



# Chapter 16

## Waste Generation and Waste Disposal



**Polystyrene  
cup**

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**Paper  
cup**



**Figure 16.2**  
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# Municipal Solid Waste

- Refuse collected by municipalities from households, small businesses, and institutions such as schools, prisons, municipal buildings and hospitals.

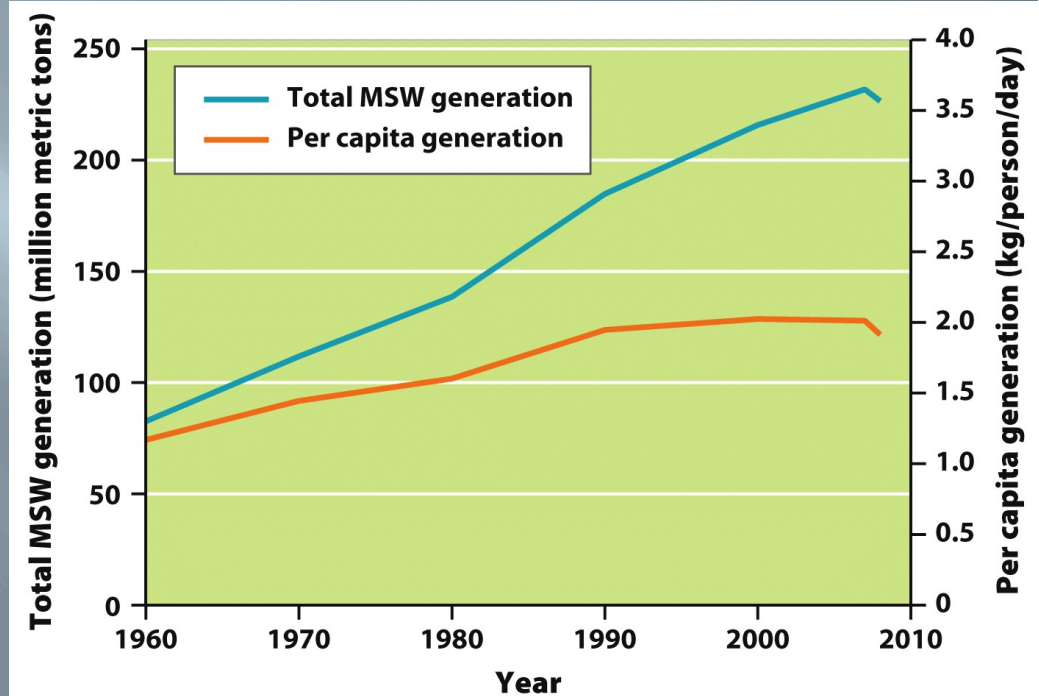
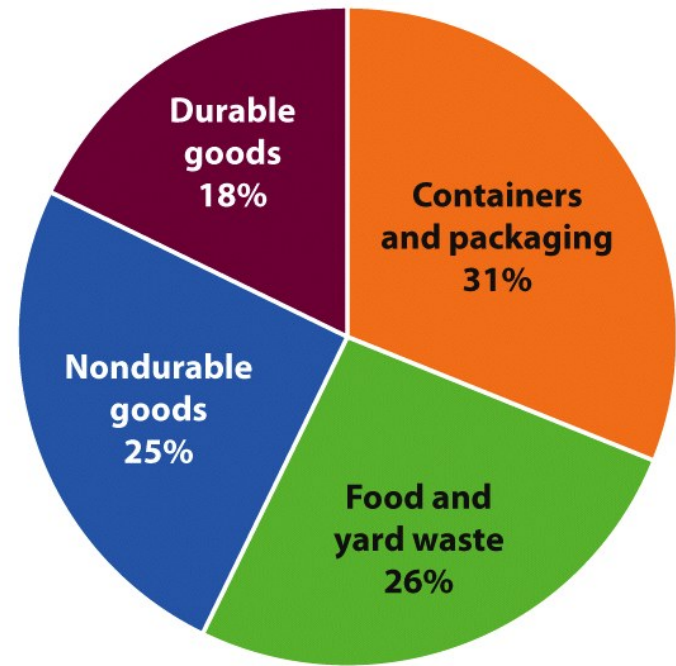
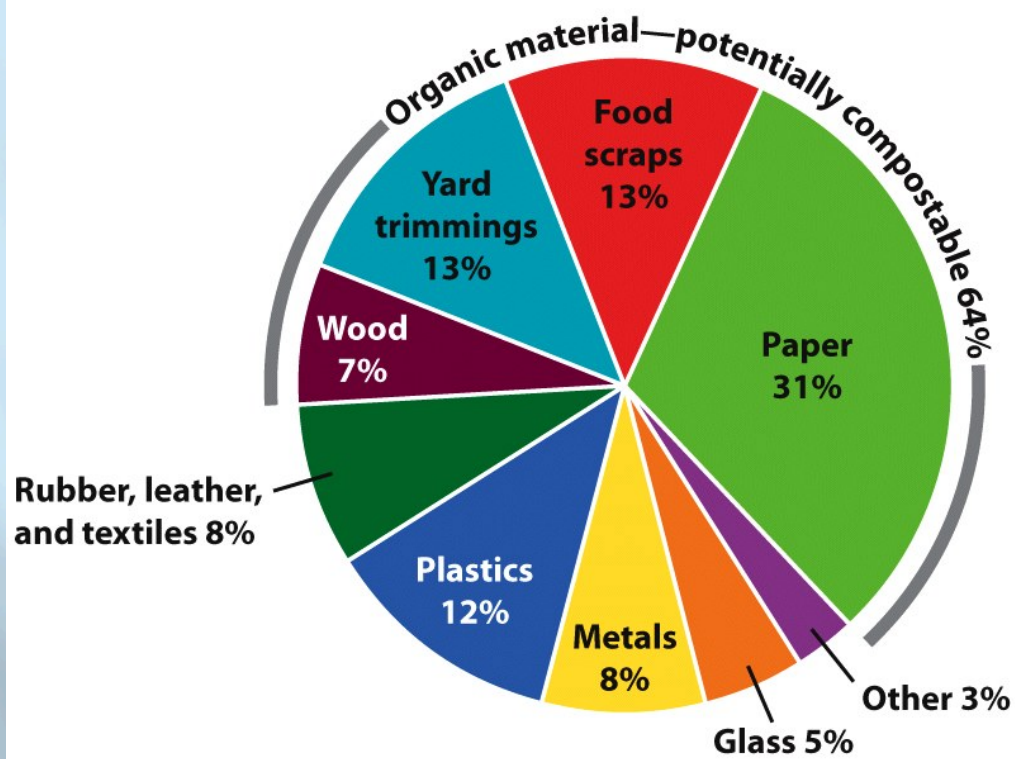


