

Solid Waste Management

Paper II Unit I

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Waste



Rubbish

Garbage

Junk

Trash



Waste

“Any Substance solid, liquid or gaseous

for which no use can be found by the organism or system that produces it
and for which a method of disposal must be devised is called waste”

- unwanted, unusable material, discarded, worthless, defective

The origin of waste

Mining



- waste rock
- tailings
- mine water
- chemicals
- and others

Agriculture Forestry



- obsolete pesticides
and fertilizers
- organics
- plastics and
containers
- manure
- slaughter waste
- and others

Industry



- textiles
- plastics
- chemicals
- ash
- nuclear waste
- and others

Household, commercial and government bodies



- municipal solid waste
- electronics
- medical waste
- tyres
- and others

Construction Demolition



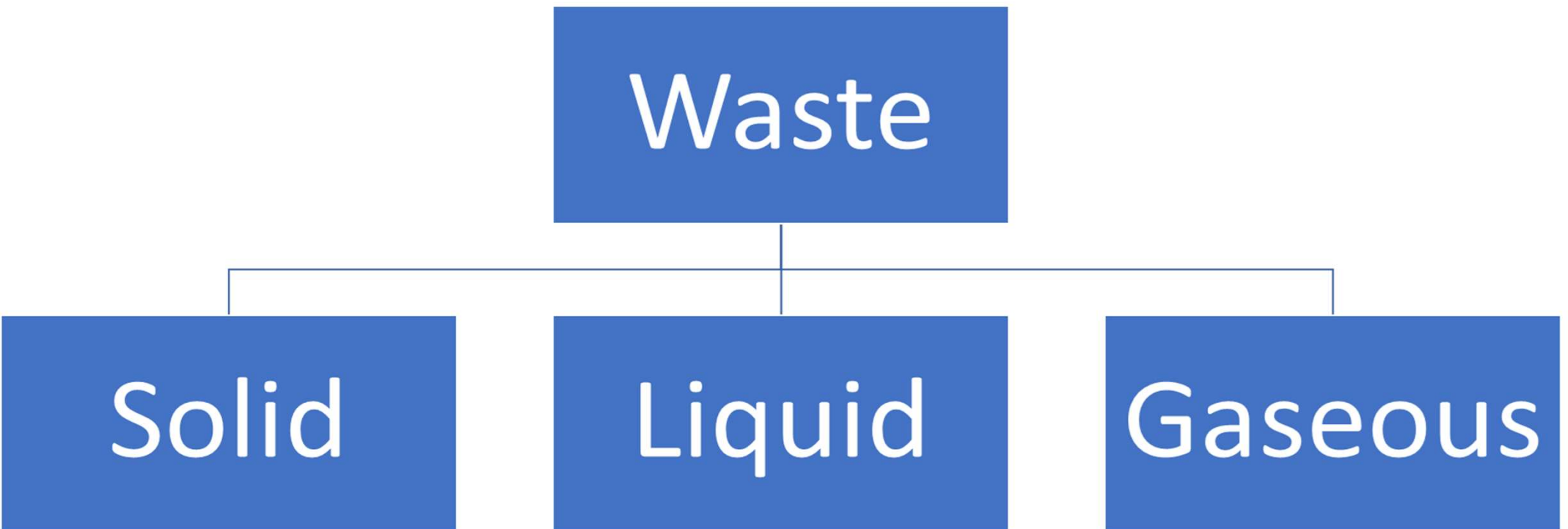
- concrete
- plastic
- wood
- metal
- glass
- and others

