SOLID WASTE MANAGEMENT

OVERVIEW

- Kinds of Wastes
- Waste Generation
- Solid Waste in India
- Solid Waste management methods

What are Wastes?

Waste (also known as **rubbish**, **refuse**, **garbage**, **junk**) is unwanted or useless materials. In biology, waste is any of the many unwanted substances expelled from living organisms, metabolic waste; such as urea and sweat.

Kinds of Wastes

Solid wastes: wastes in solid forms, domestic, commercial and industrial wastes Examples: *plastics , bottles, cans, papers, scrap iron, and other trash*

Liquid Wastes: wastes in liquid form Examples: *domestic washings, chemicals, oils, waste water from ponds, manufacturing industries and other sources.*

Bio-degradable :can be degraded (paper, wood, fruits and others)

Non-biodegradable :cannot be degraded (plastics, bottles, old machines, cans, Styrofoam containers and others)

Hazardous wastes: Substances unsafe to use commercially, industrially, agriculturally, or economically and have any of the following properties- ignitability, corrosivity, reactivity & toxicity.

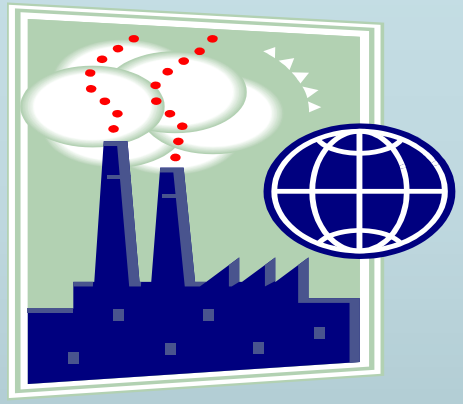
Non-hazardous : Substances safe to use commercially, industrially, agriculturally, or economically and do not have any of those properties mentioned above. These substances usually create disposal problems.

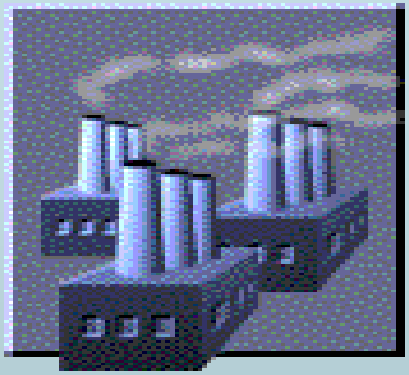
Classification of wastes according to their origin and type

- **Municipal Solid wastes:** Solid wastes that include household garbage, rubbish, construction & packaging materials, trade refuges etc. are managed by any municipality.
- **Bio-medical wastes:** Solid or liquid wastes including containers, products generated during diagnosis, treatment & research activities of medical sciences.
- **Industrial wastes:** Liquid and solid wastes that are generated by manufacturing & processing units of various industries like chemical, petroleum, coal, metal gas, sanitary & paper etc.
- **Agricultural wastes:** Wastes generated from farming activities. These substances are mostly biodegradable.
- **Fishery wastes:** Wastes generated due to fishery activities.
- **E-wastes:** Electronic wastes generated from any modern establishments. They may be described as discarded electrical or electronic devices. Some electronic scrap components, such as CRTs, wires, circuits, mobile, computers etc.

