

# PLAN OF PRESENTATION

- ◉ Introduction to waste and types
- ◉ Solid waste
- ◉ Types of solid waste
- ◉ Effects of solid waste
- ◉ Waste management concept
- ◉ Concept of 3R
- ◉ solid waste management
  - storage
  - collection
  - waste handling and transport
  - method of disposal
- ◉ Technology
- ◉ Zero waste system
- ◉ Recommendation

# WASTE

- ◉ It is defined as

Waste (also known as rubbish, trash, refuse, garbage, junk) is any unwanted or useless materials.

OR

Any materials unused and rejected as worthless or unwanted and “A useless or profile less activity using or expanding or consuming thoughtlessly or carefully.”

# TYPES OF WASTE

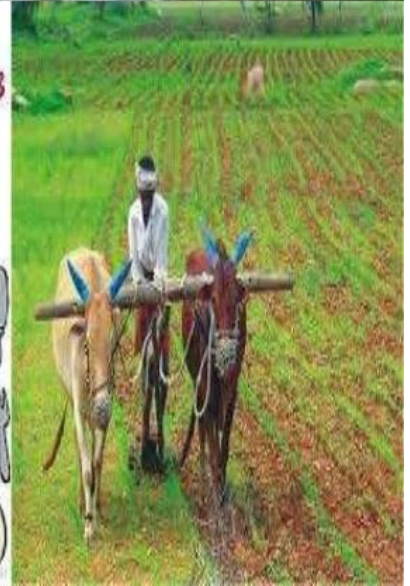
- ◉ Solid waste
- ◉ Liquid waste
- ◉ Gaseous waste
- ◉ Animal by product (ABPs)
- ◉ Biodegradable waste
- ◉ Chemical waste
- ◉ Commercial waste/  
Business waste
- ◉ Biomedical waste
- ◉ Bulky waste

# SOLID WASTE

- ◉ It is defined as  
“ non liquid, non-soluble materials ranging from municipal garbage to industrial wastes that contain complex & sometimes hazardous substances”
  
  - ◉ Solid waste also include
    - Garbage
    - Rubbish
    - Demolition products
    - Sewage treatment residue
    - Dead animals
    - Manure and other discarded material.
- Per capita solid waste out put 0.25-2.5 Kg/day

