

# The Toxics Release Inventory (TRI) and Factors to Consider When Using TRI Data

## EXECUTIVE SUMMARY

The Toxics Release Inventory (TRI) contains information about releases of certain chemicals and management of wastes at a wide variety of sources, including manufacturing operations, certain service businesses, and federal facilities. Since its inception, the program has grown in several important ways, including expanding the businesses covered and the chemicals on which they report. Equally important is the number of creative ways the general public, government agencies, and the reporting industries use the information made available. This paper provides an introduction and background on the TRI and identifies a number of important factors that must be considered when reviewing or using the data.

Key factors to consider when using the data, which are discussed in greater detail in the main body of the paper, include:

- Toxicity varies among the covered chemicals; data on amounts of the chemicals alone are inadequate to reach conclusions or formulate policy;
- The presence of a chemical in the environment must be evaluated along with the potential and actual exposures and the route of exposures, the chemical's fate in the environment, and other factors before any statements can be made about potential risks associated with the chemical or a release;
- Many options for managing production-related wastes are subject to stringent technical standards and exacting state and federal regulatory oversight;
- Regulatory controls apply to many of the releases reported that are production related; reporting facilities must comply with environmental standards in addition to reporting residual releases; and
- Some reporters send chemicals off-site in waste to be managed at specialized waste management facilities that are also reporters; adjustments must be made to avoid double counting.

As you read the document you will encounter a variety of specialized terms. Many are further defined in the boxes that appear throughout the document. There are also other sources of additional information that may help you understand the data. The TRI home page (<http://www.epa.gov/tri>) includes background information on the TRI program and TRI data as well as information on applicable standards, regulations and guidance. The TRI User Support Service (202-566-0250, [tri.us@epa.gov](mailto:tri.us@epa.gov)) can provide assistance in accessing and using the TRI data.

## Introduction and Background

Following a fatal chemical-release accident in Bhopal, India, the Emergency Planning and Community Right-to-Know Act (EPCRA) was enacted to promote emergency planning, to minimize the effects of an accident such as occurred at Bhopal, and to provide the public with information on releases of toxic chemicals in their communities.

Section 313 of EPCRA established the Toxics Release Inventory, which is a database that contains information on the quantities of certain toxic chemicals released into the environment, including the specific sources and locations from which these releases occurred, and to which environmental media (i.e., land, air, water). The U.S. Environmental Protection Agency's (EPA's) Toxics Release Inventory (TRI) Program was also established by section 313 of EPCRA and is responsible for maintaining and updating the TRI database. Specifically, section 313 of EPCRA requires certain facilities within certain industry sectors to file reports of their disposal or other environmental releases as well as other waste management quantities of chemicals listed on the EPCRA section 313 list of toxic chemicals if they manufacture, process, or otherwise use more than established threshold quantities of these chemicals.<sup>1</sup> The TRI Program is responsible for collecting the release and other waste management information and disseminating it to the public. These data inform the public of releases and other waste management quantities of toxic chemicals in their communities, and enable citizens to make informed decisions regarding the consequences of such releases. The releases and other waste management quantities of a listed chemical are filed by completing an EPCRA section 313 release report (Form R) and submitting it to the U.S. EPA, state, and tribal governments.

In 1990, Congress passed the Pollution Prevention Act (PPA). Among its requirements was a mandate to expand TRI to include additional information on toxic chemicals in waste and on source reduction methods. Beginning in 1991, covered facilities were required to report quantities of TRI chemicals treated on-site, recycled, and combusted for energy recovery. Waste management data have strengthened TRI as a tool to provide information on facilities' handling of TRI chemicals in waste as well as to analyze progress in reducing disposal or other releases.

The TRI Program has been tremendously successful. Industries that have reported to TRI since its inception have reduced on-and off-site disposal or other releases of TRI chemicals by 49 percent or 1.59 billion pounds (for chemicals reportable in all years). Governments - federal, state, and local - have used TRI to set priorities, measure progress, and target areas of special and immediate concern. The public has used the TRI data to understand their local environment, to participate in local and national debates about the choices being made that may affect their health and the health of their children and, ultimately, to exert their influence on the outcome of these debates.

Estimated facility releases are one input to considering potential exposures or potential risks to human health and the environment, but by themselves do not represent risk. Given the potential for using TRI data in these ways, it is important for the public to understand the limitations as well as the benefits of

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<sup>1</sup> A reporting threshold for a listed chemical is a pre-established annual manufacture, process or otherwise use quantity that, when exceeded within a calendar year by a facility, triggers reporting of disposal or other releases and other waste management quantities of the chemical. Most listed chemicals have two reporting thresholds. These are (1) 25,000 pounds per calendar year for manufacture or processing activities; and (2) 10,000 pounds per calendar year for "otherwise used" activities. Reporting thresholds are also known as activity thresholds because they are related to manufacturing, processing, or otherwise used activities. Certain persistent bioaccumulative and toxic chemicals (PBTs), as explained later, have different thresholds.

TRI data and the factors that should be considered in drawing conclusions from the data about risks to human health or the environment. The determination of potential risk depends on many factors, including toxicity, chemical fate after disposal or other release, location, and population concentrations.

Since TRI began in 1987, the scope of the program has grown. For the reporting year 2000, TRI was expanded to include certain new persistent bioaccumulative toxic (PBT) chemicals. In addition, reporting thresholds were lowered for both the newly-added PBT chemicals and certain PBT chemicals already on the TRI list. The year 1998 marked the first reporting by seven additional industry sectors: metal mining, coal mining, electrical utilities that combust coal and/or oil, hazardous waste treatment and disposal facilities, chemical wholesale distributors, petroleum bulk stations and terminals, and solvent recovery services (see **Who Must Report?** below for specific industry identification). Since 1994, federal facilities have been added to TRI and the number of reportable chemicals has nearly doubled.

Now in the second decade of the TRI Program, many challenges in the Right-to-Know Program remain to be met. The TRI was designed to be a program that would evolve, over time, to meet the changing needs of an informed and involved public. The TRI is not a static program. As new chemicals of concern are identified, they will be added. Sectors that appear to contribute to environmental loadings will be added. Data collection will be modified to meet new information needs and access technologies will be developed over time to assure enhanced public access to the TRI data.

## TRI Reporting

Each year, facilities that meet certain thresholds must report their disposal or other releases and other waste management activities for listed toxic chemicals to EPA and to the state or tribal entity in whose jurisdiction the facility is located. The TRI list for 2002 included nearly 600 individually listed chemicals and 30 chemical categories. (Facilities report certain chemical categories as a whole rather than each of the closely related chemicals within the category. For example, if a facility released both benzo(a)anthracene and benzo(a)pyrene, the facility would report the total amount of both of these polycyclic aromatic compounds under the single category called polycyclic aromatic compounds.) Each facility submits a TRI reporting form for each TRI chemical it has manufactured, processed, or otherwise used during 2002 in amounts exceeding the thresholds (see **How Do Facilities Report?** below).

Reports for each calendar year are due by July 1 of the following year. After completion of data entry and data quality assurance activities, the Agency makes the data available to the public via the TRI database and through a variety of other information products. States also make copies of the forms filed by facilities in their jurisdiction available to the public. In addition, some states produce independent reports.

## Who Must Report?

Box 1 lists the kinds of facilities that are required to report to TRI.

### **Box 1. Who is Required to Report Under the Toxics Release Inventory Program?**

A facility must report to TRI if it:

- Operates within any of the following industry sectors:
  - Manufacturing (SIC<sup>2</sup> codes 20-39),
  - Metal mining (SIC code 10, except 1011, 1081, and 1094),
  - Coal mining (SIC code 12, except 1241),
  - Electrical utilities that combust coal and/or oil for the purpose of generating power for distribution in commerce (SIC codes 4911, 4931, and 4939),
  - Resource Conservation and Recovery Act (RCRA) Subtitle C hazardous waste treatment and disposal facilities (in SIC code 4953),
  - Chemical wholesalers (SIC code 5169),
  - Petroleum terminals and bulk stations (SIC code 5171),
  - Solvent recovery services (SIC code 7389),
  - A federal facility in any SIC code; and
- Employs 10 or more full-time-equivalent employees; and
- Manufactures or processes more than 25,000 pounds or otherwise uses more than 10,000 pounds of any listed chemical during the calendar year, except for PBT chemicals where the thresholds are 0.1 gram for dioxin and dioxin-like compounds, and 10 or 100 pounds for other PBT chemicals.

