

Hazardous Waste

A hazardous waste can be a liquid, solid, or gas that is acutely or chronically hazardous to human health if not managed or handled properly. By definition, these substances may be toxic, corrosive, ignitable, or reactive. Hazardous waste can be a by-product of a manufacturing process or may simply be a commercial product, such as a cleaning fluid, that contains ingredients hazardous to the environment. Hazardous waste can be both persistent and bioaccumulative in ecosystems and food chains, remaining in the environment for long periods of time. Toxics can bioaccumulate in the bodies of mammals, fish, and birds, and may eventually be passed on to humans who consume them.

Hazardous waste indicators presented in this catalog fall under *volume generated*, *management*, *spills*, and *sites*. Radioactive waste indicators are split between *low-level* and *high-level* waste.

How is Hazardous Waste Generated?

Industries produce waste that is sometimes toxic (harmful to human health or the environment even in very small quantities) or dangerous if mishandled. Common household garbage, also referred to as municipal solid waste, is primarily nonhazardous, but it frequently contains wastes that are hazardous, spread disease, or disrupt the environment in other ways.

Many chemical wastes are classified as hazardous wastes. They include materials that are: explosive or highly reactive; flammable; corrosive, such as acids and bases; and, toxic or poisonous, which may cause long-term physiological problems such as cancer, birth defects, and other abnormalities. Chemical wastes come from three main sources. The first source includes chemical manufacturing processes, all of which produce certain wastes. For example, raw materials such as crude oil are made into numerous synthetic organic chemicals used in plastics, synthetic fibers, coatings, pesticides, drugs, and other products. The second source includes the numerous chemicals used as solvents, cleaning fluids, or other agents in various processes; these “process materials” are also discarded after use. The third source includes residues that remain as residuals in “empty” containers and drums along with unused portions of chemicals that are discarded.

Federal Initiatives

Numerous regulations have been passed to support toxic-free communities. The Toxic Substances Control Act (TSCA) regulates the manufacture, use, distribution, and disposal of chemicals, and the Resource Conservation and Recovery Act (RCRA) authorizes USEPA to regulate hazardous waste generation, transport, treatment, storage, and disposal. The RCRA requires records to be kept on the handling and transfer of all hazardous wastes from their point of origin to their ultimate disposal. All landfills or other facilities receiving hazardous wastes must be authorized by the issuance of a permit.

The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) is a major federal program aimed at identifying and cleaning up existing hazardous waste sites. The law is well known for establishing the Superfund. CERCLA, through a tax on the chemical industry, provides a fund to clean up those sites where parties responsible for the dumping of hazardous substances could not be found. Where responsible parties could be found, the law forces them to clean up the site. To address health-related issues surrounding Superfund sites, the Agency for Toxic Substances and Disease Registry (ATSDR) was established. ATSDR is mandated to prevent exposure, adverse human health effects, and diminished quality of life associated with exposure to hazardous substances from waste sites, unplanned releases, and other sources of pollution present in the environment.¹

In 1986, Superfund Amendments and Reauthorization Act (SARA Title III) required states to establish a process for developing local chemical emergency preparedness programs and to receive and disseminate information on hazardous chemicals present at facilities within local communities. The USEPA has since increased actions to achieve faster Superfund cleanups at sites with high economic reuse potential. The Pollution Prevention Act (PPA) of 1990 established pollution prevention as a national objective and required the USEPA to identify measurable goals, consider the effects of Agency programs on source reduction, and evaluate existing barriers to source reduction.

Examples of Hazardous Waste: Heavy Metals

Heavy metals are metallic elements such as lead, mercury, cadmium, tin, chromium, zinc, and copper. Heavy metals are contained primarily in the wastes of metal processing industries and industries producing pigments. As ions or in certain compounds, these metals are soluble in water and may be ingested and absorbed into living tissue. They are extremely toxic because atoms tend to combine with and inhibit the functioning of particular enzymes. Thus, very small amounts can have severe physiological and/or neurological consequences.

Examples of Hazardous Waste: Synthetic Organic Chemicals

Organic chemicals are based on various arrangements of carbon atoms bonded with hydrogen or other certain elements. Organic chemists have learned to make hundreds of thousands of unique organic molecules, which are referred to as synthetic organic chemicals. Production of these chemicals has grown rapidly and thousands of new compounds are produced each year.

