Introduction to the 2017 TRI National Analysis

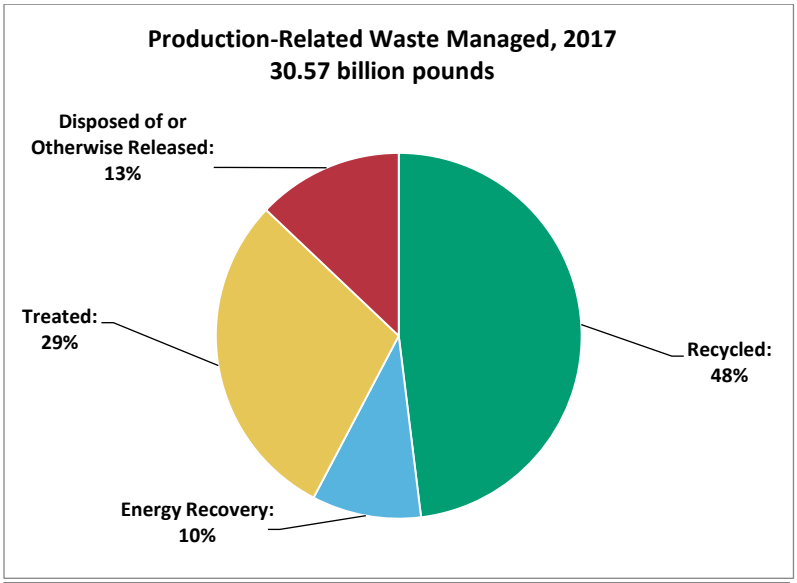
Industries and businesses in the United States (U.S.) use chemicals to make the products we depend on, such as pharmaceuticals, computers, paints, clothing, and automobiles. While the majority of chemicals included on the Toxics Release Inventory (TRI) chemical list are managed by industrial facilities to minimize releases into the environment, releases do still occur as part of their normal business operations. It is your right to know what TRI chemicals are being used in your community, how they are managed, how much is released into the environment, and whether such quantities are increasing or decreasing over time.

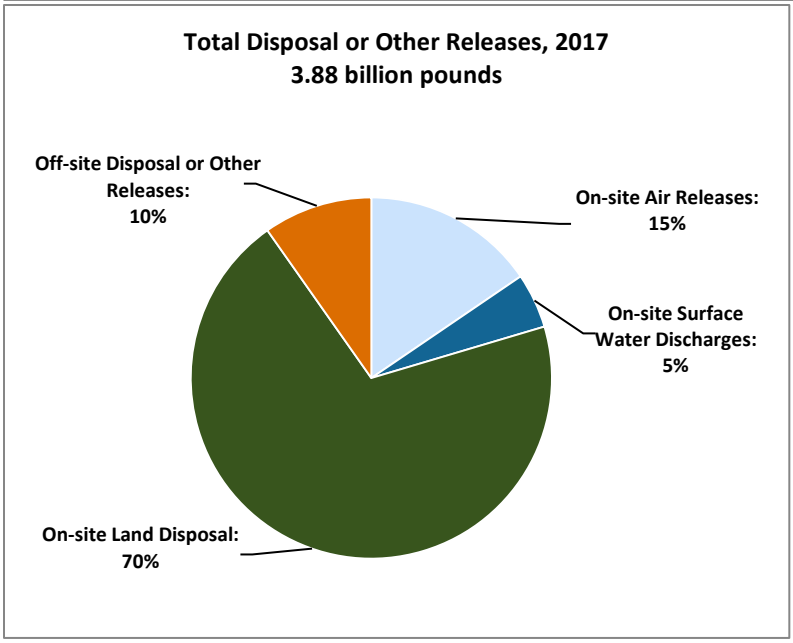
The TRI is a publicly available database maintained by EPA that tracks the management of certain chemicals. The information contained in the TRI is submitted by facilities in the U.S. in industry sectors such as manufacturing, metal mining, electric utilities, and commercial hazardous waste management. Under the Emergency Planning and Community Right-to-Know Act (EPCRA), facilities must report details about their releases of TRI-listed chemicals for the prior calendar year to EPA by July 1 of each year. The Pollution Prevention Act (PPA) requires facilities to include in their report submissions information on pollution prevention and other waste management activities involving TRI chemicals. For calendar year 2017, more than 21,000 facilities submitted TRI data to EPA.

Each year, EPA prepares and publishes the TRI National Analysis. In support of EPA's mission to protect human health and the environment, the TRI National Analysis summarizes recently submitted TRI data, explores data trends, and interprets the findings.

Highlights from the 2017 TRI data

As an overview, the two charts below summarize the most recent TRI data on: 1) how chemical wastes were managed in 2017; and 2) how the portion of wastes that were disposed of or otherwise released were handled.

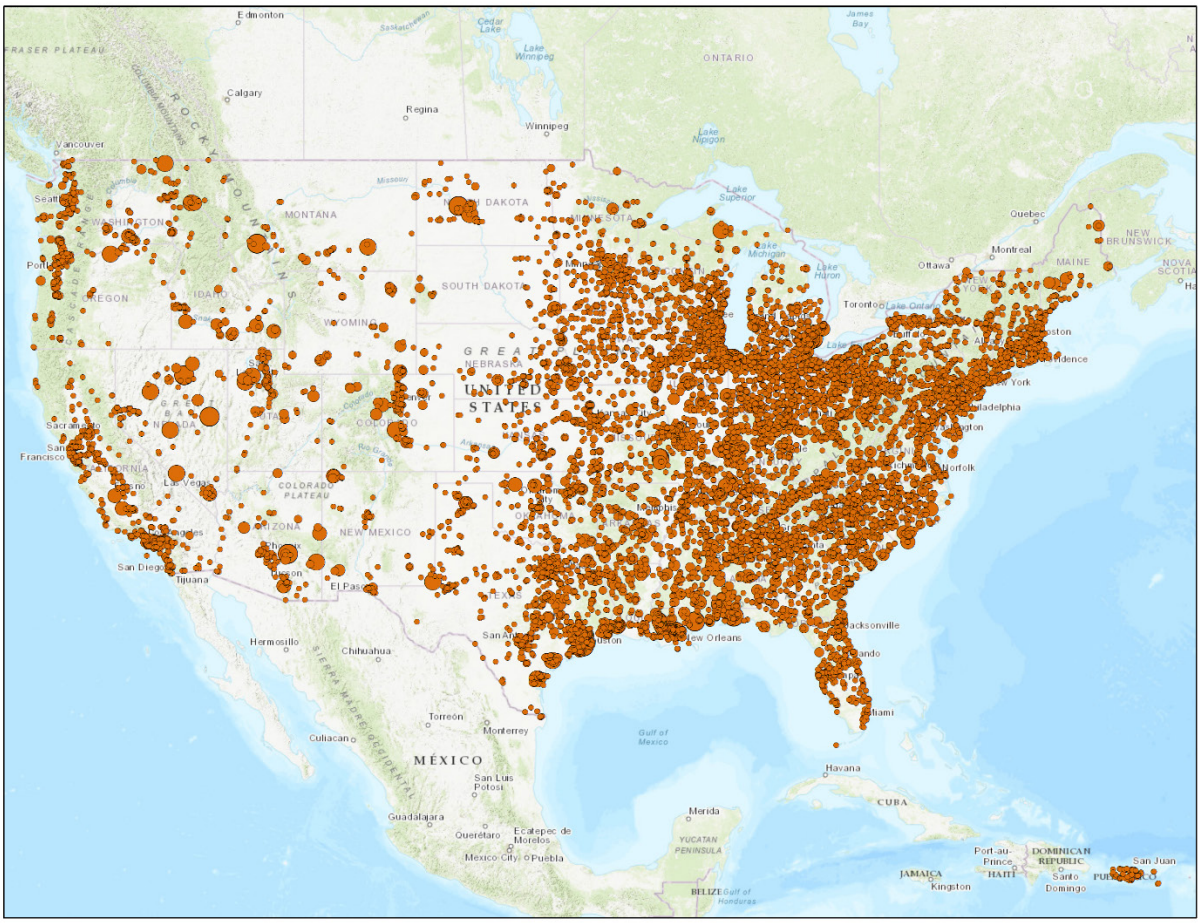




- Facilities reported managing 30.57 billion pounds of TRI-listed chemicals as production-related waste. This is the quantity of TRI chemicals in waste that is recycled, combusted for energy recovery, treated, disposed of, or otherwise released into the environment. In other words, it encompasses the TRI chemicals in waste generated from the production processes and operations of the facilities.
    - Of this total, 87% was recycled, combusted for energy recovery, or treated. Only 13% was disposed of or otherwise released into the environment.

- For chemical wastes that were disposed of or otherwise released, facilities also reported where the wastes were released—to air, water, or land (on site or off site). Most waste was disposed of on site to land (including landfills, other land disposal, and underground injection).
- As highlighted in the Releases of Chemicals section, releases to air continued to decline in 2017. Since 2007, air releases reported to TRI have decreased by 57% (757 million pounds).

Where are TRI Facilities Located?



What's in the 2017 TRI National Analysis

The Toxics Release Inventory (TRI) National Analysis is prepared and published annually, and the 2017 TRI National Analysis is EPA's summary and interpretation of TRI data reported for activities that occurred at facilities in the U.S. during 2017. It offers valuable information for improving our understanding of how the environment and communities may be affected by TRI chemicals and is a snapshot of the data at one point in time. To conduct your own analysis of TRI data, use the most recent data available on the TRI Data and Tools webpage.

Additional information is presented in the following sections of the TRI National Analysis:

- Pollution Prevention and Waste Management presents the types of pollution prevention activities that facilities have implemented, and trends on recycling, energy recovery, treatment, and releases of TRI chemical waste generated and managed as part of industrial operations.
- Releases of Chemicals presents trends in releases of TRI chemicals to the air and water, and disposed of to land, including a focus on selected chemicals of special concern.
- Industry Sectors highlights TRI chemical waste management trends for five industry sectors: manufacturing, paint and coating manufacturing, chemical manufacturing, metal mining, and electric utilities.
- Where You Live presents analyses of the TRI data specific to U.S. geographic areas: state, city, county, ZIP code, metropolitan area and micropolitan area, and by Large Aquatic Ecosystems (LAEs), such as the Chesapeake Bay, as well as information about facilities in Indian Country.
- TRI and Beyond presents TRI data used in conjunction with data from other environmental programs, such as chemical production data reported to EPA under the Toxic Substances Control Act (TSCA). The use of TRI as a model for other pollutant release and transfer inventories around the world is also discussed in this section.

TRI Data Considerations

As with any dataset, there are several factors to consider when reviewing results or using the Toxics Release Inventory (TRI) data. Key factors associated with data presented in the TRI National Analysis are summarized below; for more information see Factors to Consider When Using Toxics Release Inventory Data.

- **Covered sectors and chemicals.** TRI includes information reported by many industry sectors on the quantities of many chemicals that are released or otherwise managed as waste, but it does not contain such information on all chemicals manufactured, processed or otherwise used by facilities or from facilities in all industry sectors within the United States. A list of the sectors covered by the TRI Program is available on the TRI webpage, as well as a current list of the chemicals reportable to the TRI Program.
- **TRI trends**. The list of TRI chemicals has changed over the years; as a result, trend graphs in the TRI National Analysis include only those chemicals that were reportable for the entire time period presented so that the year-to-year data are comparable. Results which focus only on the year 2017 include all chemicals reportable for 2017. Thus, the results for 2017 analyses may differ slightly from results presented in trend analyses, which include 2017 and previous years.
- **Data quality.** Facilities determine the quantities of chemicals they report to TRI using best available data. Each year, EPA conducts an extensive data quality review that includes contacting facilities to review potential errors in reported information. This data quality review ensures the National Analysis is based on accurate and useful information.
- **Risk.** The quantity of TRI chemicals released is not an indicator of health risks posed by the chemicals. Although TRI data generally cannot indicate the extent to which individuals may have been exposed to chemicals, TRI data can be used as a starting point to evaluate the potential for exposure and whether TRI chemical releases might pose risks to human health and the environment. In particular, note that:
    - The level of toxicity varies among the covered chemicals; data on amounts of the chemicals alone are inadequate to reach conclusions on health-related risks; and
    - 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 judgements can be made about potential risks associated with the chemical or a release.