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**Figure 16.4**  
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**(a) Breakdown of MSW by composition**

**(b) Breakdown of MSW by source**

**Figure 16.5**

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# Composition of Municipal Solid Waste

- ▣ 31% - paper
- ▣ 33%- organic materials (yard waste, food scraps, wood)
- ▣ 12%- plastic
- ▣ 18%- durable goods (appliances, tires)

# E-Waste

- ❑ Electronic waste (E-waste) televisions, computers, cell phones that contain toxic metals.



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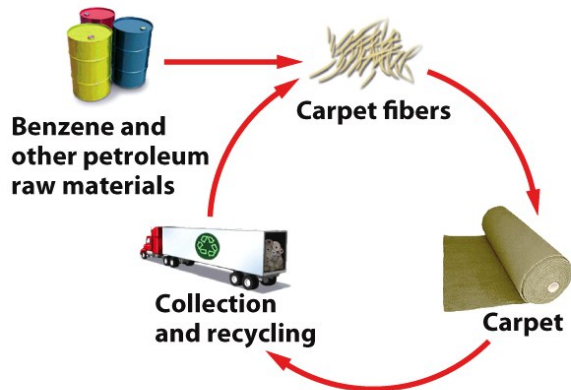


# Reduce, Reuse, Recycle

- ❑ Reduce- waste minimization or prevention
- ❑ Reuse- reusing something like a disposable cup more than once
- ❑ Recycle- materials are collected and converted into raw materials and then used to produce new objects



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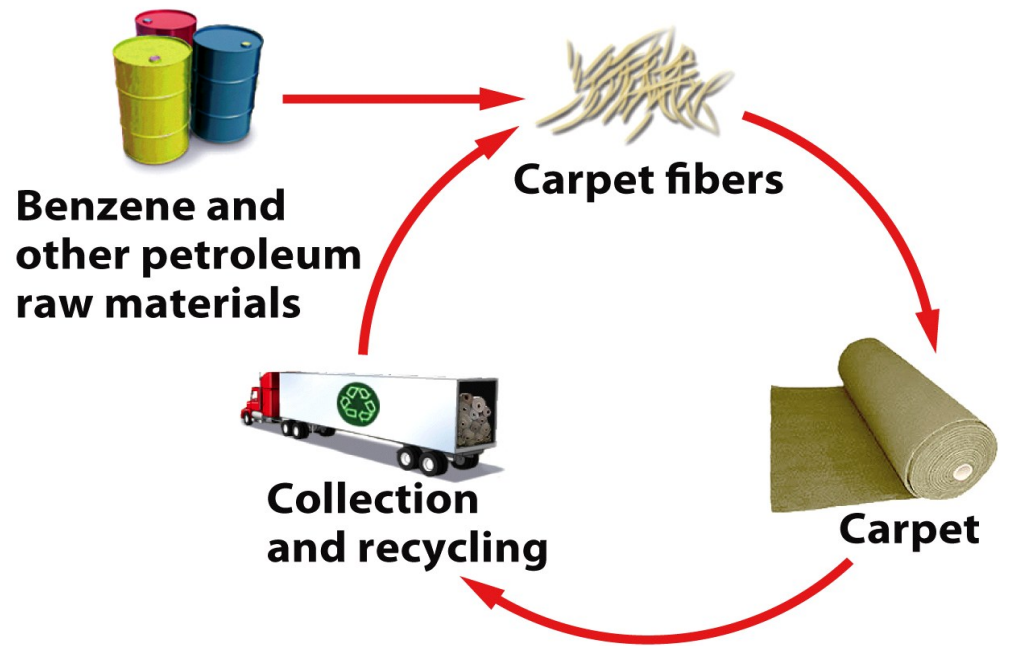