Wastewater treatment

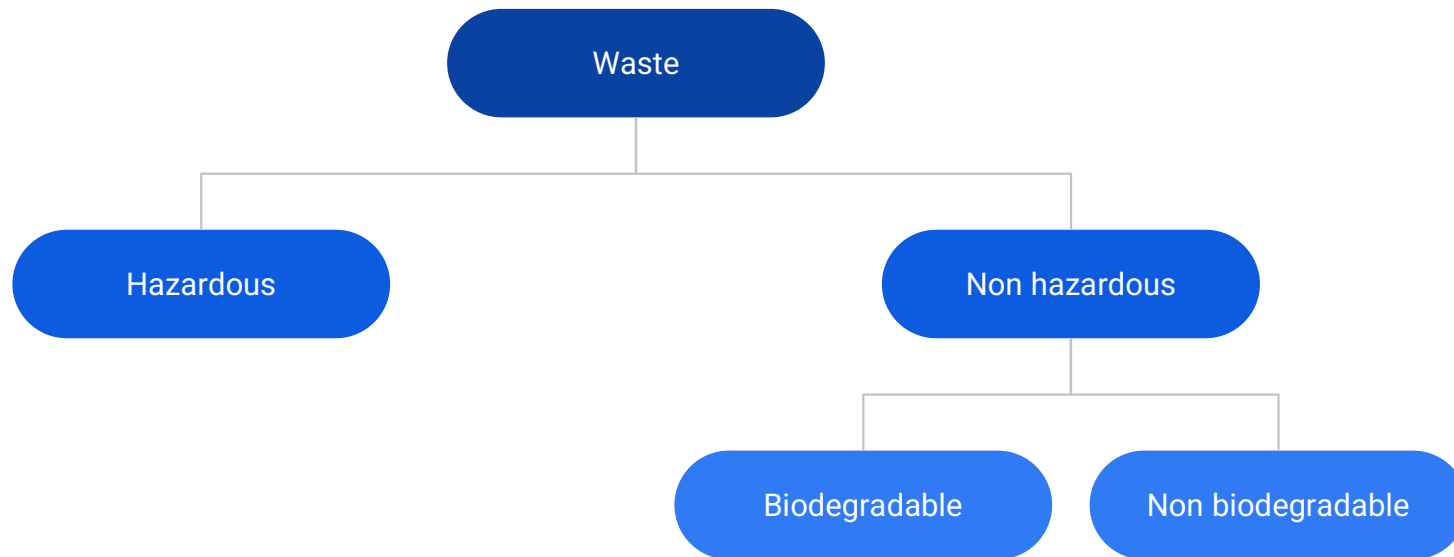


- sewage sludge
- solid waste
- chemicals
- and others

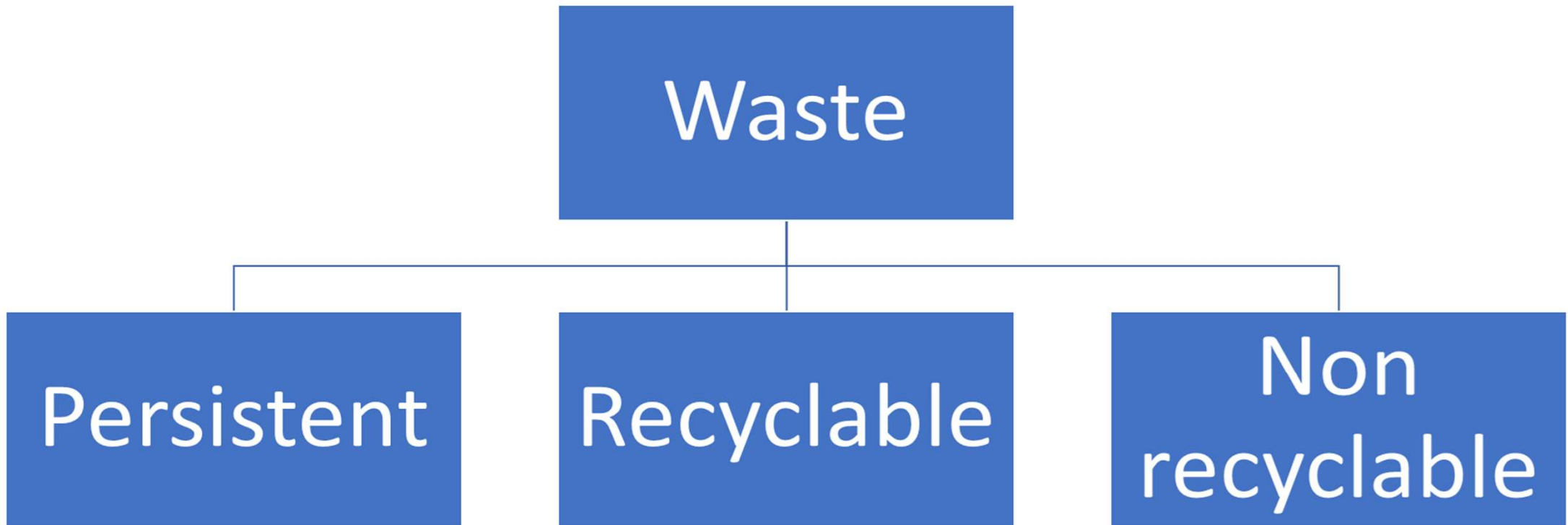
Classification of Waste (on the basis of its physical state)



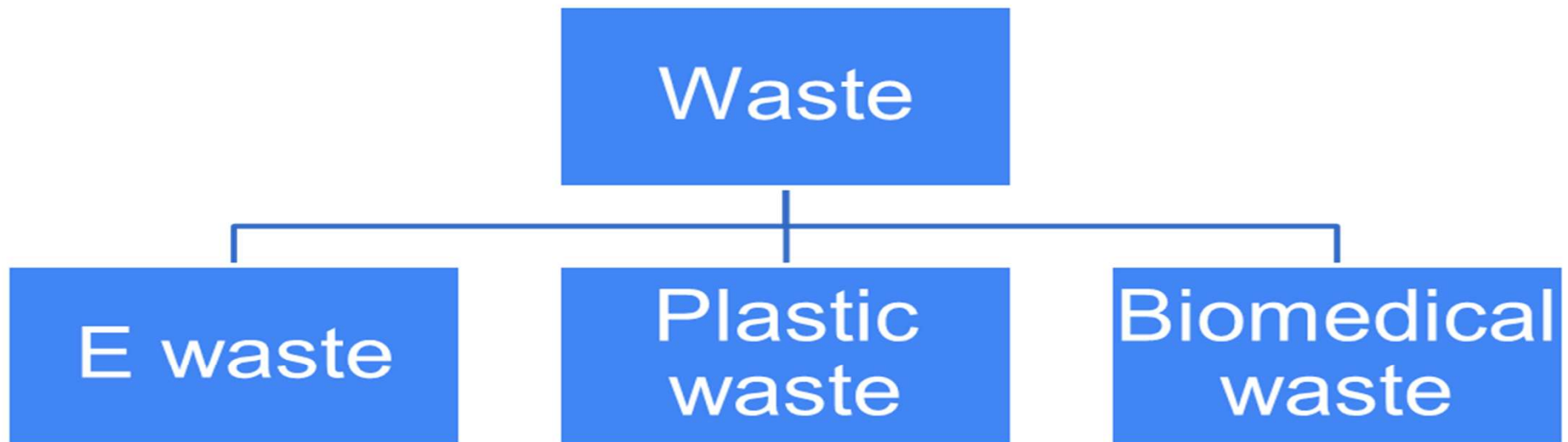
Classification of Waste (on basis of harmful nature)