# SOURCE

- Agriculture
- Fisheries
- Household
- Commerce and industry



# TYPES

Broadly there are 3 types of waste which as follows

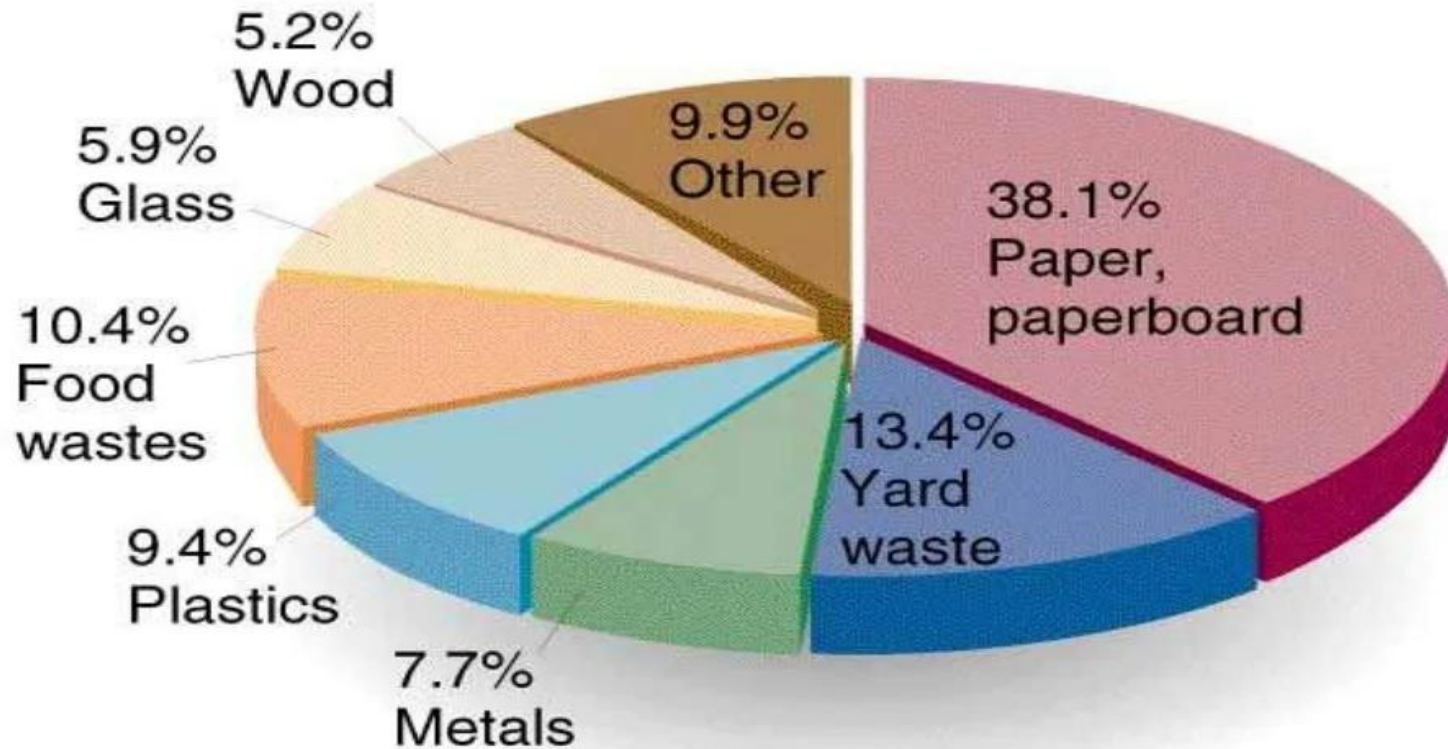
1. Household waste as municipal waste
2. Industrial waste as hazardous waste
3. Biomedical waste or hospital waste as infectious waste



# 1. MUNICIPAL SOLID WASTE

- ◉ Municipal solid waste consist of---
  - household waste
  - construction and demolition debris
  - sanitation residue
  - waste from streets
- ◉ With rising urbanization and change in life style and food habits ,the amount of municipal solid waste has been increasing rapidly and its composition changing.

# CHARACTERIZATION OF MUNICIPAL SOLID WASTE





# HAZARDOUS WASTE

- ◉ Industrial and hospital waste is considered hazardous as they may contain toxic substances
- ◉ Hazardous waste could be highly toxic to humans, animals and plants. They are
  - corrosive
  - highly inflammable or explosive
- ◉ In the industrial sector the major generators of hazardous waste are the metal, chemical, paper, pesticide, dye and rubber goods industries.
- ◉ Direct exposure to chemicals in hazardous waste such as mercury and cyanide can be fatal

# HOSPITAL WASTE OR BIOMEDICAL WASTE

- ◉ Bio-medical waste means “Any waste which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining thereto or in the production or testing of biological”

-Bio-medical waste rules ,1998

- ◉ It may includes wastes like sharp waste, pathological waste, pharmaceutical waste, genotoxic waste, chemical waste, and radioactive waste etc.

## EFFECTS OF SOLID WASTE

### A:Health hazard

- ◉ If solid waste are not collected and allowed to accumulate , they may create unsanitary conditions.
- ◉ This may lead to epidemic outbreaks .
- ◉ Many diseases like cholera. Diarrhea, dysentery, plague, jaundice, or gastro-intestinal diseases may spread and cause loss of human lives.

## CONTD...

- ◉ In addition improper handling of the solid wastes ,a health hazard for the workers who come in direct contact with the waste.

### B: Environmental impact

- ◉ If the solid wastes are not treated properly decomposition and putrefaction( decay) may take place .
- ◉ The organic solid waste during decomposition may generate obnoxious (intolerable odour)

# WASTE MANAGEMENT CONCEPT

- ◉ The 3Rs (Reduce, Reuse, Recycle) to be followed for waste management.





