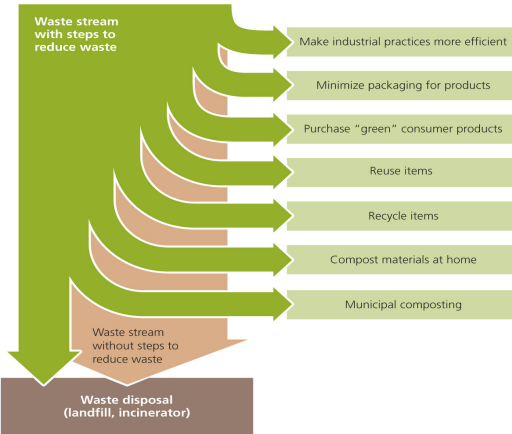


# Chapter 22: Waste Management

• **Waste** = any unwanted material or substance that results from human activity or process, aka: trash, garbage



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Three main components of waste management

1. source reduction (make less waste)
2. recover and recycle
3. dispose safely and effectively

**Recovery (recycling, composting)** = next best strategy in waste management

**Recycling** = sends used goods to manufacture new goods

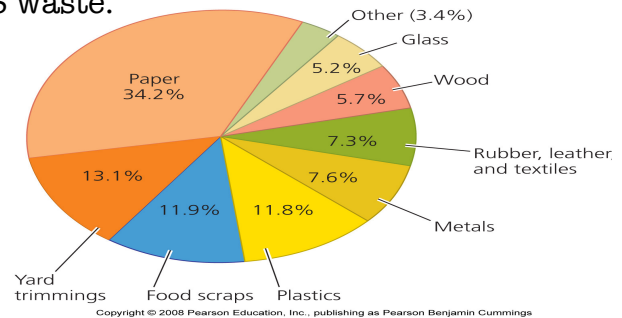
**Composting** = recovery of organic waste

All materials in nature are recycled – so why can't we recycle more of our consumer goods?!?

Paper and packaging are the 2 largest components of US waste.

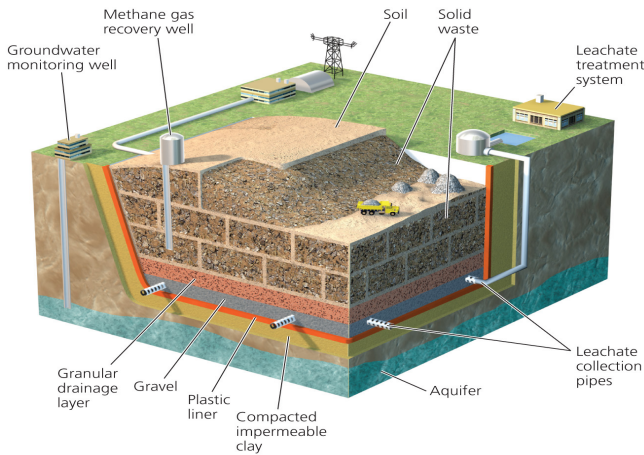
Ways to dispose of waste: (% utilized in the US)

1. composting
2. recycling
3. lined and covered landfills (54%)
4. incineration facilities (13%)



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## LANDFILLS



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Bury waste in the ground or in large mounds. Decomposition occurs (slowly.) Layered with soil nightly to reduce smell, aid decomp, and reduce pests.

\*\* MUST meet **RCRA**!!!!

- Resource Conservation and Recovery Act (1976, 1984) : gives EPA the authority to control hazardous waste from the "cradle-to-grave."

Many transformed into parks, etc after closure.

## NIMBY (Not in my backyard!!!) - drawbacks to landfills



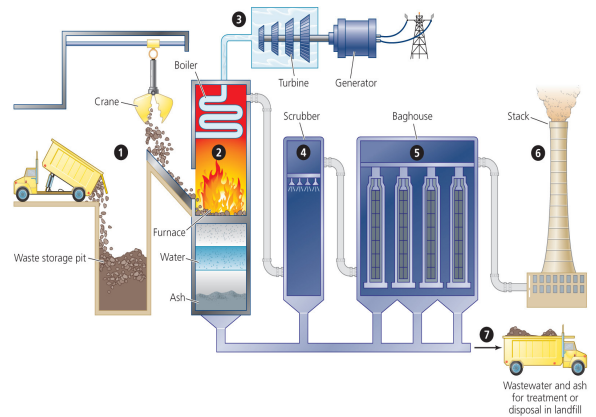
- belief leachate (left over liquid) will escape (faulty liner)
- no one wants one in their neighborhood
- once full, where does the waste go?

Random facts:

- Each day the average American throws away 4.5lbs of trash. Compared to 2.5lbs by the Canadians/Japanese
- The Miramar Landfill is slated to close in 2019, when this happens where will the City of San Diego put it's trash?

**Incineration** = burn garbage at high temp.

- can only burn non-toxic materials!
- still creates toxic pollutants (dioxins, Pb, etc.)
  - o use scrubbers to keep out of atm
- Waste-to-energy (WTE) facilities use heat to produce energy (see picture->)



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**“THE GARBAGE PROJECT” (1973)**

*a methodical study of the contents of modern trash*

A combination of archeology and dumpster diving, *garbology* provides insights to our culture and how we can change our often wasteful habits.

**REDUCE, REUSE, RECYCLE**

Source Reduction: prevent waster generation in the first place.

- less packaging, buy unwrapped fruits/veggies, buy bulk,

Change habits to reuse items

- bring own coffee cup, reuse bags, bring own tupperware.

Composting recovers organic waste through the process of decomposition.

Recycling = collecting materials that can be broken down and reprocessed to manufacture new items.



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**Industrial waste**

waste from factories, mining, agriculture, petroleum extraction, etc

U.S. industrial facilities generate 7.6 billion tons of waste, 97% is wastewater!

**Hazardous Waste**

Solid, liquid, or gas that is *ignitable, corrosive, reactive, or toxic*

Sources include: industry, mining, households, businesses, agriculture, utilities, etc.

**Heavy Metals are a BIG Problem!** (cadmium, lead, chromium, mercury, arsenic, tin, copper) Most are fat soluble and can bioaccumulate & biomagnify!

**e waste is a major contributor!**



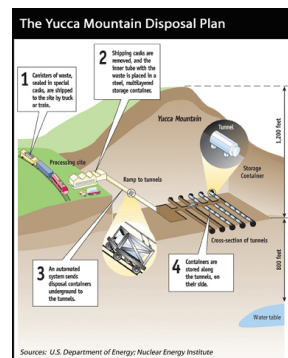
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**RCRA sets standards for disposal of hazardous waste.**

- this does nothing to decrease hazard, just keeps it away from us.
- Landfills, surface impoundments, injection wells.

**Yucca Mountain**

- *site of nuclear waste repository.*
- *Approved by Congress 2002 but funding to develop was just canceled this year!*



Sources: U.S. Department of Energy/Nuclear Energy Institute

**Superfund** – a cleanup program

-Experts identify polluted sites, take action to protect groundwater near these sites, and clean up the pollution (usually takes at least 12-15yrs!)

- Polluter pays principle
- Influenced by *Love Canal, New York* where families were evacuated b/c of toxic chemicals buried under the city.