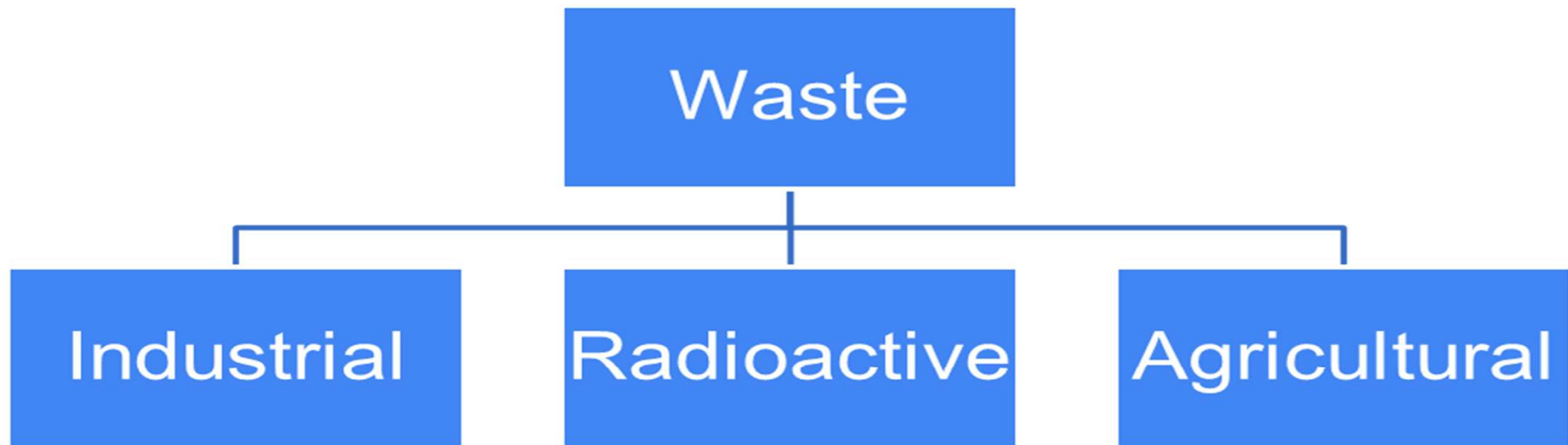
Classification of Waste (on basis of its reuse)



Classification of Waste (on basis of its composition)



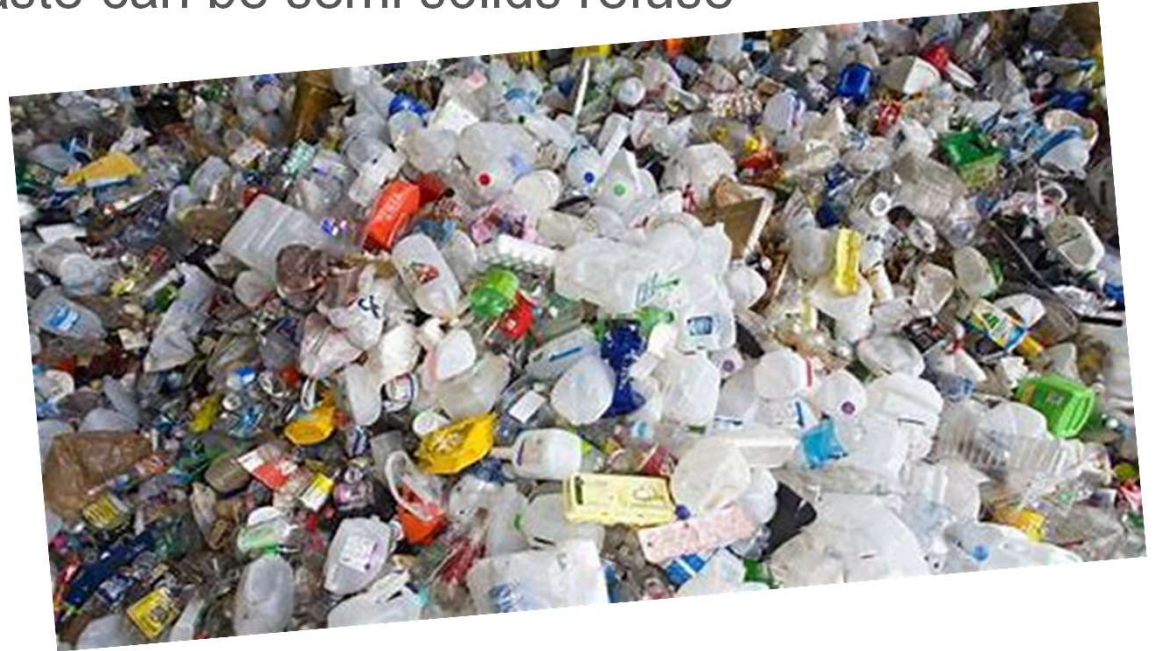
Classification of Waste (on basis of its source)