For more information on the use of TRI data in exposure and risk analyses, see Factors to Consider When Using Toxics Release Inventory Data and the Hazard and Potential Risk of TRI Chemicals in the Releases section.

- **Late submissions.** TRI reporting forms submitted to EPA after the July 1 reporting deadline may not be processed in time to be included in the National Analysis. While revisions can be submitted after the July 1 reporting deadline, the data used to develop the National Analysis is frozen in mid-October. Therefore, revisions received after this freeze date will not be reflected in the National Analysis. Those late revisions will be incorporated into the TRI dataset during the Spring refresh of the data and will be reflected in next year's National Analysis when it refers to 2017 data.
- **Double-counting.** The National Analysis presents summaries of many quantitative data elements (see "Quick Facts" below) including releases to the environment, which occur on site and off site after wastes are transferred to other businesses for further waste management. When aggregating releases across facilities, such as national totals, EPA adjusts off-site releases to eliminate double counting of releases if the receiving facility also reports to TRI.

Quick Facts for 2017

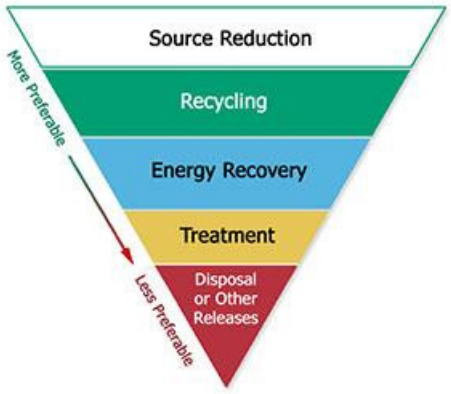
Measure	*Value*
Number of TRI Facilities	**21,456**
Production-Related Waste Managed	**30.57 billion lb**
Recycled	14.69 billion lb
Energy Recovery	2.95 billion lb
Treated	8.98 billion lb
Disposed of or Otherwise Released	3.95 billion lb
Total Disposal or Other Releases	**3.88 billion lb**
On-site	**3.50 billion lb**
Air	0.60 billion lb
Water	0.19 billion lb
Land	2.71 billion lb
Off-site	**0.38 billion lb**

Note that two metrics shown in the Quick Facts box related to disposal or other releases are similar (3.95 and 3.88 billion pounds), but total disposal or other releases is slightly lower.

One of the reasons total disposal or other releases is lower is that it removes "double counting" that occurs when a facility that reports to EPA's TRI Program transfers waste to another TRI-reporting facility. For example, when TRI Facility A transfers a chemical off site for disposal to Facility B, Facility A reports the chemical as transferred off site for disposal while Facility B reports the same chemical as disposed of on site. In processing the data, the TRI Program recognizes that this is the same quantity of the chemical and includes it only once in the total disposal or other releases value. The production-related waste value in TRI, however, considers all instances where the waste is managed (first as a quantity sent off site for disposal and next as a quantity disposed of on site), and reflects both the off-site transfer and the on-site disposal.

Pollution Prevention and Waste Management

Each year, the Toxics Release Inventory (TRI) collects information from more than 21,000 facilities on the quantities of TRI-listed chemicals they recycle, combust for energy recovery, treat for destruction, and dispose of or otherwise release both on and off site as part of their normal operations. These quantities, in total, are collectively referred to as the quantity of production-related waste managed.



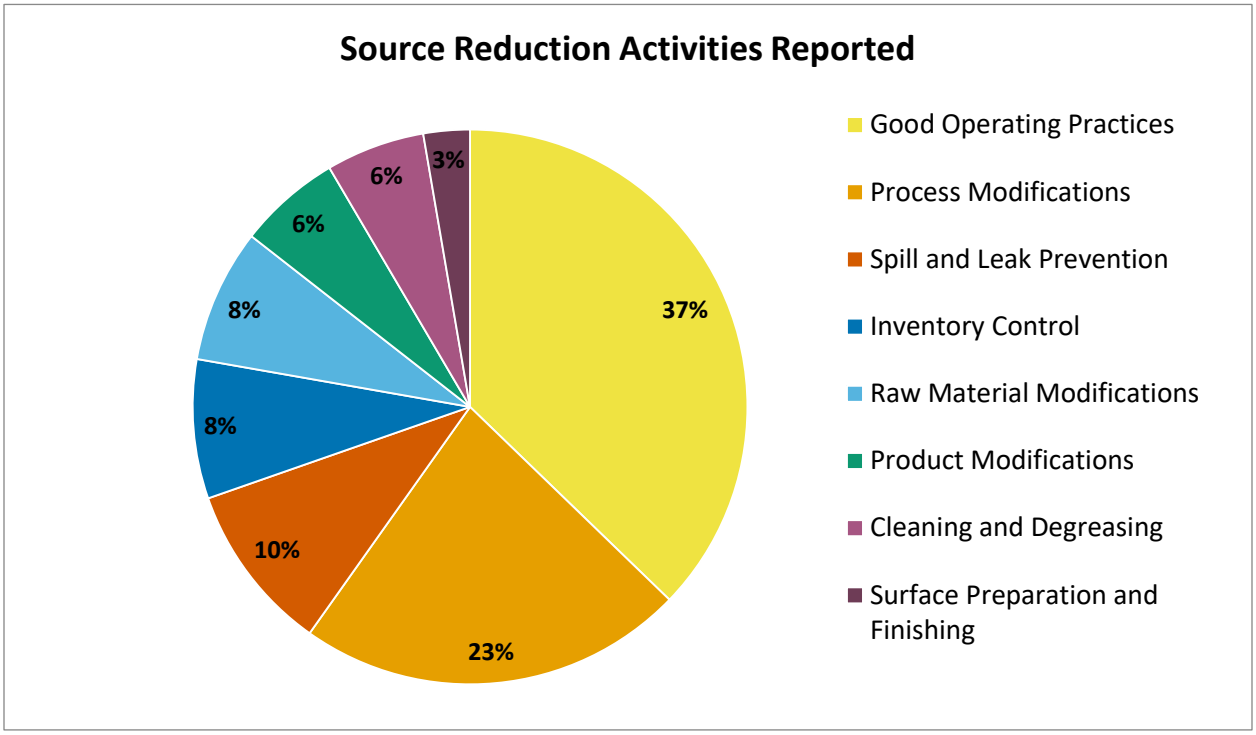
Looking at production-related waste managed over time helps track progress made by industrial facilities in reducing the amount of chemical waste generated and in adopting waste management practices that are preferable to disposing of or otherwise releasing waste to the environment. EPA encourages facilities to first eliminate the creation of chemical waste through source reduction activities. For wastes that are generated, the most preferred management method is recycling, followed by combusting for energy recovery, treatment, and, as a last resort, disposing of or otherwise releasing the chemical waste into the environment. These waste management practices are illustrated in the waste management hierarchy image shown here and discussed in the Pollution Prevention Act (PPA) of 1990. One goal of the PPA is that over time facilities will shift from disposal or other releases toward the more preferred techniques in the waste management hierarchy that do not result in releases to the environment.

As with any dataset, there are several factors to consider when using the TRI data. Key factors associated with data presented are summarized in the Introduction. For more information see Factors to Consider When Using Toxics Release Inventory Data.

Also note that the list of TRI chemicals has changed over the years. For comparability, trend graphs include only those chemicals that were reportable for all years presented. Figures that focus only on the year 2017 include all chemicals reportable for 2017, therefore, values for a 2017-only analysis may differ slightly from results for 2017 in a trend analysis.

Source Reduction Activities Reported

Facilities are required to report to TRI new source reduction activities that they started or fully implemented during the year. Source reduction includes activities that eliminate or reduce the generation of chemical waste. Other waste management practices, such as recycling and treatment, refer to how chemical waste is managed after it is generated and are not considered source reduction activities.



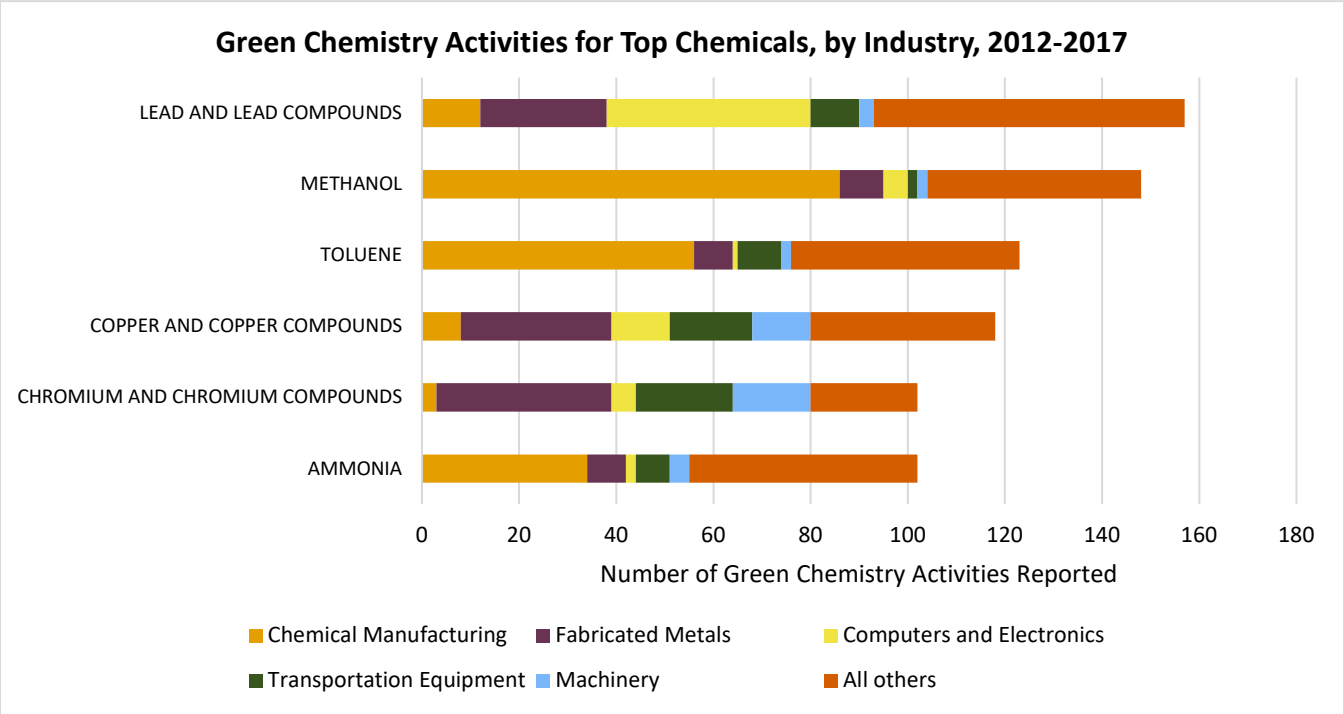
Note: Facilities report their source reduction activities by selecting codes that describe their activities. These codes fall into one of eight categories listed in the graph legend and are defined in the TRI Reporting Forms and Instructions. Percentages may not sum to 100% due to rounding.

In 2017:

- 1,581 facilities (7% of all facilities that reported to TRI) initiated or implemented a total of 3,994 new source reduction activities.
- Note that facilities may have ongoing source reduction activities initiated in previous years that are not included in this figure. You can find information on previously implemented source reduction activities by using the TRI Pollution Prevention (P2) Search Tool.

Green Chemistry Activities

Green chemistry is a discipline within the field of chemistry which seeks to prevent formation of pollution through the design and implementation of manufacturing syntheses that use safer reagents (e.g., green solvents) or feedstocks, use minimal energy, and produce the desired product in high yield without forming unwanted byproducts or wastes. It is based on the premise that the best way to deal with pollution is to not generate it in the first place. In the pollution prevention hierarchy green chemistry is a means to achieve source reduction. Advancements in green chemistry allow industry to reduce or even prevent pollution at its source by, for example, designing manufacturing processes that use or produce fewer quantities of TRI chemicals, or no TRI chemicals at all. Starting with the 2012 reporting year, EPA added six green chemistry activities to its list of source reduction activities so that facilities could indicate the green chemistry practices they implemented. This figure shows the chemicals for which the most green chemistry activities were implemented and the sectors that reported those activities.



