

SOLID WASTE MANAGEMENT

- Initial methods: simply throwing into unpaved streets, open pits outside the city walls
- Population increased: transport wastes out further away from cities
- Until recent times: dumping solid wastes outside the city/village limits/ occasionally burning/ compacting .
- Lack of space : forced us to go for burning to reduce volume

- Effects: burning and dumping is not acceptable today because it caused lot of problems(attracting mosquitoes, pigs, dogs etc.,) reducing heigenity, pollution to atmosphere, water, soil
- Hence integrated waste management is planned for scientific method of disposal of solid waste
- **integrated waste management: involves collection, processing, resource recovery, and final disposal**

Solid waste: Municipal solid waste & industrial waste

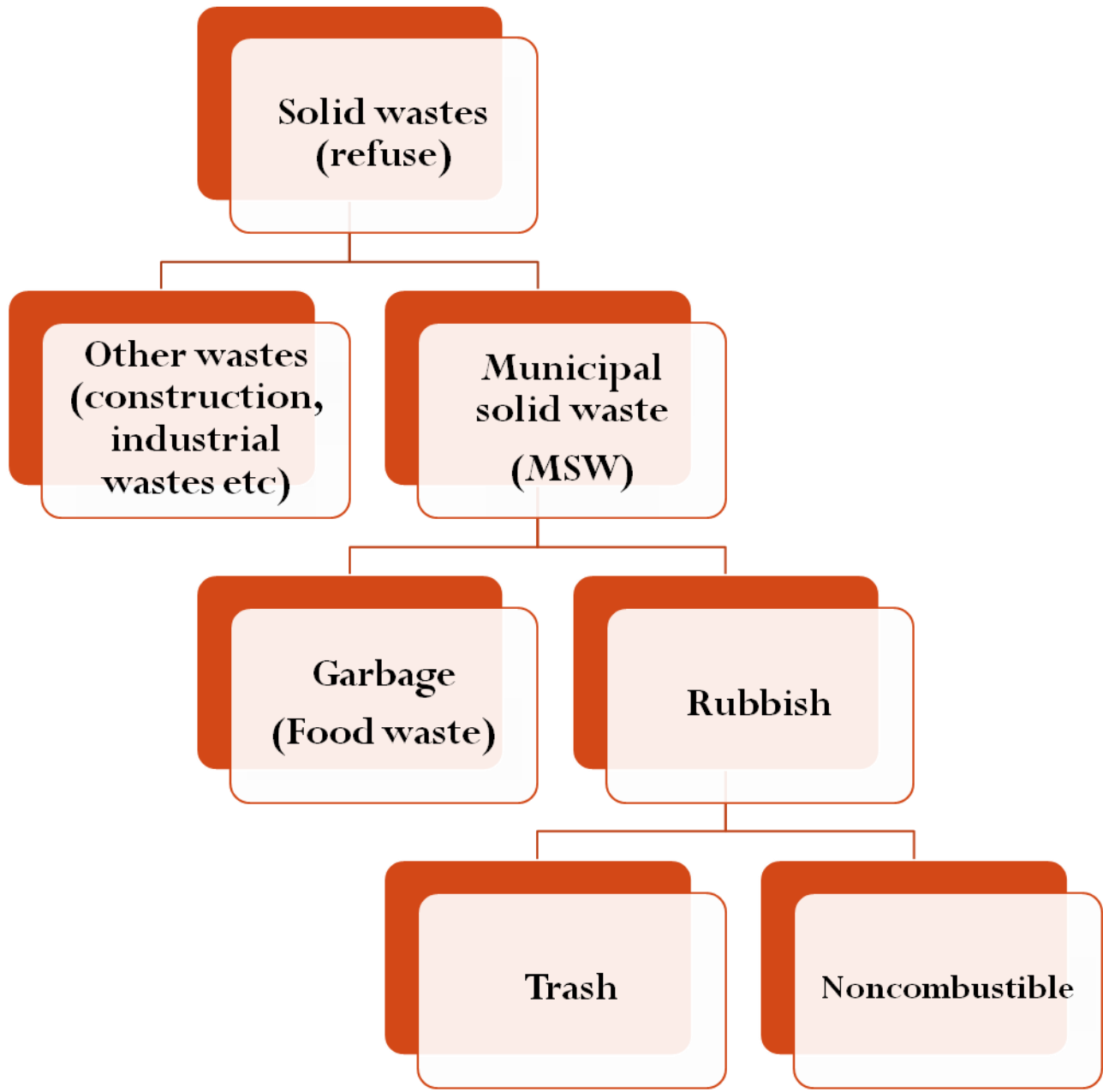
- Municipal solid waste:
 - **1. includes:** waste from our homes, commercial establishments and institutions,
 - **2. does not include:** wastes from industrial processes, construction and demolition debris, sewage sludge, mining wastes or agricultural wastes