Standard Industrial Classification (SIC) codes are used throughout the federal government to classify economic activity by industry. As shown in Box 1, TRI reporting covers facilities in the manufacturing sectors—that is, SIC codes 20 through 39—as well as some additional SIC Codes. On TRI Form Rs and on TRI Form A certification statements, facilities report the four-digit SIC codes that define their

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<sup>2</sup> Facilities are often classified by Standard Industry Classification (SIC) codes. As required by law, facilities that are categorized within certain SIC codes may have to file Toxics Release Inventory (TRI) reports if they also meet other reporting criteria. On April 9, 1997, the Office of Management and Budget (OMB) published a Federal Register Notice of final decision to adopt the North American Industry Classification System (NAICS) for the United States. In the near future, EPA plans to publish a rule that will adopt the NAICS coding for TRI reporting purposes. While this rule will effectively replace the SIC codes regarding TRI reporting, it will not affect the universe of facilities now subject to TRI reporting.

operations. A facility might report, for example, SIC code 2873, nitrogenous fertilizers. Industries are grouped into broader categories at the three-digit and two-digit SIC code levels. In our example, at the two-digit level it falls into the chemicals and allied products major group, SIC code 28. Producers of nitrogenous fertilizers have been required to report to TRI since 1987. Facilities that mine silver ore (SIC code 1044, in the gold and silver ores group SIC code 104, in the metal mining major group SIC code 10) were required to report to TRI beginning in 1998. Solvent recovery facilities in SIC code 7389 were also required to report beginning in 1998, although other types of economic activity in that SIC code (e.g., miscellaneous business services) do not report to TRI. Box 2 lists the TRI industries by Standard Industrial Classification (SIC) code.

Industrial facilities may conduct interrelated operations that result in products or services classified in more than one SIC code. Box 3 explains the classification of facilities reporting multiple codes as well as the “no-codes” group.

### **Box 2. Standard Industrial Classification (SIC) Codes for TRI Industries**

**10 Metal Mining**

Mining of metals ores, including copper, lead, zinc, gold, silver and nickel ores, but not including uranium, radium and vanadium ores or services related to metal mining.

**12 Coal Mining**

Mining of coal, including bituminous coal and lignite surface mining, bituminous coal underground mining, and anthracite mining, but not including services related to coal mining.

**20 Food and kindred products**

Manufacture or processing of foods and beverages for human consumption, and related products, such as manufactured ice, chewing gum, vegetable and animal fats and oils, and prepared feeds for animals and fowls.

**21 Tobacco products**

Manufacture of cigarettes, cigars, smoking and chewing tobacco, snuff, and reconstituted tobacco. Stemming and redrying of tobacco. Manufacture of non-tobacco cigarettes.

**22 Textile mill products**

Preparation of fiber and subsequent manufacture of yarn, thread, braids, twine, and cordage. Manufacture of broadwoven fabrics, narrow woven fabrics, knit fabrics, and carpets and rugs from yarn. Dyeing and finishing of fiber, yarn, fabrics, and knit apparel. Coating, waterproofing, or otherwise treating fabrics. Integrated manufacture of knit apparel and other finished articles from yarn. Manufacture of felt goods, lace goods, nonwoven fabrics, and miscellaneous textiles.

**23 Apparel and other finished products made from fabrics and similar materials**

Production of clothing. Fabrication of products by cutting and sewing purchased woven or knit textile fabrics and related materials, such as leather, rubberized fabrics, plastics, and furs. Manufacture of clothing by cutting and joining (e.g., by adhesives) material such as paper and nonwoven textiles.

**24 Lumber and wood products, except furniture**

Cutting timber and pulpwood. Also, merchant sawmills, lath mills, shingle mills, cooperage stock mills, planing mills, and plywood mills and veneer mills engaged in producing lumber and wood basic materials. Manufacture of finished articles made entirely or mainly of wood or related materials.

- 25 Furniture and fixtures**  
Manufacture of household, office, public building, and restaurant furniture, and office and store fixtures.
- 26 Paper and allied products**  
Manufacture of pulps from wood and other cellulose fibers and from rags. Manufacture of paper and paperboard. Manufacture of paper and paperboard into converted products, such as paper coated off the paper machine, paper bags, paper boxes, and envelopes. Manufacture of bags from plastic film and sheet.
- 27 Printing, publishing, and allied industries**  
Printing by one or more common processes, such as letterpress, lithography (including offset), gravure, or screen. Bookbinding, platemaking, and other services performed for the printing trade. Publishing newspapers, books, and periodicals (whether or not the establishment also prints them).
- 28 Chemicals and allied products**  
Production of basic chemicals. Manufacture of products by predominantly chemical processes. There are three general classes of products: 1) basic chemicals, such as acids, alkalis, salts, and organic chemicals; 2) chemical products to be used in further manufacture, such as synthetic fibers, plastics materials, dry colors, and pigments; 3) finished chemical products to be used for ultimate consumption, such as drugs, cosmetics, and soaps, or to be used as materials or supplies in other industries, such as paints, fertilizers, and explosives.
- 29 Petroleum refining and related industries**  
Production of gasoline, kerosene, distillate fuel oils, residual fuel oils, and lubricants, through fractionation or straight distillation of crude oil, redistillation of unfinished petroleum derivatives, cracking, or other processes. (Establishments also produce aliphatic and aromatic chemicals as byproducts.)
- 30 Rubber and miscellaneous plastics products**  
Manufacture of products, not elsewhere classified, from plastics resins and from natural, synthetic, or reclaimed rubber, gutta percha, balata, or gutta siak. Includes manufacture of tires.
- 31 Leather and leather products**  
Tanning, currying, and finishing hides and skins. Converting leather. Manufacture of finished leather and artificial leather products and some similar products made of other materials.
- 32 Stone, clay, glass, and concrete products**  
Manufacture of flat glass and other glass products, cement, structural clay products, pottery, concrete and gypsum products, cut stone, abrasive and asbestos products, and other products from materials taken principally from the earth in the form of stone, clay, and sand. (May include mining and quarrying activities operated by manufacturing establishments in this group.)
- 33 Primary metal industries**  
Smelting and refining ferrous and nonferrous metals from ore, pig, or scrap. Rolling, drawing, and alloying metals. Manufacture of castings and other basic metal products. Manufacture of nails, spikes, and insulated wire and cable. Includes production of coke.
- 34 Fabricated metal products, except machinery and transportation equipment**  
Fabrication of ferrous and nonferrous metal products, such as metal cans, tinware, handtools, cutlery, general hardware, non-electric heating apparatus, fabricated structural metal products, metal forgings, metal stampings, ordnance (except vehicles and guided missiles), and a variety of metal and wire products, not elsewhere classified.

**35 Industrial and commercial machinery and computer equipment**  
Manufacture of industrial and commercial machinery and equipment and computers.  
Manufacture of engines and turbines; farm and garden machinery; construction, mining, and oil field machinery; elevators and conveying equipment; hoists, cranes, monorails, and industrial trucks and tractors; metalworking machinery; special industry machinery; general industrial machinery; computer and peripheral equipment and office machinery; and refrigeration and service industry machinery.

**36 Electronic and other electrical equipment and components, except computer equipment**  
Manufacture of machinery, apparatus, and supplies for the generation, storage, transmission, transformation, and utilization of electrical energy. Manufacture of electricity distribution equipment, electrical industrial apparatus, household appliances, electrical lighting and wiring equipment, radio and television receiving equipment, communications equipment, electronic components and accessories, and other electrical equipment and supplies.

**37 Transportation equipment**  
Manufacture of equipment for transportation of passengers and cargo by land, air, and water. Includes motor vehicles, aircraft, guided missiles and space vehicles, ships, boats, railroad equipment, and miscellaneous transportation equipment, such as motorcycles, bicycles, and snowmobiles.

**38 Measuring, analyzing, and controlling instruments, photographic, medical, and optical goods; watches and clocks**  
Manufacture of instruments (including professional and scientific) for measuring, testing, analyzing, and controlling, and their associated sensors and accessories; optical instruments and lenses; surveying and drafting instruments; hydrological, hydrographic, meteorological, and geophysical equipment; search, detection, navigation, and guidance systems and equipment; surgical, medical, and dental instruments, equipment, and supplies; ophthalmic goods; photographic equipment and supplies; and watches and clocks.

**39 Miscellaneous manufacturing industries**  
Manufacture of products not classified in any other major manufacturing group. Includes jewelry, silverware, and plated ware; musical instruments; dolls, toys, games, and sporting and athletic goods; pens, pencils, and artists' materials; buttons, costume novelties, and miscellaneous notions; brooms and brushes; caskets; and other miscellaneous products.

**4911/4931/4939 Electric, Gas, and Sanitary Services**  
Electric services, limited to facilities that combust coal and/or oil for the purpose of generating electricity for distribution in commerce.

**5169 Chemical Wholesale Distributors**  
Wholesale trade of nondurable goods of chemical and allied products.

**5171 Petroleum Terminals/Bulk Storage**  
Wholesale trade of nondurable goods undertaken at petroleum terminals and bulk storage facilities.

**4953 Refuse Systems (Hazardous Waste Treatment and Disposal Facilities)**  
Facilities managing hazardous waste, limited to facilities regulated under RCRA subtitle C, 42 U.S.C. section 6921 *et seq.*

**7389 Business Services (Solvent Recovery Facilities)**

Facilities engaged in solvent recovery, limited to facilities primarily engaged in solvents recovery services on a contract or fee basis.

**Source:** Executive Office of the President, Office of Management and Budget, *Standard Industrial Classification Manual*, 1987.

**Box 3. Multiple SIC Codes and No SIC Codes in TRI**

**Multiple Codes 20–39.** TRI facilities may report up to six four-digit Standard Industrial Classification (SIC) codes that describe their operations. If all the processes or operations that are associated with a facility’s disposal or other releases or other waste management of a TRI chemical can be described by one SIC code, then only one SIC code is reported on the form. If several economic activities, designated by different SIC codes, describe the specific operations at a facility that are associated with disposal or other releases or other waste management of a TRI chemical, then the facility will report those SIC codes (up to six) on the form it submits for that chemical.