- Since 2012, facilities have reported 2,226 green chemistry activities for 147 TRI chemicals and chemical categories. Green chemistry activities were reported most frequently for lead and lead compounds, methanol, toluene, copper and copper

compounds, chromium and chromium compounds, and ammonia. The sectors reporting the highest number of green chemistry activities were chemical manufacturing, fabricated metals, and computers and electronics.

- Chemical manufacturers used green chemistry to reduce or eliminate their use of TRI solvent and reagent chemicals, such as methanol, toluene, and ammonia. For example:
    - A pharmaceutical manufacturing facility scaled up a process to increase product yields. The facility also modified a process for production qualification to reduce raw material needs and toluene waste generated per pound of product produced. [Click to view facility details in the Pollution Prevention (P2) Tool]
- Fabricated metal producers applied green chemistry techniques to reduce their usage of metals including lead, copper, and chromium. For example:
    - A metal coating and engraving facility increased their use of chromium-free treatment chemicals. [Click to view facility details in the P2 Tool]
- Computer and electronic products manufacturers reduced or eliminated their use of lead, such as lead found in solder. For example:
    - To meet European restrictions on lead in electronics, an electronics manufacturer redesigned its printed circuit assemblies to use lead-free solder. [Click to view facility details in the P2 Tool]

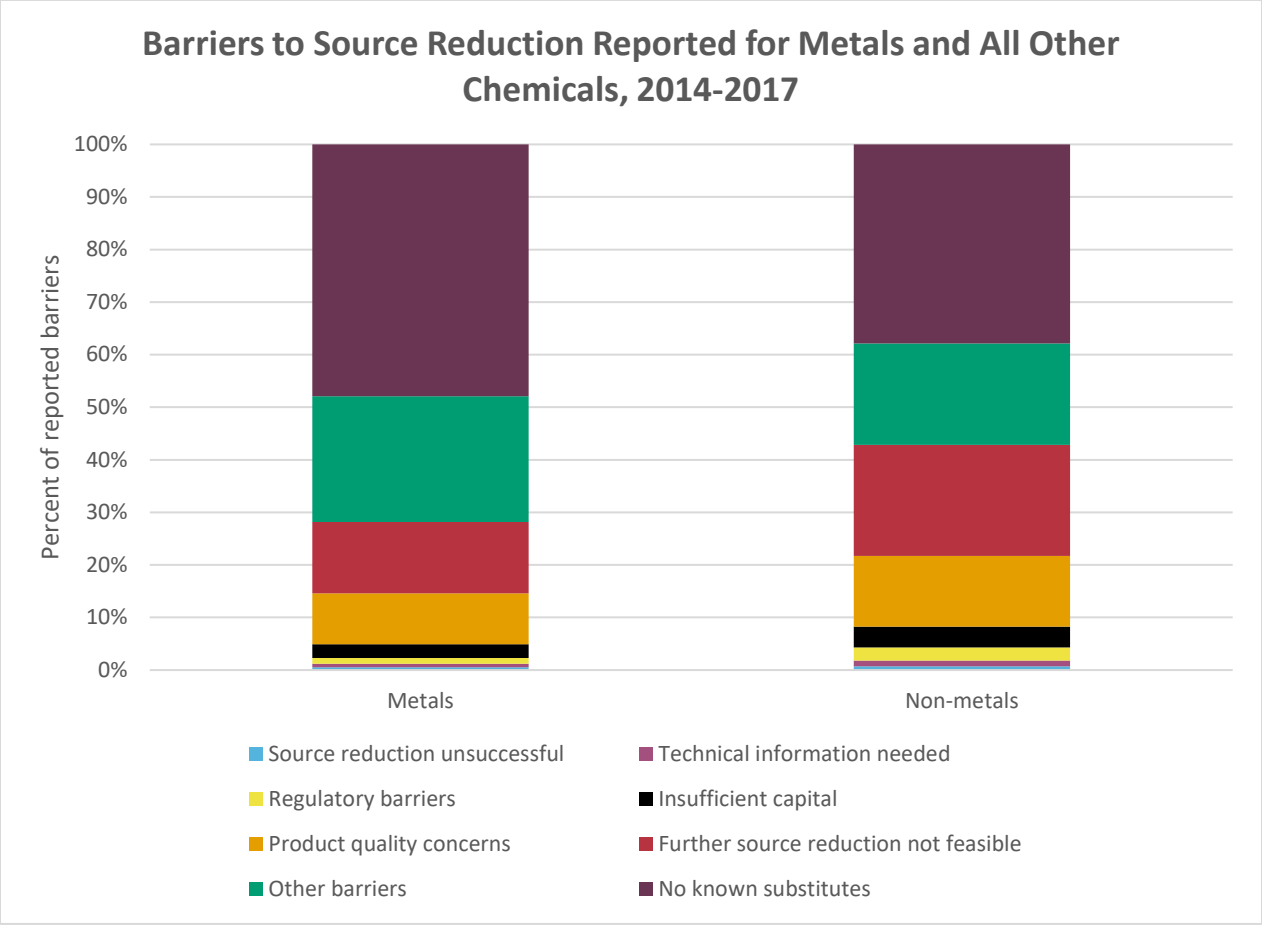
Green Chemistry Resources

Source reduction activities such as green chemistry are the preferred way to reduce formation of chemical wastes. Find more information on green chemistry using the following resources:

- EPA's TRI Pollution Prevention (P2) Search Tool to find green chemistry examples for a specific chemical and/or industry.
- EPA's Green Chemistry program for information about green chemistry and EPA's efforts to facilitate its adoption.
- EPA's Safer Choice program for information about consumer products with lower hazard.
- For more details on the types of green chemistry activities reported to TRI and trends in green chemistry reporting, see The Utility of the Toxic Release Inventory (TRI) in Tracking Implementation and Environmental Impact of Industrial Green Chemistry Practices in the United States. EXIT

Reported Barriers to Source Reduction

Facilities that did not implement new source reduction activities for a TRI chemical have the option to disclose any barriers that prevented them from implementing source reduction. Since 2014, TRI reporting forms include barrier codes, which enable reporting and analysis of obstacles that facilities may be experiencing. This figure shows the types of barriers that facilities reported for metals and for all other (non-metal) TRI chemicals.



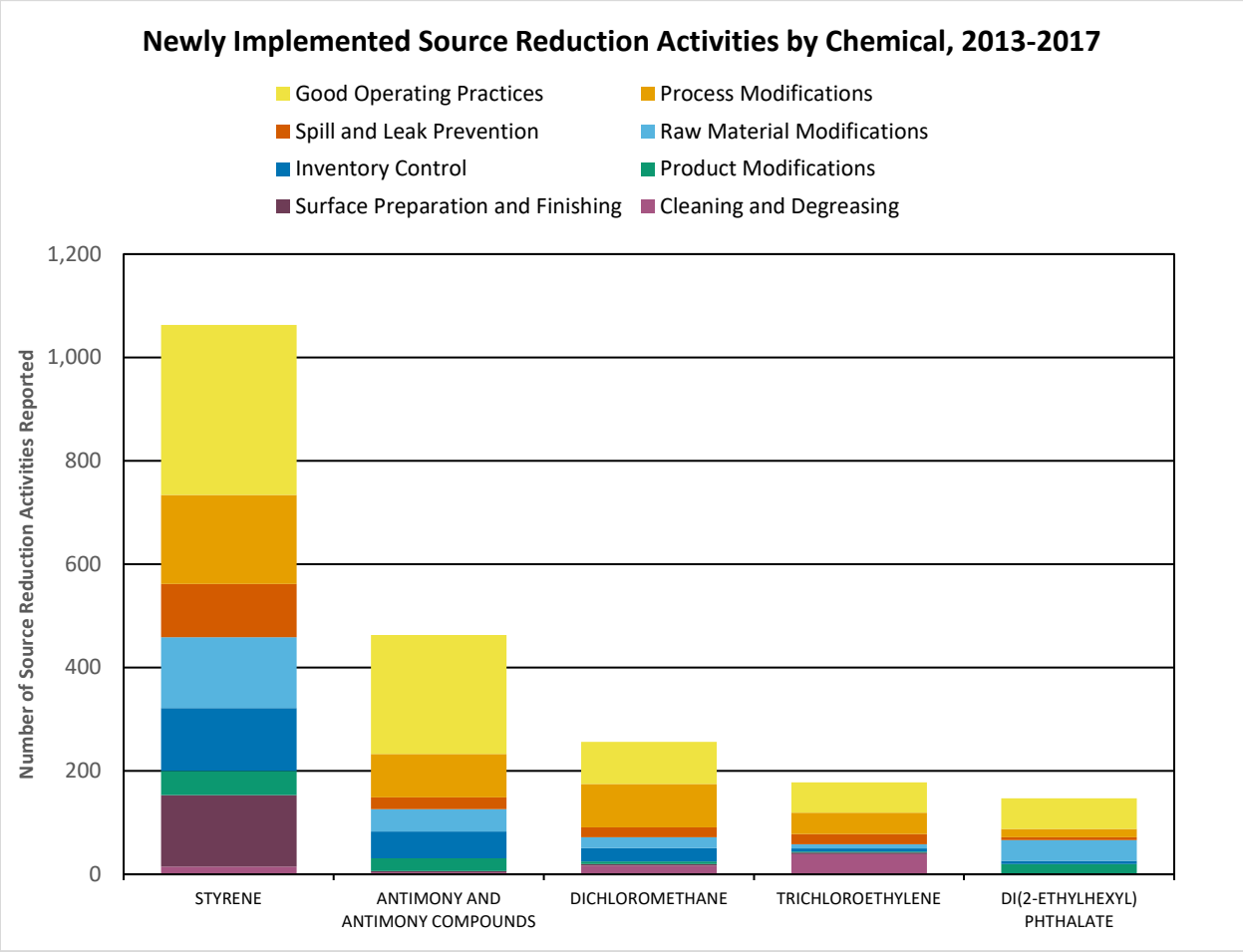
From 2014 to 2017:

- Facilities reported barriers to source reduction for 345 chemicals and chemical categories.
- The most frequently reported barriers for both metals and non-metals were *no known substitutes or alternative technologies* and *further source reduction not feasible*. This excludes *other barriers*, a catch-all category available to facilities.

- While *no known substitutes* was the most frequently reported barrier for both metals and non-metals, it accounted for almost half (48%) of the barriers reported for metals but made up a smaller portion (38%) of barriers reported for non-metals.
- For the *no known substitutes* barrier for metals, many facilities reported the presence of the TRI metal in their raw materials (e.g., metal alloys) as the reason they did not implement source reduction activities. Examples include:
    - An iron foundry reported that the premium grade scrap iron they purchase to melt contains a trace amount of lead as an undesirable contaminant. [Click to view facility details in the Pollution Prevention (P2) Tool]
    - A steel tubing manufacturer noted that American Society for Testing and Materials (ASTM) standards require minimum acceptable quantities of chromium, manganese, and nickel in stainless steel, so they are unable to reduce their use of these chemicals. [Click to view facility details in the P2 Tool]
- *Further source reduction not feasible* was another commonly reported barrier, especially for non-metals. Facilities select this barrier code when additional reductions do not appear technically or economically feasible. For example:
    - A die and tooling manufacturing facility previously implemented monitoring and periodic maintenance activities related to its methanol usage. Further reducing waste and improving efficiency would require replacing all existing equipment, which is currently not economically feasible for the facility. [Click to view facility details in the P2 Tool]
- Analyzing the source reduction barriers reported to TRI helps identify where more research is needed, for example to address technological challenges or promote development of viable alternatives.
- You can view barriers reported for any TRI chemical by using the TRI P2 Search Tool.

Source Reduction Activities by Chemical

For the chemicals with the highest source reduction reporting rates over the last 5 years, this figure shows the number and types of activities implemented.



Note: 1) Limited to chemicals with at least 100 reports of source reduction activities from 2013-2017. 2) Facilities report their source reduction activities by selecting codes that describe their activities. These codes fall into one of eight categories listed in the graph and are defined in the TRI Reporting Forms and Instructions.

From 2013 to 2017:

- TRI facilities reported 36,522 source reduction activities for 285 chemicals and chemical categories.
- Chemicals with the highest source reduction reporting rate were: styrene, antimony and antimony compounds, dichloromethane (DCM, also known as methylene chloride), trichloroethylene, and di(2-ethylhexyl)phthalate.

