
Waste Management

A look into the historical and social context of the management of solid and hazardous waste in the U.S.

Types of Waste

- Solid Waste
- Liquid Waste
- Gaseous Waste
- Chemical Waste
- Commercial Waste
- Industrial Waste
- Biomedical Waste
- Compost Waste



What is Non-Hazardous Waste?

- In a nutshell, non-hazardous wastes are:
 - Any discarded or abandoned materials
 - Can be solid, liquid, semi-solid or containerized gaseous material
 - Waste that is safe to use and/or dispose of commercially, industrially, agriculturally or economically
 - Examples of non-hazardous solid wastes include the following materials when discarded:
 - Waste tires
 - Scrap metal
 - Latex paints debris, etc.
 - Garbage
 - Furniture and toys
 - Construction & demolition
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What is Hazardous Waste?

- Waste that is reactive, toxic, corrosive or otherwise dangerous to humans and/or the environment
 - Due to quantity and/or physical, chemical or infectious characteristics
- Generated from many sources ranging from industrial manufacturing process wastes to batteries
- May come in many forms, including:
 - Liquids
 - Solids
 - Gases
 - Sludges



Waste Management Issues

- Mid-1900s solid and hazardous waste management issues rose to new heights of public concern in the U.S. due to:
 - Increasing generation of waste
 - Shrinking of disposal capacity
 - Rising disposal costs
 - Public opposition to the siting of new disposal facilities
- Led to the passing of federal regulations by the Environmental Protection Agency (EPA)



Landmark Hazardous Waste Episodes

Love Canal, NY - Superfund Site

- Love Canal constructed to link the Niagara River to Lake Ontario (1894)
- Hooker Chemicals and Plastic Corporation took over site (1947) and buried thousands of tons of toxic chemicals
- Love Canal sold to the Board of Education of Niagara Falls (1953)



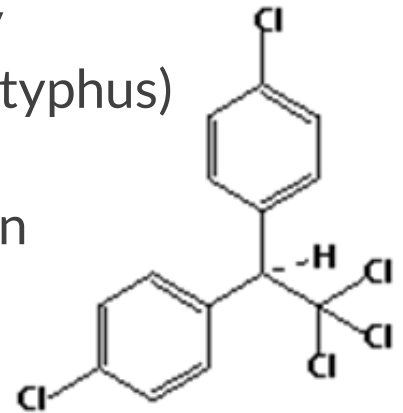
Love Canal, NY - Superfund Site

- October 1976: Niagara Gazette reports materials from a chemical landfill have been seeping into basements in the area; people falling ill
- November 1976: Gazette reports chemical analyses of residues near Love Canal indicating the presence of 15 organic chemicals, including toxic chlorinated hydrocarbons (PCBs)
- May 1980: President Carter declares the site a national emergency

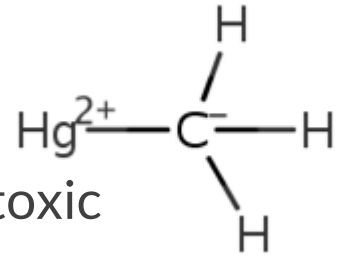


Dichlorodiphenyltrichloroethane – DDT

- Widely used chlorinated organic pesticide originally developed in 1873
- 1939: Paul Muller of Geigy Pharmaceutical in Switzerland discovered the effectiveness of DDT as an insecticide
- 1948: Muller awarded the Nobel Prize in medicine and physiology
- Use of DDT increased enormously after WWII, primarily due to effectiveness against mosquitos (malaria) and lice (typhus)
 - However, indicated to cause lack of fertility in birds
 - First chemical to be associated with causing cancer in humans



Mercury - Hg



- Elemental mercury (oxidation state = 0) relatively non-toxic
- Mercuric cation (oxidation state = +2) toxic
- If dumped into the environment, Hg can be converted to methylmercury by microorganisms
- Methylmercury (oxidation state = +1) VERY toxic
 - 100-fold more toxic than mercuric cation
- “Mad as a Hatter” = Mercury salts used in curing felt for hats caused mercury poisoning