Industrial facilities often conduct interrelated operations. They may, for example, manufacture distinct products using common or related feedstocks. Such products may be classified in similar but separate categories in the SIC system. Thus, many forms submitted to TRI contain more than one industrial classification. When TRI data are analyzed by type of industry—that is, by SIC code—forms that report more than one SIC code must be categorized separately because they do not fall into the individual industry groups. They are included in a separate “multiple-codes” category to avoid including them more than once, in more than one industry category.

The “multiple-codes” category represents forms that report in more than one two-digit SIC code within the manufacturing sector (SIC codes 20–39). For example, a facility may refine petroleum (SIC code 29) and then use that feedstock in the manufacture of chemicals (SIC code 28); it will report on its TRI forms SIC codes in both these industries—for example, at the four digit level, SIC codes 2911, petroleum refining, and 2869, industrial organic chemicals. In this event, its forms are included in the “multiple-codes” category.

In addition, on forms with more than one SIC code, any SIC code that is not within manufacturing (that is, not within the SIC code range 20 to 39) is ignored when assigning a form to an industry category. For example, a form with SIC codes 2642 (manufacture of envelopes) and 5112 (wholesale trade—stationery and office supplies) would be included in SIC code 26 and not the “multiple-codes” category.

Forms that have a SIC code within the manufacturing sector as well as a SIC code within the additional industry sectors required to report to TRI beginning with the 1998 reporting year are included in the manufacturing sector SIC code if the facility reported to TRI before 1998. If the facility reported for the first time for 1998 with both manufacturing and other industry codes, it is included in the analyses under the other industry code.



**No Codes.** Forms that report no SIC code required to report to TRI are included in these tables under the “No codes” category. Such forms may include, for example, submissions by federal facilities, all of which are required to report regardless of the SIC code covering their operations. This group also includes forms with no valid SIC code.

## What Must Be Reported?

Each year, facilities report to TRI the amounts of toxic chemicals disposed of or otherwise released on-site to air, water, and land and injected underground (Section 5 of TRI Reporting Form R), and the amounts of chemicals transferred off-site for recycling, energy recovery, treatment, and disposal or release (Section 6 of Form R). They also report production-related waste management information on quantities recycled, combusted for energy recovery, treated, or disposed of or otherwise released, both on- and off-site, and catastrophic or other one-time releases (Section 8 of Form R). To some extent, data in Sections 5 and 6 of Form R and those in Section 8 represent a different view of essentially the same information. While Section 5 and 6 include total amounts disposed of or otherwise released or transferred, the corresponding parts of Section 8 do not include in those amounts the catastrophic or other one-time releases. In addition, Section 8 includes on-site recycling, energy recovery and treatment which are not reported in Sections 5 and 6.

Box 4 summarizes the basic information that facilities must report to TRI.

### **Box 4. What Must Be Reported?**

Information reported by facilities includes:

- Basic information identifying the facility (including name, location, type of business, and name of parent company),
- Name and telephone number of a contact person,
- Environmental permits held,
- Amounts of each listed chemical disposed of or released to the environment at the facility,
- Amounts of each chemical sent from the facility to other locations for recycling, energy recovery, treatment, or disposal or other release,
- Amounts of each chemical recycled, burned for energy recovery, or treated at the facility,
- Maximum amount of chemical present on-site at the facility during year,
- Types of activities conducted at the facility involving the toxic chemical, and
- Source reduction activities.

Facilities also provide general information about the manufacture, process, and otherwise use of the listed chemical at the facility. Facilities provide information about methods used to treat waste streams containing the toxic chemicals at the site and the efficiencies of those treatment methods. In addition to information about the amount of toxic chemicals sent off-site for further waste management, facilities also must specify the destination of these transfers.

Beginning with the 1991 reports, facilities were required to provide information about source reduction and other pollution prevention activities, along with the quantities managed in waste by activities such as recycling. Companies must provide a production index that can help relate changes in reported quantities of toxic chemicals in waste managed to changes in production. These additional data elements facilitate tracking of industry progress in reducing waste generation and moving towards preferred management alternatives. While current TRI data cannot provide an absolute measure of pollution prevention, the data can provide new insight into the complete toxics cycle.

## What Are the Benefits and Limitations of the Data?

### **Benefits**

The TRI Program has given the public unprecedented direct access to toxic chemical disposal or other release and other waste management data at the local, state, regional, and national level. Use of this information can enable the public to identify potential concerns, gain a better understanding of potential risks, and work with industry and government to reduce toxic chemical use, disposal or other releases and the risks associated with them. When combined with hazard and exposure data, this information can allow informed environmental priority-setting at the local level.

Federal, state, and local governments can use the data to compare facilities or geographic areas, to identify hot spots, to evaluate existing environmental programs, to more effectively set regulatory priorities, and to track pollution control and waste reduction progress. TRI data, in conjunction with demographic data, can help government agencies and the public identify potential environmental justice concerns.

Industry can use the data to obtain an overview of the disposal or other releases and other waste management of toxic chemicals, to identify and reduce costs associated with toxic chemicals in waste, to identify promising areas of pollution prevention, to establish reduction targets, and to measure and document progress toward reduction goals. Public availability of the data has prompted many facilities to work with communities to develop effective strategies for reducing environmental and potential human health risks posed by disposal or other releases and other waste management of toxic chemicals.

### **What to Consider When Using TRI Data**

Users of TRI information should be aware that TRI data do not reveal whether or to what degree the public is exposed to listed chemicals. TRI data, in conjunction with other information, can be used as a

starting point in evaluating exposures and risks. The determination of potential risk to human health and/or the environment depends upon many factors, including the toxicity of the chemical, the fate of the chemical in the environment, and the amount and duration of human or other exposure to the chemical. Box 5 highlights some of the factors that should be considered when reviewing TRI data.

#### **Box 5. Factors to Consider in Using TRI Data**

**Toxicity of the Chemical:** TRI chemicals vary widely in toxicity. High volume releases of less toxic chemicals may appear to be a more serious problem than lower volume releases of highly toxic chemicals, when just the opposite may be true.

**Exposure Considerations:** The potential for exposure may be greater the longer the chemical remains unchanged in the environment. Sunlight, heat, or microorganisms may or may not decompose the chemical. For example, microorganisms readily degrade some chemicals, such as methanol, into less toxic chemicals, whereas metals are persistent and will not degrade in the environment.

**Bioconcentration of the Chemical in the Food Chain:** As a chemical becomes incorporated in the food chain, it may concentrate or disperse.

- Some chemicals, such as mercury, accumulate and magnify in concentration in organisms as they move up the food chain.
- Small amounts of a chemical that bioaccumulate may result in significant exposures to consumers.

**Type of Disposal or Release (Environmental Medium):** The extent to which chemical exposure of a population occurs depends on the environmental medium (air, water, land) to which a chemical is either disposed of or otherwise released. The medium also affects the types of exposures possible, such as inhalation, dermal exposure, or ingestion. For example, disposal in underground injection wells are regulated by EPA's Underground Injection Control Program to provide safeguards so that injection wells do not endanger current and future underground sources of drinking water. When wells are properly sited, constructed, and operated, underground injection is an effective and environmentally safe method to dispose of wastes.

#### **Type of Off-Site Facility Receiving the Chemical and the Efficiency of its Waste Management**

**Practices:** The amount of a toxic chemical that ultimately enters the environment depends on how the chemical was handled during treatment, energy recovery, or recycling activities. Several factors to keep in mind when considering amounts sent off-site are presented below:

- The efficiency of recycling operations varies depending on the method of recycling and the chemical being recycled.
- Use of a combustible toxic chemical for energy recovery typically results in the destruction of 95% to 99% or more of the toxic chemical. The remaining quantity may be either released to air or disposed of in ash to land.

**On-site Waste Management of the Toxic Chemical:** As with off-site waste management, the amount of the toxic chemical disposed of or otherwise released to the environment depends on how the chemical was handled during treatment, energy recovery, or recycling activities. However, since the waste management is on-site, any amount of the chemical that enters the environment after waste management is reported to TRI as part of that facility's disposal or other releases.

Assembling this additional information can be challenging, but EPA has developed a tool known as the Risk-Screening Environmental Indicators (RSEI) that systematically addresses many of the factors related to the chronic human health risk associated with TRI activities. Since TRI data reflect total releases over an entire year, RSEI modeling is based on long-term (chronic) exposures to TRI chemicals, not acute exposures of shorter duration. RSEI incorporates detailed facility data from TRI along with toxicity information from EPA's Integrated Risk Information System, population data from the US Census, and other EPA models and databases. Although RSEI does not provide a full risk assessment, it provides additional hazard and risk-related perspectives that may be helpful to users of TRI information. More information on RSEI is available at <http://www.epa.gov/oppt/rsei>.

## **Limitations**

While TRI provides the public, industry, and state and local governments an invaluable source of key environmental data, it has some limitations that must be considered when using the data. The preceding section, **What to Consider When Using TRI Data**, describes specific information to keep in mind when analyzing TRI data.