Sources of Wastes

Households

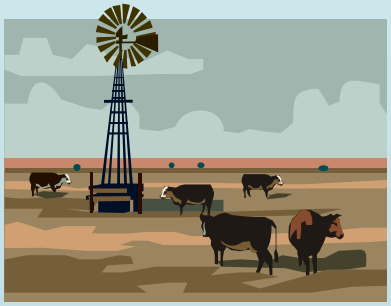




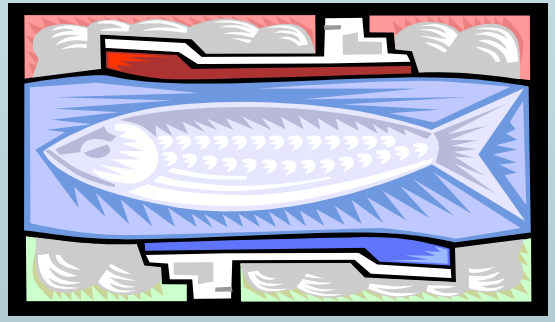
Industry

Sources of Wastes

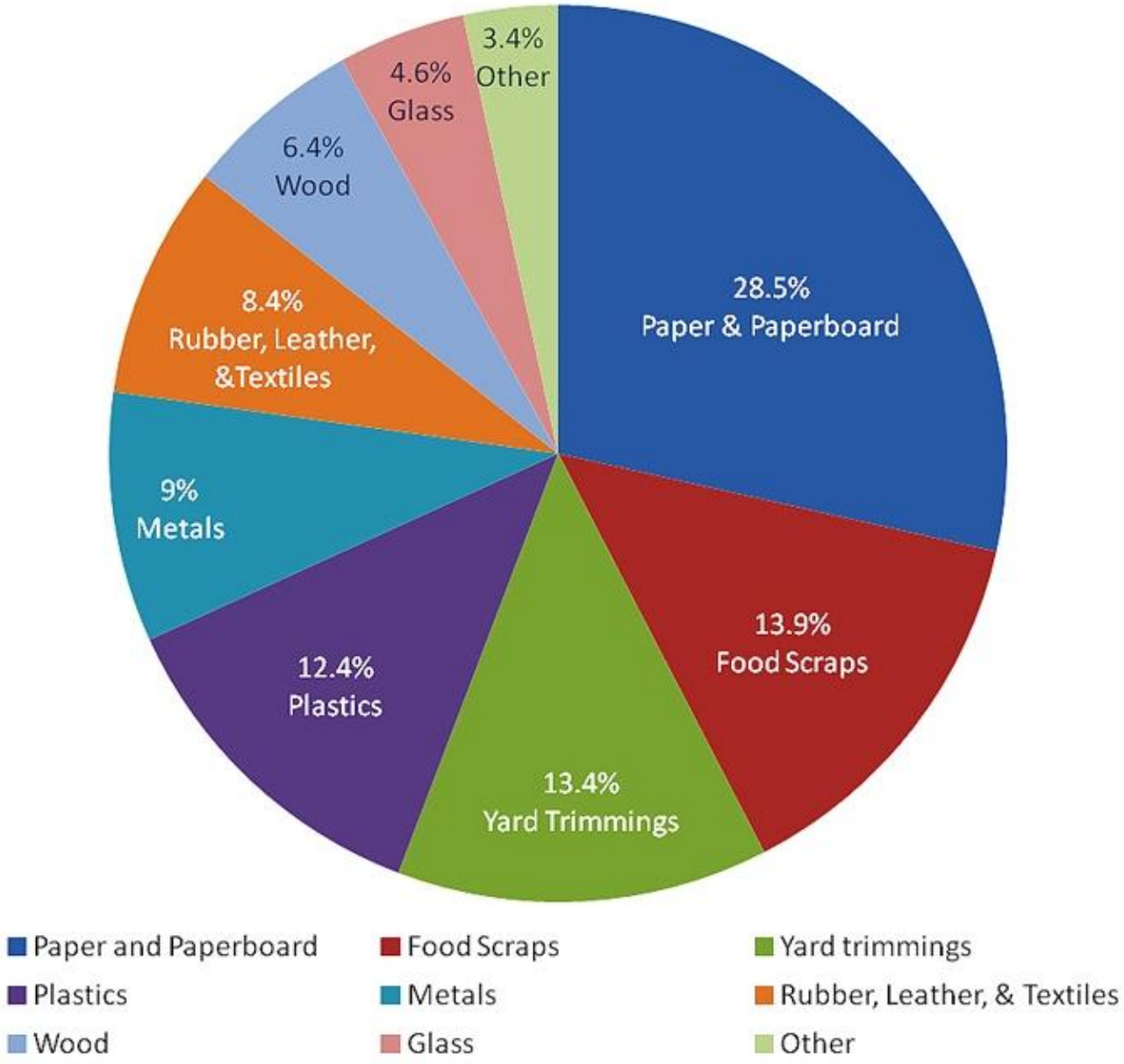
Agriculture



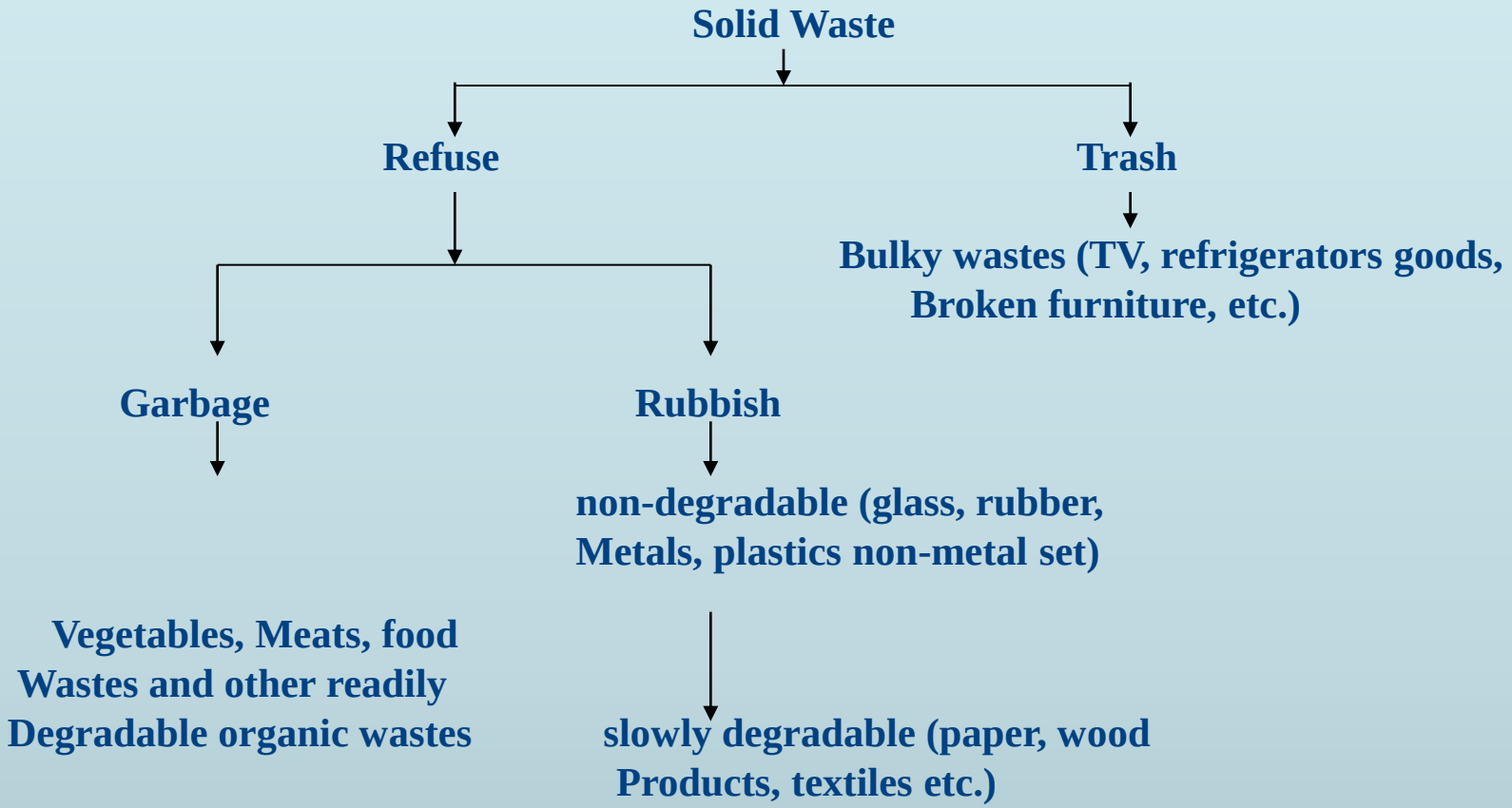
Fisheries



Sources of Wastes



STRUCTURE OF SOLID WASTE



WASTE GENERATIONS RATES OF SOME ASIAN COUNTRIES

Country	GNI[a]	Waste generation [kg/capita day]	Reference
Nepal	240	0.2 - 0.5	(UNEP, 2001)
Cambodia	260	1.0	(Yem, 2001)
Lao PDR	290	0.7	(Hoornweg, 1999)
Bangladesh	370	0.5	(Hoornweg, 1999)
Vietnam	390	0.55	(Hoornweg, 1999)
Pakistan	440	0.6 - 0.8	(World Wildlife Fund, 2001)
India	450	0.3 - 0.6	(Ahmed, 2000; Akolkar, 2001)
Indonesia	570	0.8 - 1.0	(Mukawi, 2001)
China	840	0.8	(Hoornweg, 1999)
Sri Lanka	850	0.2 - 0.9	(Jayatilake, 2001; Hoornweg, 1999)
Philippines	1040	0.3 - 0.7	(World Bank, 2001)
Thailand	2000	1.1	(Hoornweg, 1999)

MSW GENERATION FROM THE METROPOLITANS OF INDIA