Many synthetic organic compounds are similar enough to natural organic compounds that they interact with particular enzymes or other biochemicals. This results in some synthetic organics being acutely poisonous while others may serve as beneficial drugs. Adverse effects of synthetic organic chemicals include mutagenesis (occurrence of genetic mutations), carcinogenesis (causing cancer), and teratogenesis (causing birth

¹ *Don't Hazard A Guess, Addressing Community Health Concerns at Hazardous Waste Sites*, National Association of County and City Health Officials, 1994.

defects). In addition, they may cause serious liver and kidney dysfunction, sterility, and numerous other physiological problems.

Examples of Hazardous Waste: Halogenated Hydrocarbons

Halogenated hydrocarbons are compounds of hydrogen and carbon in which one or more of the hydrogen atoms have been replaced by atoms of chlorine, bromine, fluorine, or iodine. Those compounds containing chlorine (referred to as chlorinated hydrocarbons) are by far the most common. Such compounds are widely used in plastics (e.g., polyvinyl chloride), pesticides (e.g., DDT, kepone, and mirex), solvents (e.g., carbon tetrachloride), wood preservatives (e.g., pentachlorophenol), electrical insulation (e.g., PCBs or polychlorinated biphenyls), flame retardants (e.g., TRIS), and many other products. Consequently, such compounds are common in the wastes of industries that produce or use these products. PCBs and dioxins are examples of chlorinated hydrocarbons that are notorious for their pollution hazard. Heavy metals and halogenated hydrocarbons are particularly detrimental because they bioaccumulate. Halogenated hydrocarbons may persist more or less indefinitely in the environment.

Radioactive Waste

Approximately 800,000 cubic feet of low-level radioactive wastes were disposed of in 1993.² 28,000 metric tons of high-level radioactive waste remains stored at nuclear power reactor sites. Radioactive wastes are the by-products of radioactive substances that emit ionizing radiation. These substances may be used in medical, education, or research facilities (generally low-level), or as part of a nuclear power plant's core operations (high-level). Numerous issues exist in dealing with low-level and high-level radioactive waste, including transportation within a state or across state boundaries, where or how to store waste, preparing for potential hazards, and assigning responsibility.

² *Radioactive Waste*, available through the USEPA Homepage: <http://www.epa.gov/>

List of Indicators

Waste indicators are grouped according to the following categories:

Hazardous Waste

Hazardous Waste Generation

Hazardous Waste Management

Treatment/Disposal

Reduction Activities

Underground Injection

Shipping/Tracking

Toxics and Metals-Incinerator Discharges

Compliance/Enforcement

Spills

Hazardous Waste Sites

Number of Sites

Sites With Cleanup Activities

Superfund

Radioactive Waste

Low-level Radioactive Waste

Sites

Generation/Volume

Shipping/Transfer

High-level Radioactive Waste

The list is summarized from state and federal environmental reports with the source for each indicator given in parenthesis. The category listings are to facilitate ease of use of the information. There will be numerous occasions where one indicator can fit into another category in addition to the one in which it is listed here.

Hazardous Waste Generation

- **Hazardous Waste Generation and Management: Amounts Generated, Recovered/Recycled, Incinerated, Stored** (EPA92) *Source:* Biennial Reporting System.
- **Total Hazardous Waste Generation at RCRA Regulated Facilities by Industry Type** (EPA92) *Source:* Biennial Reporting System. *Description:* This includes only waste generated on-site from production processes, service activities, or management of non-hazardous waste. The analysis does not include wastes resulting from “secondary” generation, meaning hazardous waste residuals resulting from treatment or recycling of previously existing hazardous waste. Examples of “secondary” generation wastes are landfill leachates or a solid resulting from a stabilization process. This indicator shows that the dominant industry category in waste generation is “Manufacturing of Chemicals and Allied Products” (SIC 28), representing 85 percent of total primary hazardous waste generated.
- **Amount of Hazardous Waste Generated, by Waste Category (Normal Operations, RCRA Large Generator Cleanups, and One-time Cleanups)** (NC95) *Source:* State Solid Waste Management.
- **Progress in Pollution Generation (Large Generator, Small Generator, and Exempt)** (VT96) *Source:* State Agency of Natural Resources. *Description:* An indicator of change in hazardous waste generator status.
- **Quantity of Hazardous Waste Generated** (MN92) *Source:* State Pollution Control Agency.
- **Hazardous Waste Generation Trends** (KY94) *Source:* State Division of Waste Management.
- **Percentage Reduction of Hazardous Waste Generated From 1991 Base Year** (CT95) *Source:* State Hazardous Waste Management Section.
- **Percent Hazardous Waste Generated, by Series Category** (NC95) *Source:* State Solid Waste Management. *Description:* For regulatory purposes, USEPA places hazardous waste into categories: D Series wastes exhibit at least one of the four hazardous substance characteristics (ignitability, corrosivity, reactivity, or toxicity). F Series waste represents hazardous solvents and sludge waste from non-specific sources. K Series represents waste from specific manufacturing processes. P and U Series represent waste from discarded commercial chemical products, containers, and spill residues.
- **Ratio of Hazardous Waste Generated to Production Quantity Ratio** (Cat95) *Proposed in the “Inventory of Indicators” and at the “Environmental Indicators Workshop, July 1991.”*
- **Volume of Hazardous Waste (Federal, Other, Remediation, Businesses, Shipments)** (CA95) *Source:* State and federal government. *Description:* There has been a decrease in federal hazardous waste volume, increase in recycling of other hazardous waste, and an increase in remediation waste volume; the total number of regulated businesses and shipments per year has increased dramatically.