# REDUCE

- ◉ Disposable goods: paper plate, paper bowl, Styrofoam cup, plastic spoon, roll of paper towels, paper napkin; Durable goods: ceramic/plastic plate, metal spoon, glass/plastic drinking cup, dish towel, cloth napkin)
- ◉ Recovery of one tonne paper can save 17 trees.

# REUSE

- ◉ Instead of buying new containers from the market, use the ones that are in the house.
- ◉ Don't throw away the soft drink can or bottle cover them with home made paper or paint on them and use them as pencil stands or small vases.

# RECYCLE

- ◉ Use shopping bags made of cloth or jute which can be used over and over



## What We Cannot RECYCLE



**Biscuit and chips packets**

**Wrappers of bread, noodles and wheat flour (ATTA) bags**



**Thermocole and aluminium lined dishware**

**Packaging of diapers and sanitary napkins**



**Cigarette, pan, 'guthka' packets, small shampoo sachets**

**Laminated gift wrapping paper**



**Takeaway Food Parcels**

**Note:** The items listed here have multi layer packaging that makes segregating and recovering plastic or aluminium layers difficult. These items are unlikely to get recycled and end up being a cost to the environment. As far as possible avoid or minimize their use. Look out for or ask for packaging that can be recycled.

# WASTE MANAGEMENT HIERARCHY

- ◉ There are a number of concepts about waste management which vary in their usage between countries or regions. Some of the most general, widely used concepts include:
  1. Waste hierarchy - The waste hierarchy refers to the "3 Rs" reduce, reuse and recycle, which classify waste management strategies according to their desirability in terms of waste minimization. The waste hierarchy remains the cornerstone of most waste minimization strategies.
- The aim of the waste hierarchy is to extract the maximum practical benefits from products and to generate the minimum amount of waste .





## CONTD...

- ◉ Polluter pays principle - the Polluter Pays Principle is a principle where the polluting party pays for the impact caused to the environment. With respect to waste management, this generally refers to the requirement for a waste generator to pay for appropriate disposal of the unrecoverable material.

# SOLID WASTE MANAGEMENT

Waste management is the

- ◉ storage
- ◉ collection
- ◉ transport and handling
- ◉ recycling
- ◉ disposal and monitoring of waste materials.

# STORAGE

- ◉ Storage:
  - Galvanized steel dust bin
  - Paper sack
  - Public bins



# COLLECTION

- ◉ Collection
  - House-to-house collection
  - Collection from the public bins





# WASTE HANDLING AND TRANSPORT

- ◉ Waste handling and separation involves activities associated with waste management until the waste is placed in storage containers for collection. Handling also encompasses the movement of loaded containers to the point of collection.
- ◉ waste is transferred from a smaller collection vehicle to larger transport equipment



# RECYCLING

- Recycling refers to the collection and refuse of waste materials such as empty beverage container.
- The materials from which the items are made can be processed into new products.
- Materials for recycling may be collected separately from general waste using dedicated bins.



# METHOD OF DISPOSAL

1. Dumping
2. Controlled Tipping or Sanitary Landfill
3. Incineration
4. Composting
5. Manure pits
6. Burial

# OBJECTIVES

- ⦿ Public hygiene and health.
- ⦿ Reuse, recovery and recycle
- ⦿ Energy generation
- ⦿ Sustainable development
- ⦿ Aesthetics

# 1. DUMPING

- ◉ Low lying areas.
- ◉ Mainly for dry refuses
- ◉ Kolkata disposes by this
- ◉ method and reclaimed land given for cultivation.
- ◉ Unsanitary method
  - Exposed to flies and rodents
  - Nuisance
  - Dispersed by wind
  - pollution of surface water





## 2. CONTROLLED TIPPING/ SANITARY LANDFILL

- ◉ Satisfactory method
  - Material placed in a trench
  - compacted with earth at the end of the working day.
- ◉ Modified sanitary land fill-where compaction and covering are accomplished once or twice a week.

