Solid Waste Management

Principles and Terminologies

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1. What is solid waste?

The sight of a dustbin overflowing and the stench rising from it are all too familiar sights and smells of a crowded city. You look away from it and hold your nose as you cross it. Have you ever thought that you also have a role to play in the creation of this stench? That you can also play a role in the lessening of this smell and making this waste bin look a little more attractive if you follow proper methods of disposal of the waste generated in the house?

Since the beginning, humankind has been generating waste, be it the bones and other parts of animals they slaughter for their food or the wood they cut to make their carts. With the progress of civilization, the waste generated became of a more complex nature. At the end of the 19th century the industrial revolution saw the rise of the world of consumers. Not only did the air get more and more polluted but the earth itself became more polluted with the generation of non-biodegradable solid waste. The increase in population and urbanization was also largely responsible for the increase in solid waste.

1.1 Types of Solid Waste

Solid waste can be classified into different types depending on their source:

- Household waste is generally classified as municipal waste
- Industrial waste as hazardous waste
- Biomedical waste or hospital waste as infectious waste

Municipal solid waste

Consists of household waste, construction and demolition debris, sanitation residue, and waste from streets. This garbage is generated mainly from residential and commercial complexes. With rising urbanization and change in lifestyle and food habits, the amount of municipal solid waste has been increasing rapidly and its composition changing. In 1947 cities and towns in India generated an estimated 6 million tonnes of solid waste; in 1997 it was about 48 million tonnes. More than 25% of the municipal solid waste is not collected at all; 70% of the Indian cities lack adequate capacity to transport it and there are no sanitary landfills to dispose of the waste. *The existing landfills are neither well equipped nor well managed and are not lined properly to protect against contamination of soil and ground water.*

Over the last few years, the consumer market has grown rapidly leading to products being packed in cans, aluminium foils, plastics, and other such non biodegradable items that cause incalculable harm to the environment. In India, some municipal areas have banned the use of plastics and they seem to have achieved success. For example, today one will not see a single piece of plastic in the entire district of Ladakh where the local authorities imposed a ban on plastics in 1998. Other states should follow the example of this region and ban the use of items that cause harm to the environment. One positive note is that in many large cities, shops have begun packing items in reusable or biodegradable bags.

Hazardous waste

Industrial and hospital waste is considered hazardous as they may contain toxic substances. Certain types of household waste are also hazardous. *Hazardous wastes could be highly toxic to humans, animals, and plants; are corrosive, highly inflammable, or explosive; and react when exposed to certain things e.g. gases***.** India generates around 7 million tonnes of hazardous wastes every year, most of which is concentrated in four states: Andhra Pradesh, Bihar, Uttar Pradesh, and Tamil Nadu. Household wastes that can be categorized as hazardous waste include old batteries, shoe polish, paint tins, old medicines, and medicine bottles.

In the industrial sector, the major generators of hazardous waste are the metal, chemical, paper, pesticide, dye, refining, and rubber goods industries.

Direct exposure to chemicals in hazardous waste such as mercury and cyanide can be fatal.

Hospital waste

Hospital waste is generated during the diagnosis, treatment, or immunization of human beings or animals or in research activities in these fields or in the production or testing of biologicals. It may include wastes like sharps, soiled waste, disposables, anatomical waste, cultures, discarded medicines, chemical wastes, etc. These are in the form of disposable syringes, swabs, bandages, body fluids, human excreta, etc. This waste is highly infectious and can be a serious threat to human health if not managed in a scientific and discriminate manner. It has been roughly estimated that of the 4 kg of waste generated in a hospital at least 1 kg would be infected.

Hospital waste contaminated by chemicals used in hospitals is considered hazardous. These chemicals include formaldehyde and phenols, which are used as disinfectants, and mercury, which is used in thermometers or equipment that measure blood pressure. Most hospitals in India do not have proper disposal facilities for these hazardous wastes.

1.2 Health impacts of solid waste

Modernization and progress has had its share of disadvantages and one of the main aspects of concern is the pollution it is causing to the earth – be it land, air, and water. With increase in the global population and the rising demand for food and other essentials, there has been a rise in the amount of waste being generated daily by each household. This waste is ultimately thrown into municipal waste collection centres from where it is collected by the area municipalities to be further thrown into the landfills and dumps. However, either due to resource crunch or inefficient infrastructure, not all of this waste gets collected and transported to the final dumpsites. If at this stage the management and disposal is improperly done, it can cause serious impacts on health and problems to the surrounding environment.