(a) Closed-loop recycling



(b) Open-loop recycling

Figure 16.8  
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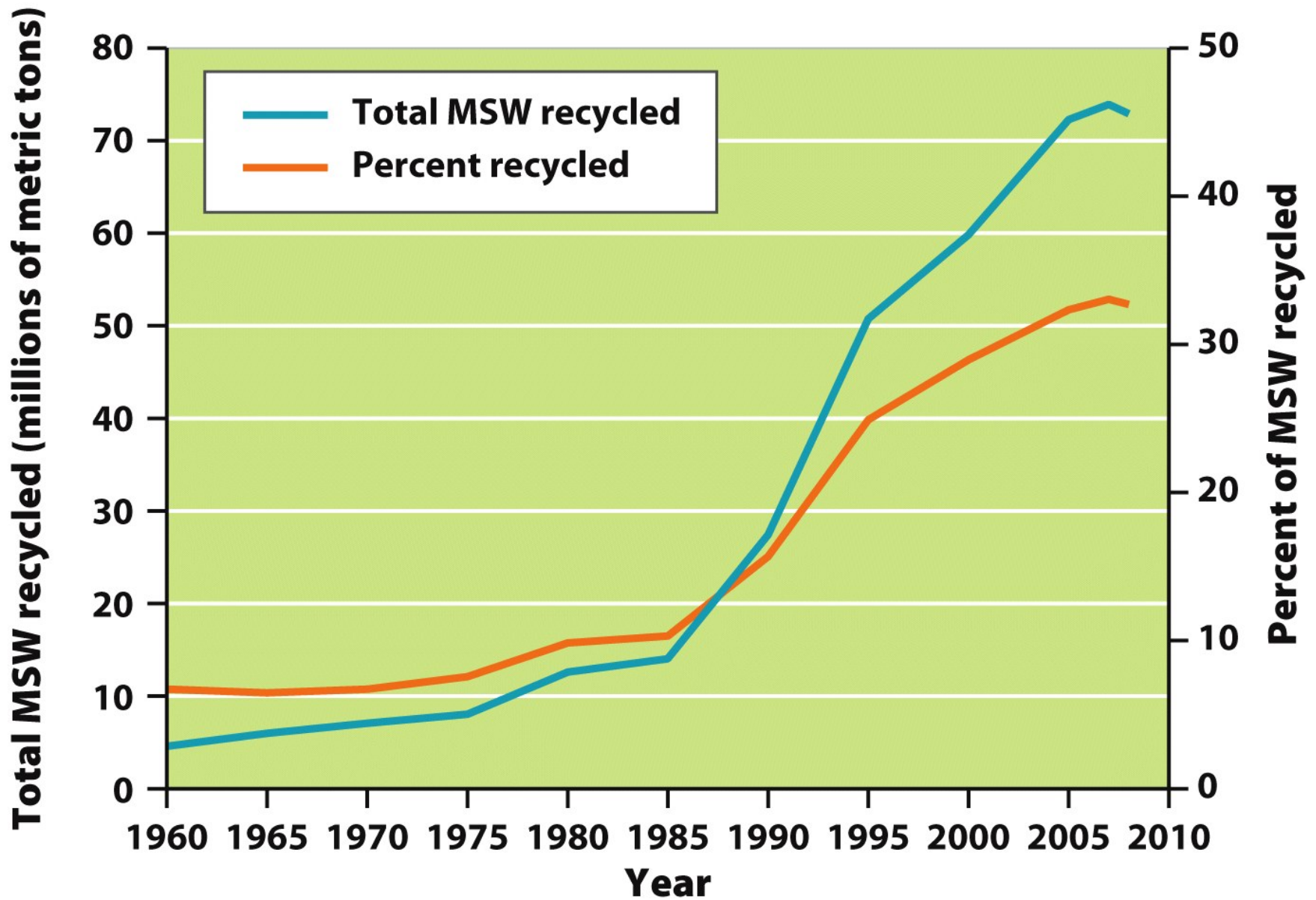


Closed-loop recycling



Open-loop recycling

Figure 16.8b  
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**Figure 16.9**

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**Figure 16.10**

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# Composting

- Compost- organic material that has decomposed under controlled conditions to produce an organic-rich material.



**Figure 16.11**  
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Don't toss it...compost it!



**1** Waste is dumped in tipping area.

**2** Compostable and noncompostable materials are separated.

**3** Noncompostable material is removed to landfill.



Organic waste: Newspaper, leaves and grass, food scraps, woody materials, etc.

Finished compost

**4** Compostable material is aerated and turned one or more times (to speed up aerobic respiration) for a period of 30 days to 1 year.