U.S. Environmental Protection Efforts

Environmental Protection Efforts

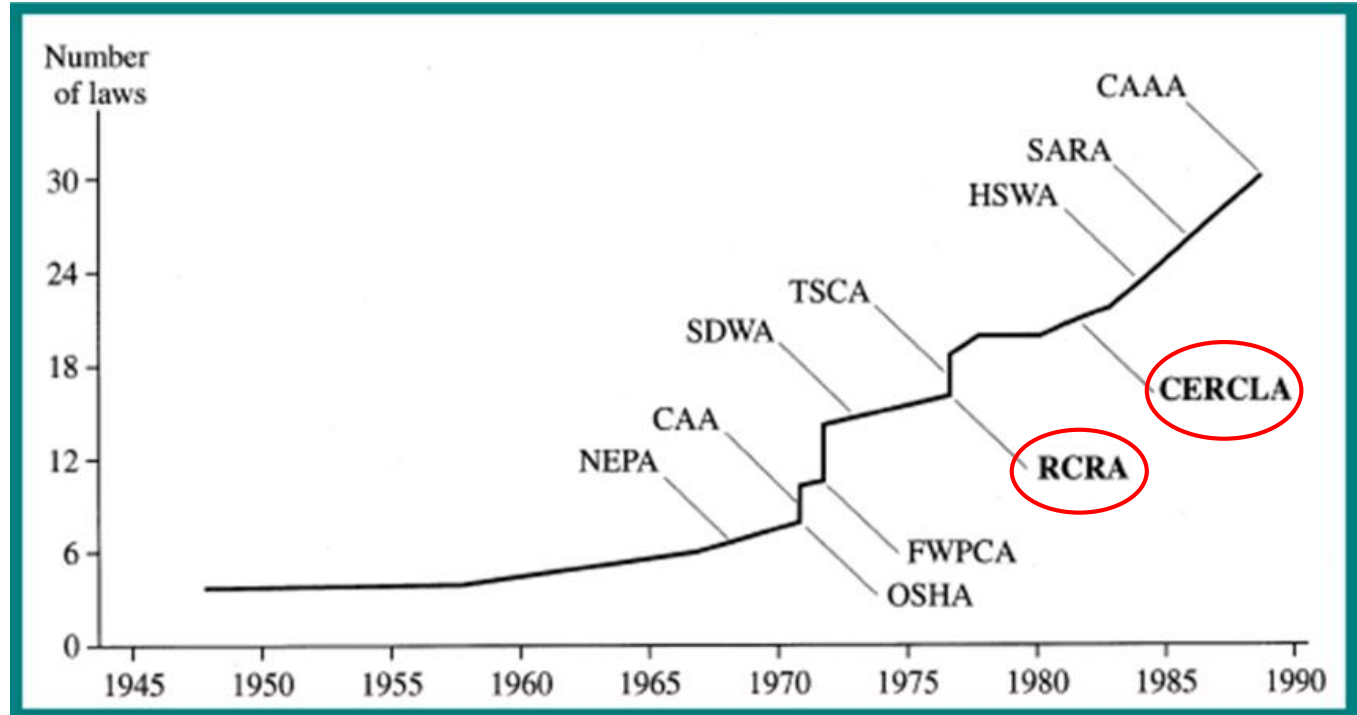
- Common Environmental Values:
 - No adverse effect on our personal health
 - Minimal or no affect on public health
 - Worthwhile to protect species and natural environments
 - Minimize the constraints placed on individual liberties
 - Consider both the costs and benefits of environmental protection efforts
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Historical Stages of U.S. Environmental Protection Efforts



- pre-1945: Common Law/Conservation Era
 - 1945-1962: Public Works Era
 - 1962-1972: Environmental Movement
 - 1972-1980: Federal Regulatory Era
 - 1980-1990: Refining Regulatory Strategies
 - 1990-?: Regulatory Recoil
 - post-?: Unknown
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Growth of Environmental Laws