State/Union Territory	*City*	*Urban Population in Lakhs (2001)*	*MSW generated (MT/day)*
Andhra Pradesh	Hyderabad	3829753	957
Andhra Pradesh	Visakhapatnam	982904	246
Bihar	Patna	1961532	588
Delhi	New Delhi	350000	272
Delhi	Delhi	13363471	6000
Gujarat	Ahmedabad	4215497	1265
Gujarat	Surat City	2433835	730
Gujarat	Vadodara	1491045	447
Karnataka	Bangalore	1304008	326
Kerala	Kochi	275225	69
Maharashtra	Mumbai	11914398	7500
Maharashtra	Nagpur	2040175	700
Maharashtra	Pune	2540000	1000
Madhya Pradesh	Bhopal	1482718	445
Madhya Pradesh	Indore	1550880	465
Punjab	Ludhiana	1429709	500
Rajasthan	Jaipur	1870771	561
Tamil Nadu	Chennai	4343645	1086
Tamil Nadu	Coimbatore	1501373	375
Tamil Nadu	Madurai	1233083	308
Uttar Pradesh	Kanpur	2725207	954
Uttar Pradesh	Lucknow	2262369	792
Uttar Pradesh	Varanasi	1250039	438
West Bengal	Kolkata	4572876	1143
Grand Total	-	70924513	27167

Solid Waste in India

- 7.2 million tonnes of hazardous waste
- One Sq km of additional landfill area every-year
- Rs 1600 crore for treatment & disposal of these wastes
- In addition to this industries discharge about 150 million tonnes of high volume low hazard waste every year, which is mostly dumped on open low lying land areas.

Growth of Solid Waste In India

- Waste is growing by leaps & bounds
- In 1981-91, population of Mumbai increased from 8.2 million to 12.3 million
- During the same period, municipal solid waste has grown from 3200 tonnes to 5355 tonne, an increase of 67%
- City like Bangalore produces 2000 tonnes of waste per annum.
- Waste collection is very low for all Indian cities.

Waste Collection in India

- **Primarily by the city municipality**

  -No gradation of waste product e.g. bio-degradable, glasses, polybags, paper shreds etc

  -Dumps these wastes to the city outskirts
- **Local raddiwala / kabadiwala**
- -Collecting small iron pieces by magnets

  -Collecting glass bottles

  -Collecting paper for recycling

How solid waste affected us in recent years?

