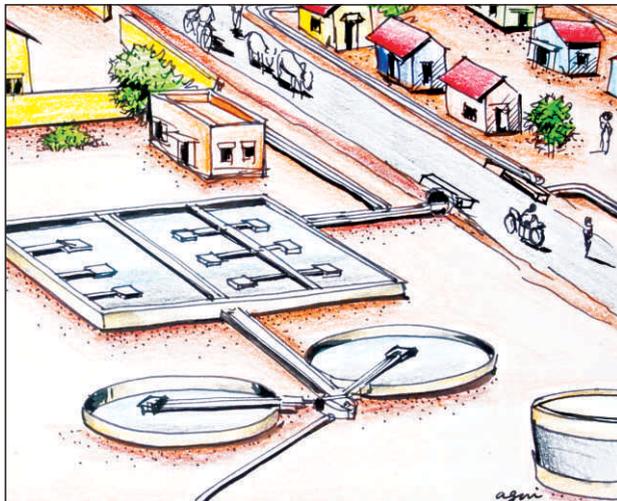


pot with coir pith or coconut fibre. This would help to filter out any solid or detergent waste.

- Place the pot at the centre of the pit and connect the waste water drain to the pot.
- Soak pit can be covered with waste gunny bag

Drainage and treatment

Other than for cities, constructing waste water drainage systems in small rural areas is an expensive way to dispose grey water due to low quantum of waste collected and scattered location of households. Also, in few villages Gram Panchayats can mobilize resources to build drainage plants, but their operation and maintenance is a challenging task both in terms of money and skill. Drainage systems are feasible in places where there is proper system and place

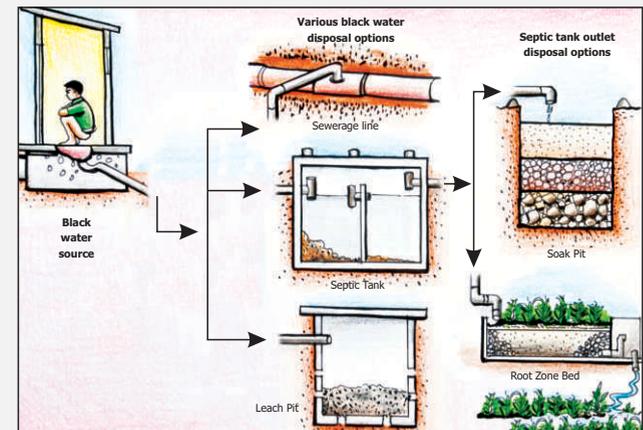


available to treat and drain water in efficient ways. Also treatment of wastewater collected from the drain is an important aspect before considering building drainage systems in any location. The treated water released from localized treatment plants should meet wastewater disposal standards established by the state and central governments.

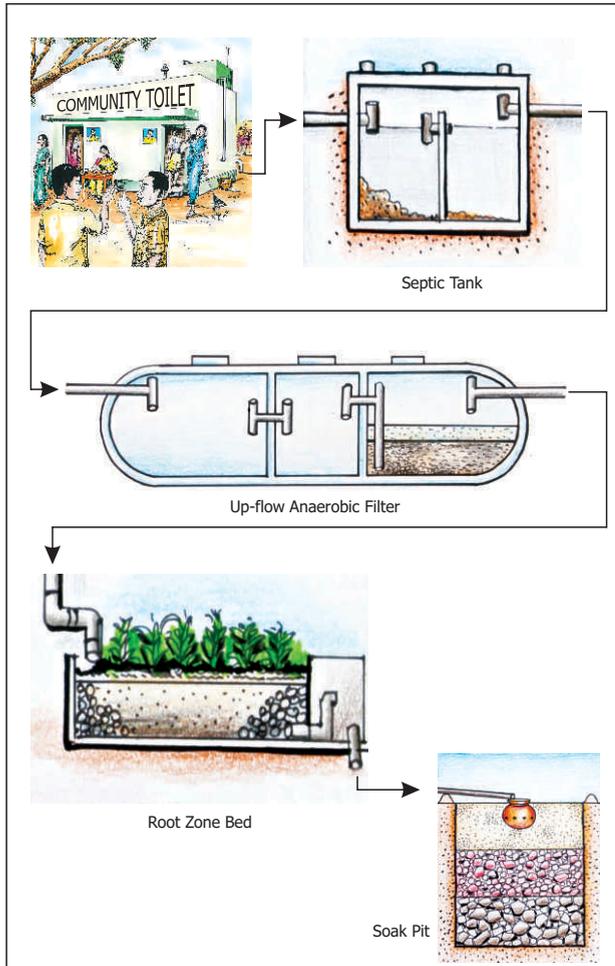
Low cost Waste Water Treatment Unit

Wastewater from the toilet/Black water contains harmful pathogens, it should be disposed properly. Leach pit, septic tank with soakage arrangement or connectivity to sewerage line is an effective way to dispose black water.

In places where there are complications around frequent emptying of septic tank used in community toilets such as in the rural area or small towns, low cost Waste Water Treatment Units may be an apt technology. This technique consists of Septic Tank, Up-flow Anaerobic Filter, Root Zone Bed (also called constructed wet land) and soak pit.



As shown in the flow diagram, wastewater from the septic tank passes through the up-flow anaerobic filter into the root zone bed where nutrient absorbing plant such as Canna



Indica can be grown. Filtered water from the root zone bed is finally disposed in the subsurface through soak pit. Now days, a prefabricated Up-flow Anaerobic chambers are available, using these readily available tanks will help in bringing down the construction cost and time spent.

Roles and Responsibilities of communities

The citizen role is critical for a better management of solid and liquid waste. The following are the key aspects that should be kept in mind while dealing or handling the waste:

Prevention: Prevention is better than cure. As far as possible take appropriate steps to prevent generating more harmful waste and ensure that the work or the product your dealing is not harming the eco, environmental and human health.

Minimizing the risks: Take all possible measures to minimize the risk to others while disposing waste that generated/produced by due to your nature of work.

Reuse : Adopt 'reduce, recycle and reuse' principles and always explore ways and means to reuse the waste through proper treatment.

Recycle : As narrated in earlier pages of the guide book some of the waste can be recycled easily, employ those options wherever possible.

Energy recovery: Always explore the possibilities of resource or energy recovery from the waste material that can be used to meet with ever growing demand of increasing population.

Polluters Pay : Watch out for surroundings and environment that households, industries or commercial establishments are properly disposing the waste as per the established norms of the government and ensure that polluters are meeting the expenses involved in treating the waste released by them.

Dispose: As mentioned in the guidebook, assist in segregating the waste right at the source and be a responsible citizen to dispose the waste at right dumping location. It helps in cost effective transport and treatment of waste.



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