Waste that is not properly managed, especially excreta and other liquid and solid waste from households and the community, are a serious health hazard and lead to the spread of infectious diseases. Unattended waste lying around attracts flies, rats, and other creatures that in turn spread disease. Normally it is the wet waste that decomposes and releases a bad odour. This leads to unhygienic conditions and thereby to a rise in the health problems. The plague outbreak in Surat is good example. Plastic waste is another cause for ill health. Thus excessive solid waste that is generated should be controlled by taking certain preventive measures.

The group at risk from the unscientific disposal of solid waste include – the population in areas where there is no proper waste disposal method, especially the pre-school children; waste workers; and workers in facilities producing toxic and infectious material. Other high-risk group includes population living close to a waste dump and those, whose water supply has become contaminated either due to waste dumping or leakage from landfill sites. Uncollected solid waste also increases risk of injury, and infection.

In particular, *organic domestic waste* poses a serious threat, since they ferment, creating conditions favourable to the survival and growth of microbial pathogens. Direct handling of solid waste can result in various types of infectious and chronic diseases with the waste workers and the rag pickers being the most vulnerable.

Exposure to hazardous waste can affect human health, children being more vulnerable to these pollutants. In fact, direct exposure can lead to diseases through chemical exposure as the release of chemical waste into the environment leads to chemical poisoning. Many studies have been carried out in various parts of the world to establish a connection between health and hazardous waste.

Waste from agriculture and industries can also cause serious health risks. Other than this, co-disposal of industrial hazardous waste with municipal waste can expose people to chemical and radioactive hazards. Uncollected solid waste can also obstruct storm water runoff, resulting in the forming of stagnant water bodies that become the breeding ground of disease. Waste dumped near a water source also causes contamination of the water body or the ground water source. Direct dumping of untreated waste in rivers, seas, and lakes results in the accumulation of toxic substances in the food chain, through the plants and animals that feed on it directly or indirectly.

Disposal of hospital and other medical waste requires special attention since this can create major health hazards. This waste generated from the hospitals, health care centres, medical laboratories, and research centres such as discarded syringe needles, bandages, swabs, plasters, and other types of infectious waste are often disposed with the regular non-infectious waste.

Waste treatment and disposal sites can also create health hazards for the neighbourhood. Improperly operated incineration plants cause air pollution and improperly managed and designed landfills attract all types of insects and rodents that spread disease. Ideally these sites should be located at a safe distance from all human settlement. Landfill sites should be well lined and walled to ensure that there is no leakage into the nearby ground water sources.

Recycling too carries health risks if proper precautions are not taken. Workers working with waste containing chemical and metals may experience toxic exposure. Disposal of health-care wastes require special attention since it can create major health hazards, such as Hepatitis B and C, through wounds caused by discarded syringes. Rag pickers and others who are involved in scavenging in the waste dumps for items that can be recycled, may sustain injuries and come into direct contact with these infectious items.

1.3 Occupational hazards associated with waste handling

Infections

- Skin and blood infections resulting from direct contact with waste, and from infected wounds
- Eye and respiratory infections resulting from exposure to infected dust, especially during landfill operations
- Different diseases that results from the bites of animals feeding on the waste
- Intestinal infections that are transmitted by flies feeding on the waste

Chronic diseases

- Incineration operators are at risk of chronic respiratory diseases, including cancers resulting from exposure to dust and hazardous compounds

Accidents

- Bone and muscle disorders resulting from the handling of heavy containers
- Infecting wounds resulting from contact with sharp objects
- Poisoning and chemical burns resulting from contact with small amounts of hazardous chemical waste mixed with general waste.
- Burns and other injuries resulting from occupational accidents at waste disposal sites or from methane gas explosion at landfill sites.

Source - Adapted from UNEP report, 1996

2. Importance of waste reduction

In the affluent countries, the main motivations for waste reduction are frequently related to the high cost and scarcity of sites for landfills, and the environmental

degradation caused by toxic materials in the deposited wastes. The same considerations apply to large metropolitan areas in developing countries that are surrounded by other populous jurisdictions. The places that currently do not have significant disposal pressures can still benefit from encouraging waste reduction. Their solid waste departments, already overburdened, cannot afford to spend more money and effort on the greater quantities of wastes that will inevitably be produced as consumption levels rise and urban wastes change.

Solid waste managers in developing countries tend to pay little attention to the topic of reducing non-organic wastes because the wastes they collect are between 50% to 90% organics, dirt and ashes. These municipal wastes, however, are amenable to composting or digestion, provided they contain very low levels of synthetic materials. Solid waste departments thus have an interest in promoting diversion of synthetic recyclables from the waste stream.