- **Pounds per Year of Hazardous Waste Generated per Capita (WA95)** *Source:* State Department of Ecology.
- **RCRA Hazardous Waste Generation (DIIR95)** *Source:* The Biennial RCRA Hazardous Waste Report. *Description:* Indicator shows millions of tons of Newly-Regulated RCRA Waste, Status Uncertain, and Waste Regulated Under RCRA in 1989.
- **Top Ten Hazardous Waste Generating Counties (NC95)** *Source:* State Solid Waste Management.
- **Top Ten Hazardous Waste Generators (NC95, KY94)** *Source:* State Solid Waste Management departments.
- **Hazardous Waste Generated by County/ by Year (NC95, FL94)** *Source:* State Solid Waste Management departments.
- **Full Quantity Hazardous Waste Generators (KY92)** *Source:* State Division of Waste Management. *Description:* These are facilities that produce over 2,200 pounds of hazardous waste each per month.
- **Reportable Hazardous Waste Generation by County (KY92)** *Source:* State Division of Waste Management.
- **Major Sources of Hazardous Waste Generated (KY92)** *Source:* State Division of Waste Management. *Description:* The chemical (and allied products) industry produced 96 percent of the hazardous waste generated in Kentucky during 1989. Paper industries produced 3 percent of the total.
- **Hazardous Waste Generation by Physical State (Liquid Waste or Sludge and Solid Waste) (KY92)** *Source:* State Division of Waste Management.
- **Hazardous Waste Generation by Waste Type (KY92)** *Source:* State Division of Waste Management. *Description:* It is important to determine the composition and risk of hazardous waste. Most of Kentucky's hazardous waste is corrosive wastewater, which poses little risk if treated properly.
- **Groups of Hazardous Waste Generators (Very Small Quantity Generators, Small Quantity Generators, Large Quantity Generators) and Total Waste Amounts (MN95)** *Source:* State Pollution Control Agency. *Description:* A new focus of the MPCA is on the large number of businesses that generate less than 22 gallons of waste per month. These "very small quantity generators" are typically small businesses with few resources and little knowledge of how to properly handle their hazardous wastes.
- **Number of Hazardous Waste Generators, by Category (Generators, Treatment, Storage & Disposal Facilities, One-Time Generators) (NC95)** *Source:* State Solid Waste Management.
- **Generators of Medical Waste (KY92)** *Source:* USEPA. *Description:* According to the USEPA, about 80 percent of the medical waste generators are physicians, dentists, laboratories, nursing homes, and veterinarians, which each produce less than 50 pounds of medical waste per month. The Kentucky Hospital Association estimates that hospitals generate from 13 to 15 pounds of medical waste per patient each day.

- **Generators of Infectious Wastes (KY92)** *Source: USEPA.*

Analysis

These indicators measure hazardous waste by generation and management, by industrial type, by county or generator, and by type of waste. Some of the indicators deal with abandoned sites that are still hazardous and need to be remediated. Many are tied directly to hazardous waste regulations. The indicators can measure increases or decreases in hazardous waste generation, effectiveness of regulatory programs, or reductions in risks if measured for a minimum of three years.

