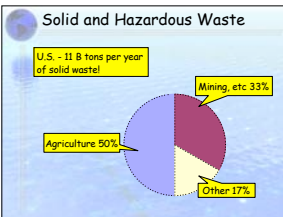


Solid and Hazardous Waste

U.S. - 11 B tons per year of solid waste!



Solid and Hazardous Waste

Animal Waste

Type of Waste	BOD5 (mg/L)	Ammonia (mg/L)
Undiluted Livestock Waste	40,000	10,000
Manure Lagoon Effluent	14,400	-
Runoff from a Concrete Lot	1,000	-
Runoff from a Dirt Lot	500	-
Raw Municipal Sewage	250	50
Treated Municipal Sewage	30	15

Solid and Hazardous Waste

Industrial Waste

400 M tonnes per year (60 M = hazardous)
• recycled, converted to other forms,
destroyed, put in landfills, put in deep
injection wells

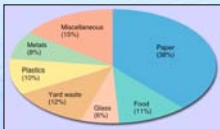
Municipal Waste

209 M tonnes per year
• household and commercial refuse

In the U.S.: 4.6 lbs per person per day -
2x Europe/Japan - 5-10x developing
countries

Solid and Hazardous Waste

Municipal Waste



Solid and Hazardous Waste

Disposing of waste includes use of open dumps,
ocean dumping, landfills, exporting waste and
incineration.

1. **Open dumping** - drop trash into a big hole -
predominant method in developing countries -
e.g. Manila, Philippines has "Smoky Mountain"
a 30 m high smoldering heap of trash on
which 1000s of people work and live! They
spend the day looking for edible and
recyclable items...

Most developed countries forbid open
dumping - U.S. - 200 M liters per year of
waste motor oil poured into sewers or onto
the ground

Solid and Hazardous Waste

Disposing of waste includes use of open dumps, ocean dumping, landfills, exporting waste and incineration.

2. **Ocean dumping** - every year 25,000 tons of packaging including 500,000 bottles, cans and plastic containers dumped at sea

150,000 tons of fishing gear including 1000 km of nets is lost or discarded at sea

Until 1992, U.S. continued to dump municipal refuse, industrial waste, sewage and sewage sludge in the ocean

Solid and Hazardous Waste

Disposing of waste includes use of open dumps, ocean dumping, landfills, exporting waste and incineration.

3. **Landfills** - sanitary landfills: solid waste disposal is regulated and controlled - costs U.S. \$10 B per year

Landfill operators are required to compact and cover refuse every day - but the dirt cover takes up as much as 20% of the space

Since 1994 all U.S. landfills must control such things as oil, chemicals, toxic metals and contaminated rain water by using clay/plastic liners, etc

Solid and Hazardous Waste

Disposing of waste includes use of open dumps, ocean dumping, landfills, exporting waste and incineration.

4. **Exporting waste** - Most industrialized countries no longer export waste but it still occurs

1999 - The Formosa Plastics Company of Taiwan dumped 3000 tons of incinerator waste in Cambodia (during the night) after they paid a \$3,000,000 bribe to Cambodian officials

Solid and Hazardous Waste

Disposing of waste includes use of open dumps, ocean dumping, landfills, exporting waste and incineration.

5. **Incineration (and Resource Recovery)** - Burn garbage to produce steam to turn a turbine and produce electricity

Reduces the waste stream by about 90% but the incinerator ash is then more concentrated with toxins such as dioxins, furans, lead and cadmium

Solid and Hazardous Waste

Shrinking the Waste Stream includes recycling, composting, demanufacturing and reusing

1. **Recycling** - the reprocessing of discarded materials into new useful products

Aluminum cans and glass containers are usually recycled to make more aluminum cans and glass containers. Old tires become rubberized road surfaces, newspapers become cellulose insulation and kitchen wastes become fertilizer

Americans throw away enough aluminum to make 3800 Boeing 747s

Solid and Hazardous Waste

Shrinking the Waste Stream includes recycling, composting, demanufacturing and reusing

2. **Composting** - the biological degradation or breakdown of organic matter under aerobic conditions

Can easily set up a composter in your backyard - build it yourself or buy a kit or buy a preassembled one for about \$200

Solid and Hazardous Waste

Shrinking the Waste Stream includes recycling, composting, demanufacturing and reusing

3. **Demanufacturing** - the disassembly and recycling of obsolete consumer products such as TVs, computers, refrigerators, washing machines and air conditioners

Computers and other electronics contain toxic metals and valuable metals - U.S. discards 50 M computers per year

Cheapest way is to ship junk to developing countries

Solid and Hazardous Waste

Shrinking the Waste Stream includes recycling, composting, demanufacturing and reusing

4. **Reusing** - cleaning and reusing materials in their present form - old auto parts from the junkyard, stained glass from demolished houses, fine woodwork and bricks from old houses, etc. Returning and refilling old beer bottles is another example

This is usually much cheaper than buying new parts

Solid and Hazardous Waste

Hazardous waste disposal - EPA estimates that there are 36,000 seriously contaminated sites in the U.S. - total cost for cleanup: \$370 - \$1700 B

- » In Oswego County - ~~4 Federal~~ Clothier site (south of county), Fulton Terminals, Bateman (E. Seneca, Oswego, it was the 7th biggest site in the country), Valney/Silk Rd./Oswego Valley Landfill - all remediated, and 2 monitored by 19 wells AND 27 state: all remediated, 2 under continuous monitoring
- » ALCAN- several sites investigated: lagoon with PCB's left to self-preserve them.

Solid and Hazardous Waste

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Secure Landfill

The diagram illustrates a cross-section of a secure landfill. At the top, there is a layer labeled 'Landfills removal'. Below this is a 'Topsoil cover' layer, followed by a 'Clay cap'. Underneath the clay cap is a 'Methane removal' system consisting of a 'Plastic liner' and a 'Leachate collection' layer. The bottom of the landfill is labeled 'Existing site'. Several 'Monitoring wells' are shown as vertical tubes extending from the surface down through the various layers to monitor for leaks or gas accumulation.
