Municipal Solid Waste: Characteristics, Collection, Processing, and Disposal

Municipal Solid Waste (MSW) refers to the waste generated in urban areas from households, commercial establishments, institutions, and municipal services.
With rapid urbanization and population growth, MSW management has become one of the most pressing environmental and public health challenges in India and across the world.

1. Sources of Municipal Solid Waste

- **Households** – food waste, paper, plastics, textiles, and glass.
- **Commercial Establishments** – packaging materials, plastics, e-waste.
- **Institutions** – offices, schools, hospitals generating paper, organic waste, and biomedical residues.
- **Municipal Services** – street sweepings, parks and garden waste, drain silt.
- **Construction and Demolition** – debris, cement dust, bricks, and metals.

2. Characteristics of Municipal Solid Waste

- **Physical Characteristics**
    - Moisture content varies between 20–40%.
    - Density ranges from 200–500 kg/m³ depending on waste type.
    - Particle size varies widely – from food scraps to bulky plastics and metals.
- **Chemical Characteristics**
    - High proportion of **organic matter** (food, vegetables, paper).
    - Contains **carbon, hydrogen, oxygen, nitrogen, and trace elements**.
    - Calorific value ranges between 800–1100 kcal/kg, useful for energy recovery.
- **Biological Characteristics**
    - Rich in biodegradable content leading to microbial decomposition.
    - Attracts insects, rodents, and pathogens if unmanaged.

3. Collection of Municipal Solid Waste

- **Primary Collection**
    - Waste generated at households, shops, and institutions.
    - Segregation into biodegradable, recyclable, and hazardous fractions.
    - Collected in bins or bags provided by municipalities.
- **Secondary Collection**
    - Door-to-door collection by municipal workers or private contractors.

- Use of covered vehicles or handcarts to transfer waste to community bins or transfer stations.
- Emphasis on source segregation to reduce contamination.

- **Challenges**

  - Lack of household-level segregation.
  - Inconsistent collection schedules.
  - Insufficient infrastructure in many urban areas.

4. Processing of Municipal Solid Waste

- **Composting**

  - Biological decomposition of organic waste into manure.
  - Types: aerobic composting, vermicomposting.

- **Biomethanation**

  - Anaerobic digestion of biodegradable waste producing biogas and slurry fertilizer.

- **Recycling**

  - Recovery of paper, plastics, glass, and metals for re-use.
  - Reduces pressure on raw material extraction.

- **Energy Recovery**

  - Incineration or waste-to-energy plants converting combustible waste into electricity and heat.

5. Disposal of Municipal Solid Waste

- **Sanitary Landfills**

  - Engineered sites with bottom liners and leachate collection systems.
  - Controlled covering reduces pests and odor.

- **Open Dumping (Outdated Practice)**

  - Uncontrolled dumping in open areas leading to pollution.
  - Still prevalent in many Indian cities despite being banned.

- **Scientific Disposal Methods**

  - Use of incinerators for hazardous waste.

- Land reclamation with treated inert waste.
- Co-processing in cement kilns for safe disposal of non-recyclables.

6. Conclusion

Municipal Solid Waste (MSW) management requires a systematic approach covering characteristics, collection, processing, and scientific disposal.
Adopting modern techniques like composting, bio methanation, recycling, and sanitary landfills not only reduces environmental hazards but also promotes resource recovery and sustainable urban living.