Each household generates garbage or waste day in and day out. Items that are no longer needed or do not have any further use for fall in the category of waste and we tend to throw them away. There are different types of solid waste depending on their source. In today's polluted world, learning the correct methods of handling the waste generated has become essential. Segregation is an important method of handling municipal solid waste. Segregation at source can be understood clearly by schematic representation. One of the important methods of managing and treating wastes is composting.

As the cities are growing in size and in problems such as the generation of plastic waste, various municipal waste treatment and disposal methods are now being used to try and resolve these problems. One common sight in all cities is the rag picker who plays an important role in the segregation of this waste.

Garbage generated in households can be recycled and reused to prevent creation of waste at source and reducing amount of waste thrown into the community dustbins.

3. Key concepts in municipal waste reduction

Waste reduction: All means of reducing the amounts of waste that must be collected and disposed of by solid waste authorities. It ranges from legislation and agreements at the national level for packaging and product redesign to local programs to prevent recyclables and compostable organics from entering final waste streams.

Source reduction: Any procedure to reduce wastes at the point of generation, in contrast to sorting out recyclable components after they have been mixed together for collection.

Source separation: Keeping different categories of recyclables and organics separate at source, i.e. at the point of generation, to facilitate reuse, recycling, and composting.

Waste recovery, materials recovery, or waste diversion: Obtaining materials/organics (by source separation or sorting out from mixed wastes) that can be reused or recycled.

Reuse: Reusing a product for the same or a different purpose.

Recycling: The process of transforming materials into secondary resources for manufacturing new products is called recycling.

Redemption center: Waste trading enterprise that buys recyclable materials and sells to brokers. Sometimes also called "buy-back centre".

Producer responsibility: Producers of products or services accept a degree of responsibility for the wastes that result from the products/services they market, by reducing materials used in production, making repairable/recyclable goods, and/or reducing packaging.

Four Rs (Refuse, Reuse, Recycle, Reduce) to be followed for waste management

1. **Refuse** - Instead of buying new containers from the market, use the ones that are in the house. Refuse to buy new items though you may think they are prettier than the ones you already have.

2. **Reuse -** Do not throw away the soft drink cans or the bottles; cover them with homemade paper or paint on them and use them as pencil stands or small vases. Alternately, you can store them and sell it to the *kabariwalla* who takes these for recycling. Reuse the plastic bags for shopping again and again. It is better if you use shopping bags made of cloth or jute, which can be used over and over again.

3. **Recycle -** Segregate your wastes so that non-perishable wastes are easily collected and taken for recycling. Dig a small pit to compost your organic wastes like kitchen wastes at your home.

4. **Reduce** - Reduce the generation of unnecessary waste, e.g. carry your own shopping bag when you go to the market and put all your purchases directly into it.

4. Promoting waste reduction and materials recovery at the national and local levels

Action for waste reduction can take place at both national and local levels. At the national level, the main routes to waste reduction are:

- ✓ redesign of products or packaging;
- ✓ promotion of consumer awareness; and
- ✓ promotion of producer responsibility for post-consumer wastes (this applies mostly to industrialized countries).

At the local level, the main means of reducing waste are:

- ✓ diversion of materials from the waste stream through source separation and trading;
- ✓ recovery of materials from mixed waste;
- ✓ pressure on national or regional governments for legislation on redesigning packaging or products; and
- ✓ support of composting, either centralized or small-scale.

Composting

Organic matter constitutes 35%–40% of the municipal solid waste generated in India. This waste can be recycled by the method of composting, one of the oldest forms of disposal. It is the natural process of decomposition of organic waste that yields manure or compost, which is very rich in nutrients. Composting is a biological process in which micro-organisms, mainly fungi and bacteria, convert degradable organic waste into humus like substance. This finished product, which looks like soil, is high in carbon and nitrogen and is an excellent medium for growing plants. The process of composting ensures the waste that is produced in the kitchens is not carelessly thrown and left to rot. It recycles the nutrients and returns them to the soil as nutrients. Apart from being clean, cheap, and safe, composting can significantly reduce the amount of disposable garbage. The organic fertilizer can be used instead of chemical fertilizers and is better specially when used for vegetables. It increases the soil's ability to hold water and makes the soil easier to cultivate. It helps the soil retain more of the plant nutrients.