- The type of source reduction activity implemented for these chemicals varies depending on their use in industrial operations and the chemical's characteristics. For example:
    - **Raw material modifications** is commonly reported as a source reduction activity to reduce waste of di(2-ethylhexyl)phthalate (DEHP), a plasticizer; styrene, a chemical used to make plastics such as polystyrene; and antimony compounds which are used in electronics, batteries, and as a component of fire retardants.
    - **Cleaning and degreasing**, including changing to aqueous cleaners, is implemented for common industrial solvents such as trichloroethylene (TCE).
    - **Process modifications,** including optimizing reaction conditions and modifying equipment, layout, or piping, can help reduce the amount of solvents such as dichloromethane (DCM) needed for a process.

Facilities may also report additional details to TRI about their source reduction, recycling, or pollution control activities in an optional text field of the TRI reporting form.

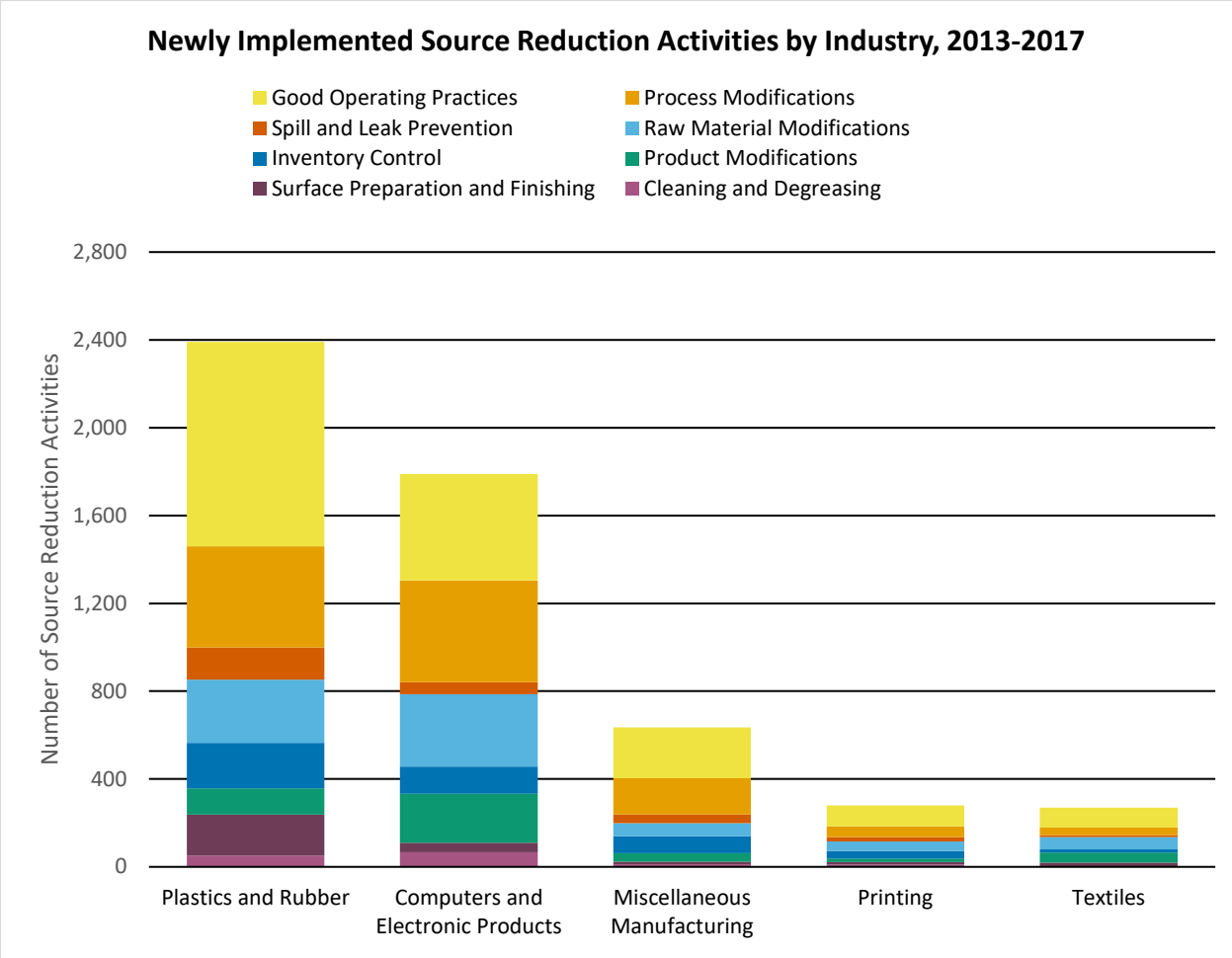
Examples of optional source reduction information for 2017:

- Styrene: A plastics product manufacturer reduced shutdown waste by placing orders back to back to keep the line running. [Click to view facility details in the Pollution Prevention (P2) Tool]
- Dichloromethane: A specialty chemical manufacturer was able to reduce their use of dichloromethane by substituting a less hazardous solvent. [Click to view facility details in the P2 Tool]
- Trichloroethylene: A precision turned parts manufacturer purchased a new parts cleaning system not requiring the use of trichloroethylene. [Click to view facility details in the P2 Tool]
- Di(2-ethylhexyl)phthalate: A plastic film manufacturer removed the raw material containing DEHP from their product line in 2017, and they estimate this change will lead to the elimination of all DEHP waste. [Click to view facility details in the P2 Tool]
- Antimony Compounds: A wire and cable manufacturer attempted to group like compounds together, minimizing changeovers and helping to eliminate scrap. [Click to view facility details in the P2 Tool]

You can compare facilities' waste management methods and trends for any TRI chemical by using the TRI P2 Search Tool.

Source Reduction Activities by Industry

For the industries with the highest source reduction reporting rates over the last 5 years, this figure shows the number and types of activities these sectors implemented.



Note: Facilities report their source reduction activities by selecting codes that describe their activities. These codes fall into one of eight categories listed in the graph legend and are in the TRI Reporting Forms and Instructions.

From 2013 to 2017:

- The five industry sectors with the highest source reduction reporting rates are plastics and rubber, computers and electronic products, miscellaneous manufacturing (e.g., medical equipment), printing, and textiles.
- For most sectors, "Good operating practices" is the most frequently reported type of source reduction activity. Other commonly reported source reduction activities vary by sector. For example, computers and electronic products manufacturers frequently

reported modifications to their raw materials and products, often associated with the elimination of lead-based solder.

- Facilities may also report additional details to TRI about their source reduction, recycling, or pollution control activities, as shown in the following examples.

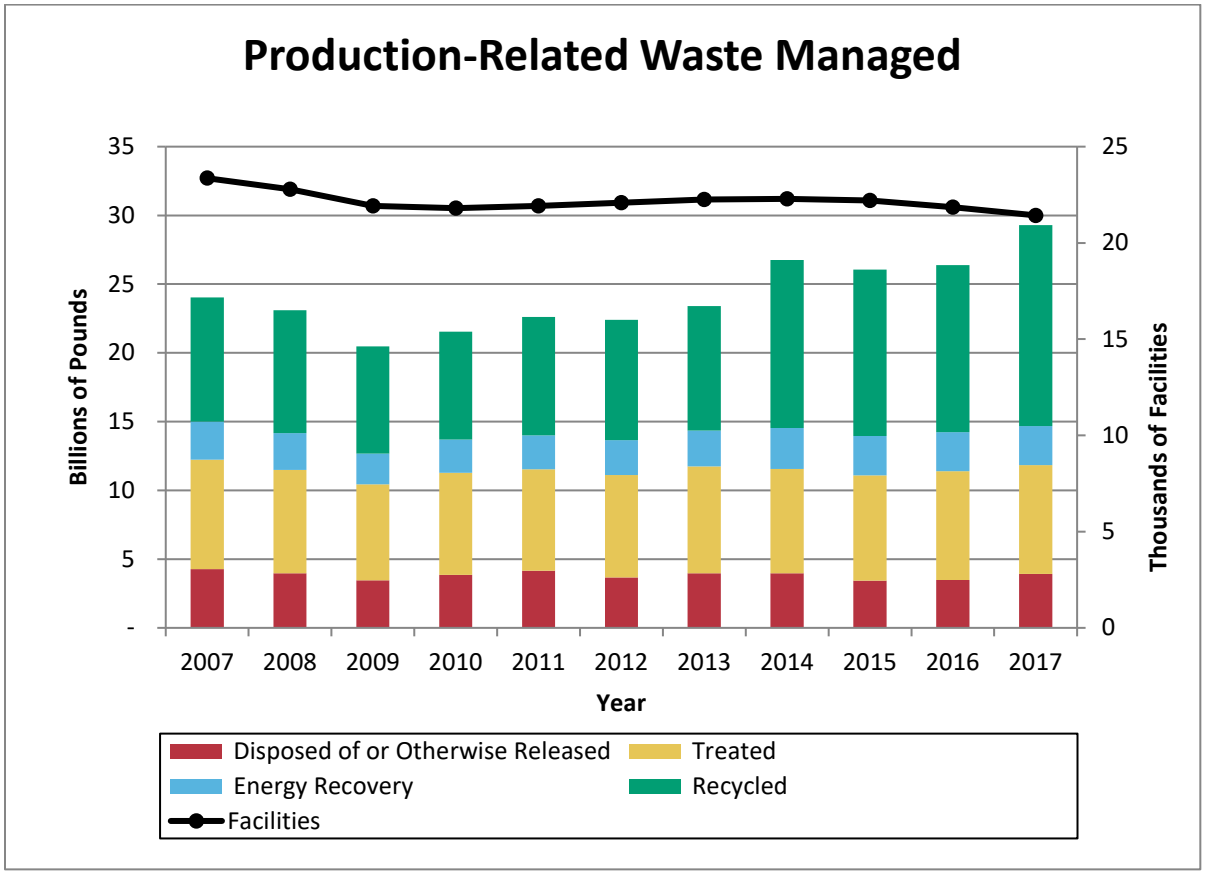
Examples of optional source reduction information for 2017

- **Plastics and Rubber**: By modifying the manufacturing process and conducting engineering trials, quality testing and product qualifications, a plastics product manufacturer was able to reformulate the raw materials for their polyester resin to low-styrene alternatives. [Click to view facility details in the Pollution Prevention (P2) Tool]
- **Computers and Electronic Products**: A printed circuit board manufacturing facility changed their plating process to a chemistry that contains less formic acid and reduced the amount of formic acid treated and released. [Click to view facility details in the P2 Tool]
- **Miscellaneous Manufacturing**: A powder processing facility reduced one clean out per month by changing their processing order to reduce their nickel releases. [Click to view facility details in the P2 Tool]
- **Textiles**: A fabric coating mill looked for alternative methods to produce products to reduce their dependence on solvent chemicals and is engaging in new opportunities that use water borne or 100% solids technologies. [Click to view facility details in the P2 Tool]
- **Printing**: A gravure printer reduced toluene use through an initiative with their ink vendors to eliminate/reduce toluene. [Click to view facility details in the P2 Tool]

You can view all reported pollution prevention activities and compare facilities' waste management methods and trends for any TRI chemical by using the TRI P2 Search Tool.

Waste Management Trends

Facilities report to the Toxics Release Inventory (TRI) the quantities of TRI-listed chemicals that they dispose of or otherwise release to the environment as a result of normal industrial operations. In addition, facilities report the quantities of these chemicals that they manage through preferred methods including recycling, combusting for energy recovery, and treating for destruction. This figure shows the trend in these quantities, collectively referred to as production-related waste managed.