Hazardous Waste Management

Treatment/Disposal

- **Permanent Household Hazardous Waste Collection Programs** (OPPE95) *Proposed.*
- **Hazardous Waste Treatment (Chemical, Physical, Incineration, Biological)** (KY92) *Source:* State Division of Waste Management. *Description:* Measured in tons, Kentucky industries treat a majority of the hazardous waste produced to render it legally non-hazardous.
- **RCRA Hazardous Wastes Treated or Disposed at TSDFs (Treatment, Storage, and Disposal Facilities)** (DIIR95) *Source:* The Biennial RCRA Hazardous Waste Report. *Description:* The quantities reported include both primary and secondary wastes. "Treatment" includes aqueous organic and inorganic units. "Recovery" includes waste sent to metals recovery, energy recovery and fuel blending, solvent recovery, and other recovery. "Other" includes surface impoundment, stabilization, sludge treatment, land application, and other treatment and disposal methods.
- **Hazardous Waste Management by Treatment Practice (Incineration, Recovery/Recycling, Land Disposal, Waste Water, Other)** (EPA92) *Source:* 1989 Biennial Reporting System.
- **Hazardous Waste Managed by Treatment or Recovery** (DIIR95) *Source:* USEPA Biennial Reporting System, 1994. (OPPE95 *Proposed*).
- **Hazardous Waste Treatment Technologies Trends (Biological, Incineration, Physical, Chemical, Other)** (KY94) *Source:* State Division of Waste Management. *Description:* The shift toward more physical treatment, which includes distillation, fuel blending, and sedimentation, reflects the growing trend by generators to minimize treatment and disposal costs.
- **Percent Hazardous Waste Processed by Facility** (NC95) *Source:* State Solid Waste Management.
- **Locations of Commercial Hazardous Waste Processing Facilities** (NC95) *Source:* State Solid Waste Management.
- **Hazardous Waste Disposal Trends (Landfilled and Underground Injection)** (KY94) *Source:* State Division of Waste Management.
- **Number of Permitted and Illegal Hazardous Waste Treatment, Storage, and Disposal (TSD) Facilities** (KY94) *Source:* State Division of Waste Management.

Analysis

These indicators measure the treatment and disposal of hazardous wastes. Some of the indicators measure by different types of treatment and different methods of disposal. These indicators can be used to establish trends in certain types of disposal or treatment methods, and in whether the amount of hazardous waste needing treatment or being disposed is growing.

Reduction Activities

- **Percent of Hazardous Waste Reduced, Recycled, or Treated at Industries Participating in Pollution Prevention Efforts (WA95)** *Source:* State Department of Ecology.
- **Hazardous Waste Reduction (TN94)** *Source:* not given. *Description:* Waste reduction measured in thousand tons from 1989 to 1992. In 1990, the Tennessee General Assembly passed the Hazardous Waste Reduction Act, requiring most industries to cut their hazardous waste by 25 percent by 1995.
- **Percentage of Operators/Facilities Practicing Waste Reduction or Prevention (CT95)** *Source:* State Underground Storage Tank Program, and Registration of Pesticide Application Businesses. *Description:* Indicator includes a variety of measurements: Non-residential underground storage tank systems meeting leak prevention installation standards; certified pesticide applicators practicing Integrated Pest Management (IPM) for structural pest control; state agencies completing environmental audit and plans to reduce air, water, solid, and hazardous waste pollution; Large Quantity Generators participating in waste minimization activities; farmers operating under a Farm Resource Management Plan and Integrated Pest Management Plan.
- **Hazardous Waste Reduction Activities (KY92)** *Source:* State Division of Waste Management quarterly reports, 1984 and 1988. *Description:* Waste generators must provide a statement describing their efforts to reduce waste volume and toxicity as part of Kentucky's annual reporting requirements.
- **Hazardous Waste Minimization Activities Reported by Major Generators (KY92)** *Source:* State Division of Waste Management. *Description:* Largest reduction activities in the most recent year of data (1989) were from changes in production process or equipment, recycled on-site contractors, and recycled off-site contractors.
- **Hazardous Waste Collected at Local Collection Centers (FL94)** *Source:* State Hazardous Waste Management Section. *Description:* This indicator shows how many pounds of hazardous waste have been collected through the Florida Hazardous Waste Collection Center Grant Program. The indicator is important because the greater the amount of hazardous waste collected, the greater the reduction in hazardous waste being improperly disposed of.
- **Percentage Reduction in the Number of Transformers at Greatest Risk of Becoming a Source of Pollution (CT95)** *Source:* State Department of Environmental Protection, PCB Transformer Registration Database. *Description:* General disrepair and vandalism of transformers at abandoned and under-utilized facilities have resulted in major discharges of PCBs.

Analysis

These indicators measure hazardous waste reduction activities. One measurement describes hazardous waste collected at collection centers as an indicator of reduced improper disposal. The indicators can measure progress if estimated for a minimum of three years.