Municipal solid waste

- **Contains**
 - **Wet garbage:** Food waste(vegetable, meat leftover food, egg shells)
 - **Dry garbage:** paper, plastic, tetra packs, plastic cans, glass bottles, card board boxes, aluminum foils, metal items, wood pieces etc.,

Solid Waste

- These are all the waste arising from human and animal activities that are normally solids and discarded as **useless or unwanted.**



Rubbish

- Combustible and non-combustible solid wastes excluding food wastes.
- **Combustible Rubbish**: paper, cardboard, textiles, plastics, rubber, woods, etc.
- **Non-combustible Rubbish**: Glass, tin cans, aluminum cans, metals and construction wastes.

Garbage

- Organic wastes like the dead animals, food and vegetable residuals resulting from handling, preparation, cooking and eating of food.

Types & Sources of Solid wastes

- Municipal Solid wastes
- Industrial Solid wastes
- Hazardous Solid wastes

Municipal Solid wastes:

- These are the wastes that arise from household activities, restaurants, public places, institutions, markets and street sweeping.
- Includes garbage, rubbish, and ash.

Causes of solid wastes

- Over population
- Urbanization
- Affluence/per-capita consumption
- Technological obsolescence

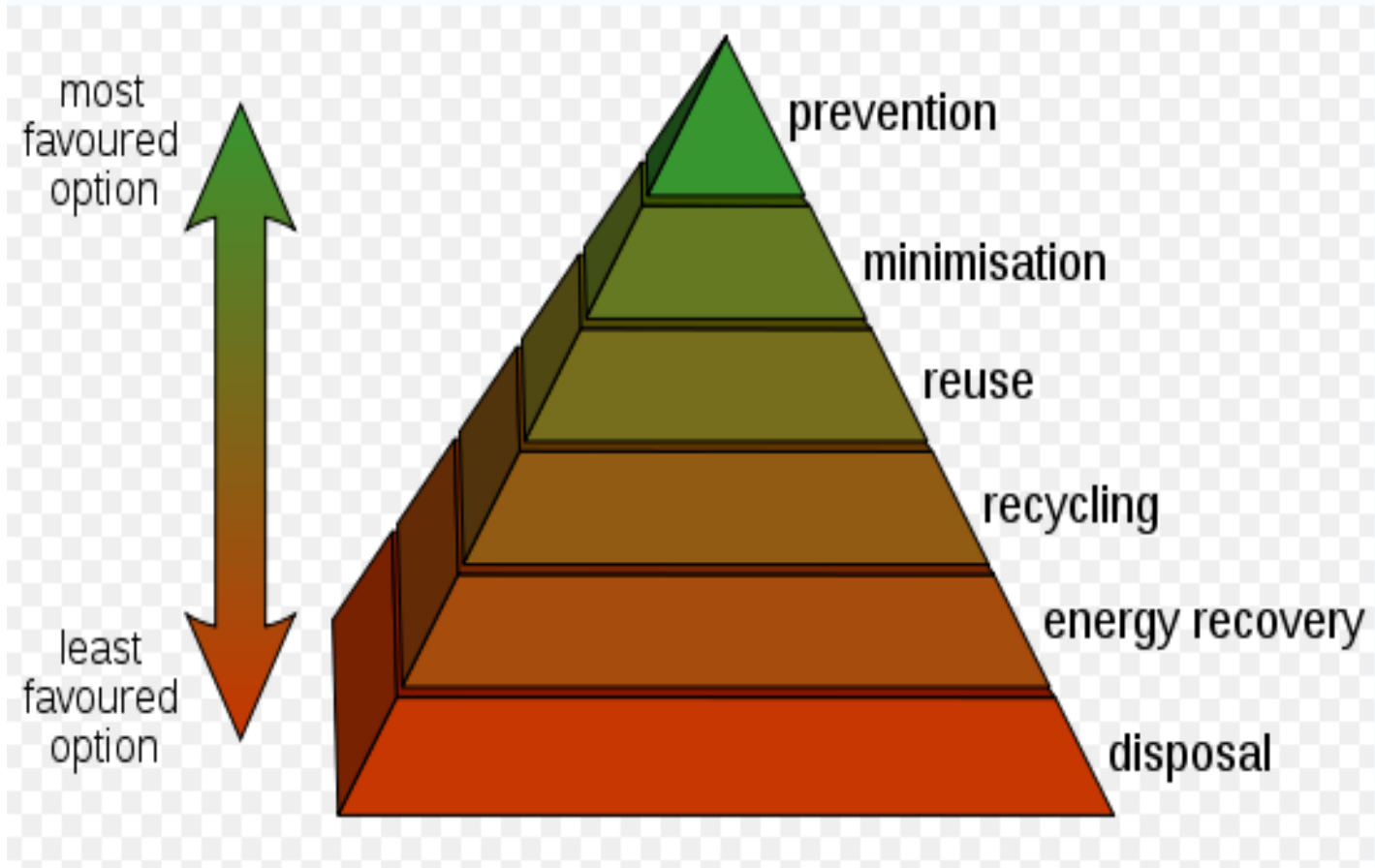
Effects

- Diseases like Cholera, jaundice, hepatitis etc.
- Water logging - Dengue, malaria etc.
- Obnoxious(extremely unpleasant) odors also pollute air due to decomposition of organic solid wastes.
- Noxious(harmful) fumes also pollute the air due to burning of plastic waste products.

Solid waste Management

- It is defined as the application of techniques that will ensure the orderly execution of the functions of collection, processing and disposal of solid wastes.
- **Major functions of solid waste management:**
 - Collection
 - Processing
 - Disposal
- **Steps involved in solid waste management:**
 - Reduce
 - Reuse
 - Recycle
 - Recovery