TRI data reflect chemical management practices, not exposures of the public to those chemicals. The data are generally not sufficient by themselves to determine exposure or to calculate potential adverse effects on human health and the environment. TRI data can be used to identify areas of potential concern. TRI data, in conjunction with other information, can be used as a starting point in evaluating exposures. The determination of potential risk depends upon many factors, including the toxicity of the chemical, the fate of the chemical in the environment, the locality, and the human and other populations that are exposed to the chemical after its disposal or release. Tools like the Risk-Screening Environmental Indicators (RSEI) (described in the previous section) can be used to address these factors for chronic human health concerns.

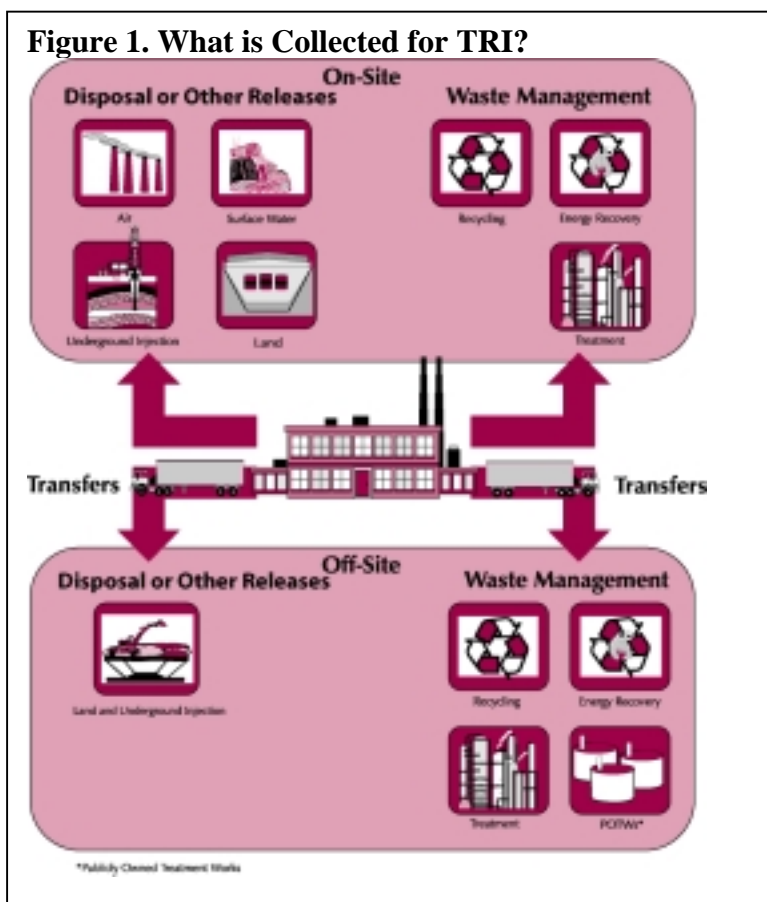
Even with expanded industry coverage since the 1998 reporting year, TRI does not address all sources of disposal or other releases and other waste management activities of TRI chemicals. Although the Agency has expanded the number of industries that must report and has added PBT chemicals to the section 313 list of toxic chemicals, the program does not cover all sources of TRI chemicals or any sources of non-TRI chemicals. Although TRI is successful in capturing information on a significant portion of toxic chemicals currently being used by covered industry sectors, it does not cover all toxic chemicals or all industry sectors. In addition, even within covered SIC codes, facilities that manage listed TRI chemicals but do not meet the TRI threshold levels (those with fewer than 10 full-time employees or those not meeting TRI quantity thresholds) are not required to report even though they may release toxic chemicals into the environment. The new PBT chemicals reporting thresholds expand the information TRI collects, but only for a subset of the TRI chemicals. Thus, while the TRI includes 93,380 reports from 24,379 facilities for 2002, the 4.79 billion pounds of on-and off-site disposal or other releases reported represent only a portion of all toxic chemical disposal or other releases nationwide.

The TRI does not include data on toxic emissions from cars and trucks, nor from the majority of sources of releases of pesticides, volatile organic compounds, fertilizers or from many other non- industrial sources.

Also, while many facilities base their TRI data on monitoring data, others report estimated data to TRI, as the program does not mandate monitoring. Various estimation techniques can be used when monitoring data are not available, and EPA has published estimation guidance for the regulated community. Variations between facilities can result from the use of different estimation methodologies. These factors should be taken into account when considering data accuracy and comparability.

As discussed above, the TRI data summarized in this report reflect chemical disposal or other releases and other waste management activities that occur in a given calendar year. Patterns of disposal or other releases and other waste management activities can change dramatically from one year to the next. Thus, it is important to recognize that current facility activities may be different from those reported for 2001 or prior years.

Figure 1 illustrates these on-site and off-site disposal or other releases, on-site waste management activities, and transfers off- site for further waste management, reportable to TRI.



## TRI On- and Off-site Disposal or Other Releases

The following section describes the categories of on- and off-site disposal or other releases that are reportable to TRI. Box 6 describes reportable disposal or other releases that may occur on-site at the facility and identifies types of activities that may contribute to the disposal or other releases to various media.

Box 7 describes disposal or other releases that may result from a facility's transferring chemicals off-site. As noted in Box 7, off-site disposal or other releases include additional details about off-site transfers of metals and metal compounds. How metal and metal category compounds are reported to TRI are explained in Box 8.

For analyses that present all on- and off-site disposal or other releases categories together consideration must be given to off-site transfers reported by one facility that are reported as on-site disposal or releases by another facility. To avoid counting the amounts twice, the off-site transfers are omitted in these analyses. The methodology used to avoid duplication of off-site transfers to disposal or other releases is found in Box 9.

### **Box 6. An Explanation of On-site Disposal or Other Releases**

On-site disposal or other releases include emissions to the air, discharges to bodies of water, disposal at the facility to land, and disposal in underground injection wells. Disposal or other releases are reported to TRI by media type. On-site disposal or other releases are reported in Section 5 of Form R.

**On-site Disposal in Underground Injection Class I wells (Section 5.4.1)** Disposal in Class I wells includes the emplacement of hazardous and nonhazardous fluids (industrial and municipal wastes) into isolated formations beneath the lowermost underground source of drinking water (USDW). Because they may inject hazardous waste, Class I wells are the most strictly regulated under the Safe Drinking Water Act (SDWA) and are further regulated under the Resource Conservation and Recovery Act (RCRA).

**RCRA Subtitle C Landfills (Section 5.5.1A).** Disposal in RCRA Subtitle C landfills in which wastes are buried. These are landfills that are subject to stringent requirements for liners, leak detection systems, and groundwater monitoring.

**Other Landfills (Section 5.5.1B).** Disposal of toxic chemicals in landfills other than RCRA Subtitle C landfills. Beginning with the 1996 reporting year, facilities report amounts disposed of in RCRA subtitle C landfills separately from amounts disposed of in other on-site landfills. This change was made to recognize the difference in management and regulatory oversight provided for RCRA subtitle C landfills.

**Fugitive Air Emissions (Section 5.1).** All releases to air that are not released through a confined air stream. Fugitive air emissions include equipment leaks, evaporative losses from surface impoundments and spills, and releases from building ventilation systems.

**Point Source Air Emissions (Section 5.2).** Air emissions, also referred to as stack emissions, that occur through confined air streams, such as stacks, vents, ducts, or pipes.

**Surface Water Discharges (Section 5.3).** Discharges to streams, rivers, lakes, oceans, and other bodies of water. This includes releases from contained sources, such as industrial process outflow pipes or open trenches. Releases due to runoff, including storm water runoff, are also reportable to TRI.

**Disposal in Underground Injection Class II-V Wells (Section 5.4.2).** The subsurface emplacement of fluids through wells. TRI chemicals associated with manufacturing, the petroleum industry, mining, commercial and service industries, and federal and municipal government-related activities may be injected into Class I, II, III, IV, or V wells, if they do not endanger underground sources of drinking water (USDW), public health, or the environment. Disposal in Class I wells (see above) are reported separately from disposal in Class II-V wells.

- Class II wells are used for injection of brines and other fluids associated with oil and gas production.
- Class III wells are used for injection of fluids associated with solution mining of minerals.
- Class IV wells are used for injection of hazardous or radioactive wastes into or above a USDW and is banned unless authorized under ground water remediation laws.
- Class V wells inject nonhazardous fluids into or above a USDW and are typically shallow, on-site disposal systems, such as floor and sink drains which discharge directly or indirectly to ground water, dry wells, leach fields, and similar types of drainage wells.

Beginning with the 1996 reporting year, facilities report amounts injected into Class I wells separately from amounts injected into all other wells. This change was made to reflect the difference in management standards and regulatory oversight provided by the Underground Injection Control Program for Class I wells as distinguished from other forms of injection reportable to TRI.

**Land Treatment/Application Farming (Section 5.5.2).** Management techniques in which a waste containing a listed chemical is applied to or incorporated into soil.