- In Mumbai (2005) clogged the sewage line due to large no. of plastic bags.
- Blast in the Bhusan Steel factory at Noida, caused due to imported scrap from Iran
- Reduction in the number of migratory birds due to consumption of contaminated foods
- animals dying on streets and farmland due to consumption of plastic bags, which blocks the food movement in their stomach

HEALTH IMPACTS OF SOLID WASTE

- **Exposure to hazardous waste can affect human health, children being more vulnerable to these pollutants.**
- **Improperly operated incineration plants cause air pollution and improperly managed and designed landfills attract all types of insects that spread disease.**
- **Direct handling of solid waste results in chronic diseases with the waste workers.**

1.LAND FILL

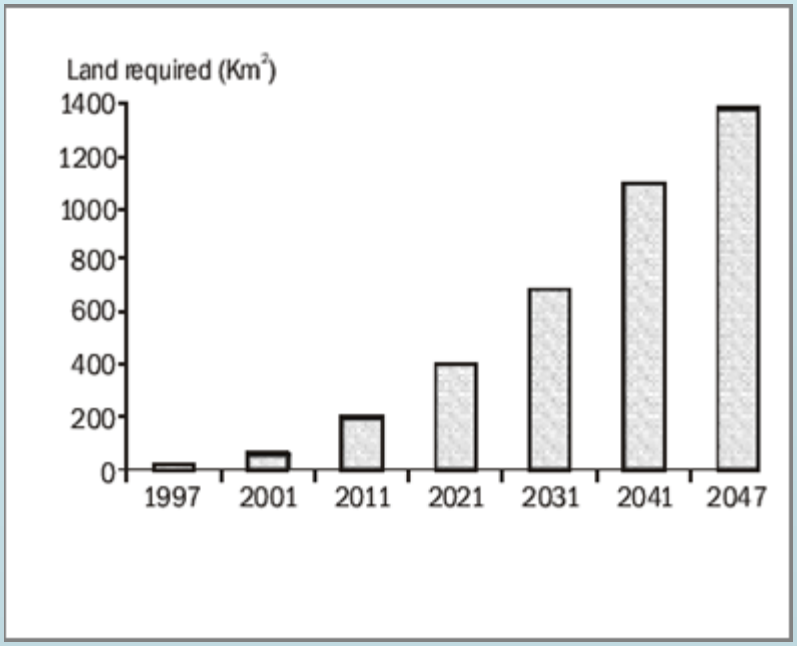
- It is the most traditional method of waste disposal.
- Waste is directly dumped into disused quarries, mining voids or borrow pits.
- Disposed waste is compacted and covered with soil
- Gases generated by the decomposing waste materials are often burnt to generate power.
- It is generally used for domestic waste.

ADVANTAGES

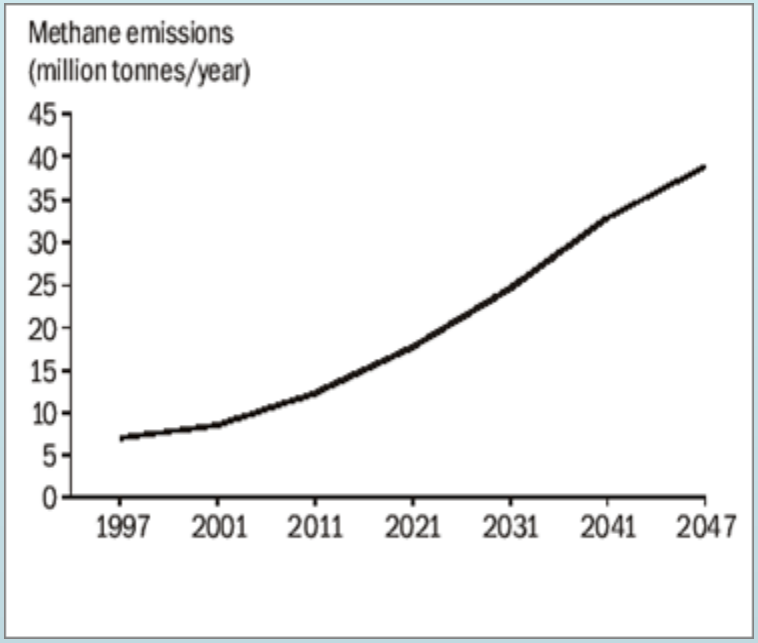
- Landfill site is a cheap waste disposal option for the local council.
- Jobs will be created for local people.
- Lots of different types of waste can be disposed of by landfill in comparison to other waste disposal methods.
- The gases given off by the landfill site could be collected and used for generating power.