Vermi-composting has become very popular in the last few years. In this method, worms are added to the compost. These help to break the waste and the added excreta of the worms makes the compost very rich in nutrients. In the activity section of this web site you can learn how to make a compost pit or a vermi-compost pit in your school or in the garden at home.

To make a compost pit, you have to select a cool, shaded corner of the garden or the school compound and dig a pit, which ideally should be 3 feet deep. This depth is convenient for aerobic composting as the compost has to be turned at regular intervals in this process. Preferably the pit should be lined with granite or brick to prevent nitrite pollution of the subsoil water, which is known to be highly toxic. Each time organic matter is added to the pit it should be covered with a layer of dried leaves or a thin layer of soil which allows air to enter the pit thereby preventing bad odour. At the end of 45 days, the rich pure organic matter is ready to be used.

Composting: some benefits

- ✓ Compost allows the soil to retain more plant nutrients over a longer period.
- ✓ It supplies part of the 16 essential elements needed by the plants.
- ✓ It helps reduce the adverse effects of excessive alkalinity, acidity, or the excessive use of chemical fertilizer.
- ✓ It makes soil easier to cultivate.
- ✓ It helps keep the soil cool in summer and warm in winter.
- ✓ It aids in preventing soil erosion by keeping the soil covered.
- ✓ It helps in controlling the growth of weeds in the garden.

5. The Plastic Nightmare?

Plastic with its exclusive qualities of being light yet strong and economical has invaded every aspect of our day-to-day life. It has many advantages: it is durable, light, and easy to mould, and can be adapted to different user requirements. Once hailed as a 'wonder material', plastic is now a serious worldwide environmental and health concern, essentially due to its non-biodegradable nature.

In India, the plastic industry is growing phenomenally. Plastics have use in all sectors of the economy – infrastructure, construction, agriculture, consumer goods, telecommunications, and packaging.

But the good news is that along with a growth in the use, a country-wide network for collection of plastic waste through rag pickers, waste collectors and waste dealers and recycling enterprises has sprung all over the country over the last decade or so. More than 50% of the plastic waste generated in the country is recycled and used in the manufacture of various plastic products.

Conventional plastics have been associated with reproductive problems in both wildlife and humans. Studies have shown a decline in human sperm count and quality, genital abnormalities and a rise in the incidence of breast cancer. Dioxin a highly carcinogenic and toxic by-product of the manufacturing process of plastics is one of the chemicals believed to be passed on through breast milk to the nursing infant. Burning of plastics, especially PVC releases this dioxin and also furan into the atmosphere. Thus, conventional plastics, right from their manufacture to their disposal are a major problem to the environment.

Plastics are so versatile in use that their impacts on the environment are extremely wide ranging. Careless disposal of plastic bags chokes drains, blocks the porosity of the soil and causes problems for groundwater recharge. Plastic disturbs the soil microbe activity, and once ingested, can kill animals. Plastic bags can also contaminate foodstuffs due to leaching of toxic dyes and transfer of pathogens. In fact, a major portion of the plastic bags i.e. approximately 60-80% of the plastic waste generated in India is collected and segregated to be recycled. The rest remains strewn on the ground, littered around in open drains, or in unmanaged garbage

dumps. Though only a small percentage lies strewn, it is this portion that is of concern as it causes extensive damage to the environment.

The plastic industry in the developed world has realized the need of environmentally acceptable modes for recycling plastics wastes and has set out targets and missions. Prominent among such missions are the Plastic Waste Management Institute in Japan, the European Centre for Plastics in Environment, the Plastic Waste Management Task Force in Malaysia. Manufacturers, civic authorities, environmentalists and the public have begun to acknowledge the need for plastics to conform to certain guidelines/standards and code of conduct for its use.

Designing eco-friendly, biodegradable plastics are the need of the hour. Though partially biodegradable plastics have been developed and used, completely biodegradable plastics based on renewable starch rather than petrochemicals have only recently been developed and are in the early stages of commercialization.

Source of generation of waste plastics

HOUSEHOLD

- Carry bags
- Bottles
- Containers
- Trash bags
- Packages

HEALTH AND MEDICARE

- Disposable syringes
- Glucose bottles
- Blood and urine bags
- Intravenous tubes
- Catheters
- Surgical gloves

HOTEL AND CATERING

- Packaging items
- Mineral water bottles
- Plastic plates, glasses, spoons

AIR/RAIL TRAVEL

- Mineral water bottles
- Plastic plates, glasses, spoons
- Plastic bags

The following gives you an idea about the type of litter we generate and the approximate time it takes to degenerate