Regulation of Waste Disposal

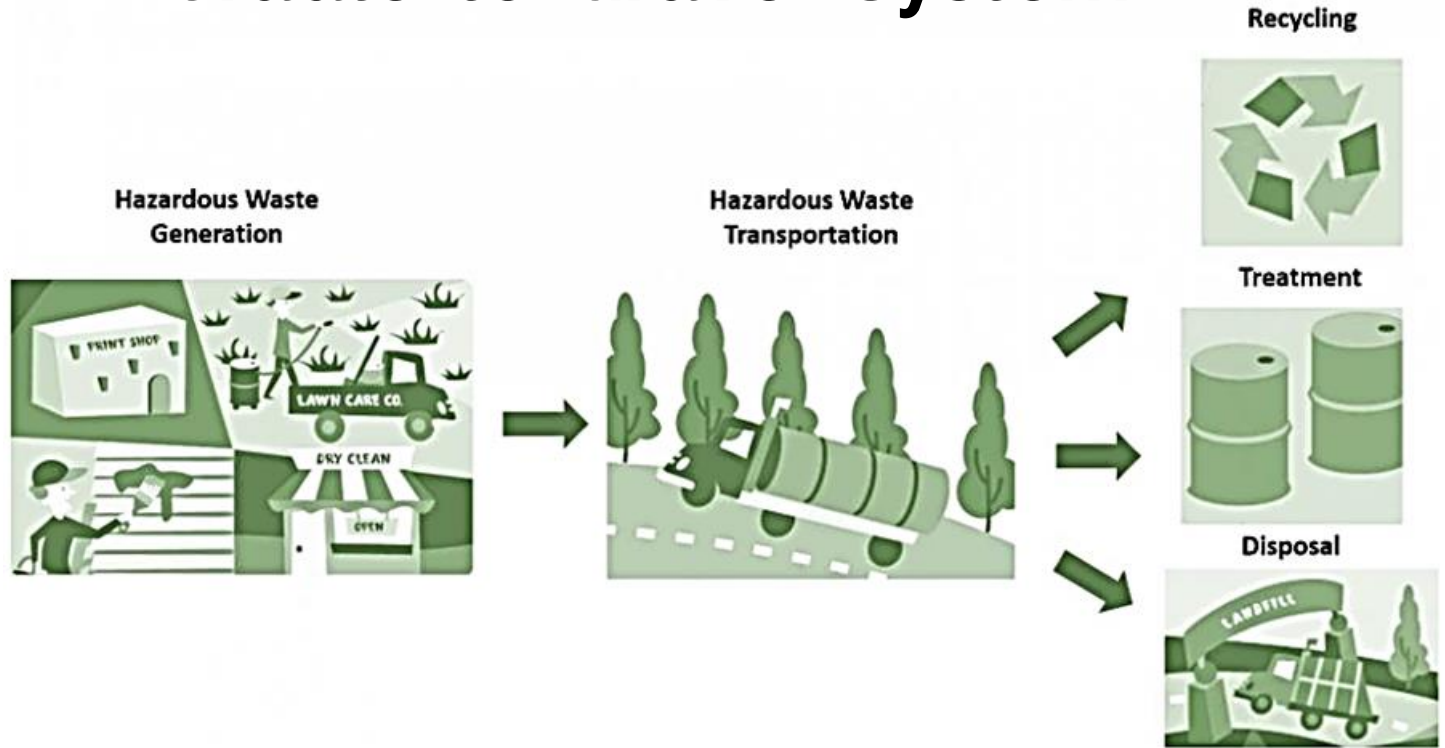
- RCRA – Resource Conservation and Recovery Act of 1976
 - Public law that creates the framework for the proper management of both non-hazardous and hazardous solid waste
 - Guidelines and policies set to ensure the safe management and cleanup of non-hazardous and hazardous waste
 - Subtitle D – Non-hazardous solid waste
 - Subtitle C – Hazardous solid waste
 - Bans open dumping of waste and sets minimum federal criteria for the operation of municipal and industrial waste landfills
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Regulation of Waste Disposal

- RCRA's "Cradle to Grave" concept for hazardous waste management
 - Ensures safe management of hazardous waste from the moment it is generated to its final disposal
- Safe management of hazardous waste, includes:
 - When it is created
 - While it is transported, treated and stored
 - When it is disposed



“Cradle-to-Grave” System



RCRA & Medical Waste

- MWTA – Medical Waste Tracking Act of 1988
 - Added medical waste to RCRA
 - After NY and NJ beach closures in 1987-1988 due to washed-up medical waste
- Required “Red Bag” (potentially infectious) waste
- Regulated waste per MWTA:
 1. Cultures and stocks
 2. Pathological wastes
 3. Human blood and blood products
 4. Used and unused sharps
 5. Isolation waste