**Surface Impoundments (Section 5.5.3).** Holding areas used to volatilize and/or settle waste materials.

**Other Disposal (Section 5.5.4).** Other disposal methods including waste piles, spills, or leaks.

#### **Box 7. An Explanation of Off-site Disposal or Other Releases**

An off-site disposal or other release is a discharge of a toxic chemical to the environment that occurs as a result of a facility's transferring a waste containing a TRI chemical off-site for disposal or other release, as reported in Section 6 of Form R. Certain other types of transfers are also categorized as off-site disposal or other release because, except for location, the outcome of transferring the chemical off-site is the same as disposing of it or releasing it on-site. For each transfer, the amount of the chemical in the waste, type of management activity (chosen from a list of codes referred to as "M" codes) undertaken by the receiving facility, and the address of the receiving site is reported.

**Off-site Disposal to Underground Injection Wells (Section 6.2, M71).** Toxic chemicals in waste may be transferred off-site to sites that inject the wastes underground. (See discussion of on-site underground injection for a description of these disposal types in Box 6.) The 2002 reporting year Form R does not collect data that distinguishes off-site transfers to Class I vs. Class II-V Underground Injection Wells. The Form R has been modified starting with reporting year 2003 to collect this information to distinguish between Class I and Class II-V Underground Injection Wells.

**Off-site Disposal to RCRA Subtitle C Landfills (Section 6.2, M65).** Toxic chemicals in waste may be transferred off-site for disposal in RCRA Subtitle C landfills. (See discussion of on-site disposal to RCRA Subtitle C landfills for a description of these disposal types.) Beginning with the 2002 reporting year, facilities report amounts transferred off-site for disposal in RCRA Subtitle C landfills separately from those sent to other landfills. This change was made to recognize the difference in management and regulatory oversight provided for RCRA Subtitle C landfills as distinguished from other landfills. The Section 6.2 code for off-site disposal in landfills prior to the 2002 reporting year was M72.

**Off-site Disposal in Other Landfills (Section 6.2, M64).** Toxic chemicals in waste may be transferred off-site for disposal in landfills other than RCRA Subtitle C landfills. (See Box 6 for a discussion of on-site disposal to other landfills for a description of these disposal types.) Prior to the 2002 reporting year, off-site transfers to landfills/disposal surface impoundments were all reported in Section 6.2 under code M72. Any transfers reported erroneously under M72 for 2002 are included in this category.

**Storage Only (Section 6.2, M10).** On occasion, a toxic chemical is sent off-site for storage if there is no known disposal method. One example is toxic chemicals in mixed hazardous and radioactive waste. EPA considers this an off-site disposal or release because this method is being used as a form of disposal and the toxic chemical will remain there indefinitely.

**Solidification/Stabilization (metals only) (Section 6.2, M41 or M40 (metals and metal category compounds only)).** Waste solidification/stabilization is a physical or chemical process used to either reduce the mobility of the chemical or to eliminate free liquids in a hazardous waste. A waste stabilization process includes mixing the hazardous waste with binders or other materials, and curing the resulting hazardous waste and binder mixture.

**Wastewater Treatment (metals only) (Section 6.2, M62 or M61 (metals and metal category compounds only)).** Transfers to wastewater treatment facilities (excluding to facilities that are publicly-owned treatment works (POTWs)) of metals and metal category compounds only.

**Transfers to POTWs (metals only) (Section 6.1, metals and metal category compounds only).** Transfers to publicly-owned treatment works (POTWs) of metals and metal category compounds only. Because metals are not destroyed by sewage treatment processes, amounts of metals and metal category compounds reported in Section 6.1 are considered transfers to disposal or other releases.

**Surface Impoundments (Section 6.2, M63).** Surface impoundments are holding areas used to volatilize and/or settle waste materials.

**Land Treatment (Section 6.2, M73).** Management techniques in which a waste containing a listed chemical is applied to or incorporated into soil.

**Other Land Disposal (Section 6.2, M79).** Other land disposal methods include waste piles, spills, or leaks.

**Other Off-site Management (Section 6.2 (M90).** Chemicals in waste sent to sites where the waste is managed by techniques not specifically listed in Section 6.2.



**Transfers to Waste Broker (Section 6.2, M94).** Chemicals in waste sent to a broker where the broker sends the waste for disposal, but the facility sending the waste does not know the location of the disposal site and, therefore, reported the name of the waste broker instead. The Section 6.2 code for transfers to waste broker prior to the 1991 reporting year was M91.

**Unknown (Section 6.2, M99).** The “unknown” category of disposal indicates that a facility is not aware of the type of waste management used for the toxic chemical that is sent off-site. Therefore, EPA has categorized this method as the least desirable type of waste management (environmentally least desirable) and has included it as a type of disposal or other release for reporting purposes.

## **How Metals and Metal Category Compounds Should be Reported to TRI**

Transfers of metals and metal category compounds to solidification/stabilization, to wastewater treatment (excluding POTWs), and to publicly owned treatment works (POTWs, or municipal sewage treatment) also result in disposal or other releases and are classified as off-site disposal or other releases. How such transfers should be reported to TRI is described in Box 8.

### **Box 8. How Metals and Metal Category Compounds Should be Reported to TRI**

In Section 6.2 of the Form R, facilities report the amounts sent to each off-site location to which the facility transfers wastes containing the reported toxic chemical for the purposes of recycling, energy recovery, treatment, or disposal or other release. Metals and metal category compounds are managed in waste either by being disposed of or otherwise released or by being recycled. The metal has no heat value and thus cannot be combusted for energy recovery and cannot be treated because it cannot be destroyed regardless of whether the stream containing the metal is sent for energy recovery or treatment. Thus, transfers of metals and metal category compounds for further waste management should be reported as either a transfer for recycling or a transfer for disposal or other release. The applicable waste management codes for transfers of metals and metal category compounds for recycling are M24, M26 or M93. Applicable codes for transfers for disposal or other releases include M10, M41, M62, M63, M64, M65, M71, M73, M79, M90, M94, and M99.

Two codes, M41 and M62, were new for the 1997 reporting year. These codes are for transfers to waste management in which the wastestream may be treated but the metal contained in the wastestream is not treated and is ultimately disposed of or otherwise released. For example, M41 would be used for a metal or metal category compound which is stabilized in preparation for disposal. Prior to the 1997 reporting year, some facilities reported transfers of metals and metal category compounds for further waste management using two waste treatment codes, M40 and M61. Beginning in reporting year 1997, metals and metal category compounds must be reported under Section 6.2 using one of the disposal or other release codes or the applicable recycling code (M24 for metals recovery, M26 for other reuse or recovery or M93 for transfers to waste broker - recycling).

The code M72 was used for transfers to landfill/disposal surface impoundment prior to reporting year 2002. Three new codes, M63 (surface impoundments), M64 (other landfills) and M65 (RCRA Subtitle C landfills) have replaced M72 starting with reporting year 2002. Any amounts erroneously reported under M72 for 2002 are included as other landfills (equivalent to the M64 code for 2002).

In Section 8.1 of the Form R, facilities report quantities of listed chemicals disposed of or otherwise released on- and off-site (excluding one-time catastrophic or remedial releases). Except for those quantities recycled, metals and metal category compounds should be reported in Section 8.1 of the Form R. This includes those quantities of metals and metal category compounds reported in:

- Section 5 as on-site disposal or other releases,
- Section 6.2 as sent off-site for stabilization/solidification (M41) or wastewater treatment (excluding POTWs) (M62) and/or,
- Section 6.1 as discharges to POTWs.

These quantities should not be reported in Section 8.7 of the Form R.

### **Duplication of Off-site Transfers to Disposal or Other Releases**

TRI facilities transfer chemicals in waste off-site to other facilities for disposal or other releases. These recipient facilities can place the wastes in on-site landfills, disposal surface impoundments, in land treatment facilities, or use other types of land disposal methods. They may also dispose of wastes in underground injection wells or, if metals and metal category compounds are sent to a wastewater treatment facility, they may be discharged to surface waters. The recipient facilities generally are treatment, storage and disposal (TSD) facilities regulated under the federal Resources Conservation and Recovery Act (RCRA). Such facilities are one of the added industries that must, beginning with the 1998 reporting year, report their disposal and other releases, transfers, and other waste management to TRI. Thus, the facility that sends these transfers would report to TRI the amounts as transfers to disposal or other releases and the TSD facility that receives the material would report the amounts as on-site disposal or other releases to underground injection, land, or surface waters. Box 9 describes EPA's methodology for avoiding duplication of amounts reported in off-site transfers that are also reported as on-site disposal or other releases by facilities that received such transfers.

#### **Box 9. Duplication of Off-site Transfers to Disposal or Other Releases**

To avoid double counting the transfers off-site to the TSD facilities that are also reported to TRI as on-site disposal or other releases by the TSD facilities, the off-site transfer quantities must be omitted from tables that compare or summarize on-site and off-site disposal or other releases for all industries. Only the on-site disposal or other releases from the TSD facilities are included in analyses. The RCRA ID number that facilities report was used to identify such transfers and match them to on-site disposal or other releases reported by TSD facilities. A TRI facility must report its own RCRA ID number as well as the RCRA ID number of the TSD facility receiving the transfer.

Each amount of off-site transfer to TSDs should have the RCRA ID number of the receiving facility.