From 2007 to 2017:

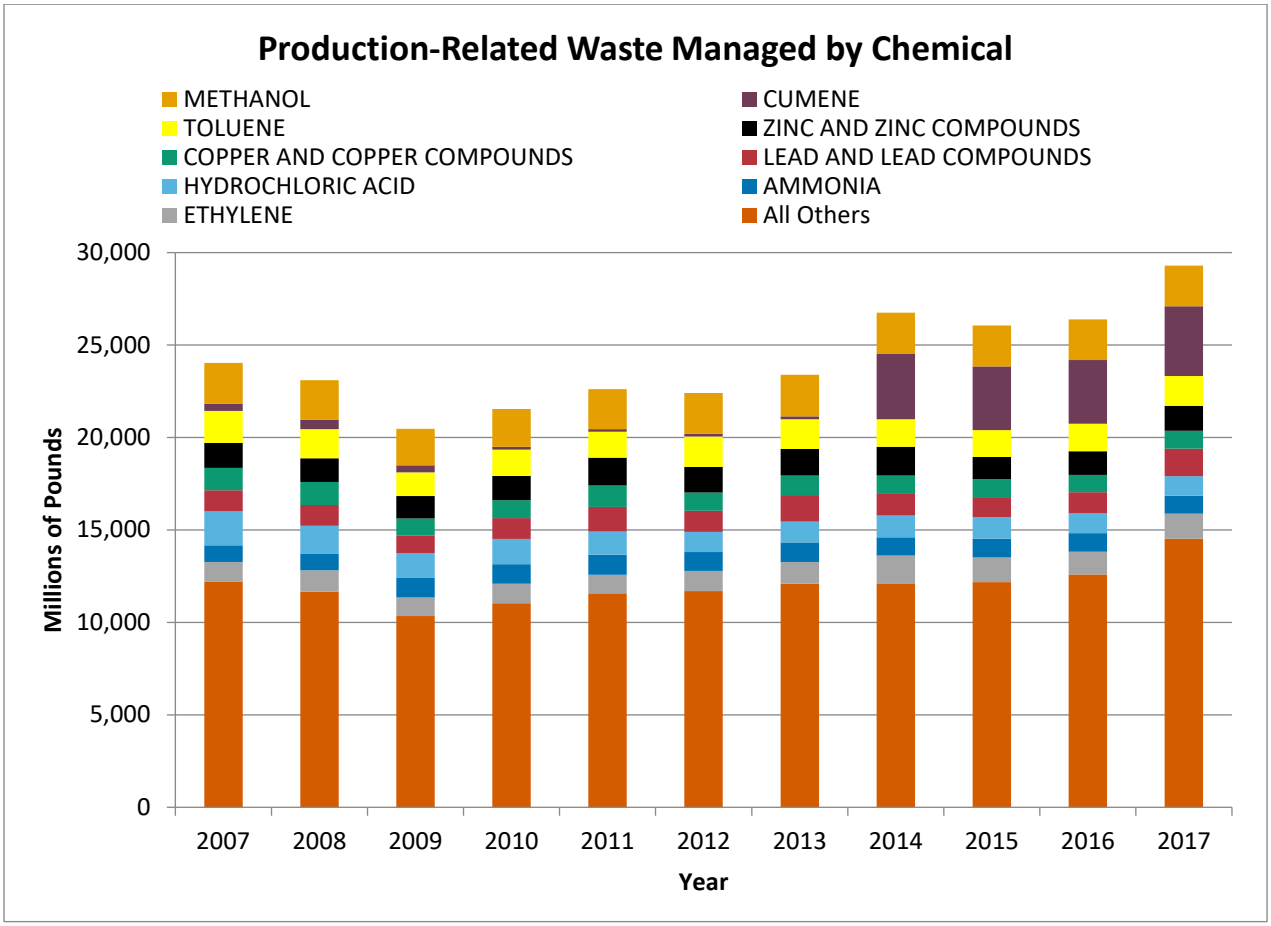
- Production-related waste decreased during the recession. Since 2009, production-related waste managed has generally been increasing as the U.S. economy has improved.
- Since 2007, production-related waste managed increased by 5.3 billion pounds (22%).
    - Disposal and other releases decreased by 354 million pounds (-8%).
    - Treatment decreased by 38 million pounds (-0.5%).

  - Energy recovery increased by 76 million pounds (3%).
  - Recycling increased by 5.6 billion pounds (62%), a trend mostly driven by one facility reporting over 3.4 billion pounds of cumene recycled each year from 2014-2017 [Click to view facility details in the Pollution Prevention (P2) Tool] and another facility reporting 1.5 billion pounds of dichloromethane recycled in 2017 [Click to view facility details in the P2 Tool].

- The number of facilities that report to TRI has declined by 8% since 2007. Reasons for this decrease include facility closures, outsourcing of operations to other countries, and facilities reducing their manufacture, processing, or other use of TRI-listed chemicals below the reporting thresholds.

Production-Related Waste Managed by Chemical

This figure shows the chemicals that were managed as waste in the greatest quantities from 2007 to 2017.



From 2007 to 2017:

- Facilities reported production-related waste for 563 chemicals and chemical categories. The nine chemicals for which facilities reported the most production-related waste, shown above, represent 50% of all production-related waste reported.
- The reported quantities of most of the top chemicals contributing to production-related waste managed have remained relatively constant since 2007.
- Of the chemicals shown above, facilities reported increased quantities of waste managed for five: zinc and zinc compounds, lead and lead compounds, cumene, ethylene, and ammonia.
    - Production-related waste of lead and lead compounds increased by 30%.

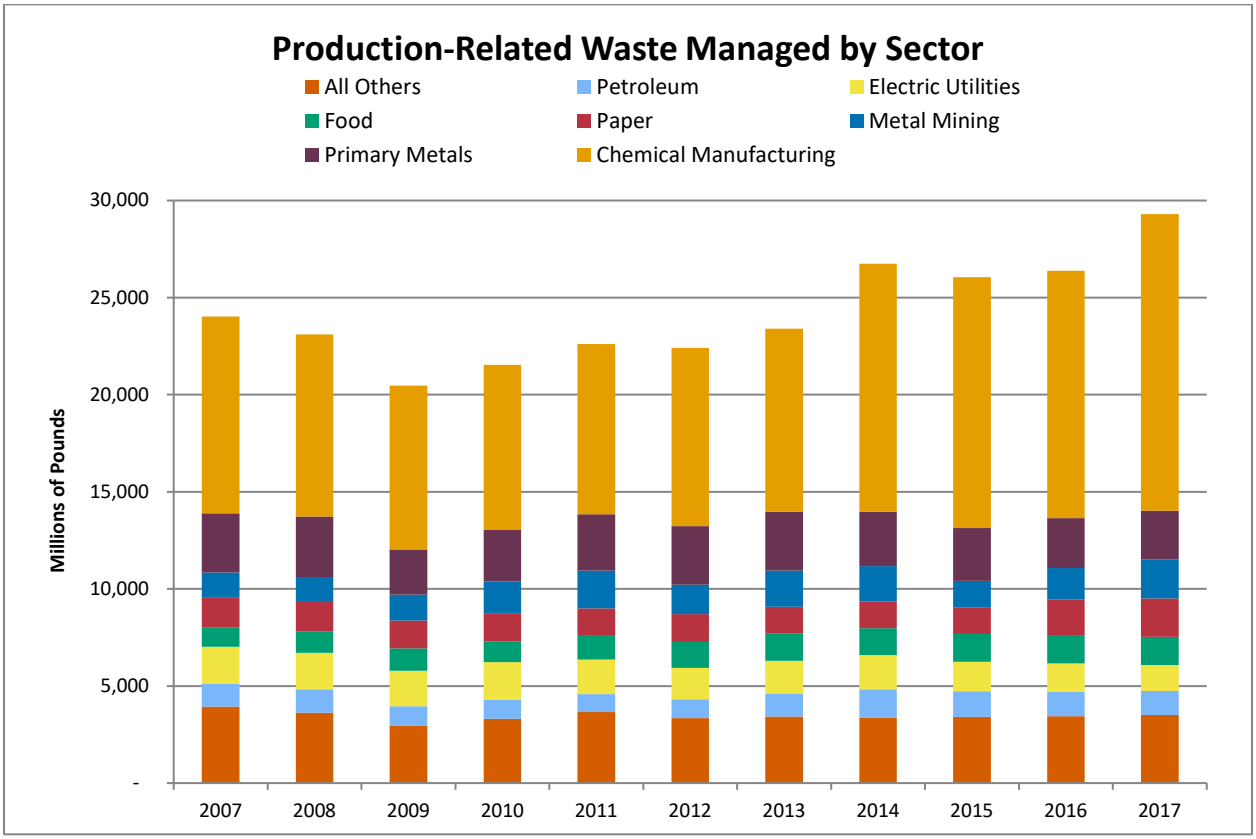
- Cumene waste managed increased eight-fold, mostly driven by one facility reporting over 3.4 billion pounds of cumene recycled annually during 2014-2017. [Click to view facility details in the Pollution Prevention (P2) Tool]

From 2016 to 2017:

- Facilities reported decreases in overall waste quantities for these chemicals:
  - Ammonia decreased by 43.5 million pounds (-4%)
  - Hydrochloric acid decreased by 9.85 million pounds (-1%)
- The quantities of lead and lead compounds managed as waste increased by 332 million pounds (29%).

Production-Related Waste Managed by Industry

This figure shows the industry sectors that managed the most waste from 2007 to 2017.



From 2007 to 2017:

- The percent contribution of each of the top sectors to production-related waste managed has remained relatively constant since 2007.
- Of the sectors shown in the graph, five increased their quantity of waste managed:
  - Chemical manufacturing increased by 5 billion pounds (51%)
  - Metal mining increased by 738 million pounds (58%)
  - Paper manufacturing increased by 431 million pounds (28%)
  - Food manufacturing increased by 440 million pounds (44%)
  - Petroleum products manufacturing increased by 47 million pounds (4%)

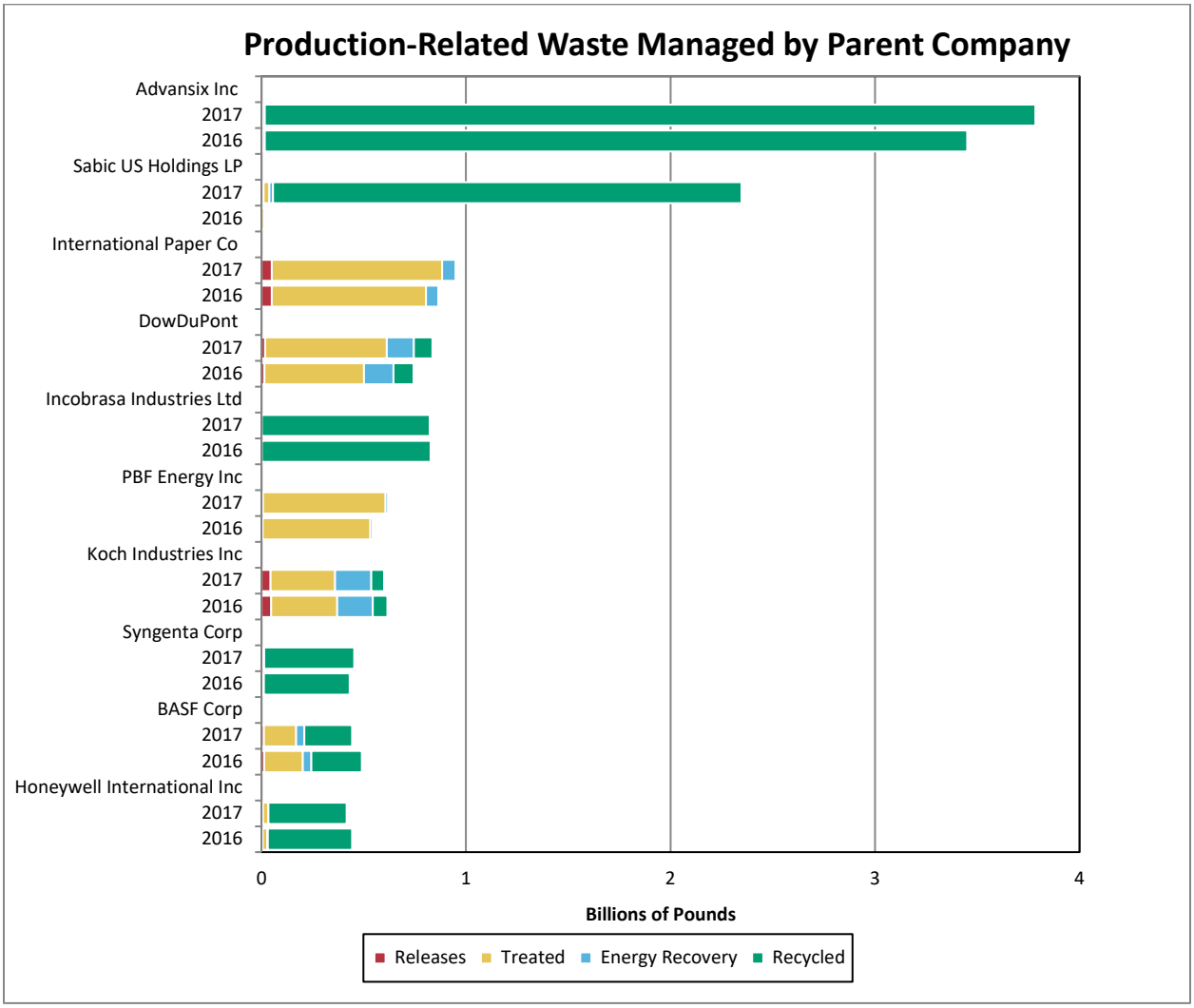
- The quantity of waste generated in some industries fluctuates considerably from year to year, due to changes in production or other factors. For example, quantities of waste managed reported by metal mining facilities can change significantly based on changes in the composition of waste rock.