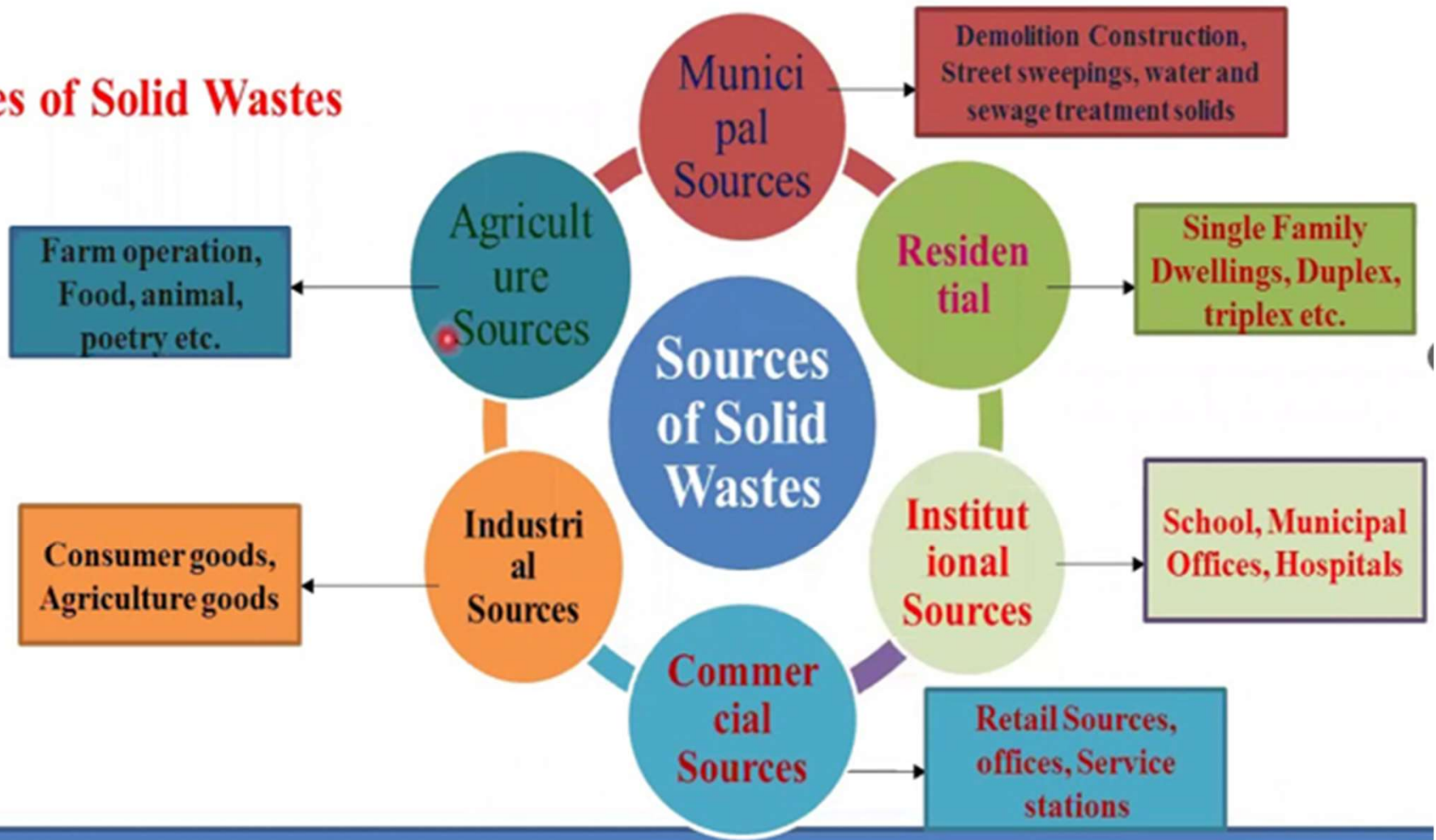
Classification of Waste (on basis of its region)