DISADVANTAGES

- The site will look ugly while it is being used for landfill.
- Dangerous gases are given off from landfill sites that cause local air pollution and contribute to global warming.
- Local streams could become polluted with toxins seeping through the ground from the landfill site.
- Once the site has been filled it might not be able to be used for redevelopment as it might be too polluted.



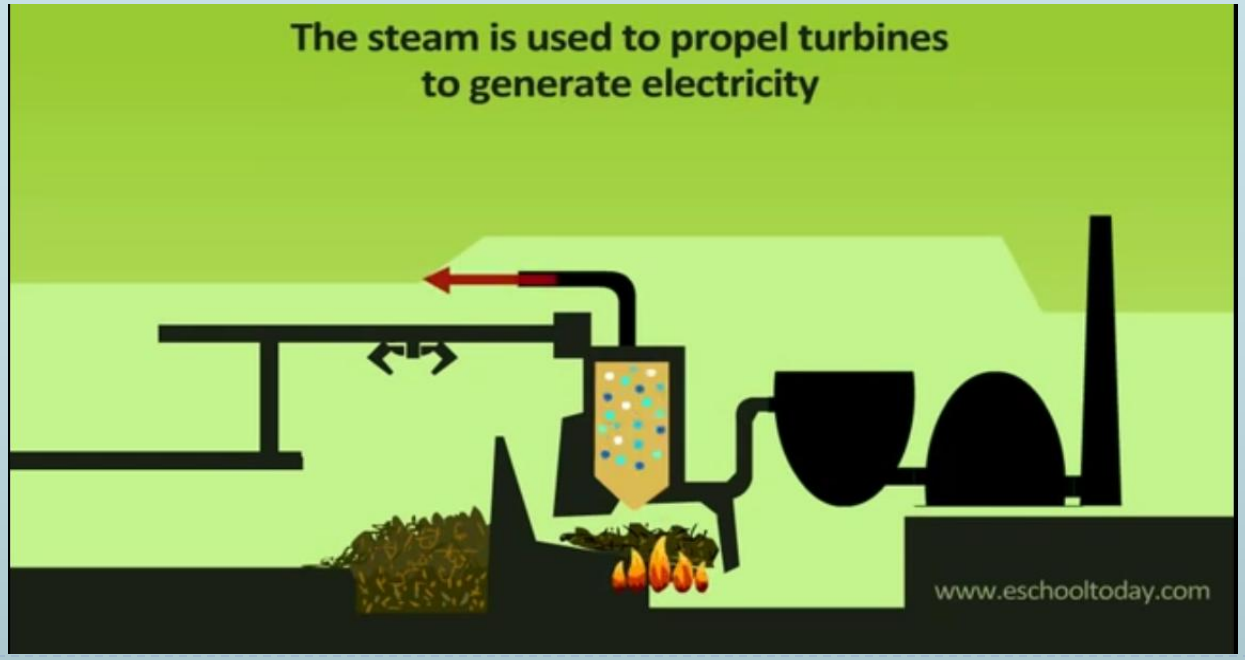
LAND REQUIRED FOR DISPOSAL OF MSW



EMMISION OF METHANE FROM LANDFILL

2. INCINERATION

- Incineration is a waste treatment process that involves the combustion of solid waste at 1000C.
- waste materials are converted into ash, flue gas, and heat.
- The ash is mostly formed by the inorganic constituents of the waste and gases due to organic waste.
- the heat generated by incineration is used to generate electric power.



ADVANTAGES

- Minimum of land is needed compared to other disposal methods.
- The weight of the waste is reduced to 25% of the initial value.
- No risk of polluting local streams and ground waters as in landfills.
- Incineration plants can be located close to residential areas.
- Gases are used to generate power.