- ◎ 3 Methods

1. Trench method
2. Ramp method
3. Area method

Refuse is compacted on its exposed surface with excavated earth (30 cm).

## TRENCH METHOD

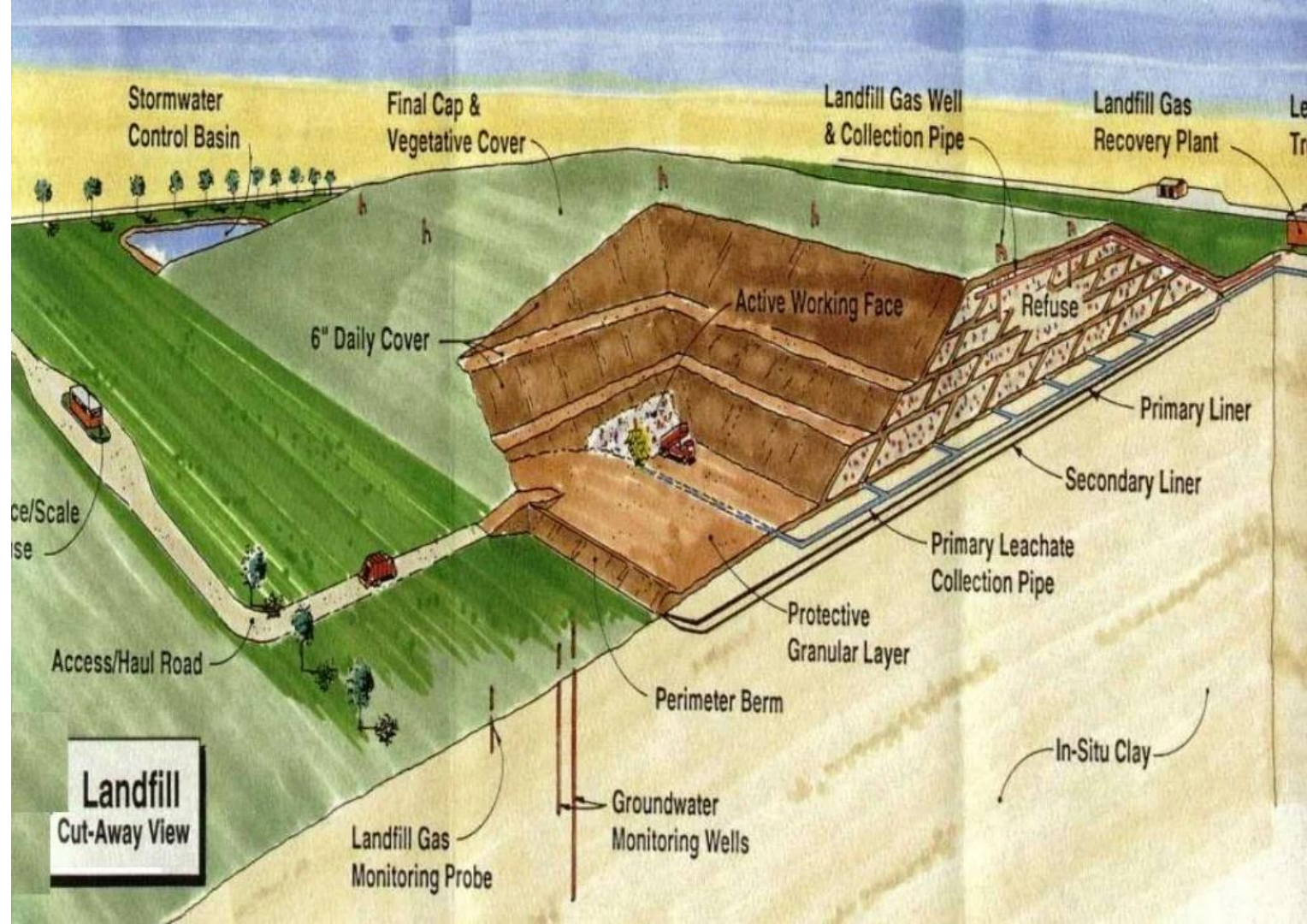
- ◉ Long trench of 6-10 feet deep and 12-36 feet wide.
- ◉ Refuse is compacted and covered with excavated earth.
- ◉ Refuse is filled up to 6 feet.
- ◉ It is estimated one acre of land per year for 10,000 population.
- ◉ **RAMP METHOD:** suited where the terrain is moderately slopping.