If this RCRA ID number matches the RCRA ID number of a TRI facility and the TRI facility receiving the waste reported on-site disposal or other releases of the same chemical (or the metal and its compounds in the case of metals) that were greater than or equal to the sum of the off-site transfers reported as transferred, then the amount of chemicals transferred from other TRI facilities are omitted from the analysis. If the TRI facility receiving the waste reported an amount of on-site disposal or other releases of the chemical less than the total amount reported as transferred to the facility, then the amount omitted from the analysis is reduced proportionally. For example, if Facility A reported 20,000 pounds transferred to Facility C and Facility B reported 80,000 pounds transferred to Facility C, but Facility C only reported 90,000 pounds disposed of or otherwise released on-site (which is 90 percent of the total amount of 100,000 pounds reported as transferred), then the amount of transfers omitted from the analysis for Facility A is 18,000 pounds (or 90 percent of 20,000 pounds) and for Facility B is 72,000 pounds (or 90 percent of 80,000 pounds).

In analyses that present off-site transfers but not on-site disposal or other releases, these amounts are not omitted in order to present complete data on off-site transfers for analysis. Also, analyses that present data on waste managed do not omit any reported data in order to present complete data on how waste is being managed. In addition, analyses that do not include all TRI facilities (for example, data for one state or one industry sector) do not omit any reported data because the transfers may be sent to facilities not included in the analysis.

The following shows which types of off-site transfers to disposal or other releases are matched with which types of on-site disposal or other releases to determine if the transfers should be omitted.

**Off-site Transfer M Code (Section 6.2)      Section 5 Checked for Recipient TRI Facilities Based on Matching Chemical or, if Metal, Metal plus Metal Category Compounds**

M10	5.5.4	
M41*	5.5.1 A and B	M62*      5.5.1 A and B, 5.5.3 and 5.3
M63	5.5.3	
M64	5.5.1B	
M65	5.5.1A	
M71	5.4	
M72	5.5.1 A and B, 5.5.3 (reporting years 1998-2001)	
M73	5.5.2	
M79	5.5.4	
M90	All Section 5	
M99	All Section 5	

\*Includes metals and metal category compounds reported under codes M40 and M61.

M94 (transfer to waste broker) is not included since a waste broker does not dispose of or release the chemical.

## TRI Transfers Off-site for Further Waste Management, including Transfers for Disposal or Other Release

Off-site transfers of TRI chemicals in waste include, in addition to transfers to disposal or other releases described above, transfers to treatment, publicly-owned treatment works (POTWs), recycling, and energy recovery. These transfers are reported in Section 6.1 and 6.2 of Form R. Analyses that focus specifically on types of off-site transfers include transfers to disposal or other releases as well as the other types of transfers. Box 10 describes the various categories of transfers off-site for further waste management including for disposal or other releases.

### **Box 10. An Explanation of Transfers Off-site for Further Waste Management, including Transfers for Disposal or Other Release**

An off-site transfer, reported in Section 6 of Form R, is the transfer of toxic chemicals in waste to a facility that is geographically or physically separate from the facility reporting under TRI. Chemicals reported to TRI as transferred are sent to off-site facilities for purposes categorized as recycling, energy recovery, treatment, or disposal or other release. The amounts reported represent a movement of the chemical away from the reporting facility. Except for off-site transfers to disposal or other release, these amounts do not necessarily represent entry of the chemical into the environment.

**Transfers Off-site to Recycling (Section 6.2, M20, M24, M26, M28, M93).** Toxic chemicals in waste that are sent off-site for the purposes of recycling are generally recovered by a variety of recycling methods, including solvent recovery and metals recovery. The choice of the recycling method depends on the toxic chemical being sent for recycling. Once they have been recycled, these chemicals may be returned to the originating facility for further processing or made available for use in commerce.

**Transfers Off-site to Energy Recovery (Section 6.2, M56, M92).** Toxic chemicals in waste sent off-site for purposes of energy recovery are combusted off-site in industrial furnaces (including kilns) or boilers that generate heat or energy for use at that location. Treatment of a chemical by incineration is not considered to be energy recovery.

**Transfers Off-site to Treatment. (Section 6.2, M40 (except metals and metal category compounds), M50, M54, M61 (except metals and metal category compounds), M69, M95)** Toxic chemicals in waste that are transferred off-site may be treated through a variety of methods, including biological treatment, neutralization, incineration, and physical separation. These methods typically result in varying degrees of destruction of the toxic chemical.

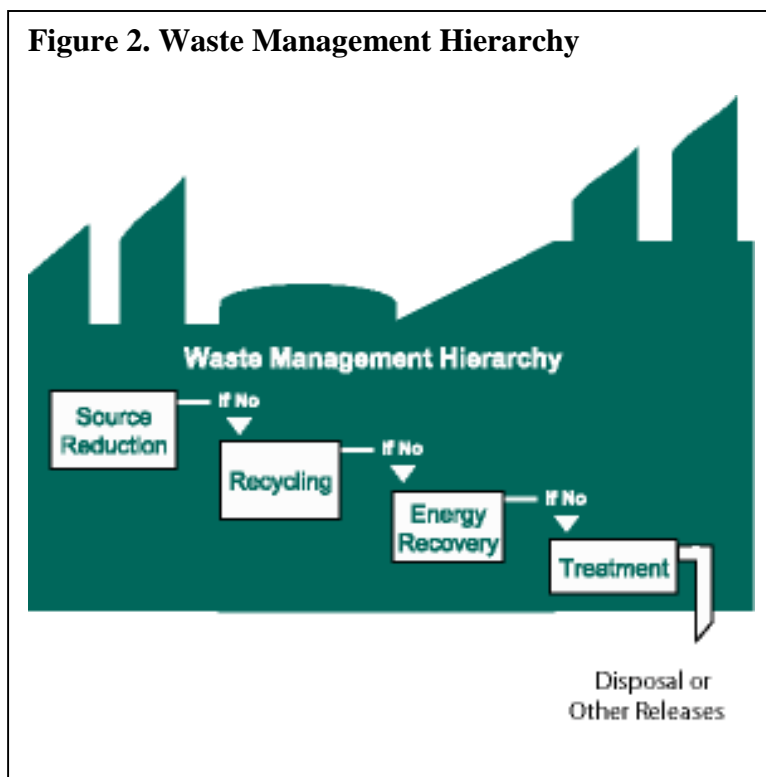
**Transfers to Publicly Owned Treatment Works (POTWs) (Section 6.1).** A POTW is a wastewater treatment facility that is owned by a state or municipality. Wastewaters from facilities reporting under TRI are transferred through pipes or sewers to a POTW. Treatment or removal of a chemical from the wastewater depends upon the nature of the chemical, as well as the treatment methods present at the POTW. In general, chemicals that are easily utilized as nutrients by microorganisms, or have a low solubility in water, are likely to be removed to some extent. Chemicals that are volatile and have a low solubility in water may evaporate into the atmosphere. Not all TRI chemicals can be treated or removed by a POTW. Some chemicals, such as metals, may be removed, but are not destroyed and may be

disposed of in landfills or discharged to receiving waters; transfers of metals and metal category compounds to POTWs are categorized as off-site disposal or other releases, as explained in Box 7. **Other Off-site Transfers (Section 6.2, invalid or no codes).** In this report, toxic chemicals in waste that were reported as transferred off-site but for which the off-site activity (i.e., recycling, energy recovery, treatment, or disposal) was not specified or was not an accepted code have been classified as “other off-site transfers.” **Other Transfers Off-site for Disposal or Other Releases.** See Box 7, except does not include metals and metal category compounds sent to POTWs.

## TRI Chemicals Managed in Waste

The Pollution Prevention Act of 1990 (PPA) requires facilities to report information about the quantities of TRI chemicals they manage in waste, both on-and off-site. The PPA established as national policy that source reduction is the preferred approach to managing waste. Source reduction is defined as an activity that prevents the generation of waste. The PPA also established as national policy a hierarchy of waste management options, illustrated in Figure 2, for situations where source reduction cannot be implemented feasibly.

Although source reduction is the preferred method of reducing risk, environmentally sound recycling shares many of its advantages. Like source reduction, recycling reduces the need for treatment or disposal of waste and helps conserve energy and natural resources. Where source reduction and recycling are not feasible, waste can be treated. Disposal or other releases of a chemical is viewed as a last resort, to be employed only if the preferred methods of waste management cannot be implemented. The PPA did not specifically address the combustion of waste for energy recovery as a waste management option. However, because energy recovery shares aspects of recycling and treatment, EPA chose to list this activity separately in the waste management hierarchy.



Box 11 describes the waste management information facilities must report to TRI. The amount of TRI chemicals in waste reported includes both waste generated by the facility and waste received by the facility for the purpose of waste management. Facilities report these data in Section 8 of the Form R as estimates for the reporting year (2002), the previous year (2001), and as projections for the two following years (2003 and 2004). The PPA requires this data projection to encourage facilities to consider their future waste generation, opportunities for source reduction, and potential improvement in waste management options as presented in the hierarchy. Future-year estimates are not commitments that facilities reporting to TRI must meet.