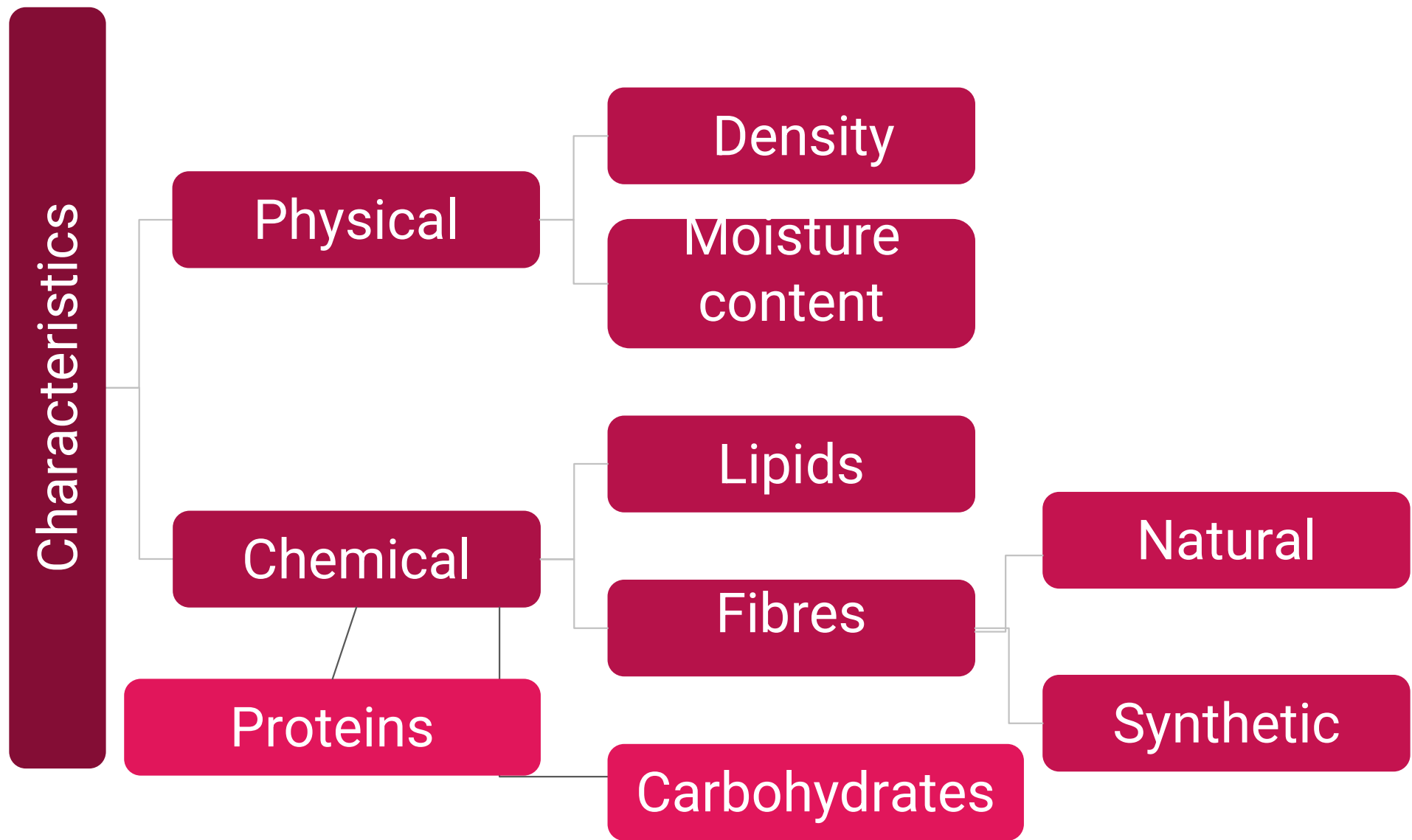
Solid Waste

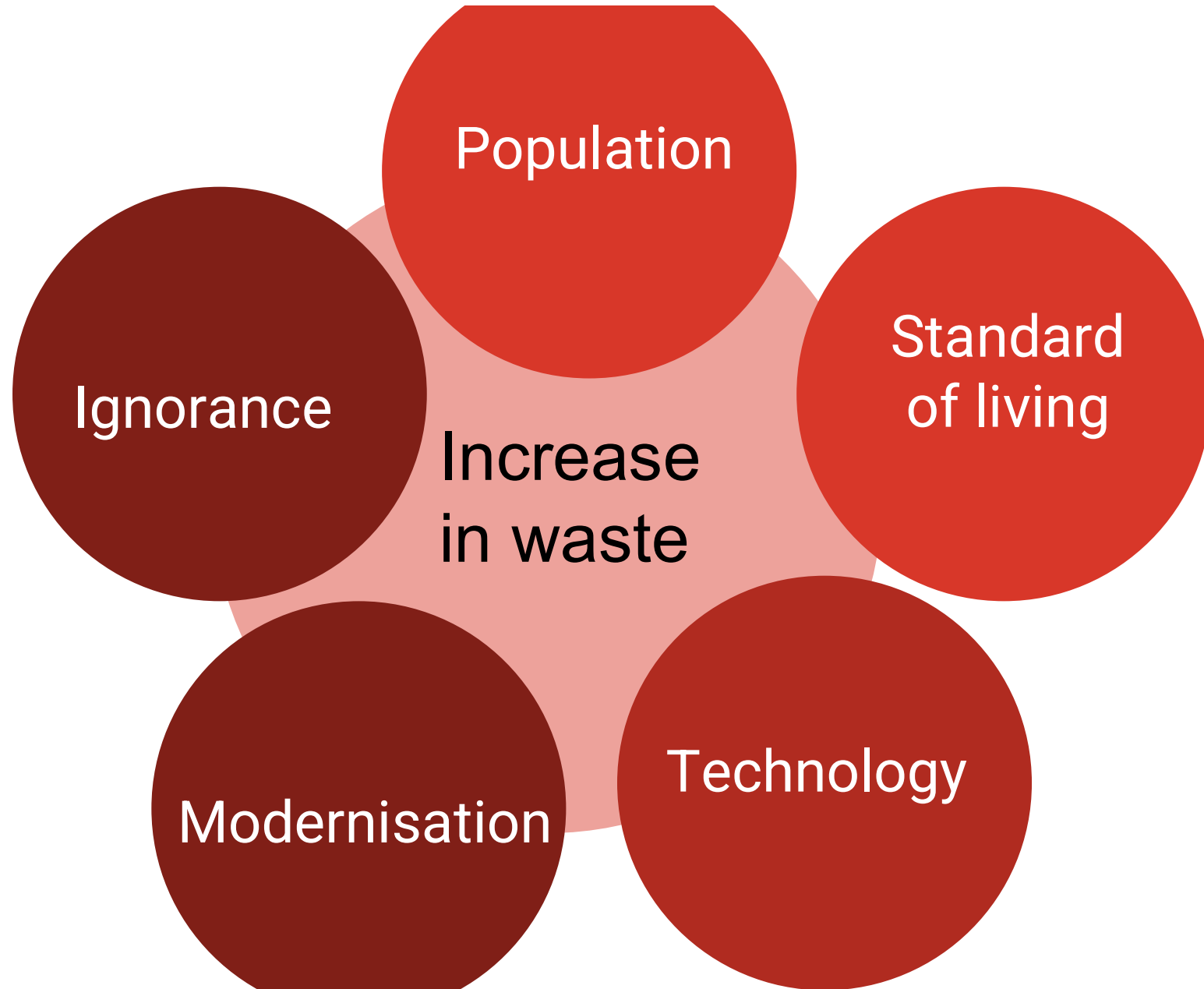
- Any useless, unwanted discarded material that is not a liquid or gas
- According to the EPA, solid waste can be semi solids refuse