DISADVANTAGES

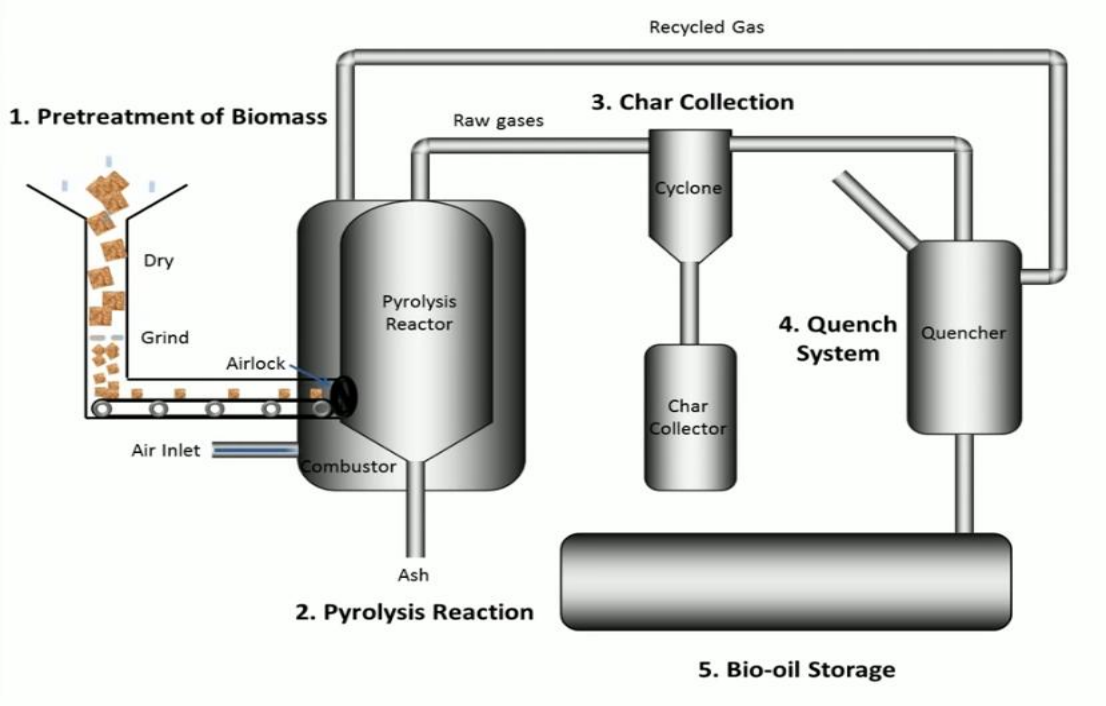
- Expensive
- Required skilled labour.
- The chemicals that would be released into the air could be strong pollutants and may destroy ozone layer (major disadvantage).
- high energy requirement.

COMPACTION:

- The waste is compacted or compressed. It also breaks up large or fragile items of waste.
- This process is conspicuous in the feed at the back end of many garbage collection vehicles. Deposit refuse at bottom of slope for best compaction and control of blowing litter.

PYROLYSIS:-

- Pyrolysis is defined as thermal degradation of waste in the absence of air to produce char, pyrolysis oil and syngas, e.g. the conversion of wood to charcoal also it is defined as destructive distillation of waste in the absence of oxygen. External source of heat is employed in this process.