**6** Finished compost is transported for use.

**5** Composted material is allowed to cure.

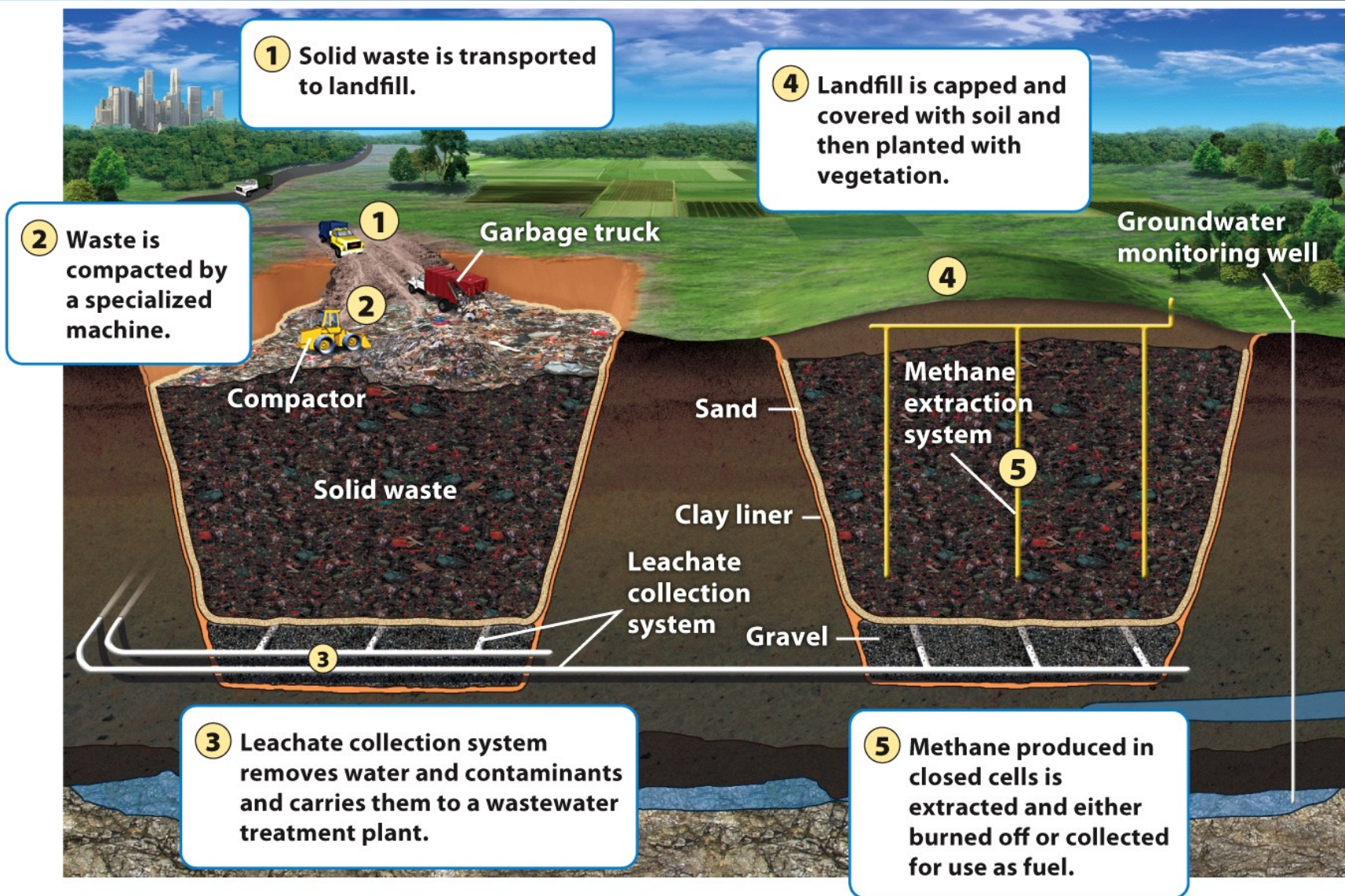


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# Landfills

- ▣ Sanitary landfills- engineered ground facilities designed to hold MSW with as little contamination of the surrounding environment as possible.
- ▣ Leachate- the water that leaches through the solid waste and removes various chemical compounds with which it comes into contact.





**Figure 16.14**

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# Landfill



# Incineration

- Incineration- the process of burning waste materials to reduce its volume and mass and sometimes to generate electricity and heat.