- **Organic waste such as vegetable and fruit peels, leftover foodstuff, etc.**: A week or two
- **Paper**: 10–30 days
- **Cotton cloth**: 2–5 months
- **Wood**: 10–15 years
- **Woolen items**: 1 year
- **Tin, aluminium, and other metal items such as cans**: 100–500 years
- **Plastic bags**: One million years?
- **Glass bottles**: Undetermined

6. What you can do to reduce solid waste?

- Carry your own cloth or jute bag when you go shopping
- Say no to all plastic bags as far as possible
- Reduce the use of paper bags also.
- Reuse the soft drinks poly bottles for storing water.
- Segregate biodegradable and the non biodegradable are put into separate bins and disposed off separately.
- Dig a compost pit in your garden and put all the biodegradable materials into it.
- See to it that all garbage is thrown into the municipal bin as the collection is generally done from there.
- When you go out do not throw paper and other wrappings or even leftover food here and there, make sure that it is put in the correct place, which is into a dustbin.

- As far as possible try to sell all the recyclable items that are not required to the *Kabariwalla* (person who trades in waste).

7. What you should not do?

- **Do not** litter. If we drop litter it will encourage others to litter.
- **Do not** put out garbage too early, especially garbage that contains meat and fish scraps.
- **Do not** dump or litter illegally at the sides of the roads or in gullies, it is not only unsightly but dangerous and hazardous to health.
- **Do not** allow water to collect in your garbage bin.
- **Do not** place your old stoves, refrigerators, or other big or bulky items at the side of the road.
- **Do not** use an oversize bin (e.g. 50 gallons (190L) drum) to contain your garbage. They are generally too heavy to lift.
- **Do not** overload your garbage bags; they may burst as a result of excessive weight or bulk.
- **Do not** throw broken objects (e.g. glass, ceramic, etc.) into the garbage without wrapping them first.
- **Do not** place needles and syringes in the garbage or leave them lying around.
- **Do not** overload your waste bin or put out loosely tied or untied bags for collection.
- **Do not** compact waste in the waste bin. This makes it difficult to extract the waste.

8. Solid Waste Management Glossary

Aerobic composting
A method of com-posting organic wastes using bacteria that need oxygen. This requires that the waste be exposed to air, either via turning or by forcing air through pipes that pass through the material.

Anaerobic digestion
A method of composting that does not require oxygen. This composting method produces methane. It is also known as anaerobic composting.

Ash
The noncombustible solid by-products of incineration or other burning process.

Autoclaving
Sterilization via a pressurized, high-temperature steam process.

Baghouse
A combustion plant emission control device that consists of an array of fabric filters through which flue gases pass in an incinerator flue. Particles are trapped and thus prevented from passing into the atmosphere.

Basel Convention
An international agreement on the control of trans-boundary movements of hazardous wastes and their disposal, drawn up in March 1989 in Basel, Switzerland, with over 100 countries as signatories.

Biodegradable material
Any organic material that can be broken down by microorganisms into simpler, more stable compounds. Most organic wastes (e.g., food, paper) are biodegradable.

Bottom ash
Relatively coarse, noncombustible, generally toxic residue of incineration that accumulates on the grate of a furnace.

Bulky waste
Large wastes such as appliances, furniture, and trees and branches, that cannot be handled by normal MSW processing methods.

Cell
The basic unit by which a landfill is developed. It is the general area where incoming waste is tipped, spread, compacted, and covered.

Chemocar
A special vehicle for the collection of toxic and hazardous wastes from residences, shops, and institutions.

Cleaner production
Processes designed to reduce the wastes generated by production.

Co-disposal
The disposal of different types of waste in one area of a landfill or dump. For instance, sewage sludges may be disposed of with regular solid wastes.

Cogeneration
Production of both electricity and steam from one facility, from the same fuel source.

Collection
The process of picking up wastes from residences, businesses, or a collection point, loading them into a vehicle, and transporting them to a processing, transfer, or disposal site.

Combustibles
Burnable materials in the waste stream, including paper, plastics, wood, and food and garden wastes.

Combustion
In Municipal Solid Waste Management, the burning of materials in an incinerator.

Commingled
Mixed recyclables that are collected together after having been separated from mixed Municipal Solid Waste.

Communal collection
A system of collection in which individuals bring their waste directly to a central point, from which it is collected.

Compactor vehicle
A collection vehicle using high-power mechanical or hydraulic equipment to reduce the volume of solid waste.

Composite liner
A liner system for a land-fill consisting of an engineered soil layer and a synthetic sheet of material.