Sources of Solid Wastes





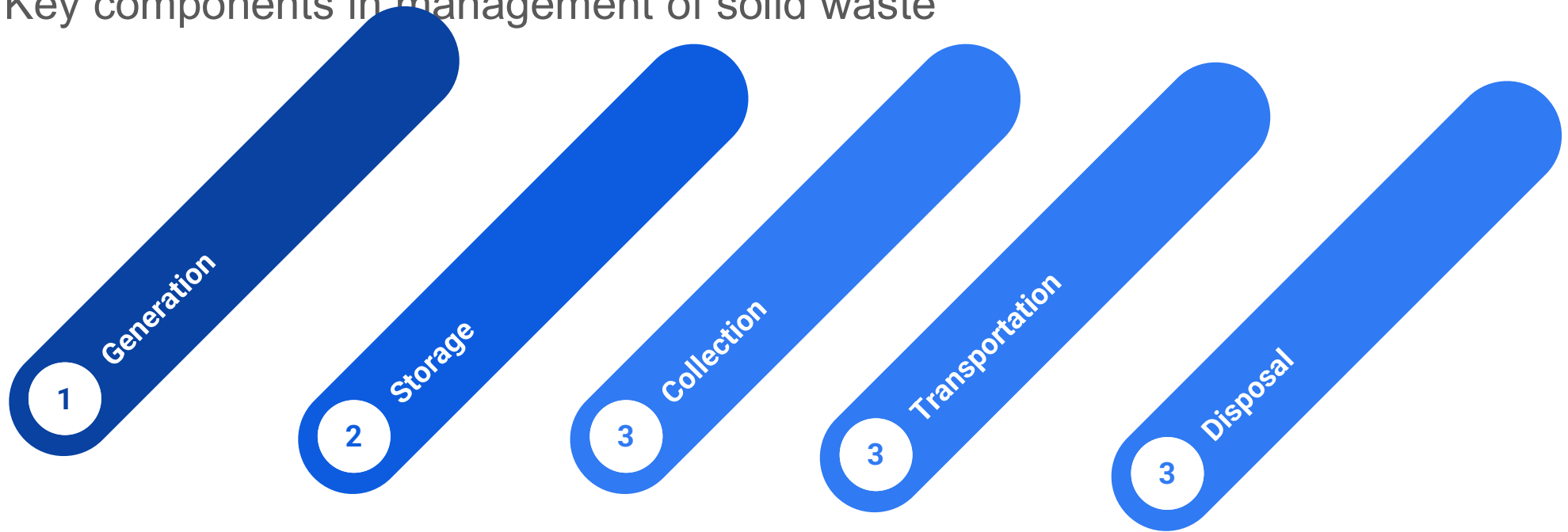


Quantity of Solid Waste

- Mumbai generates around 7000 tonnes of waste per day
- Quantity of municipal waste varies from 0.3 to 0.6 kg/capita/day
- Urban waste has potential to generate 8 million tonnes of agricultural manure per year
- At present, less than 25% of its potential is being exploited.

Solid Waste Management

Key components in management of solid waste



Solid Waste Management

Generation

- It is the stage at which materials become valueless to the owner and since they have no use for them and require them no longer, they wish to get rid of them
- Items which may be valueless to one individual may not necessarily be valueless to another.

Storage

- It is a system for keeping materials after they have been discarded and prior to collection and final disposal.

Solid Waste Management

- Small containers: household containers, plastic bins
- Large containers: communal bins, oil drums,
- Shallow pits,
- Communal depots



Collection

- It refers to how waste is collected for transportation to the final disposal site.
- Any collection system should be carefully planned to ensure that storage facilities do not become overloaded.
- Collection intervals and volumes of collected waste must be estimated carefully.

Solid Waste Management

Transportation

- This is the stage when solid waste is transported to the final disposal site
- There are various modes of transport which may be adopted and the chosen method depends upon local availability and the volume of waste to be transported.
- Types of transportation can be divided into three categories:

Human-powered: open hand-cart, hand-cart with bins, wheelbarrow, tricycle

Animal-powered: donkey-drawn cart

Motorised: tractor and trailer, standard truck, tipper-truck





Solid Waste Management

Disposal

- The final stage of solid waste management is safe disposal where associated risks are minimised.
- There are four main methods for the disposal of solid waste:

Land application: burial or landfilling

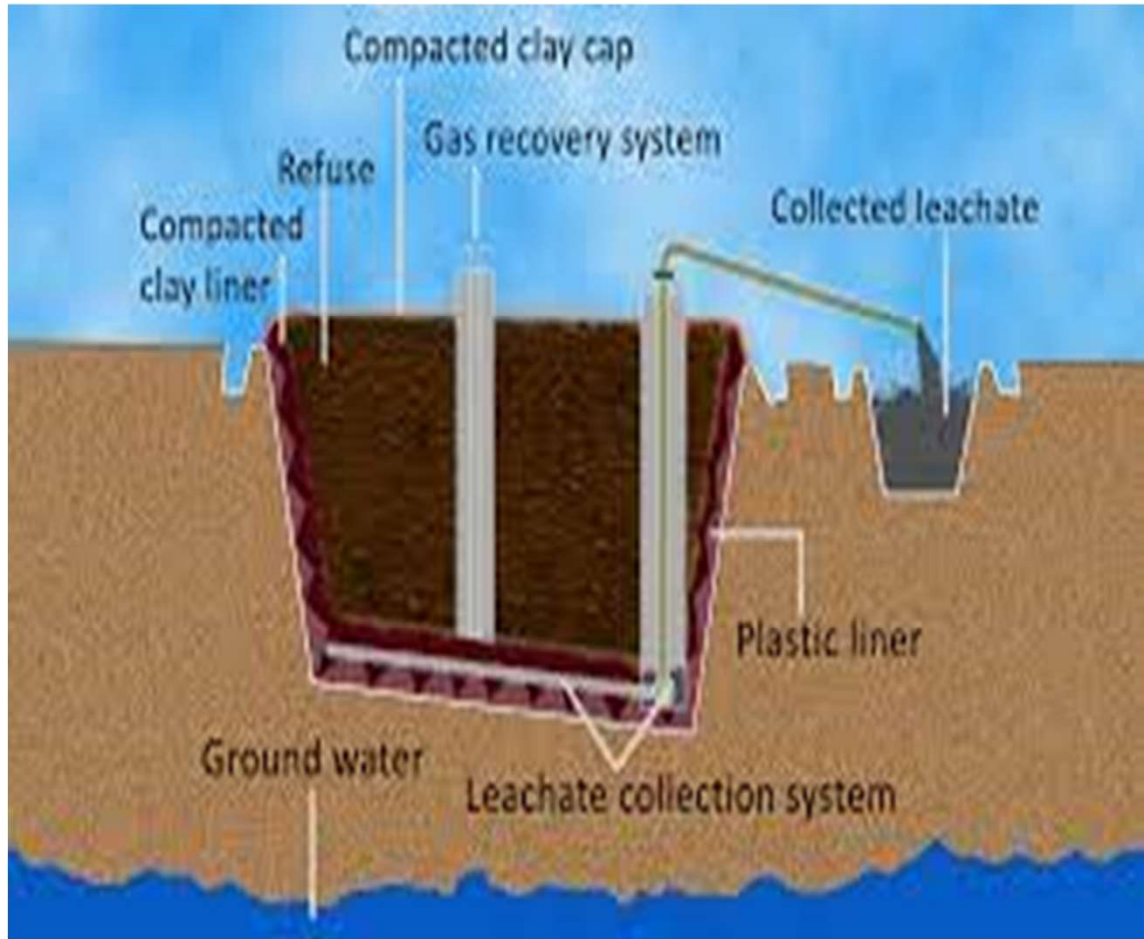
Composting

Burning or incineration

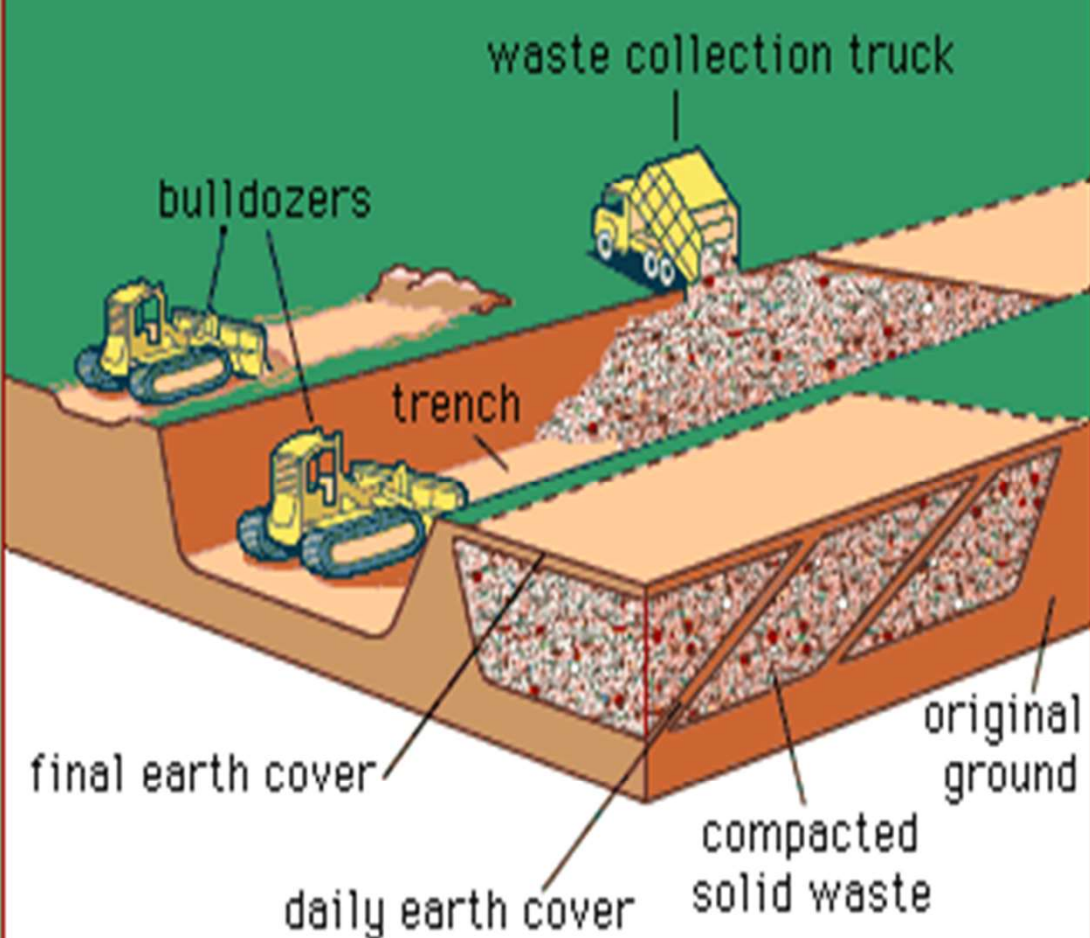
Recycling (resource recovery)