From 2016 to 2017:

- Industry sectors with the greatest reported changes in overall waste quantities are:
    - Chemical manufacturing increased by 2.5 billion pounds (20%)
    - Metal mining increased by 388 million pounds (24%)

Waste Management by Parent Company

Facilities that report to the Toxics Release Inventory (TRI) provide information on their parent company. For TRI reporting purposes, the parent company is the highest-level company located in the United States. This figure shows the parent companies whose facilities reported the most production-related waste for 2017. Facilities outside of the manufacturing sector, such as electric utilities and coal and metal mines, are not included in this chart because the nature of the activities conducted by those sectors do not lend themselves to the same types or degree of source reduction and waste management activities as manufacturing facilities. Note that almost all of these companies are largely managing their waste through EPA's preferred waste management methods–recycling, energy recovery, or treatment–rather than releasing it to the environment.



Notes: 1) For TRI reporting, the parent company is the highest-level U.S. company which directly owns at least 50% of the voting stock of the company. This figure uses EPA's standardized parent name. 2) To view facility counts by parent in 2016 or 2017, mouse over the bar graph. 3) One facility, Incobrasa Industries Ltd, does not report a parent company but it is included in this figure because it has a comparable quantity of production-related waste managed. 4) Graphic Packaging Holding Co. acquired several International Paper facilities as of January 2018. One of these facilities listed its parent company for reporting year 2017 as Graphic Packaging Holding Co. and was changed to the 2017 parent, International Paper Co., for this figure. 5) The increases by Sabic Holdings are driven by one facility which reported almost 1.5 billion pounds of dichloromethane recycling in 2017 as well as greatly increased recycling quantities of several other chemicals.

These parent companies' TRI-reporting facilities operate in the following industry sectors:

- Chemical manufacturing: Advansix Inc, DowDuPont, BASF, Syngenta, Honeywell International, Sabic US Holdings LP
- Paper: International Paper
- Soybean processing: Incobrasa
- Multiple sectors, e.g. pulp and paper, petroleum refining, and chemicals: Koch Industries
- Petroleum refining: PBF Energy

Half of these top parent companies reported implementing new source reduction activities in 2017. Some of these companies reported additional (optional) information to TRI about their pollution prevention or waste management activities.

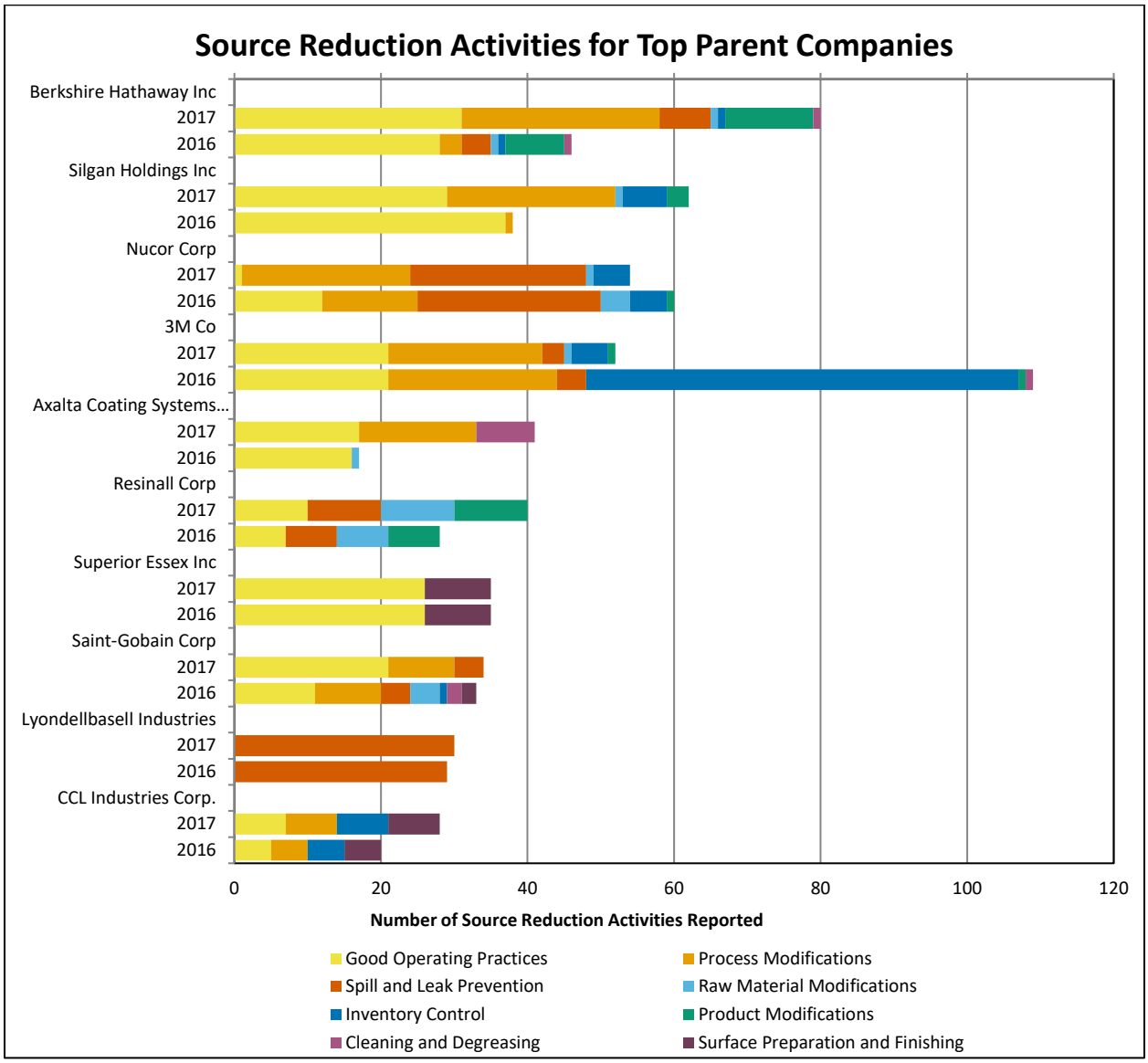
Examples of additional pollution prevention-related information for 2017:

- A BASF facility installed more accurate feed control valves which reduced excess ammonia usage. [Click to view facility details in the Pollution Prevention (P2) Tool]
- A paperboard mill owned by Koch Industries upgraded a boiler to eliminate bark burning. [Click to view facility details in the P2 Tool]

To conduct a similar type of parent company comparison for a given sector, chemical, or geographic location, use the TRI P2 Search Tool.

Source Reduction Activities by Parent Company

This figure shows the parent companies whose facilities implemented the most source reduction activities during 2017. Facilities outside of the manufacturing sector, such as electric utilities and coal and metal mines, are not included in this chart because those sectors' activities (e.g., the release of TRI chemicals present in large volumes of earth moved from below ground or metal mining pit to the surface, to get to the target ore) do not lend themselves to the same source reduction opportunities as the activities at manufacturing facilities.



Notes: 1) For TRI reporting, the parent company is the highest-level U.S. company which directly owns at least 50% of the voting stock of the company. This figure uses EPA's standardized parent company names. 2) Facilities report their source reduction activities by selecting codes that describe their activities. These codes fall into one of eight categories listed in the graph legend and are defined in the TRI Reporting Forms and Instructions. 3) One CCL Industries facility reported no US parent company and was assigned to CCL Industries Corp. 4) To view facility counts by parent in 2016 or 2017, mouse over the bar graph.

These parent companies' facilities primarily operate in the following industries:

- Chemical manufacturing sector: 3M, Resinall, Lyondellbasell, Axalta
- Multiple sectors: Saint-Gobain Corp, Berkshire Hathaway
- Steel manufacturing: Nucor

- Wire and cable manufacturing: Superior Essex
- Metal containers: Silgan Holdings, CCL Industries

Good operating practices, such as improving maintenance scheduling and installation of quality monitoring systems, are the most commonly reported types of source reduction activities for these parent companies. Spill and leak prevention and process modifications are also commonly reported.

Some of these parent companies submitted additional optional text on their TRI reporting forms describing their pollution prevention or waste management activities.

Examples of additional pollution prevention-related information for 2017:

- A 3M facility reduced its use of formaldehyde and phenol by organizing scheduling to minimize changeovers as much as possible. [Click to view facility details in the Pollution Prevention (P2) Tool]
- A Berkshire Hathaway facility reduced chromium waste by using pre-manufactured components that eliminate most of the scrap metal. [Click to view facility details in the P2 Tool]

You can find P2 activities reported by a specific parent company and compare facilities' waste management methods and trends for any TRI chemical by using the TRI P2 Search Tool.

Releases of Chemicals

Disposal or other releases of Toxics Release Inventory (TRI) chemicals into the environment occur in several ways. Chemicals may be disposed of on a facility's property by being released to the air, water or land. Facilities may also ship (transfer) wastes that contain TRI chemicals to an off-site location for treatment or disposal. Most disposal or other release practices are subject to a variety of regulatory requirements designed to minimize potential harm to human health and the environment. To learn more about what EPA is doing to help limit the release of TRI chemicals into the environment, see EPA's laws and regulations webpage.

Evaluating releases of TRI-listed chemicals can help identify potential concerns and gain a better understanding of potential risks that may be posed by the releases. This evaluation can also help identify priorities and opportunities for government and communities to work with industry to reduce chemical releases and potential associated risks. However, it is important to consider that the quantity of releases is not an indicator of health impacts posed by the chemicals. Human health risks resulting from exposure to TRI chemicals are determined by many factors, as discussed further in the Hazard and Potential Risk of TRI Chemicals section.

Helpful Concepts

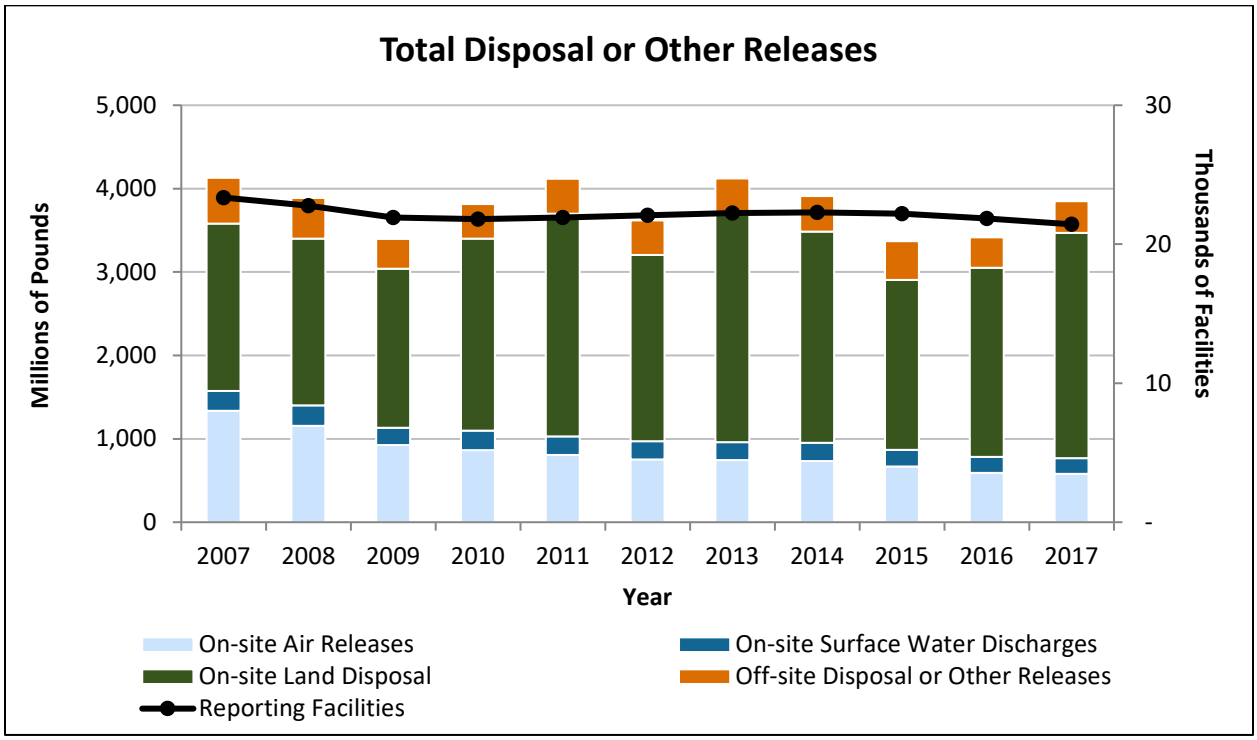
What is a release?