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Regulation of Waste Disposal

- CERCLA – Comprehensive Environmental Response, Compensation and Liabilities Act of 1980
 - Also known as the “Superfund Act”
 - Identifies sites where hazardous waste threatens the environment and/or public health as a result of leakage, spillage or general mismanagement
 - Identifies the responsible party and holds the responsible party accountable for clean-up of contaminated site
 - Referred to as Potentially Responsible Parties (PRPs)
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“Superfund” Cleanup

- CERCLA authorizes Superfund cleanup responses in two ways:
 1. Emergency Response or Short-Term Removal
 - For sites with contamination that poses an immediate threat to human health and/or the environment
 2. Long-Term Remedial Action
 - EPA’s National Priorities List (NPL)
 - List of contaminated sites of national priority
 - Intended to guide EPA in determining which sites warrant further investigation
 - As of 2014, there are more than 1,300 Superfund sites in the U.S.
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Waste Management & Disposal

Classification of Wastes

- Biodegradable
 - Can be degraded (e.g., paper, wood, fruits) or composted
 - Biological decomposition of solid organic materials by bacteria, fungi and other organisms into a soil-like product
- Non-biodegradable
 - Cannot be degraded (e.g., plastics, bottles, old machines, cans, containers)



Management of Waste

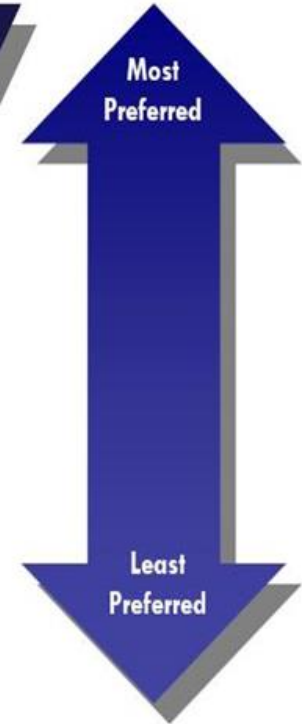
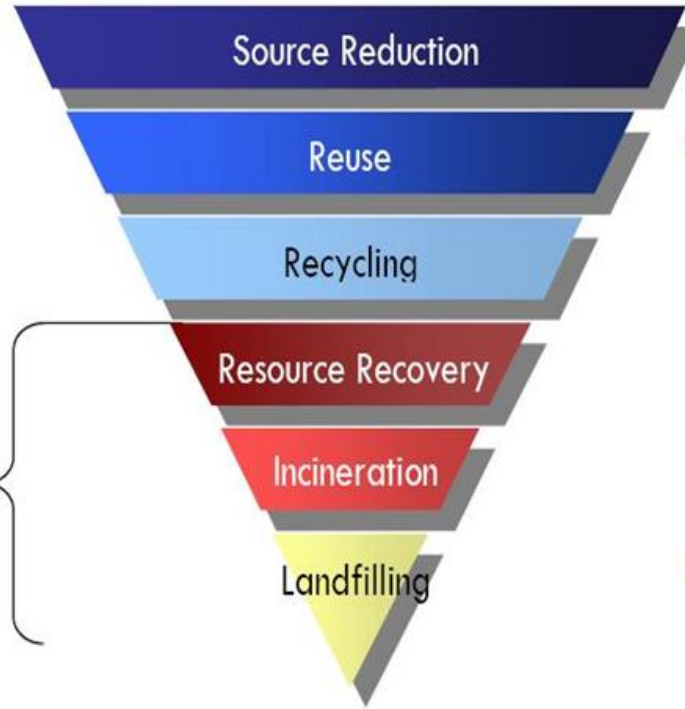
- Waste Disposal
 - Final handling of solid waste, following collection, processing or incineration
 - Most often means placement of wastes in a dump or landfill
- Landfilling
 - Final disposal of solid waste by placing it in a controlled fashion in a place intended to be permanent



Waste Management Hierarchy



Waste
Disposal





RECYCLE
REUSE
REDUCE