Underground Injection

- **Hazardous Wastes Managed by Underground Injection (DIIR95)** *Source:* The Biennial RCRA Hazardous Waste Report.
- **Hazardous Wastes Managed by Underground Injection (OPPE95)** *Proposed.*
- **Oil and Gas Brine Injection Wells (KY94)** *Source:* USEPA, Underground Injection Program, Region 4. *Description:* Salty brine water, extracted during oil drilling, can degrade streams and is toxic to aquatic life.

Analysis

This indicator measures hazardous waste disposed of deep underground. The growth in this type of disposal can be gauged if measured for a minimum of three years. This indicator can also be used as an indirect indicator of risk to groundwater.

Shipping/Tracking

- **Breakdown of Hazardous Waste Management Methods (On-site Processing, Shipped In-State, Shipped Out-of-State) (NC95)** *Source:* State Solid Waste Management.
- **Amount of Hazardous Waste Shipped Off-site to In-State Facilities, by Processing Method (Storage, Recycling, Treatment) (NC95)** *Source:* State Solid Waste Management.
- **Amount of Hazardous Waste Received at Commercial Facilities from In-State and Out-of-State Sources (NC95)** *Source:* State Solid Waste Management. *Description:* In millions of pounds since 1989.
- **Amount of Hazardous Waste Shipped Off-site to Out-of-State Facilities by Processing Method (NC95)** *Source:* State Solid Waste Management.
- **Hazardous Waste Imported Into and Exported Out of State (KY94)** *Source:* State Division of Waste Management.
- **Toxic Chemical Transfers Into and Out of State (KY94)** *Source:* TRI.
- **Tons of Hazardous Waste Followed to Safe Disposal (MN93)** *Source:* State Pollution Control Agency. *Description:* The MPCA has an energetic state outreach program that tracks the tons of hazardous waste to final disposal as well as the number of companies reporting waste generated.
- **Hazardous Waste Imports and Exports (KY92)** *Source:* State Division of Waste Management.

Analysis

These indicators measure the shipping and tracking of hazardous waste. They can relate changes in the number of shipments, changes in the types of shipments such as in-state or out-of-state, and any changes in the amounts of hazardous waste shipped. These indicators are important because of increased risk of exposure from spillage during shipment. An increase in shipments may also be a sign of hazardous waste reaching capacity in some states.

Toxics and Metals-Incinerator Discharges

- **Dioxin/Furan Emissions From Hazardous Waste Combustion Facilities** (PEGA 7/95) *Source:* USEPA. 1994. Office of Solid Waste and Emergency Response. *Description:* An indicator of potential threat to human respiratory systems.
- **Dioxin Emissions from Hazardous Waste Combustion Facilities** (OPPE95) *Proposed.*

Analysis

These indicators measure specific emissions. A trend in the amount of emissions will develop if measured for a minimum of three years.

Compliance/Enforcement

- **Percentage of Facilities Operating in Substantial Compliance With State and Federal Environmental Regulations or Standards (Solid or Hazardous Waste Management Facilities and Major Surface Water Discharges)** (CT95) *Source:* Quarterly Noncompliance Report to the Federal Government.
- **Compliance Rates (Percent of Inspections Showing Proper Management or Proper Storage) Among Hazardous Waste Generators Inspected** (MN95) *Source:* State Pollution Control Agency.
- **State Hazardous Waste Enforcement Activities (Inspections, Notices of Violations, Penalties, and Active Cases)** (KY92) *Source:* State Division of Waste Management

Analysis

These indicators measure compliance and enforcement activities in hazardous waste management, and indirectly measures the effectiveness of regulatory laws and programs. If the indicators are measured for a minimum of three years, progress can be determined.

Spills

- **Oil Spills In/Around U.S. Waters (Average Volume Per Spill)** (OPPE) *Proposed.*
- **Oil Spills In and Around U.S. Waters and Consumption of Crude Oil** (Cat95)
Source: US Department of Transportation, US Coast Guard, Pollution Incidents In and Around US Waters (as reported in the Compendium of Selected National Environmental Statistics). *Description:* Analyzing the number of spills along with domestic oil consumption provides additional insight for comparison.
- **Transportation Incidents Involving Hazardous Materials** (OPPE95) *Proposed-using National Transportation Statistics.* *Description:* The number of accidents involving hazardous materials is a good indicator of spill occurrence.
- **Liquid and Gas Pipeline Failures** (OPPE95) *Proposed-using National Transportation Statistics.*
- **Reduced Accidental Release Frequency and Magnitude** (OPPE95) *Proposed.*

Analysis

These indicators measure the number and type of hazardous waste spills and/or releases. These indicators are important because of increased risk of exposure from spillage during shipment or accidental releases. An increase in the number of spills could indicate a need for new regulations. This would be more apparent if the number of spills or releases are measured for a minimum of three years.