## AREA METHOD

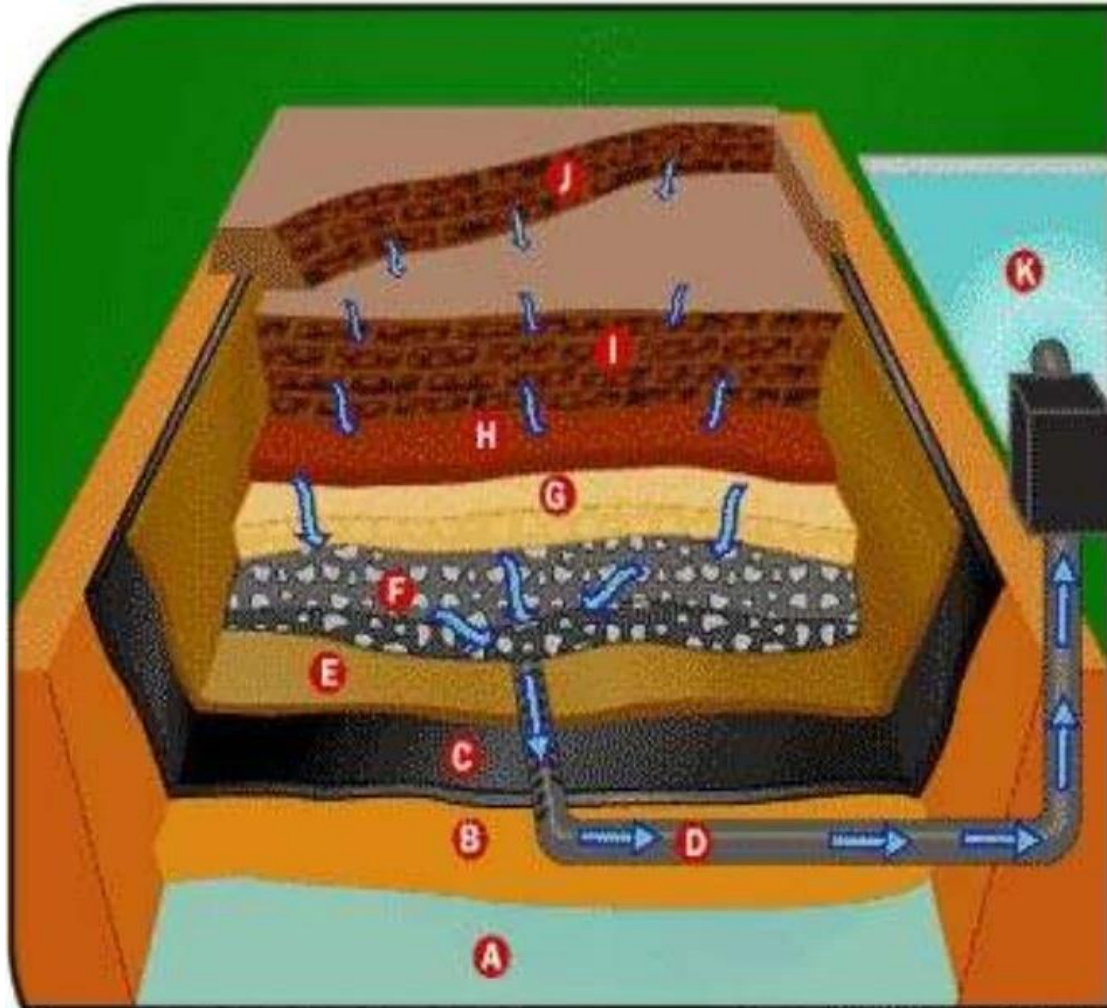
- ◉ Used for filling land depressions, disused quarries and clay pits.
- ◉ Refuse is deposited, packed and consolidated in uniform layers for 6-8 feet.
- ◉ Each layer is sealed with a mud cover at least 12 inches.
- ◉ Sealing prevents infestation by flies and rodents.
- ◉ Prevents nuisance of smell and dust.