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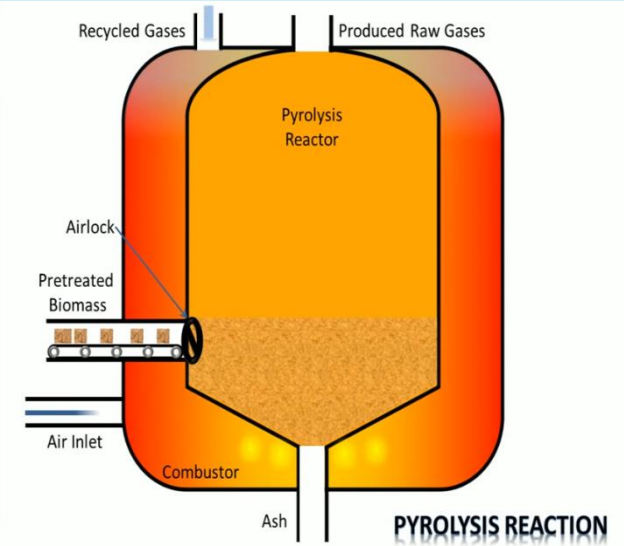
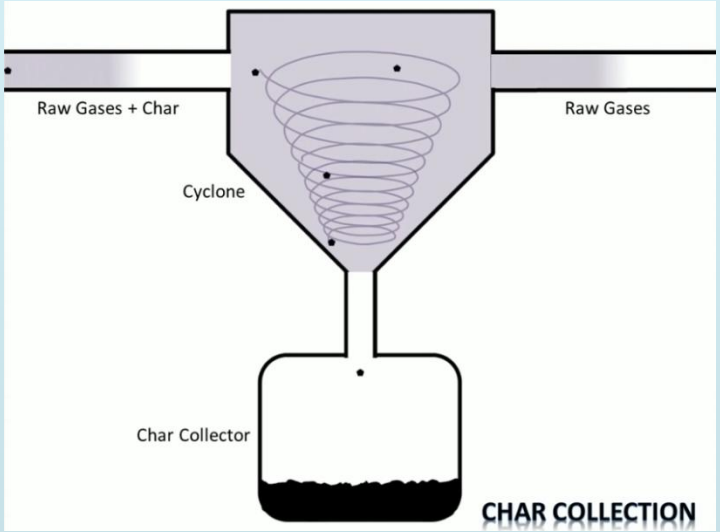
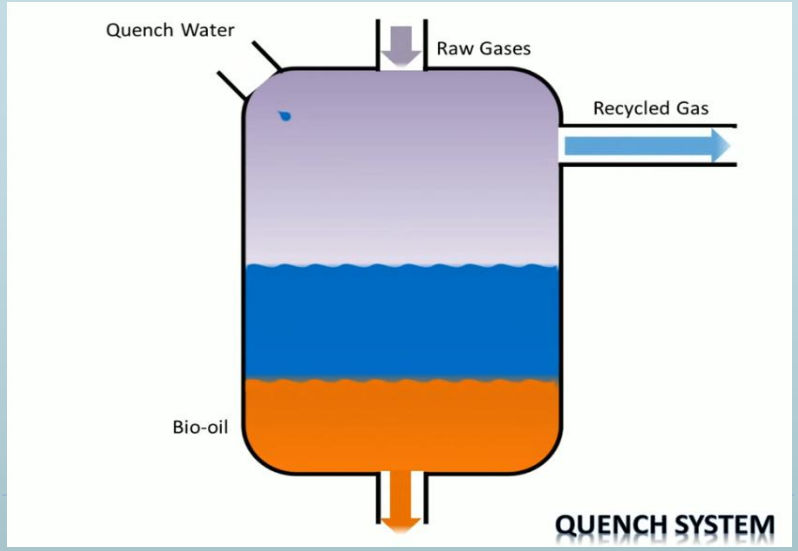

Recycled Gases
Produced Raw Gases
Pyrolysis Reactor
Airlock
Pretreated Biomass
Air Inlet
Combustor
Ash
PYROLYSIS REACTION

2


Raw Gases + Char
Raw Gases
Cyclone
Char Collector
CHAR COLLECTION

3


Quench Water
Raw Gases
Recycled Gas
Bio-oil
QUENCH SYSTEM

The 3 R's

- **REDUCE**
  - You can help by *PRECYCLING*. 1/3 of all garbage is packaging.
  - Buy things that are in packages that can be recycled or are made of recycled materials.
  - When you buy something small, say no thanks to a bag.
- **REUSE**
  - Many things can be reused before you throw them out.
  - Use coffee cans and cottage cheese containers for storage
  - Use backs of paper or backs of used envelopes for jotting notes
  - Put leftovers in resalable containers instead of using wraps and foil
  - Use old clothes as rags for cleaning instead of paper towels
  - Have a garage sale or donate clothes, books or toys that you don't use anymore
- **RECYCLE**
  - Each year we use:
    - 25 billion plastic containers
    - 30 billion bottles & jars
    - 65 billion aluminum cans
    - 100 billion pounds of paper

CONCLUSION:

- It is found that 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. 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.