Hazardous Waste Sites

Number of Sites

- **Hazardous Substance Sites (TN94)** *Source:* not given. *Description:* Indicates the number of potential sites, EPA NPL sites, voluntary sites, and state Superfund sites.
- **Potential Hazardous Waste Sites (KY92)** *Source:* State Division of Waste Management. *Description:* These are sites that are under investigation for contamination.
- **Number of Unregulated Hazardous Waste Sites (OH95)** *Source:* State EPA, Master Sites List.
- **Contamination Detected at Hazardous Waste Sites (KY92)** *Source:* State Division of Waste Management. *Description:* The contamination could be groundwater contamination, surface water contamination, or soil contamination.
- **Number of Sites (Individual Solid Waste Management Units (SWMUs), Areas of Concern (AOCs), or Operable Units Containing Multiple SWMUs or AOCs) (CO95)** *Source:* Hazardous Material and Waste Management Division.
- **Number of Sites Being Investigated (CO95)** *Source:* State Hazardous Materials and Waste Management Division.
- **Facilities With Current Human Exposures Under Control (Number Evaluated/Number Under Control) (CO95)** *Source:* State Hazardous Materials and Waste Management Division.
- **Number of Toxic Cleanup Sites Either Confirmed or Suspected of Contaminating Air, Land, or Water (WA95)** *Source:* State Department of Ecology.
- **Changes in Air, Soil, and Water Contamination at Remediation Sites (CO95)** *Source:* State Hazardous Materials and Waste Management Division. *Description:* Proposed indicator on the development of a comparative index which would show changes in air, soil, and water contamination at remediation sites.
- **Status of Hazardous Waste Facilities in Corrective Action (Assessments, Contamination, Controlling Contaminant Releases) (EPA92)** *Source:* RCRIS.
- **Number of Industrial and Hazardous Waste Facilities Stabilized or Controlled (DIIR95)** *Source:* USEPA, RCRA Information System. (OPPE95 *proposed.*)
- **Industrial Hazardous Waste Facilities With Final Operating or Closure Permits (DIIR95)** *Source:* USEPA RCRA Information System.
- **Percent of Hazardous Waste Sites with Confirmed Contamination of Ground Water (FL94)** *Source:* State Bureau of Waste Cleanup.
- **Contamination at Petroleum Sites (FL94)** *Source:* Florida Petroleum Contamination Tracking System.
- **Petroleum-Contaminated Wells Replaced and Saved (ME94)** *Source:* not given.
- **Contaminated Properties (Sites Backlogged, Sites Cleaned Up, Sites in Process) (CT94)** *Source:* State Department of Environmental Protection.

Description: This indicator is meant to accelerate private sector clean-up and development of contaminated urban properties.

Analysis

These indicators measure the number and types of hazardous waste sites and work as measurements of how effective regulatory programs are. Changes in the number of sites can be measured with a minimum of three years' of data.

Sites With Cleanup Activities

- **Voluntary Cleanup Programs, Pending and Completed Remediation (CO95)** *Source:* State Hazardous Materials and Waste Management Division.
- **Number of Federal Sites Remediated (DIIR95)** *Source:* USEPA Federal Facilities Restoration and Reuse Office.
- **Number of Sites With Cleanup Activities (TN94)** *Source:* not given.
- **Number of Sites Undergoing Cleanup (CO95)** *Source:* State Hazardous Materials and Waste Management Division.
- **Number of Sites With Cleanup Completed or No Further Action Required (CO95)** *Source:* State Hazardous Materials and Waste Management Division.
- **Sites Investigated and/or Cleaned Up Voluntarily (MN95)** *Source:* State Pollution Control Agency. *Description:* The Voluntary Investigation and Cleanup (VIC) program for contaminated property encourages property owners to clean up sites in exchange for reduced liability.
- **Percentage of Identified Oregon Hazardous Waste Sites That Are Cleaned Up or Being Cleaned Up (OR92)** *Source:* State Department of Environmental Quality, Hazardous and Solid Waste Division.
- **Number of State Superfund Sites and Cumulative Sites Cleaned Up (TN96)** *Source:* not given.
- **Corrective Action Activity (Confirmed Releases, Cleanups Initiated, Cleanups Completed) (EPA92)** *Source:* Office of Underground Storage Tanks. *Description:* This indicator pertains to underground storage tanks.