- ◉ Changes
  - Chemical
  - Bacteriological
  - Physical
- ◉ The temperature rises to over 60 deg. C within 7 days and kills all pathogens and hastens the decomposition process.
- ◉ It takes 4 to 6 months for complete decomposition.









- A** Ground Water
- B** Compacted Clay
- C** Plastic Liner
- D** Leachate Collection Pipe
- E** Geotextile Mat
- F** Gravel
- G** Drainage Layer
- H** Soil Layer
- I** Old Cells
- J** New Cells
- K** Leachate Pond



# SINKHOLE





### 3. INCINERATION

- ◉ it is a disposal method in which solid organic wastes are subjected to combustion so as to convert them into residue and gaseous products.
  - ◉ This process reduces the volumes of solid waste to 20-30% of the original volume.
  - ◉ Also described as thermal treatment
- 
- ◉ Where land is not available
  - ◉ Hospital waste



## 4.COMPOSTING



- ◉ Method of combined disposal of refuse and night soil/ sludge
- ◉ Principal by products are:  $\text{CO}_2$  , Water and heat
- ◉ End product- compost
- ◉ Methods
  - a. Bangalore method
  - b. Mechanical composting
  - c. Vermicomposting

### Raw materials

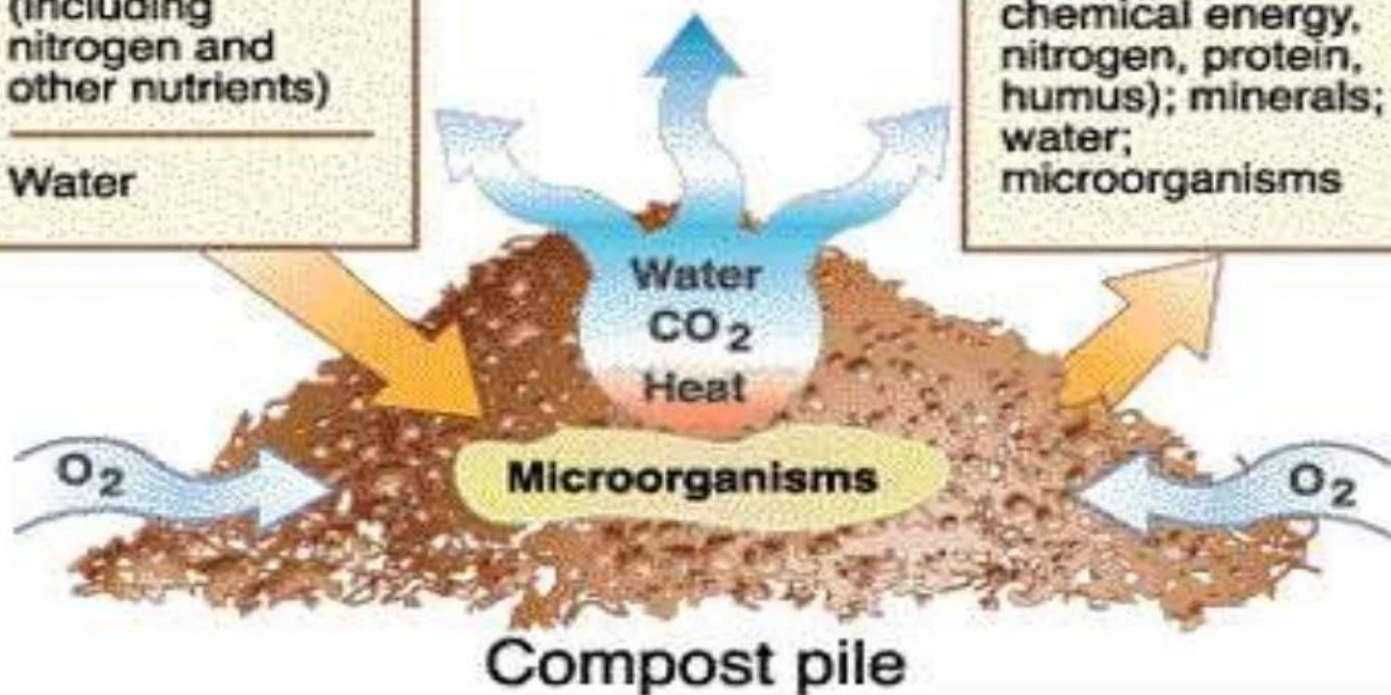
Organic matter  
(including carbon,  
chemical energy,  
protein, nitrogen)