In the context of TRI, a "release" of a chemical generally refers to a chemical that is emitted to the air, discharged to water, or disposed of in some type of land disposal unit.

Many factors can affect trends in releases at facilities, including production rates, management practices, the composition of raw materials used, and the installation of control technologies.

As with any dataset, there are several factors to consider when using the TRI data. Key factors associated with data presented are summarized in the Introduction. For more information see Factors to Consider When Using Toxics Release Inventory Data. Also note that the list of TRI chemicals has changed over the years. For comparability, trend graphs include only those chemicals that were reportable for all years presented. Figures that focus only on the year 2017 include all chemicals reportable for 2017, therefore, values for a 2017-only analysis may differ slightly from results for 2017 in a trend analysis.

The following graph shows the disposal or other releases of TRI chemicals, including on-site disposal to land, water, and air, and off-site transfers for disposal.



From 2007 to 2017:

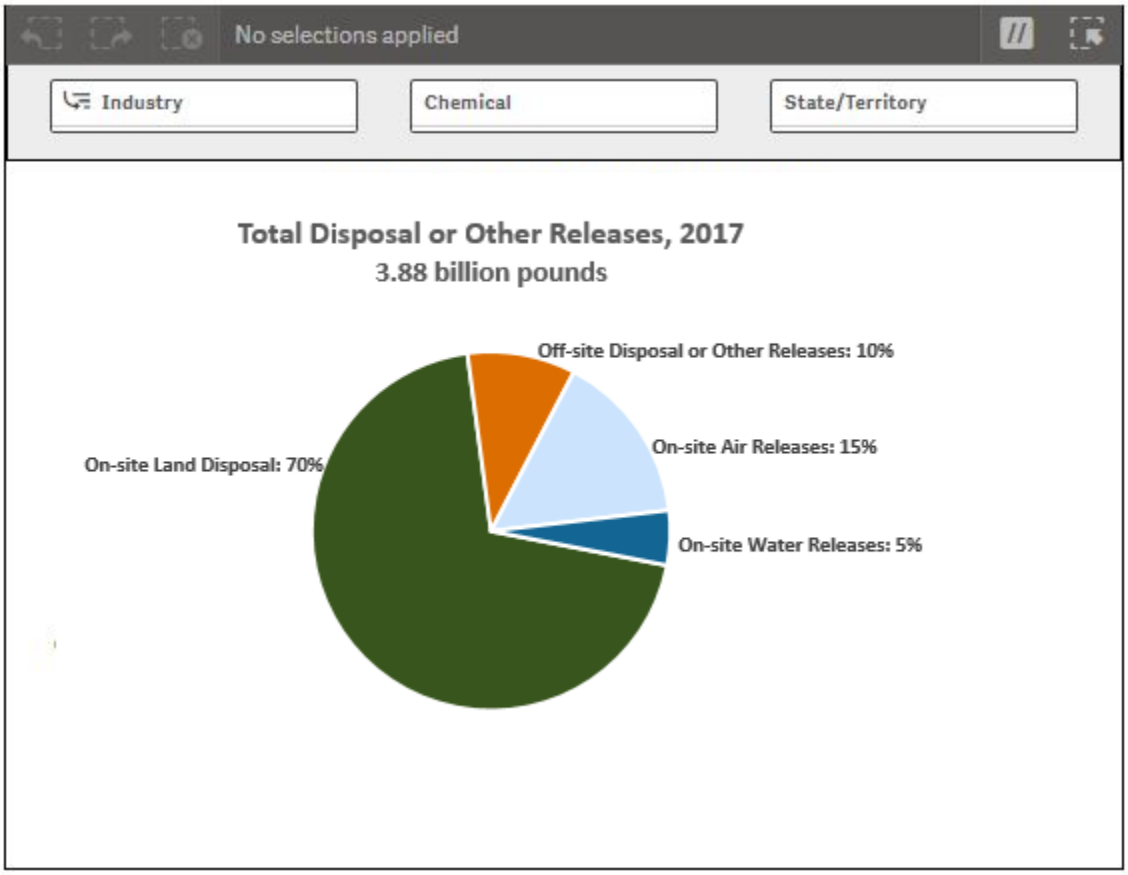
- Total disposal or other releases of TRI chemicals decreased by 7%.
  - Excluding the metal mining sector, releases decreased by 37%.
  - Reduced hazardous air pollutant (HAP) emissions, such as hydrochloric acid, from electric utilities were the most significant contributor to the decline, with additional air emission reductions from the chemical and paper manufacturing sectors.
- On-site air releases (down 57% from 2007), on-site surface water discharges (down 20% since 2007), and off-site releases (down 31% since 2007) declined during this 10-year period.
- The number of facilities reporting to the TRI Program declined by 8% overall, although the count has remained relatively steady since 2010.

From 2016 to 2017:

- On-site air releases and on-site surface water discharges decreased while off-site disposal increased, each with under 5% change. Total releases to the environment increased by 13%, driven by the 21% increase (433 million pounds) in on-site land disposal.

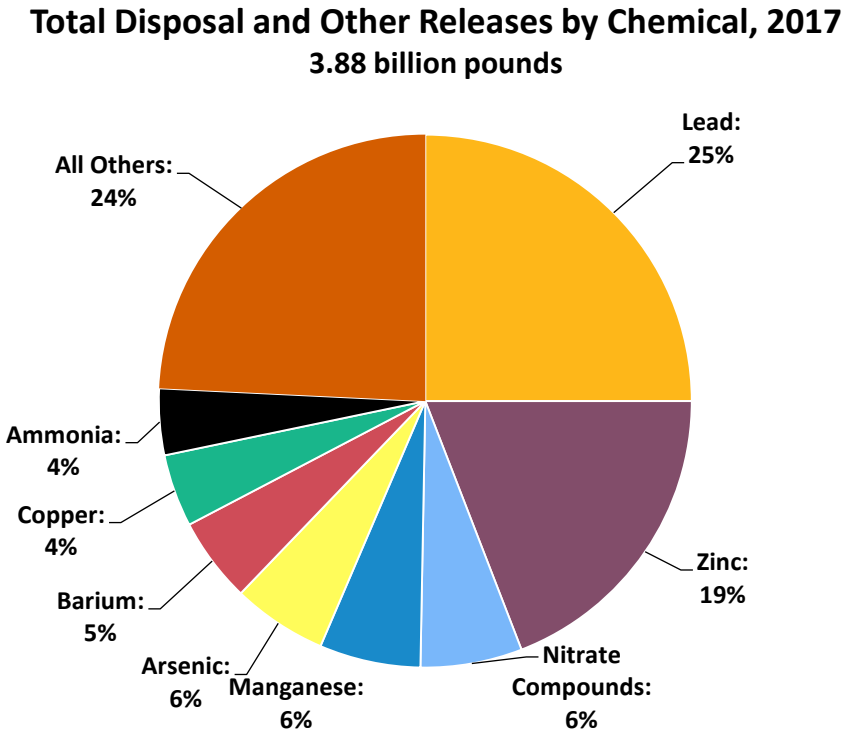
Releases in 2017

Use the interactive chart below to explore how total releases of chemicals that occurred in 2017 Visit the full TRI National Analysis Qlik dashboard to explore even more information about releases of chemicals.



Releases by Chemical

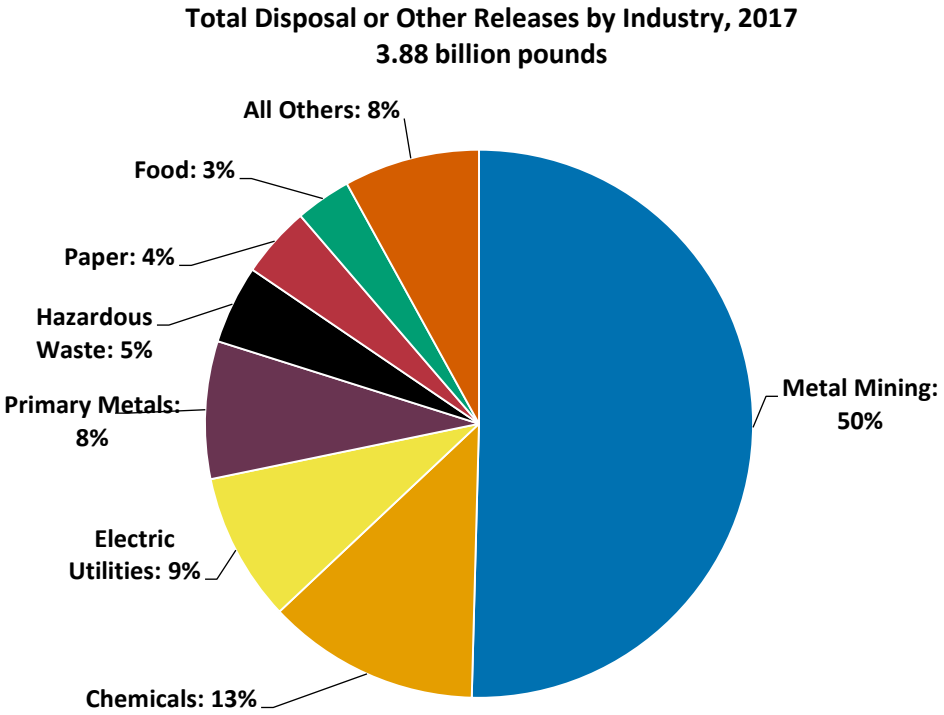
Release quantities of 8 chemicals comprised 76% of total releases.



Note: In this figure, metals are combined with their metal compounds, although metals and compounds of the same metal are usually listed separately on the TRI list (e.g. lead is listed separately from lead compounds).
Percentages may not sum to 100% due to rounding.

Releases by Industry

The metal mining sector accounted for 50% of releases (1.95 billion pounds), which were primarily in the form of on-site land disposal.

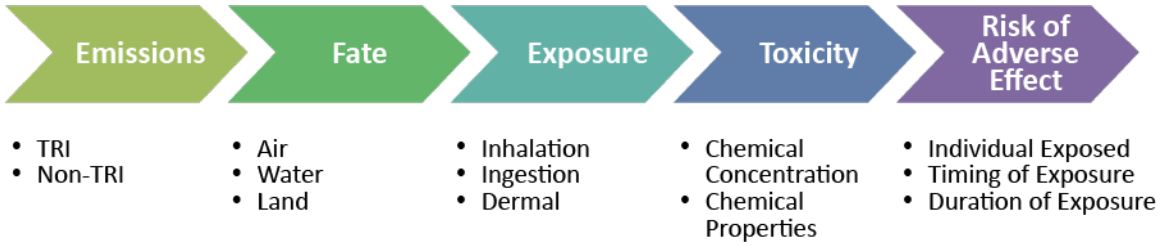


Hazard and Potential Risk of TRI Chemicals

Among other information, the Toxics Release Inventory (TRI) Program provides data about environmental releases of TRI chemicals from industrial facilities throughout the United States, measured in pounds. Pounds of releases, however, is not an indicator of health risks posed by the chemicals, as described in EPA's Factors to Consider When Using Toxics Release Inventory Data. Although TRI data generally cannot indicate to what extent individuals have been exposed to chemicals, TRI can be used as a starting point to evaluate exposure and potential risks TRI chemicals pose to human health and the environment.