**Box 11. An Explanation of On- and Off-site Waste Management Information**

On-site and off-site waste management activities are reported in Section 8 of Form R. In this section, amounts due to one-time events such as accidental releases or remediation (clean-up) are reported separately and not included in the amounts reported as recycled, burned for energy recovery, treated or disposed of or otherwise released on- or off-site.

**Recycled On-site (Section 8.4).** This is the quantity of the toxic chemical recovered at the facility and made available for further use. To avoid double-counting, the amount reported represents the amount exiting the recycling unit. It is not the quantity that entered an on-site recycling or recovery operation. For example, 3,000 pounds of a listed chemical enters a recycling operation. Of this, 500 pounds of the chemical are in residues from the recycling operation that are subsequently sent off-site for disposal. The quantity reported as recycled on-site would be 2,500 pounds.

**Recycled Off-site (Section 8.5).** This is the quantity of the toxic chemical that left the facility boundary for recycling, not the amount recovered at the off-site location. This quantity includes the amount(s) reported in Section 6 of Form R as transferred off-site for recycling, less any amount(s) associated with non-routine events.

**Used for Energy Recovery On-site (Section 8.2).** This is the quantity of the toxic chemical that was combusted in some form of energy recovery device, such as a furnace (including kilns) or boiler. The toxic chemical should have a heating value high enough to sustain combustion. To avoid double-counting, the amount reported represents the amount destroyed in the combustion process, not the amount that entered the energy recovery unit. For example, 100,000 pounds of toluene entered a boiler that, on average, combusted 98% of the toluene. Any remaining toluene was discharged to air. A total of 98,000 pounds is reported as combusted for energy recovery (the remaining 2,000 pounds is reported as disposed of or otherwise released).

**Used for Energy Recovery Off-site (Section 8.3).** This is the quantity of the toxic chemical that left the facility boundary for energy recovery, not the amount combusted at the off-site location. The toxic chemical must have a significant heating value, and the off-site location must have some form of energy recovery unit in place. This quantity includes the amount(s) reported in Section 6 of Form R as transferred off-site for energy recovery, less any amount(s) associated with non-routine events.

**Treated On-site (Section 8.6).** This is the quantity of the toxic chemical destroyed in on-site waste treatment operations, not the amount that entered a treatment operation. For example, if 100,000 pounds of benzene were combusted in an incinerator that destroyed 99% of the benzene, the facility

would report 99,000 pounds as treated on-site (the remaining 1,000 pounds would be reported as disposed of or otherwise released).

**Treated Off-site (Section 8.7).** This is the quantity of the toxic chemical that left the facility boundary and was sent to POTWs or other off-site locations for treatment, not the amount that was destroyed at the off-site location(s). This quantity includes the amount(s) reported in Section 6 of Form R as transferred to POTWs or other off-site locations for treatment, less any amount(s) associated with non-routine events and not including quantities of metals and metal category compounds.

**Quantity Disposed of or Otherwise Released On-and Off-site (Section 8.1).** This is the total quantity of the toxic chemical that was released to the environment or disposed of at the facility (discharged to air, land, and water, and injected underground on-site) or sent off-site for disposal or other release. This quantity is the sum of the amounts reported in Sections 5 and 6 of Form R (on-site disposal or other releases plus off-site transfers to disposal or other releases and transfers to POTWs of metals and metal category compounds) less any amount(s) associated with non-routine events. The Form R has been modified to collect information starting with reporting year 2003 on disposal to Class I underground injection wells, RCRA Subtitle C landfills and other landfills separately from other disposal or other releases, both on-site and off-site.

**Non-production-related Waste Managed - Released to the Environment Due to One-time Events (Section 8.8).** This amount is referred to as non-production-related waste and is the quantity disposed of or otherwise released to the environment or sent off-site for recycling, energy recovery, treatment, or disposal or other release due to one-time events not associated with routine production practices. Such events include catastrophic events, such as accidental releases, as well as remedial actions (clean-up). This quantity is separated from the quantities recycled, used for energy recovery, treated, and disposed of or released, to distinguish between quantities that are routinely associated with production operations and are more amenable to source reduction and those that are not routinely associated with production processes and are not so amenable to source reduction because they are not readily anticipated (e.g., releases due to damage from a tornado). This separation is important in assessing progress in source reduction at facilities.

The individual waste management quantities reported in Sections 8.1 through 8.8 are mutually exclusive to avoid double-counting. For example, an incinerator may destroy 99% of the chemical in the waste; in this case, the amount reported as treated on-site would be the amount destroyed by the incinerator, not the amount that entered the incinerator. The amount not destroyed in incineration (1%) would be reported as disposed of or otherwise released. The sum of the individual quantities in a given year equals the total quantity of TRI chemicals in waste resulting from routine production operations at a facility during that year.

For the reporting year only, facilities must also report the quantity of waste disposed of or otherwise released as a result of activities other than routine production operations. This quantity appears in data tables as “non-production-related waste managed.” It includes waste disposed of or otherwise released to the environment at the facility or transferred off-site because of catastrophic events or remedial (clean-up) actions at the facility. Non-production-related waste is considered less amenable to source reduction because facilities cannot reasonably anticipate these quantities.

It is important to note that facilities may vary in how they interpret some of the reporting requirements under the PPA. Differences in estimation or calculation techniques may cause a difference in the amount reported without a corresponding difference in actual quantities of the chemical reported.

Box 12 explains the differences between “total on- and off-site disposal or other releases” and “quantity disposed of or otherwise released on- and off-site.”

**Box 12. Differences between Amounts Reported in Sections 5 and 6 and in Section 8 of Form R**

"Total on- and off-site disposal or other releases" (amounts reported in Sections 5 and 6) and "quantity disposed of or otherwise released on- and off-site" (amounts reported in Section 8) are not the same. This difference arises primarily from the types of disposal or other releases reported on different sections of the Form R.

- "Total on- and off-site disposal or other releases" reflects all on-site disposal or other releases as collected in Section 5 of the Form R and transfers off-site for disposal or other releases as reported in Section 6. The amounts included from Section 6.2 are for codes M10, M41, M63, M62, M65, M64, M71, M72, M73, M79, M90, M94, and M99 and from Section 6.1 for metals and metal category compounds only.
- "Quantity disposed of or otherwise released on- and off-site" is limited to production-related on- and off-site disposal or other releases as collected in Section 8.1 of the Form R. This quantity is the sum of the amounts included from Section 6.2 for codes M10, M41, M63, M62, M65, M64, M71, M72, M73, M79, M90, M94, and M99 and from Section 6.1 for metals and metal category compounds only minus the amount for one-time events not related to production as reported in Section 8.8 and reported under each of these parts of Sections 5 and 6.

Although total amounts analyzed in these two categories are often the same, they may differ to the extent that disposal or other releases associated with catastrophic events, remedial actions, or other one-time events not related to production occur. That is, Production-related disposal or other releases reported in Section 8.1 do not include the amounts associated with the one-time events while disposal and other releases in Section 5 and Section 6 (those codes listed above) do include them.

For the same reason, the quantity used for energy recovery offsite (Section 8.3), quantity recycled offsite (Section 8.5) and quantity treated offsite (Section 8.7) do not include transfers for recycling, energy recovery, and treatment (including POTWs for non-metals) reported in Section 6 to the extent that amounts from one-time events are reported. Once again, the relevant parts in Section 8 include only production-related wastes and not amounts from one-time events whereas Section 6 includes all off-site waste management amounts.

- The amounts in Section 8.3 (quantity used for energy recovery offsite) correspond to the amounts reported in Section 6.2 under codes M56 and M92 minus amounts for one-time events not related to production as reported in Section 8.8.



- The amounts in Section 8.5 (quantity recycled offsite) correspond to the amounts reported in Section 6.2 under codes M20, M24, M26, M28 and M93 minus amounts for one-time events not related to production as reported in Section 8.8.
- The amounts in Section 8.7 (quantity treated off-site) correspond to the amounts reported in Section 6.2 under codes M40, M50, M54, M61, M69 and M95 and in Section 6.1 for chemicals other than metals and metal category compounds minus amounts for one-time events not related to production as reported in Section 8.8.

The amounts from one-time events not related to production are reported in Section 8.8.

Other reasons also contribute to the different quantities reported in different sections of the Form R. For example, an amount of less than 1,000 pounds may be reported in ranges in Section 5 and 6 whereas an exact amount must be included in Section 8. Furthermore, facilities may round off amounts, except those for PBT chemicals, to two significant digits.

## What is Source Reduction?

As noted above, the PPA of 1990 requires facilities to report the quantities of TRI chemicals they manage in waste, both on- and off-site. The PPA also requires facilities to provide information about the efforts they have made to reduce or eliminate those quantities. With the 1991 reporting year, facilities began reporting to TRI information about any source reduction activities they implemented during the year.

Source reduction activities are undertaken to reduce the amount of a toxic chemical which enters a wastestream or is otherwise released to the environment. By reducing the generation of toxic chemicals in waste, source reduction activities reduce the need to recycle, treat, or dispose of toxic chemicals. Box 13 explains source reduction as defined by the PPA.