Compost
The material resulting from com posting. Compost, also called humus, is a soil conditioner and in some instances is used as a fertilizer.

Composting
Biological decomposition of solid organic materials by bacteria, fungi, and other organisms into a soil-like product.

Construction and demolition debris
Waste generated by construction and demolition of buildings, such as bricks, concrete, drywall, lumber, miscellaneous metal parts and sheets, packaging materials, etc.

Controlled dump
A planned landfill that incorporates to some extent some of the features of a sanitary landfill: siting with respect to hydro-geological suitability, grading, compaction in some cases, leachate control, partial gas management, regular (not usually daily) cover, access control, basic record-keeping, and controlled waste picking.

Curbside collection
Collection of compostables, recyclables, or trash at the edge of a sidewalk in front of a residence or shop.

Curing
Allowing partially composted materials to sit in a pile for a specified period of time as part of the maturing process in composting.

Disposal
The final handling of solid waste, following collection, processing, or incineration. Disposal most often means placement of wastes in a dump or a landfill.

Diversion rate
The proportion of waste material diverted for recycling, composting, or reuse and away from landfilling or incineration.

Drop-off center
An area or facility for receiving compostables or recyclables that are dropped off by waste generators.

Dump
See controlled dump and open dump.

Emissions
Gases released into the atmosphere.

Energy recovery
The process of extracting useful energy from waste, typically from the heat produced by incineration or via methane gas from landfills.

Environmental impact assessment (EIA)
An evaluation designed to identify and predict the impact of an action or a project on the environment and human health and well-being. Can include risk assessment as a component, along with economic and land use assessment.

Environmental risk assessment (EnRA)
An evaluation of the interactions of agents, humans, and ecological resources. Comprised of human health risk assessment and ecological risk assessment, typically evaluating the probabilities and magnitudes of harm that could come from environmental contaminants.

Fabric filter
See baghouse.

Flaring
The burning of methane emitted from collection pipes at a landfill.

Fluidized-bed incinerator
A type of incinerator in which the stoker grate is replaced by a bed of limestone or sand that can withstand high temperatures. The heating of the bed and the high air velocities used cause the bed to bubble, which gives rise to the term fluidized.

Fly ash
The highly toxic particulate matter captured from the flue gas of an incinerator by the air pollution control system.

Garbage
In everyday usage, refuse in general. Some MSWM manuals use garbage to mean "food wastes," although this usage is not common.

Groundwater
Water beneath the earth's surface that fills underground pockets (known as aquifers), supplying wells and springs.

Hazardous waste
Waste that is reactive, toxic, corrosive, or otherwise dangerous to living things and/or the environment. Many industrial by-products are hazardous.

Heavy metals
Metals of high atomic weight and density, such as mercury, lead, and cadmium, that are toxic to living organisms.

Household hazardous waste
Products used in residences, such as paints and some cleaning compounds, that are toxic to living organisms and/or the environment.

Humus
The end product of composting, also called compost.

Incineration
The process of burning solid waste under controlled conditions to reduce its weight and volume, and often to produce energy.

Informal sector
The part of an economy that is characterized by private, usually small-scale, labor-intensive, largely unregulated, and unregistered manufacturing or provision of services.

Inorganic waste
Waste composed of material other than plant or animal matter, such as sand, dust, glass, and many synthetics.

Integrated solid waste management
Coordinated use of a set of waste management methods, each of which can play a role in an overall MSVVM plan.

International NGO
An organization that has an international headquarters and branches in major world regions, often with the purpose of undertaking development assistance.

In-vessel composting
Composting in an enclosed vessel or drum with a controlled internal environment, mechanical mixing, and aeration.

Itinerant waste buyer
A person who moves around the streets buying (or bartering for) reusable and recyclable materials.

Landfill gases
Gases arising from the decomposition of organic wastes; principally methane, carbon dioxide, and hydrogen sulfide. Such gases may cause explosions at landfills.

Landfilling
The final disposal of solid waste by placing it in a controlled fashion in a place intended to be permanent. The Source Book uses this term for both controlled dumps and sanitary landfllls.

Leachate
Liquid (which may be partly produced by deromposition of organic matter) that has seeped through a landfill or a compost pile and has accumulated bacteria and other possibly harmful dissolved or suspended materials. If uncontrolled, leachate can contaminate both groundwater and surface water.

Leachate pond
A pond or tank constructed at a landfill to receive the leachate from the area. Usually the pond is designed to provide some treatment of the leachate, by allowing settlement of solids or by aeration to promote biological processes.