Analysis

These indicators measure cleanup activities at hazardous waste sites. The indicators will show the effectiveness of cleanup programs and/or changes in the number of sites if measured for a minimum of three years.

Superfund

- **Sites Listed Under State Superfund Program (MN95)** *Source:* State Pollution Control Agency. *Description:* In 1994, the number of sites cleaned up and removed from the Superfund program exceeded the number of new sites added to the cleanup list.
- **Superfund Sites and Status (KY92)** *Source:* State and USEPA Region 4) (VT94 *Source:* not given.)
- **Number of Superfund Sites Identified and Cleaned Up (MN92)** *Source:* State Pollution Control Agency.

- **Cleanup Progress Under State Superfund Program (MN95)** *Source:* State Pollution Control Agency. *Description:* Number of new sites added to program and number of sites removed from program.
- **Administrative State of Cleanup at Sites (For the Superfund Program: Investigation, Design, Feasibility Study, Remedial Action) (CO95)** *Source:* State Hazardous Materials and Waste Management Division.
- **Actions to Reduce Immediate Threats at Superfund Sites (EPA92)** *Source:* Superfund: Reporting on Cleanup Activities through Environmental Indicators. *Description:* Includes relocating people and providing alternative water.
- **NPL Sites With Progress Toward Permanent Clean-up Goals (EPA92)** *Source:* Superfund: Reporting on Cleanup Activities through Environmental Indicators.
- **Environmental Damage at National Priority (NPL) Sites (Cat95)** *Source:* Superfund NPL Characterization Project: National Results, USEPA, 1991 (as reported in the Council on Environmental Quality's 22nd Annual Report, March 1992.)
- **Increasing Use of Treatment at NPL Sites (EPA92)** *Source:* Superfund: Reporting on Cleanup Activities through Environmental Indicators.
- **Waste Volumes Managed at Superfund Sites (EPA92)** *Source:* Superfund: Reporting on Cleanup Activities through Environmental Indicators. 1991 Update. *Description:* While not a measure of actual risk reduction, the sheer volumes of waste managed at Superfund sites indicate the magnitude of the Superfund program.
- **Cleanup of Superfund Sites: Number of Sites, Number Being Cleaned Up, Numbers With Cleanup Completed (CCS95)** *Proposed.*
- **Number of National Priority List Sites Fully Remediated (DIIR95)** *Source:* USEPA CERCLA Information System.
- **Number of Confirmed Releases (POPM95)** *Proposed.*
- **Number of Cleanups Initiated (POPM95)** *Proposed.*
- **Number of Cleanups Completed (POPM95)** *Proposed.*
- **Number of Confirmed Releases With Contaminated Groundwater or Surface Water (POPM95)** *Proposed.*
- **Number of Confirmed Releases With Contaminated Drinking Water or Other Receptors (POPM95)** *Proposed.*
- **Long-Term Actions to Restore the Environment Fully Achieved, Partially Achieved, or Underway (OPPE95)** *Proposed as an indicator for restoration of contaminated sites.*

Analysis

This group of indicators measures releases from hazardous waste sites and issues such as clean-up stage and the actual number of Superfund sites. They can also act as a measure of the programs in place to deal with cleanups and Superfund sites. The indicators will track progress in reducing releases and the number of new sites needing cleanup if measured for a minimum of three years.

Radioactive Waste Measurements

Sub-issue: Low-level Radioactive Waste

Sites

- **Percent of Radioactive Sites Remediated** (DIIR95) *Source:* USEPA Office of Air and Radiation.
- **Radioactive Sites Cleaned Up** (OPPE95) *Proposed.*
- **On-site Incineration Locations for Low-level Radioactive Waste** (NC95) *Source:* State Division of Radiation Protection.
- **Performance Measures for the UMTRA Program (Uranium Mill Sites)** (CO95) *Source:* State Hazardous Materials and Waste Management Division.
- **Area of Land Cleaned Up From Uranium Processing Operations** (CO95) *Source:* State and Federal.
- **Oil Field Sites Tested for Naturally-Occurring Radioactive Material** (KY94) *Source:* State Department for Health Services, Division of Radiation.

Analysis

These indicators measure different aspects of low-level radioactive waste sites, such as areas cleaned up and types of management methods at sites. They also measure the programs and management methods in place to deal with low-level radiation waste sites. The indicators will track changes in the number of new sites or the success of specific management methods if measured for a minimum of three years.