### **Box 13. What Is Source Reduction?**

Through source reduction, risks to people and the environment can be reduced, financial and natural resources can be saved that would otherwise have to be expended on environmental clean-up or pollution control, and industrial processes can become more efficient. Source reduction is defined in the Pollution Prevention Act of 1990 as any practice that:

- reduces the amount of any hazardous substance, pollutant, or contaminant entering any wastestream or otherwise disposed of or released into the environment (including fugitive emissions); and
- reduces the hazards to public health and the environment associated with the disposal or release of such substances, pollutants, or contaminants.

Source reduction practices can include modifications in equipment, process, procedure, or technology, reformulation or redesign of products, substitution of raw materials, and improvements in maintenance and inventory controls. Under this definition, waste management activities, including recycling, treatment, and disposal or other releases, are not considered forms of source reduction.

## Making Year-to-Year Comparisons

Year-to-year comparisons must be based on a consistent set of reporting requirements to assure that any changes in the data do not simply reflect expansion of TRI's chemical and industry coverage or other modifications in reporting requirements over the course of the years. Therefore, trend analyses have been undertaken using various baseline years, as described below. Chemicals that have been removed from the TRI list ("delisted" chemicals) are excluded from all of the year-to-year comparisons.

### **2000-2002**

For 2000, EPA made changes to the list of chemicals that must be reported and to reporting thresholds for some chemicals. EPA has the authority both to add chemicals to the TRI reporting list if they meet the statutory toxicity criteria and to delete chemicals from the list if EPA determines that they do not meet the toxicity criteria. For the 2000 reporting year, PBT chemicals already on the list had the reporting thresholds lowered and other PBT chemicals were added to the list. In addition, vanadium compounds were added to the list and the qualifier for vanadium was changed to exclude vanadium when contained in alloys starting with the reporting year 2000. These chemicals are included for analyses covering the 2000-2002 period, but not for periods covering years prior to 2000. The reporting thresholds for the PBTs lead and lead compounds were lowered starting with the reporting year 2001. Lead and lead compounds are not included for analyses covering the 2000-2002 period or for periods covering years prior to 2001.

Additional considerations also apply to analyses of TRI data for 2000-2002. Beginning with reporting year 2002, amounts sent off-site to landfills/disposal surface impoundments are reported in three separate categories (RCRA Subtitle C landfills, other landfills, and surface impoundments). These types of transfers to disposal or other releases cannot be analyzed separately for years prior to 2002.

### **1998-2002**

Chemicals whose reporting requirements changed starting with the 2000 or 2001 reporting year (see above) are excluded for analyses covering the 1998-2002 period. Seven industry sectors were required to report starting with the 1998 reporting year, including metal mining, coal mining, electric utilities, chemical wholesale distributors, petroleum bulk storage/terminals, hazardous waste management facilities and solvent recovery facilities. These industries are included for analyses covering the 1998-2002 period, but not for periods covering years prior to 1998.

### **1995-2002**

Chemicals added to TRI in EPA's chemical expansion initiative were first reportable in 1995. These chemicals are included for analyses covering the 1995-2002 period, but not for periods covering years prior to 1995. PBT chemicals whose reporting requirements changed starting with the 2000 or 2001 reporting year (see above) are excluded for analyses covering the 1995-2002 period. Since 1995, EPA has deleted three chemicals from the TRI list, including phosphoric acid in 1999. These chemicals are excluded from all analyses of multi-year data. Also, reporting by the seven industries added to the TRI starting with the 1998 reporting year is excluded from the 1998, 1999, 2000, 2001 and 2002 data for analyses covering the 1995-2002 period.

Additional considerations also apply to analyses of TRI data for 1995 to 2002: Beginning with reporting year 1996, the amounts injected underground into Class I wells are reported separately from amounts injected into underground wells of other classes (II-V), and on-site land disposal in RCRA Subtitle C landfills separately from other types of on-site landfills. These types of disposal or other releases cannot be analyzed separately for years prior to 1996.

### **1991-2002**

Reporting requirements for ammonia, hydrochloric acid, and sulfuric acid have changed since 1991. Analyses for the period 1991-2002 exclude chemicals added to TRI since 1991 and those for which reporting requirements have changed over that time. Also, reporting by the seven industries added to the TRI starting with the 1998 reporting year is excluded from the 1998, 1999, 2000, 2001 and 2002 data for analyses covering the 1991-2002 period.

Waste management information added to TRI by the Pollution Prevention Act of 1990 has been collected since 1991. In addition, reporting on off-site transfers to recycling and on off-site transfers to energy recovery were added in 1991. Therefore, waste quantity reports are available only for analyses covering the years 1991-2002, but not for periods covering years prior to 1991. Also, waste transfer reports that include transfers to recycling and energy recovery are available for analyses covering years 1991-2002, but not for periods covering years prior to 1991.

### **1988-2002**

Analyses for the period 1988 to 2002 exclude chemicals added to TRI since 1988 and those for which reporting requirements have changed over that time. This includes chemicals described above as well as aluminum oxide whose qualifier changed to "fibrous forms" for the 1989 reporting year. Also, reporting by industries required to report starting with the 1998 reporting year is excluded from the 1998, 1999, 2000, 2001 and 2002 data for analyses covering the 1988-2002 period.

Waste management information added to TRI by the Pollution Prevention Act of 1990 has been collected since 1991. In addition, reporting on off-site transfers to recycling and on off-site transfers to energy recovery were added in 1991. Therefore, waste quantity reports are not available for analyses covering the

years 1988-2002, and waste transfer reports do not include transfers to recycling and energy recovery for analyses covering the years 1988-2002.

### **Other Changes**

Apparent increases and decreases among industries can also result when facilities change the SIC codes they report from one year to another, reflecting new or discontinued facility operations or indicating a different understanding of how SIC codes relate to the facility's business.

Reporting of amounts sent offsite to RCRA Subtitle C landfills separately from amounts sent off-site to other types of landfills began in 2002. These off-site transfers types cannot be analyzed separately for years 1988 through 2001.

### **Reasons for Change**

Box 14 provides reasons that a facility's reported amounts may change from one year to another. Explanations for changes in reported amounts include actual source reduction projects undertaken to reduce a facility's generation of waste of a particular chemical, increases or decreases in production levels, changes in a facility's methods of estimating or calculating reportable amounts (which does not indicate a corresponding change in actual disposal or other releases and waste management), reporting errors in previous years for which the facility has not filed a revised submission, and others.

#### **Box 14. Reasons Facility Reported Amounts May Change**

Some reported increases and decreases are real—that is, they reflect changes in the amounts of TRI chemicals actually disposed of or released or otherwise managed in waste. Other reported increases and decreases are accounting or "paper" changes that do not reflect change in disposal or releases or other waste management. Some examples follow.

#### **Real Changes**

Source reduction activities, such as process changes, elimination of spills and leaks, inventory control, improved maintenance, chemical substitution, and alternative methods of cleaning and degreasing can cause real reduction in the amount of waste generated and/or managed.

The installation of pollution control equipment does not reduce the amount of waste generated, but may lead to real reductions in TRI chemicals disposed of or released. However, if the pollution control does not destroy the reported chemical, it may merely shift the chemical from one type of waste management to another.

Production changes can cause real changes in the quantities of TRI chemicals disposed of or released or otherwise managed as waste by facilities. Production-related waste is likely to increase when production increases and decrease when production decreases, although the relationship is not necessarily linear.

One-time events unrelated to normal production processes, such as accidental releases or clean-up operations, can cause a real but anomalous increase in the reporting year in which they occur and then a decrease from that abnormally high level the following year.

### **"Paper" Changes**

Changes in estimation or calculation techniques can cause a change in the amount reported without a corresponding change in actual quantities of the chemical disposed of or released or otherwise managed as waste.

Clarifications of reporting instructions or changes in the way a facility interprets those instructions may cause a change in reported amounts without an actual change in quantities of the chemical disposed of or released or otherwise managed as waste.

Changes in the reporting definition of a particular chemical may cause a change in the reported amounts without an actual change in quantities disposed of or released or otherwise managed as waste. For example, revising the definitions of sulfuric acid and hydrochloric acid to include only aerosol forms, as occurred in reporting years 1994 and 1995, resulted in lower reports of releases, when non-aerosol forms were no longer reported.

Similarly, a facility's use of the alternate threshold may result in a reported decrease without an actual reduction in disposal or releases if the facility begins to take advantage of an alternate manufacture, process, or otherwise use threshold of more than 1 million pounds. Beginning in the 1995 reporting year, some facilities whose "total annual reportable amount" for a reportable chemical does not exceed 500 pounds may use an alternate manufacture, process, or otherwise use threshold of 1 million pounds of the chemical. If they do not exceed this alternate threshold, they no longer need to report amounts of disposal or releases or other waste management activities.

Apparent increases or decreases can occur if a facility makes a reporting error one year and does not submit a revision for that year, but does not repeat the error the following year.

## Summary

The information collected under The Emergency Planning and Community Right-to-Know Act of 1986 and the Pollution Prevention Act of 1990 can be used by the public to identify facilities and chemical disposal or other releases and other waste management patterns that warrant further study and analysis. Keeping in mind its limitations, TRI data, when combined with hazard and exposure information, has been proven to be a valuable tool for risk identification in communities.