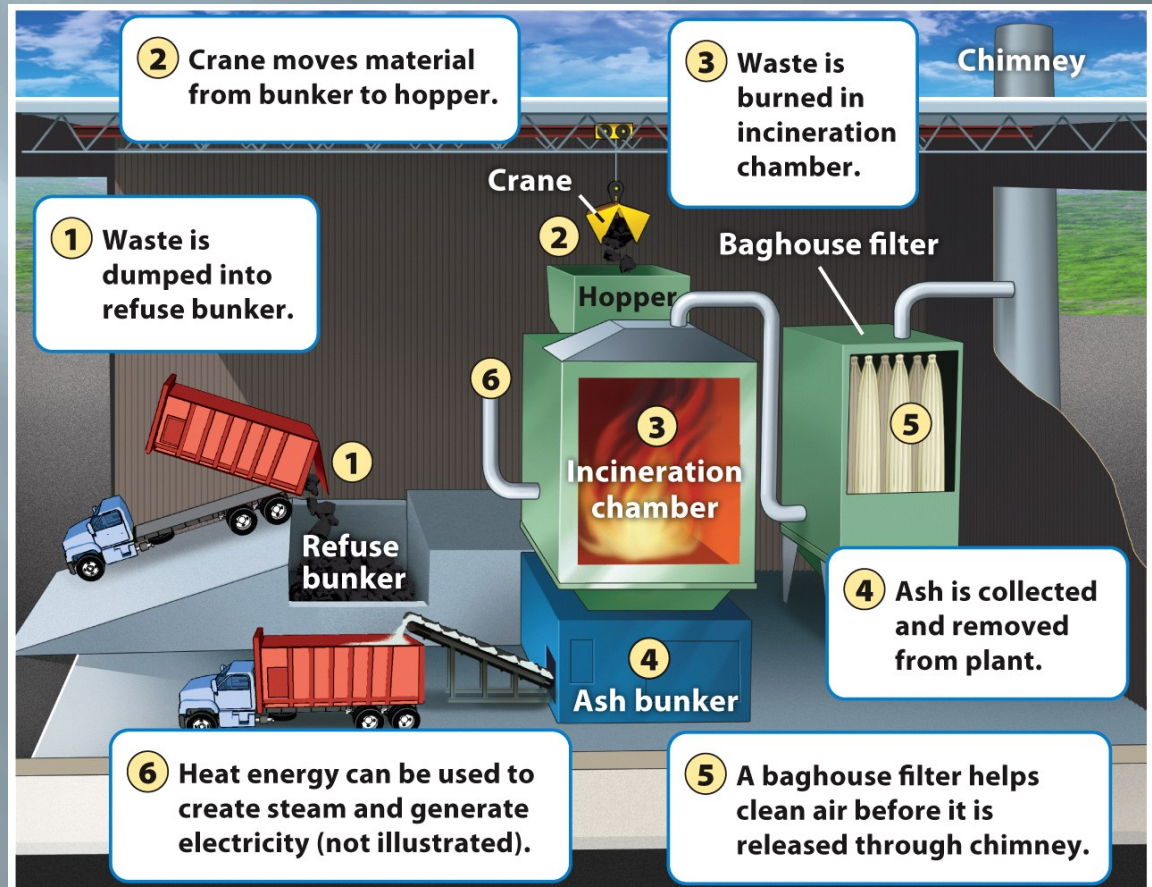


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# Hazardous Waste

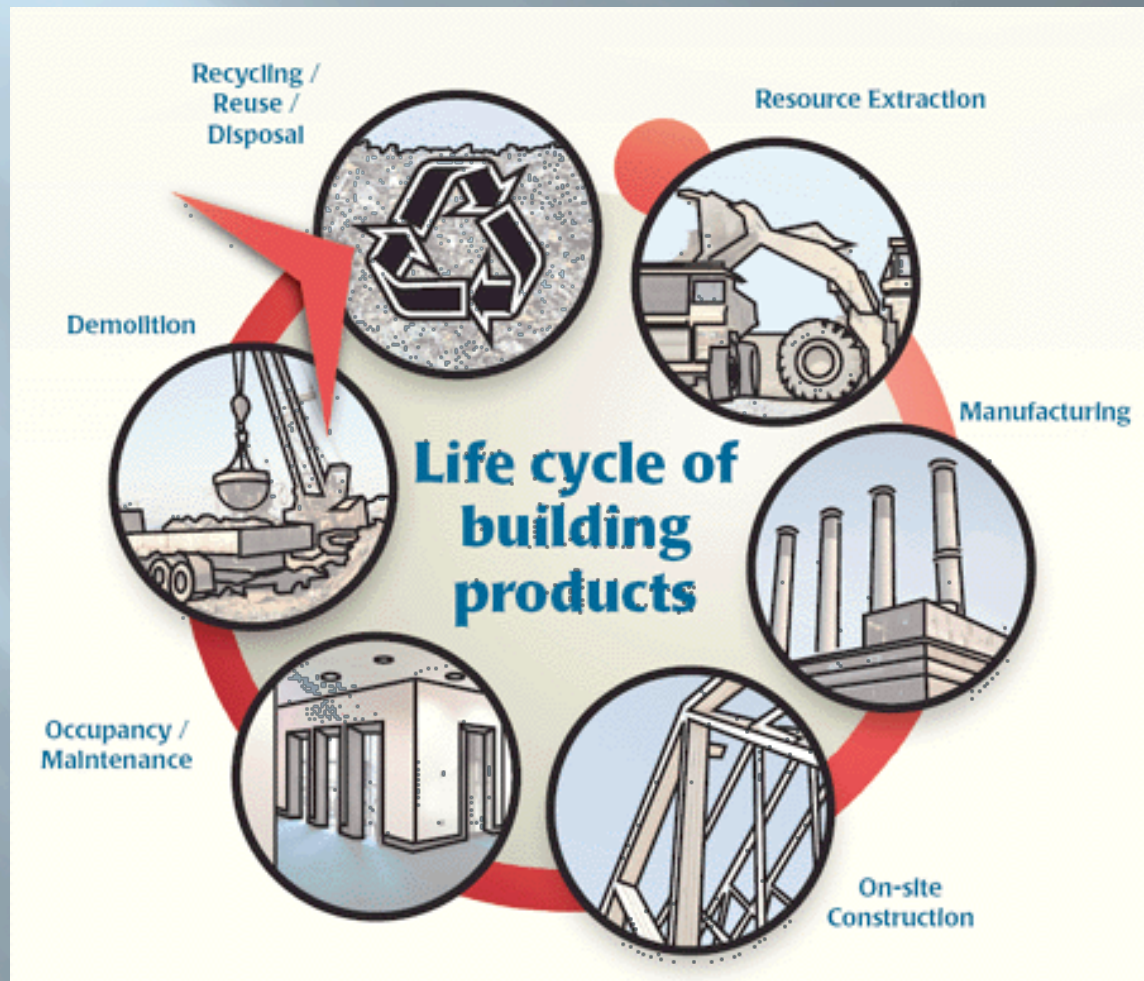
- Hazardous waste—liquid, solid, gaseous, or sludge waste material that is harmful to humans or ecosystems.
- Collection sites for hazardous waste must be staffed with specially trained personnel.
- Hazardous waste must be treated before disposal.



# Laws

- ❑ Resource Conservation and Recovery Act (RCRA)- designed to reduce or eliminate hazardous waste. Also know as “cradle-to-grave” tracking.
- ❑ RCRA ensures that hazardous waste is tracked and properly disposed of.

# Cradle to Grave



# Laws

- ❑ Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)- also know as “Superfund”.
- ❑ Puts a tax on the chemical and petroleum industries. This revenue is used to cleanup abandoned and nonoperating hazardous waste sites where a responsible party cannot be found.
- ❑ Requires the federal government to respond directly to the release of substance that may pose a threat to human health or the environment

# Love Canal





# Brownfields

- ❑ Contaminated industrial or commercial sites that may require environmental cleanup before they can be redeveloped or expanded.
- ❑ Old factories, industrial areas and waterfronts, dry cleaners, gas stations, landfills, and rail yards are some examples.

# Brownfield Rehab



# The Garbage Barge



# Integrated Waste Management

- A method that seeks to develop as many options as possible, to reduce environmental harm and cost.
- Reduction, recycling, composting, landfills, and incineration are some ways IWM is utilized.