The most common of these is undoubtedly land application

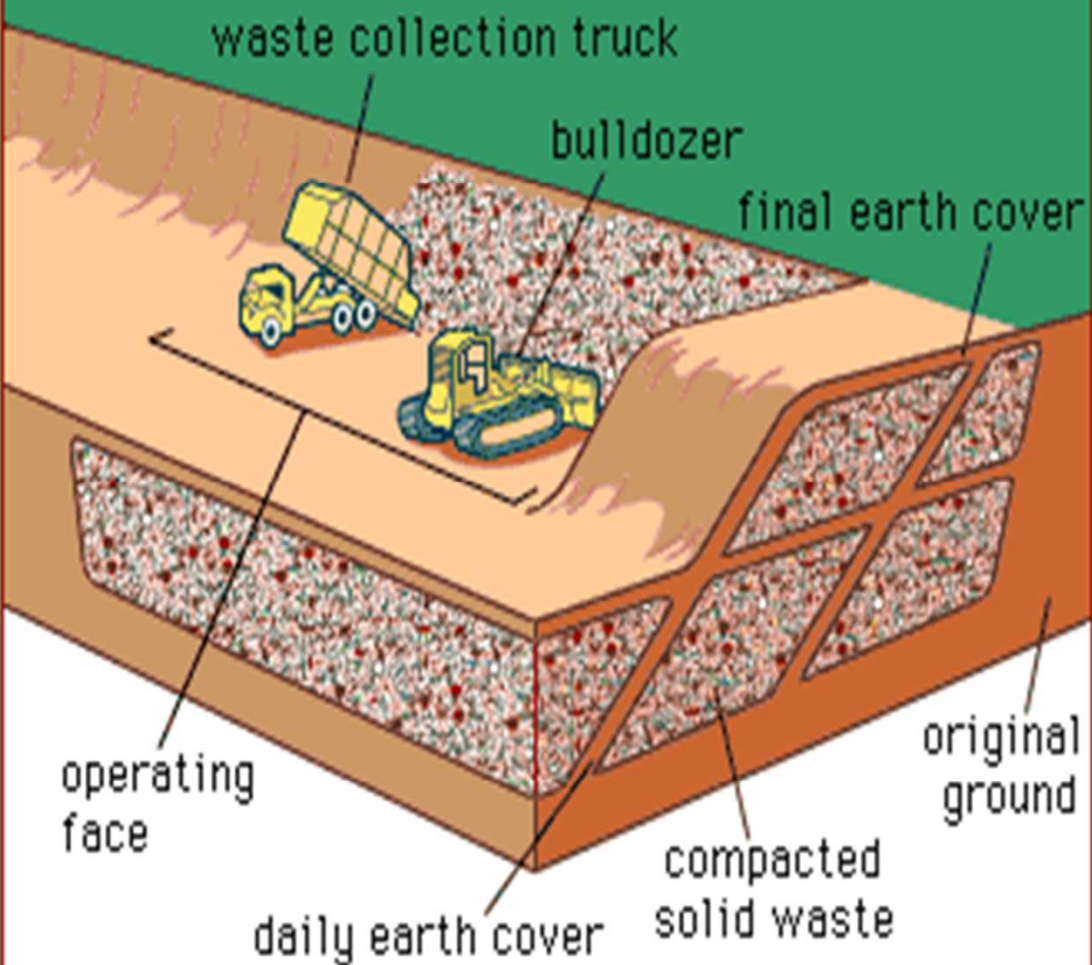




Trench method



Area method



Incineration

- **An incinerator is a furnace intended for burning dangerous items in a combustion chamber, where incineration is carried out.**
- Burning potentially dangerous materials at temperatures high enough to eliminate pollutants is known as incineration.
- Ash, heat, and combustion gases are the final byproducts of incineration.
- It eliminates various dangerous substances including solvents, PCBs and pesticides
- But it does not eliminate metals like lead and chromium.





Composting

- Simple composting of vegetables and other organic waste can be applied in many situations.
- Organic waste can be dug into the soil to add humus and fibre.
- This makes the waste perfectly safe and also assists the growing process.
- It requires careful monitoring of decomposing waste to control moisture, chemical levels and promote microbial activity.
- It acts as a good fertiliser.

Recycling

- The recycling of some waste items may be possible on occasions.
- Plastic bags, containers, tins and glass will often be automatically recycled
- In most developing country contexts there exists a strong tradition of recycling leading to lower volumes of waste

Mismanagement and Side Effects

- Huge generation of waste is a major concern
- Leading to storage problem
- In developing countries, due to lack of sophisticated technology open dumping is one of the methods of disposal
- Which is the burned in open called open burning
- Another method is dumping waste in water bodies
- Such mismanagement of waste leads to various impact on the environment and human health

Effect

<https://youtu.be/6cyRloLsm78>

Effects

Storage of waste in open

- Insects - breeding of flies on open food waste and fecal matter
 - spreading diarrhoeal diseases
 - breeding of mosquitoes
 - Spreading malaria, dengue
- Rats - feeding on open rubbish and refuse
 - spreading of diseases like rat bite fever, trichinosis

Effects

- Fire - open waste catches fire due to heat,
 - glass in open dump can act as a lens for sunlight
 - flammable, ignitable waste can lead to fire
 - leading to burning of plastic, rubber from the mixed waste
 - emitting hazardous dioxins and furans
- Odour - rotting faecal matter, left over food, vegetable
 - Bad odour is due to release of hydrogen sulfide during decomposition
 - Major environmental nuisance
- Illness to workers and rag pickers - infection, cuts and wounds, respiratory issues

Environmental Impact

Air pollution

- Emission of GHGs - NO_x, SO_x, CO₂
- Release of particulate matter - PM 10, PM 2.5
- Carcinogens and mutagens dioxins and furans - polychlorinated dibenzofurans

Water pollution

- Runoff from the dumping sites, add waste into the water bodies like rivers, lakes
- Leachates from dumping sites percolates underground contaminating groundwater

Environmental Impact

Visual pollution

- Loss of aesthetic feeling - piles of waste on roadside
- Worst situation when scavenging animals spread the waste all over the street
- Harm to environmental aesthetics leads to decrease in tourists

Waste Segregation Guidelines



1. Organic Waste

(Do **NOT** use a plastic liner)

Kitchen Waste

Vegetable/fruit peels
Cooked food/Leftovers
Egg shells
Chicken/fish bones
Rotten fruits/vegetables
Tissue paper soiled with food
Tea bags/Coffee grinds
Leaf plates



Garden waste *

(small quantity only; from Apt)
Fallen Leaves/twigs
Puja flowers/garlands
Weeds



2. Dry Waste

(Use only reusable bags for disposal)

Plastic (Must be rinsed if soiled)

Plastic covers/bottles/boxes/items
Chips/toffee wrappers
Plastic cups
Milk/Curd packets

Paper (Must be rinsed if soiled)

Newspaper/Magazines
Stationery/Junk mail
Cardboard cartons
Pizza boxes
Tetrapaks
Paper cups and plates



Metal

Foil containers
Metal cans



Glass (handle with care)

Unbroken glass bottles



Other dry waste

Rubber/Thermocol
Old mops/Dusters/Sponges
Cosmetics,
Ceramics, Wooden Chips,
Hair
Coconut shells



E-waste (handle with care)

Batteries
CDs/Tapes
Thermometers



Bulbs/tube lights/CFLs **
(hand over separately)



3. Reject Waste

(Do **NOT** use a plastic liner)

Sanitary waste

(Use a newspaper for wrapping)

Diapers/Sanitary napkins
Bandages
Condoms
Nails
Used tissues
Medicines
Swept dust



(Limited quantities of mixed waste is allowed, such as heavily soiled plastic or soiled paper)

Sharps[§] (small quantities only; wrap in newspaper and hand over separately)

Razors/Blades
Used syringes
Injection vials



Construction debris/Inerts[¶]
(Hand over separately)

Rubble
Paints
Silt from drains
Cement powder
Bricks
Flower pots



Broken glass
(wrap in newspaper)



Importance of Segregation

1. Recycling

- Boost recycling
- No mixed waste

1. Save time

- More waste can be treated
- Waste goes in appropriate facilities hence, time saved

1. Reduce the amount of waste

- Quantity going to landfill reduces
- Landfill emits GHGs so reduction in it

4. Reduces waste disposal cost

- Waste goes to its appropriate facilities
- Reducing the resources

5. Protects Environment

- Mixed waste lead to leaching leading to soil pollution
- Reducing the emission of GHGs
- Increasing the efficiency of landfill, leading to reduction in land use change

6. Protects public health

- Mixed waste in open dumps leads to mosquito breeding and other diseases
- Release of toxic gases reduced
- Diseases due to air pollution, water pollution reduced