## Hazardous and Municipal Waste Management

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- Introduction
- Legal Foundation in the US
- Hazardous Waste Management
- Land Disposal
- Municipal Waste Management
- Source Reduction, Recycling, Reuse
- "Dual System" in Germany
- Thermal Treatment



## Federal Laws governing Solid Waste

➔ Solid Waste Disposal Act (1965)

| Wastes generated presently: | Wastes deposited in the past: |
|---|---|
| ➔ Resource Conservation and Recovery Act (RCRA, 1976) | ➔ Comprehensive Environmental Responsibility, Compensation and Liability Act (CERCLA, 1980) |
| ➔ Hazardous and Solid Waste Amendments (1984) | ➔ Superfund Amendment and Reauthorization Act (SARA, 1986) |



## Legal Definition of Hazardous Waste

- Excluded Wastes (i.e. municipal waste, mining waste, agricultural run-off)
- Listed Wastes (content or process specific)
- EPA Testing Criteria:
  - **T**oxicity
  - **R**eactivity
  - **I**gnitability
  - **C**orrosivity

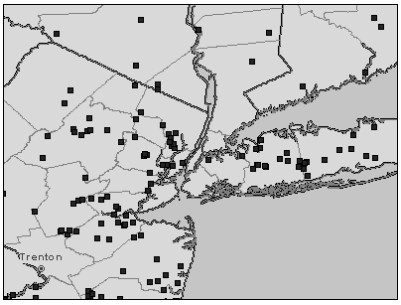


## The National Priority List (NPR)

- About 1300 sites
- Threat to human health or environment
- Groundwater contamination
- 1/3 are former landfills
- Clean-up takes 10+ years



**NPL Sites in the Tri-State Area**




EPA - EnviroMapper (Superfund)



## Hierarchy of Waste Management

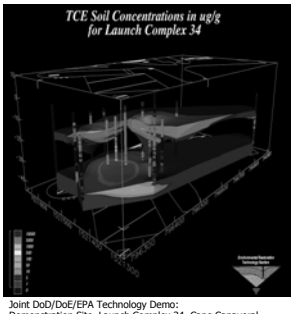
✡✡✡✡ Prevent the Generation of Waste

✡✡✡ Waste Minimization

✡✡ Recycling, Reuse, Recovery

✡ Treatment, Storage, Disposal

## Dense Non-Aqueous Phase Liquid (DNAPL)




Joint DoD/DoE/EPA Technology Demo:
Demonstration Site, Launch Complex 34, Cape Canaveral

Trichloroethylene

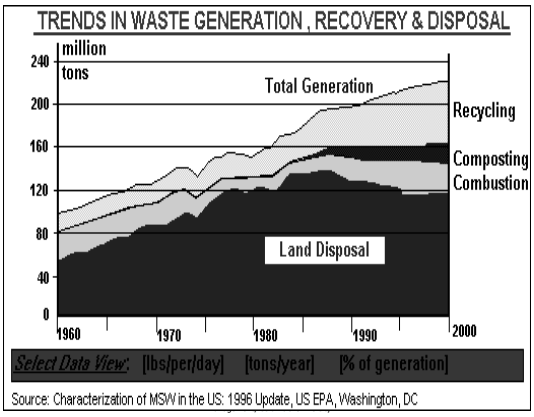
- common contaminant
- density: 1.46
- water solubility: 7ppm
- known carcinogen

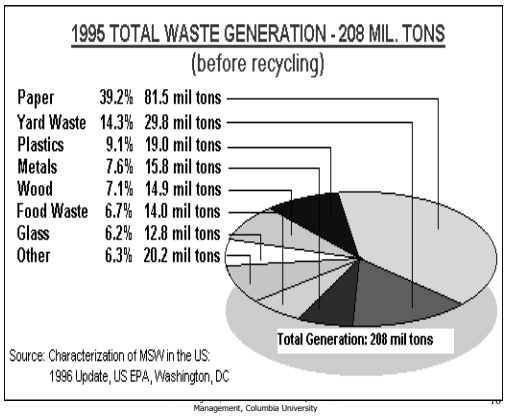


## Challenges for the Management of Hazardous Waste

- Absence of funds/Superfund Reauthorization Act
- Improve Waste Minimization
- Health effects of chronic exposures at low concentrations
- How Clean Is Clean?
- "Technical Infeasibility"
- Innovative Cleanup Technologies
- Justification of cleanup costs








## Integrated Municipal Solid Waste Management Plan

**Source Reduction**

- ↓On-site composting, reuse
- ↓eliminate packaging
- ↓extend product life

**Recycling, Reuse, Recovery**

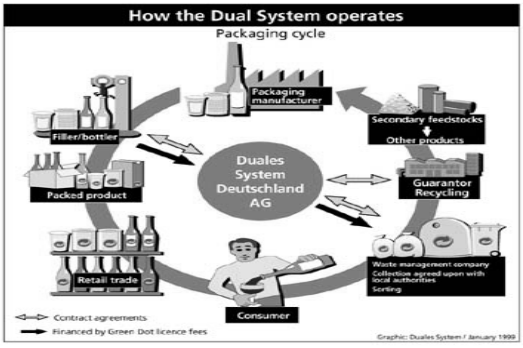
- ↓Source separation
- ↓Curb-side collection
- ↓Off-site composting, reuse, recycling

**Safe Treatment and Disposal**

- ↓ 55 % landfilled
- ↓ 17 % thermal treatment



## Germany's "Dual System"



## Problems with Recycled Materials

- Purity is not uniform
- Price can fluctuate greatly
- Lack of Market Development



## .C.O.N.C.L.U.S.I.O.N.S.

➔ Fact: Resources will go to Landfilling and Thermal Treatment

➔ Goal: Reduce Volume of Waste at the Source



**Hazardous and Municipal Waste Management**
Internet Resources

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**Solid Wastes**
- EPA's Office of Solid Waste: http://www.epa.gov/epaoswer/osw/index.htm
- Municipal Solid Waste: http://www.epa.gov/epaoswer/non-hw/muncpl/facts.htm
- Nice historical presentation on MSW, Milestones in garbage': http://www.epa.gov/epaoswer/non-hw/muncpl/timeline_alt.htm

**Superfund**
- Superfund information from EPA: http://www.epa.gov/superfund/index.htm
- The EnviroMapper: http://map3.epa.gov/enviromapper/index.html

**Waste Reduction/P2/Recycling**
- EPA's Waste Minimization Program: http://www.epa.gov/wastemin/
- Recycler's Exchange, commercial and private, information, commodities: www.recycle.net
- California's Integrated Waste Management Board has a RecycleStore for products with recycled content: http://www.ciwmb.ca.gov/RecycleStore/

**Landfills**
- Information on landfills from the Environmental Justice Network: http://www.ejnet.org/landfills/

**Thermal Treatment/Incineration**
- The Enviromental Literacy Council (not for profit organization) has a website with links to a technical tutorial and a slide show about a waste-to-energy plant in California: http://www.enviroliteracy.org/article.php/60.html

**DNAPL**
- From the Queen's University in Kingston, Canada: http://civil.queensu.ca/environ/groundwater/main.htm

**Dual System Germany**
- Information in english: www.gruener-punkt.de/e

**General Links**
- Private consulting service („Environment, Safety and Health Online") with a very thorough website and numerous links: http://www.ehso.com/contents.php