Lift
The completed layer of compacted waste in a cell at a landfill.

Liner
A protective layer, made of soil and/or synthetic materials, installed along the bottom and sides of a landfill to prevent or reduce the flow of leachate into the environment.

Manual landfill
A landfill in which most operations are carried out without the use of mechanized equipment.

Market waste
Primarily organic waste, such as leaves, skins, and unsold food, discarded at or near food markets.

Mass-burn incinerator
A type of incinerator in which solid waste is burned without prior sorting or processing.

Materials recovery
Obtaining materials that can be reused or recycled.

Materials recovery facility (MRF)
A facility for separating commingled recyclables by manual or mechanical means. Some MRFs are designed to separate recyclables from mixed MSW. MRFs then bale and market the recovered materials.

Methane
An odorless, colorless, flammable, explosive gas, CH, produced by anaerobically decomposing MSW at landfills.

Microenterprise
A synonym for small-scale enterprise: a business, often family-based or a cooperative that usually employs fewer than ten people and may operate "informally."

Mixed waste
Unsorted materials that have been discarded into the waste stream.

Modular incinerator
A relatively small type of prefabricated solid waste combustion unit.
Monofill
A landfill intended for one type of waste only.

MSW
Municipal solid waste.

MSWM
Municipal solid waste management.

Municipal solid waste
All solid waste generated in an area except industrial and agricultural wastes. Sometimes includes construction and demolition debris and other special wastes that may enter the municipal waste stream. Generally excludes hazardous wastes except to the extent that they enter the municipal waste stream. Sometimes defined to mean all solid wastes that a city authority accepts responsibility for managing in some way.

Municipal solid waste management
Planning and implementation of systems to handle MSW.

NGO
Non-governmental organization. May be used to refer to a range of organizations from small community groups, through national organizations, to international ones. Frequently these are not-for-profit organizations.

Night soil
Human excreta.

NIMBY
"Not In My Back Yard." An expression of resident opposition to the siting of a solid waste facility based on the particular location proposed.

Open dump
An unplanned "landfill" that incorporates few if any of the characteristics of a controlled landfill. There is typically no leachate control, no access control, no cover, no management, and many waste pickers.

Organic waste
Technically, waste containing carbon, including paper, plastics, wood, food wastes, and yard wastes. In practice in MSWM, the term is often used in a more restricted sense to mean material that is more directly derived from plant or animal sources, and which can generally be decomposed by microorganisms.

Pathogen
An organism capable of causing disease.

Picker
See waste picker.

Pollution
The contamination of soil, water, or the atmosphere by the discharge of waste or other offensive materials.

Post-consumer materials
Materials that a consumer has finished using, which the consumer may sell, give away, or discard as wastes.

Primary material
A commercial material produced from virgin materials used for manufacturing basic products. Examples include wood pulp, iron ore, and silica sand.

Privatization
A general term referring to a range of contracts and other agreements that transfer the provision of some services or production from the public sector to private firms or organizations.

Processing
Preparing MSW materials for subsequent use or management, using processes such as baling, magnetic separation, crushing, and shredding. The term is also sometimes used to mean separation of recyclables from mixed MSW.

Producer responsibility
A system in which a producer of products or services takes responsibility for the waste that results from the products or services marketed, by reducing materials used in production, making repairable or recyclable goods, and/ or reducing packaging.

Putrescible
Subject to decomposition or decay. Usually used in reference to food wastes and other organic wastes that decay quickly.

Pyrolysis
Chemical decomposition of a substance by heat in the absence of oxygen, resulting in various hydrocarbon gases and carbon-like residue.

Recyclables
Items that can be reprocessed into feedstock for new products. Common examples are paper, glass, aluminum, corrugated cardboard, and plastic containers.

Recycling
The process of transforming materials into raw materials for manufacturing new products, which may or may not be similar to the original product.

Refuse
A term often used interchangeably with solid waste.

Refuse-derived fuel (RDF)
Fuel produced from MSW that has undergone processing. Processing can include separation of recyclables and noncombustible materials, shredding, size reduction, and pelletizing.

Resource recovery
The extraction and utilization of materials and energy from wastes.

Reuse
The use of a product more than once in its original form, for the same or a new purpose.

Rubbish
A general term for solid waste. Sometimes used to exclude food wastes and ashes.

Sanitary landfill
An engineered method of disposing of solid waste on land, in a manner that meets most of the standard specifications, including sound silting, extensive site preparation, proper leachate and gas management and monitoring, compaction, daily and final cover, complete access control, and record-keeping.