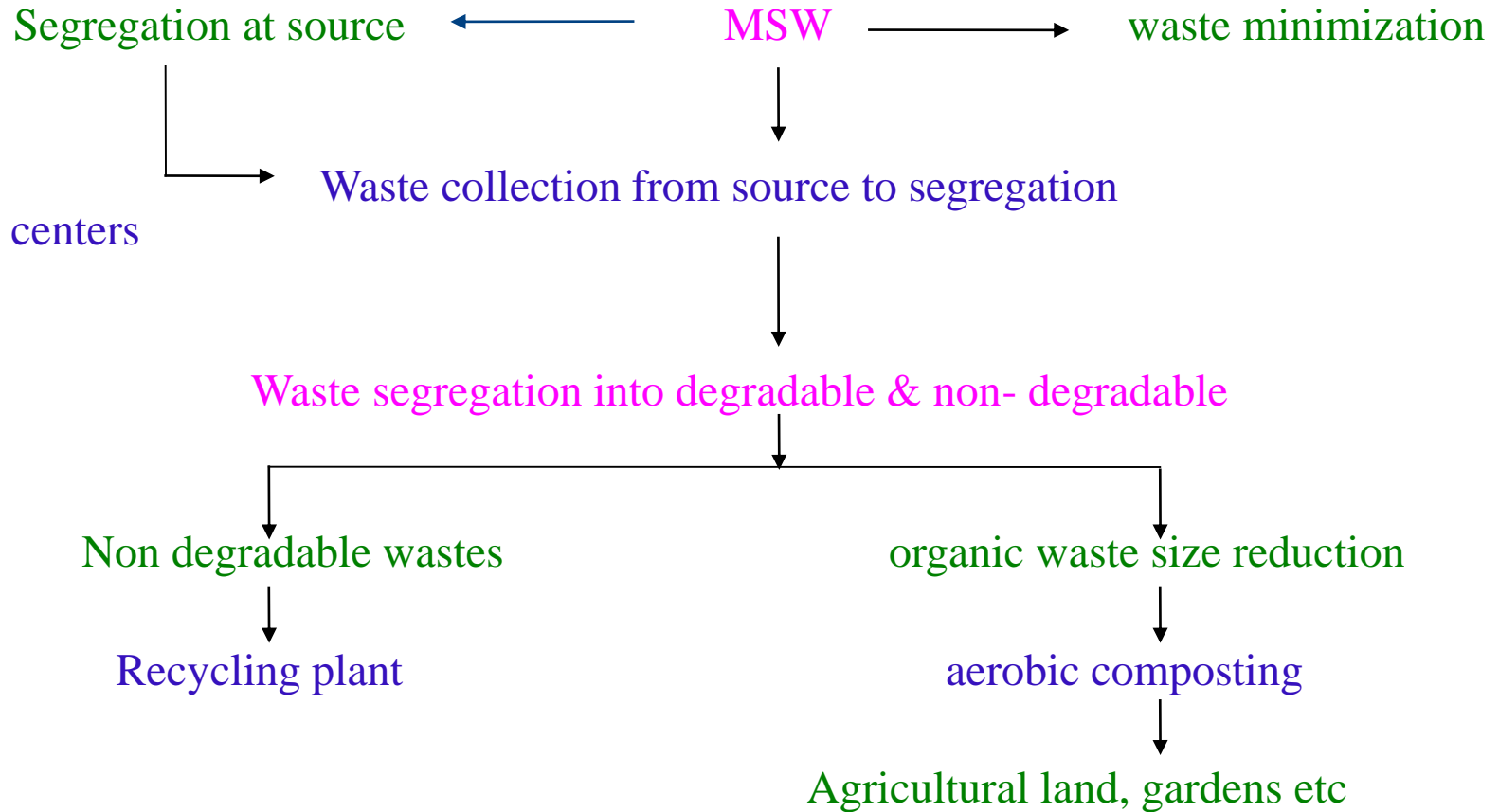
Hierarchy of Waste Management



Advantages of Solid Waste Management

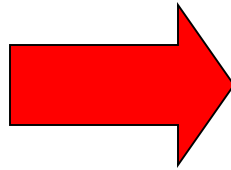
- Direct or indirect **waste utilization** contributes to economical development.
- **Waste utilization** is helpful for conservation of natural resources.
- Environmental pollution can be controlled or reduced substantially.
- Employment opportunities are generated.

Hierarchy/ ranking of Integrated Solid Waste Management



CATEGORIES OF WASTE DISPOSAL

1. **DILUTE AND
DISPERSE
(ATTENUATION)**

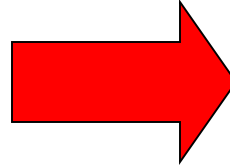


**Throw it in the river /
lake / sea
or **Burn it****

- Basically this involves spreading trash thinly over a large area to minimize its impact.

- Works for sewage, some waste chemicals, when land-disposal is not available.

**2. CONCENTRATE
AND CONTAIN
(ISOLATION)**



**Waste dumps,
landfills**

Historically, that's how most of the solid waste gets treated

Methods of Solid waste disposal

- Land Filling
- Incineration
- Pulverization
- Composting
- Pyrolysis
- Disposal into sea

Landfilling

- Solid wastes are carried and dumped into the low land areas.
- The refuse is filled up or dumped in layers of 1.5 meter or so and each layer is covered by good earth of at least 20cm thickness, so that refuse is not directly exposed.
- The filled solid wastes will get stabilized by the decomposition of organic matter and subsequent conversion into stable compounds.
- The refuse gets stabilized within a period of 2 – 12 months and settles down by 20 – 40 % of its original heights.



Advantages:

- Simple and economical.
- No costly plant and equipment required.
- Skilled labour is not required
- Separation of different kinds of solid wastes are not required.
- No residue or byproduct; hence no further disposal.
- Low lying areas can be reclaimed and put to better use.

Disadvantages:

- Large land area requirements.
- Continuous evolution of foul smell (CH_4 , CO_2 , H_2S) near the site of disposal.
- Use of insecticides is required.
- Covering good earth required for top layer may sometimes be difficult to get.
- Formation of “leachate”, which is a colored liquid formed due to seepage of rain water and contaminated to the ground water causes diseases like Cholera, Typhoid, Polio etc.