Generation/Volume

- **Number of Low-level Radioactive Waste Generators** (NC95) *Source:* State Division of Radiation Protection.
- **Number and Category of Facilities Generating and Shipping Low-level Radioactive Waste** (NC95) *Source:* State Division of Radiation Protection. *Description:* Types of facilities addressed are industrial, academic, utility, government, and medical.
- **Low-level Radioactive Waste Generated by Source** (KY94) *Source:* State Division of Waste Management.
- **Low-level Radioactive Waste Generated** (TN94) *Source:* not given.
- **Volume of Low-level Radioactive Waste, by Category (Utility, Industrial, Academic, Government, Medical)** (NC95) *Source:* State Division of Radiation Protection. (VT94) *Source:* State Low-Level Radioactive Waste Program.
- **Volume of Low-level Radioactive Waste Managed On-Site Using the Storage-for-Decay Method** (NC95) *Source:* State Division of Radiation Protection. *Description:* The storage-for-decay method is a common procedure for materials with relatively short half-lives ranging from a few hours to a few days.

- **Radioactivity of Low-level Radioactive Waste Managed On-Site Using the Storage-for-Decay Method** (NC95) *Source:* State Division of Radiation Protection.
- **On-site Storage-for-Decay Locations for Low-level Radioactive Waste** (NC95) *Source:* State Division of Radiation Protection.
- **Volume of Low-level Radioactive Waste Incinerated On-Site** (NC95) *Source:* State Division of Radiation Protection.
- **Radioactivity of Low-level Radioactive Waste Incinerated On-site** (NC95) *Source:* State Division of Radiation Protection.
- **Volume of Low-level Radioactive Waste Disposed, by Land Application** (NC95) *Source:* State Division of Radiation Protection.
- **Volume of Low-level Radioactive Waste, by Management Method (Shipped Out-of-State, Stored In-State, Incinerated In-State, Land Application)** (NC95) *Source:* State Division of Radiation Protection.
- **Low-level Radioactive Waste Generation and Storage** (KY94) *Source:* State Division of Waste Management.
- **Low-level Radioactive Waste Generated and Disposed** (KY92) *Source:* State Radiation Control Branch. *Description:* The state licenses 378 facilities to receive, handle, and dispose low-level radioactive wastes. These wastes are sent out-of-state to Washington, Nevada, and South Carolina for disposal.
- **Volume of Mixed Waste Stored** (NC95) *Source:* State Division of Radiation Protection. *Description:* Mixed waste is defined as waste that satisfies both the definition of low-level radioactive waste and hazardous waste.
- **Radioactivity of Mixed Waste Stored** (NC95) *Source:* State Division of Radiation Protection.

Analysis

These indicators measure the generation, volume, storage, and disposal of radioactive waste and reflect the management methods and programs that regulate handling of the waste; they are also indirect measures of the risks to human health. The indicators will track changes in the volume of waste, the number of sites, or track the success of specific management methods if measured for a minimum of three years.

Shipping/Transfer

- **Volume of Low-level Radioactive Waste Shipped from In-State to Out-of-State Commercial Facilities** (NC95) *Source:* State Division of Radiation Protection.
- **Radioactivity (curies) of Low-level Radioactive Waste Shipped from In-State to Out-of-State Commercial Facilities** (NC95) *Source:* State Division of Radiation Protection.

Analysis

These indicators measure the volume and radioactivity of low-level radioactive waste that is shipped or transferred from its point of origin. The indicators are indirect measures of the risk to human health and the management methods and programs that regulate shipping/transfer of the waste. The indicators will

track changes in the volume of waste shipped/transferred and track the success of specific management methods if measured for a minimum of three years.

High-level Radioactive Waste

- **Percent of Nuclear Reservation's Single-Shell Storage Tanks Stabilized** (WA95)
Source: State Department of Ecology. *Description:* The environmental impacts associated with the Hanford Site have a direct effect on the health and safety of people living and working in the area.
- **Uranium Releases to the Environment** (KY94) *Source:* US Department of Energy.
- **Number of Incidents Involving Lost/Unlicensed Radioactive Material** (Cat95)
Proposed in comments on the "1995 Indicator Report".

Analysis

These indicators indirectly measure the risks to human health from high-level radioactive waste. The risks reflect the percentage of sites unstabilized, releases to the environment, and lost/unlicensed material. The indicators will track changes in the potential risks to human health and track the success of specific management methods if measured for a minimum of three years.