Scrubber
Emission control device in an incinerator, used primarily to control acid gases, but also to remove some heavy metals.

Secondary material
A material recovered from post-consumer wastes for use in place of a primary material in manufacturing a product.

Secure landfill
A disposal facility designed to permanently isolate wastes from the environment. This entails burial of the wastes in a landfill that includes clay and/ or synthetic liners, leachate collection, gas collection (in cases where gas is generated), and an impermeable cover.

Septage
Sludge removed from a septic tank (a chamber that holds human excreta).

Set-out container
A box or bucket used for residential waste that is placed outside for collection.

Sewage sludge
A semi-liquid residue that settles to the bottom of canals and pipes carrying sewage or industrial wastewaters, or in the bottom of tanks used in treating wastewaters.

Site remediation
Treatment of a contaminated site by removing contaminated solids or liquids or treating them on-site.

Source reduction
The design, manufacture, acquisition, and reuse of materials so as to minimize the quantity and/or toxicity of waste produced.

Source separation
Setting aside of compostable and recyclable materials from the waste stream before they are collected with other MSW, to facilitate reuse, recycling, and composting.

Special wastes
Wastes that are ideally considered to be outside of the MSW stream, but which sometimes enter it and must often be dealt with by municipal authorities. These include household hazardous waste, medical waste, construction and demolition debris, war and earthquake debris, tires, oils, wet batteries, sewage sludge, human excreta, slaughterhouse waste, and industrial waste.

Subsidy
Direct or indirect payment from government to businesses, citizens, or institutions to encourage a desired activity.

Tipping fee
A fee for unloading or dumping waste at a landfill, transfer station, incinerator, or recycling facility.

Tipping floor
Unloading area for vehicles that are delivering MSW to a transfer station or incinerator.

Transfer
The act of moving waste from a collection vehicle to a larger transport vehicle.

Transfer point
A designated point, often at the edge of a neighborhood, where sma collection vehicles transfer waste to larger vehicles for transport to disposal sites.

Transfer station
A major facility at which MSW from collection vehicles is consolidated into loads that are transported by larger trucks or other means to more distant final disposal facilities, typically landfills.

Vectors
Organisms that carry diseasecausing pathogens. At landfills rodents, flies, and birds are the main vectors that spread pathogens beyond the landfill site.

Vermiculture
See worm culture.

Virgin materials
Any basic material for industrial processes that has not previously been used, for example, wood-pulp trees, iron ore, crude oil, bauxite.

Waste characterization study
An analysis of samples from a waste stream to determine its composition.

Waste collector
A person employed by a local authority or a private firm to collect waste from residences, businesses, and community bins.

Waste dealer
A middleman who buys recyclable materials from waste generators and itinerant buyers and sells them, after sorting and some processing, to wholesale brokers or recycling industries.

Waste management hierarchy
A ranking of waste management operations according to their environmental or energy benefits. The purpose of the waste management hierarchy is to make waste management practices as environmentally sound as possible.

Waste picker
A person who picks out recyclables from mixed waste wherever it may be temporarily accessible or disposed of.

Waste reduction
All means of reducing the amount of waste that is produced initially and that must be collected by solid waste authorities. This ranges from legislation and product design to local programs designed to keep recyclables and compostables out of the final waste stream.

Waste stream
The total flow of waste from a community, region, or facility.

Waste-to-energy (WTE) plant
A facility that uses solid waste materials (processed or raw) to produce energy. WTE plants include incinerators that produce steam for district heating or industrial use, or that generate electricity; they also include facilities that convert landfill gas to electricity.

Water table
Level below the earth's surface at which the ground becomes saturated with water.

Wetland
An area that is regularly wet or flooded and has a water table that stands at or above the land surface for at least part of the year.

Windrow
An elongated pile of aerobically composting materials that are turned periodically to expose the materials to oxygen and to control the temperature to promote biodegradation.

Working face
The length and width of the row in which waste is being deposited at a landfill. Also known as the tipping face.

Worin castings
The material produced from the digestive tracts of worms as they live in earth or compost piles. The castings are rich in nitrates, potassium, phosphorous, calcium, and magnesium.

Worm culture
A relatively cool, aerobic composting process that uses worms and microorganisms. Also known as *vermiculture*.

Yard waste
Leaves, grass clippings, prunings, and other natural organic matter discarded from yards and gardens.

Glossary Source:
http://www.gdrc.org

This material has been prepared based on downloaded information from the following links and other resources from the Internet:
http://edugreen.teri.res.in
http://www.unep.org
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