Minerals  
(including  
nitrogen and  
other nutrients)

Water

### Finished compost

Organic matter  
(including carbon,  
chemical energy,  
nitrogen, protein,  
humus); minerals;  
water;  
microorganisms



## A. BANGALORE METHOD (HOT FERMENTATION PROCESS/ ANAEROBIC METHOD)

- ◉ IISc- Indian Council of Agricultural Research.
- ◉ Trenches are dug 3ft deep, 5-8ft broad, 15-30ft long.
- ◉ Composting procedure
  - 1. Layer of Refuse- 15 cm
  - 2. Layer of Night soil - 5 cm

Physical, chemical and biological changes takes place



## B. MECHANICAL COMPOSTING (AEROBIC METHOD)

- ◉ Compost manufactured by processing raw materials.
- ◉ 1. Screening
- ◉ 2. Pulverization (<2inches)
- ◉ 3. Mixing
- ◉ 4. Incubation

Process completed in 4-6 week

**C: vermicomposting** :It is a method of disposal of kitchen *and* plate wastes, which serves the dual purpose of disposing off the garbage as well as proving eco-friendly.



## 5. MANURE PITS



- ◉ Mostly used in rural areas
- ◉ Digging “manure pits” is to prevent the refuses thrown around the houses.
- ◉ The garbage, cattle dung, straw, and leaves should be dumped into the mannure pits and covered with earth.
- ◉ Two pits will be needed
- ◉ In 5-6 month’s time the refuse is converted into manure which can be returned to the field.

## 6.BURIAL



- ◉ Suitable for small camp
- ◉ A trench 1.5m wide & 2 m deep is excavated
- ◉ The refuse is covered with 20 -30cm of earth
- ◉ When the level in the trench is 40cm from ground level, the trench is filled with earth & compacted
- ◉ 4-6 months

# TECHNOLOGY

- Technologies like

RFID( Radio frequency identification) tags are now being used to collect data on presentation rates for curb-side pick-ups.

GPS tracking is particularly evident when considering the efficiency of ad hoc pick-ups (like skip bins or dumpsters) where the collection is done on a consumer request basis.

Rear vision cameras are commonly used for OH&S (Occupational Health & Safety) reasons and video recording devices are becoming more widely used, particularly concerning residential services.