Incineration

- It means burning of solid wastes in properly constructed hearth furnace.
- This method is used when sustainable dumping land areas are not available and disposal into sea is not possible.
- The minimum temperature of incineration is of about 1000°C .
- The final products will be the ashes and clinkers.

Advantages

- This method is sanitary, as all the pathogens and insects are destroyed.
- No odour and dust nuisance.
- Some revenue can be generated by raising steam power and selling the clinkers.

Disadvantages

- Relatively highly initial cost.
- Nuisance of smoke, odor and ash during the improper functioning of incinerators.

Pulverization

- **This process involves size reduction of organic wastes before it goes for composting.**
- **This process reduces the overall volume by 40%.**

ADVANTAGES:

- ❖ **It will increase surface area availability for bacterial activity (decomposition).**
- ❖ **Facilitates easy handling of moisture content and aeration.**

Composting

- The organic material in solid wastes is digested aerobic & anaerobically and converted into humus and stable mineral compounds.
- Its volume is considerably reduced and made free of pathogenic organisms.
- It solves three problems simultaneously:
 - Disposal of solid waste
 - Disposal of night soil
 - Production of valuable manure for crops
- Three methods for composting are:
 - Composting by Trenching
 - Open window Composting
 - Mechanical Composting

Pyrolysis

- In this method the chemical constituents and chemical energy of some organic wastes is recovered by destructive distillation of solid wastes.
- The combustible constituents of organic wastes are heated in a Pyrolysis reactor at temperature of 650 – 1000 °C in an **Oxygen free environment**.
- It's merits and demerits are same as Incineration.

Disposal into Sea

- It is used in coastal areas having deep sea water (> 30 meters) at a distance of 16 – 20 KM.
- This is quite simple and cheap.
- Disadvantages:
 - The bulky and lighter compounds of solid wastes float, spread and tend to return to the shore areas during high tides.
 - Some portion of the solid waste may return and spoil the beach.
 - Water Pollution also may occur.