# ZERO WASTE SYSTEM

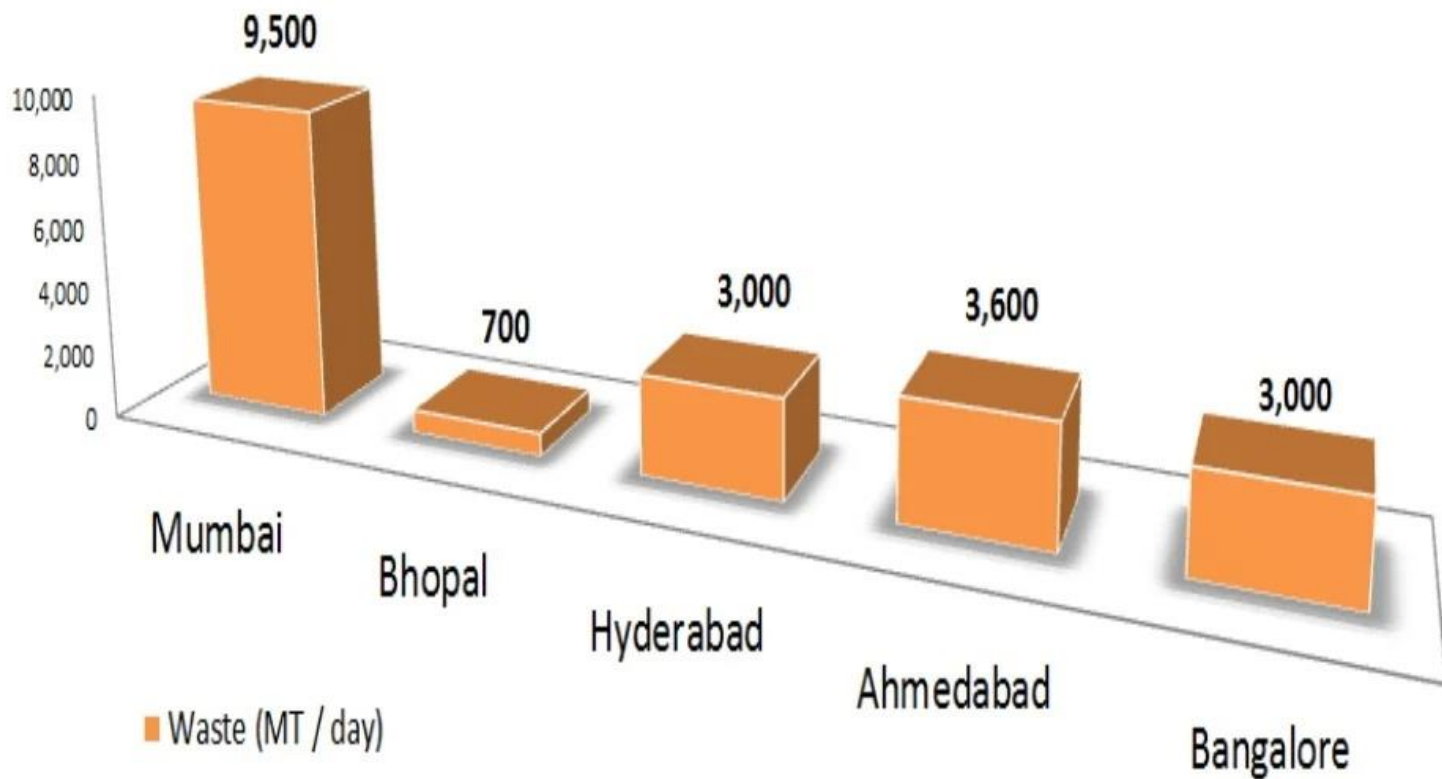
- ◉ Zero waste system which was founded by PhD chemist .Paul parmer in Okland.
- ◉ It is a philosophy that encourages the redesign of resource life cycle so that all products are reused.



**NOW WE CAN ACHIEVE  
ZERO WASTE**  
RECYCLING ALL OUR HOUSEHOLD WASTE  
**IS NOW POSSIBLE**



# WASTES PER INDIAN CITIES





# WASTE MANAGEMENT POLICIES

- ◉ Environment protection act, 1986
- ◉ Hazardous waste rule 1989
- ◉ Bio-medical waste rule 1998
- ◉ Municipal solid waste rule 2000
- ◉ Waste management act 1996
- ◉ Solid waste policy in India 2006

## RECOMENDATION

- ◉ The improvement of people and private sector through NGOs could improve the efficiency of solid waste management.
- ◉ Public awareness should be created especially at primary level.
- ◉ Littering of solid waste should be prohibited in cities towns and urban areas.
- ◉ More over house to house collecting solid waste should be .

## CONTD...

- ◉ The collection bins must be have a large enough capacity to accommodate 20% more than the expected waste generation in the area.
- ◉ Municipal authorities should maintain the storage facilities to avoid unhygienic & unsanitary condition.
- ◉ It is advisable to move from open dumping to sanitary land filling in a phased manner.