The human health risks resulting from exposure to chemicals are determined by many factors, as shown in the figure below. TRI contains some of this information, including what chemicals are released from industrial facilities; the amount of each chemical released; and the amounts released to air, water, and land.

Overview of Factors that Influence Risk



It is important to keep in mind that while TRI includes information on many chemicals used by industry, it does not cover all facilities, all chemicals, or all sources of TRI chemicals in communities. For example, potential sources of exposure to chemicals not tracked by TRI include exhaust from cars and trucks, chemicals in consumer products, and chemical residues in food and water.

To provide information on the potential hazard and risk posed by disposal or other releases of TRI chemicals, the TRI Program uses EPA's Risk-Screening Environmental Indicators (RSEI) model. RSEI is a screening-level model that uses simplifying assumptions to fill data gaps and reduce the complexity of calculations to quickly evaluate large amounts of data. RSEI includes TRI data for on-site releases to air and water, transfers to Publicly Owned

Helpful Concepts

The *hazard* of a toxic chemical is its ability to cause an adverse health effect(s) (e.g., cancer, birth defects). *Toxicity* is a way to measure the hazard of a chemical.

The *risk* of a toxic chemical is the chance of adverse health effects occurring as a result of exposure to the chemical. Risk is a function of hazard and exposure.

Treatment Works (POTWs), and transfers for off-site incineration. RSEI does not currently model other release pathways, such as land disposal.

RSEI produces hazard estimates and unitless risk "scores," which represent relative risks to human health following chronic exposure to a TRI chemical. Each type of result can be compared to other results of the same type.

- RSEI **hazard** estimates consist of the pounds released multiplied by the chemical's toxicity weight. They do not include any exposure modeling or population estimates.
- A RSEI **risk** score is an estimate of potential risk to human health. It is a unitless value that accounts for the magnitude of the release quantity of a chemical, the fate and transport of the chemical throughout the environment, the size and locations of potentially exposed populations, and the chemical's inherent toxicity.

RSEI: Risk-Screening Environmental Indictors

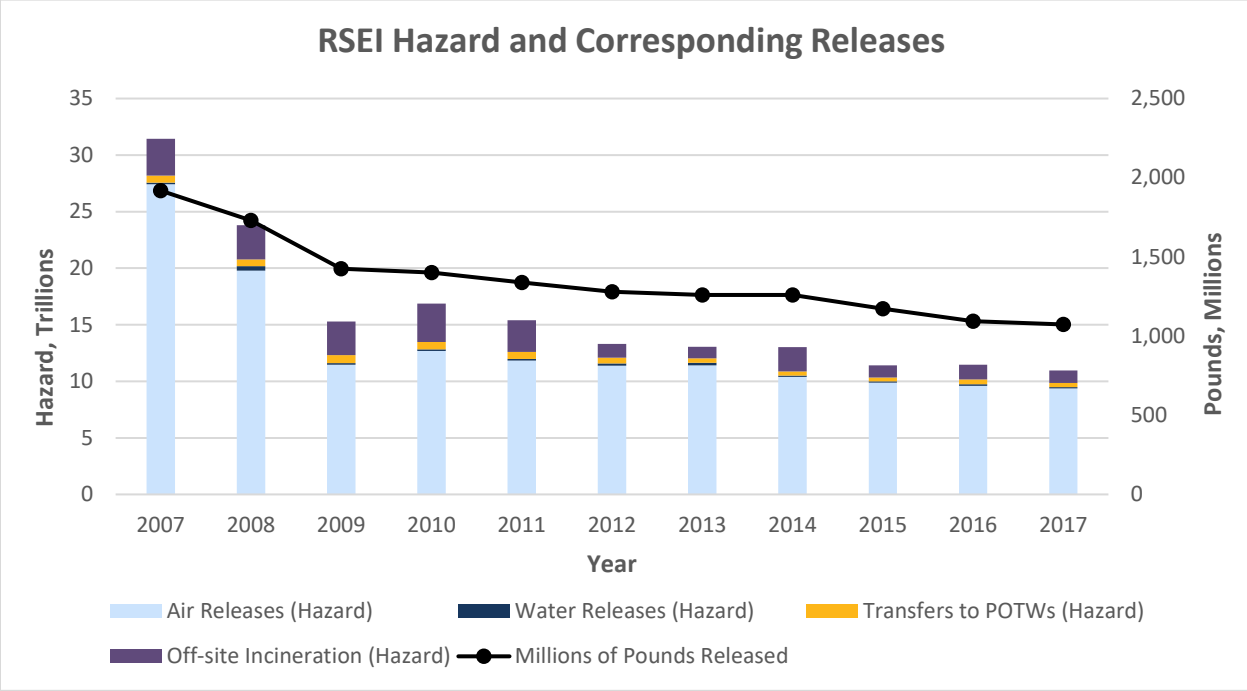
RSEI results consider more than just chemical quantities released.

- **RSEI *hazard*** results also consider:
  - Toxicity of the chemical
- **RSEI *scores*** also consider:
  - Location of releases
  - Toxicity of the chemical
  - Fate and transport
  - Human exposure pathway

Note that the RSEI model should only be used for screening-level activities such as trend analyses that compare potential relative risks from year to year, or ranking and prioritization of chemicals or industry sectors for strategic planning. RSEI does not provide a formal risk assessment, which typically requires site-specific information, more refined exposure information, and detailed population distributions.

Hazard Trend

RSEI hazard estimates provide greater insight on potential impacts of the quantities of releases of TRI chemicals than the mass quantities alone. RSEI hazard considers the amounts of chemicals released on site to air and water by TRI facilities or transferred off site to Publicly Owned Treatment Works (POTWs) or incinerators, and the toxicity of the chemicals. The following graph shows the trend in RSEI hazard compared to the trend in the corresponding pounds of TRI chemical releases.

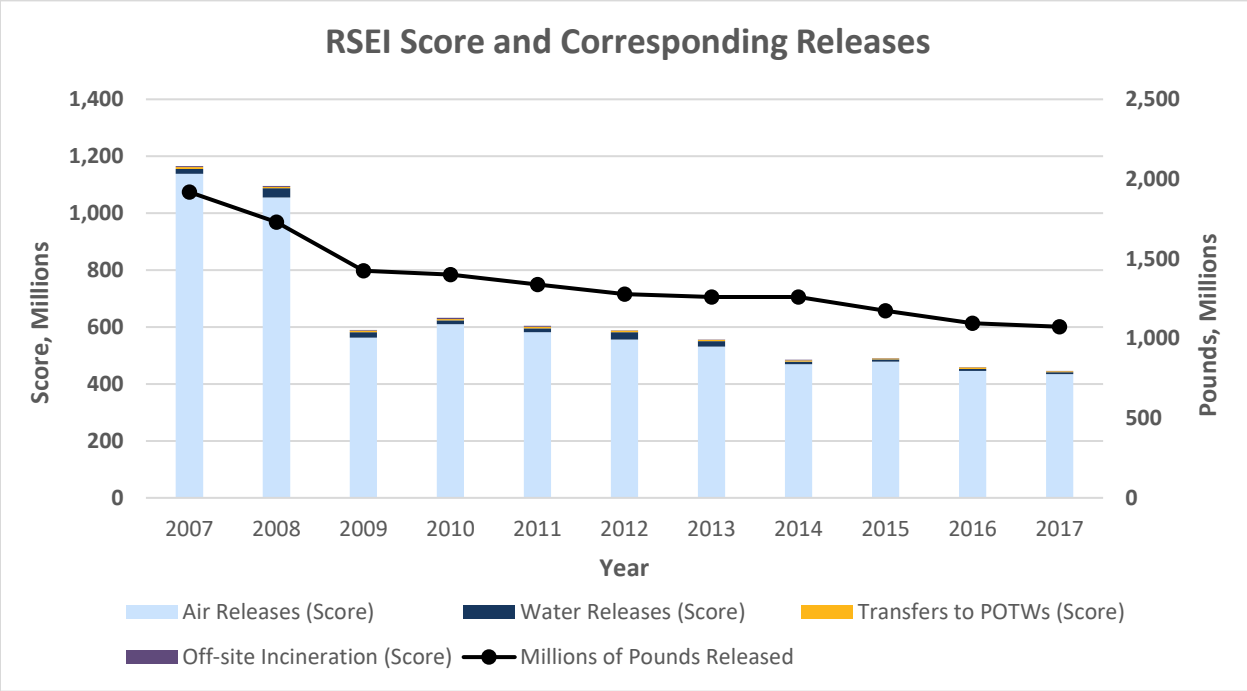


From 2007 to 2017:

- The overall RSEI hazard estimate decreased by 65%, while corresponding pounds released decreased by 44%. This indicates that the facilities that reported to TRI from 2007 through 2017 may be releasing fewer pounds of chemicals that have greater toxicities.
- The decrease in the hazard estimate from 2008 to 2009 is driven by a large decrease in chromium releases from three facilities.

Risk Trend

EPA's RSEI model also estimates risk "scores" that represent relative human health risk from chronic exposure to TRI chemicals. These risk scores can be compared to RSEI-generated risk scores from other years. RSEI scores are different from RSEI hazard estimates in that RSEI scores consider the location of the release, its fate and transport through the environment, and the route and extent of potential human exposure. The following graph shows the trend in the RSEI score compared to the trend in the corresponding pounds of TRI chemical releases.



From 2007 to 2017:

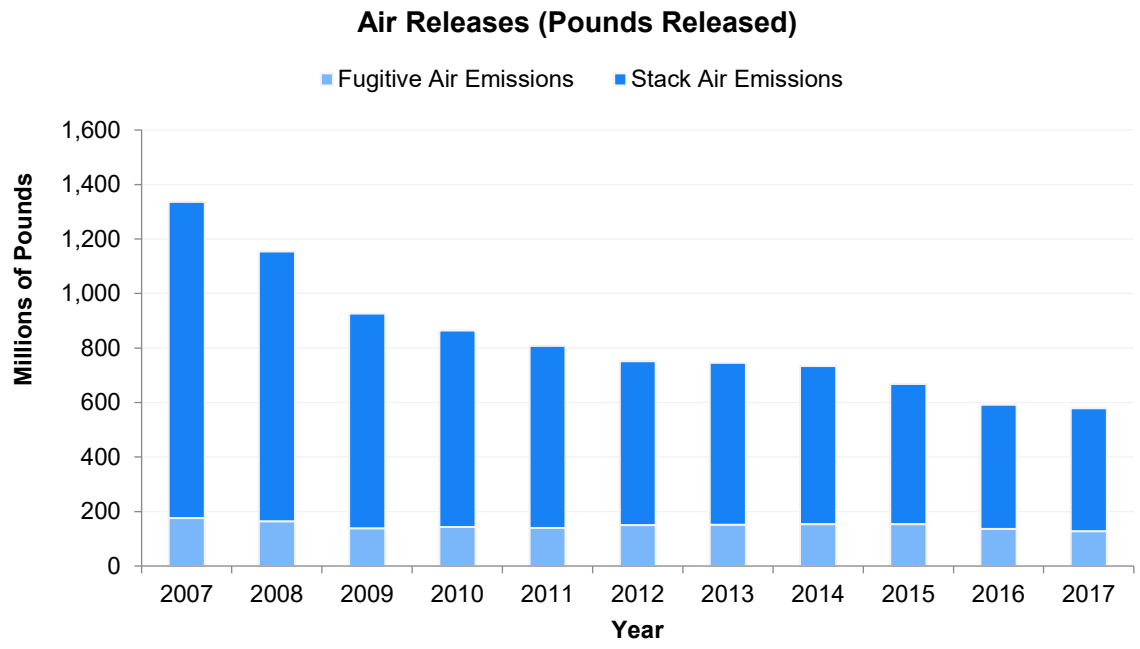
- The overall RSEI score estimate decreased by 62%, while corresponding pounds released decreased by 44%.
- Of the types of releases modeled by RSEI, air releases, by far, contribute the most to the RSEI scores.

RSEI Dashboard

- Use the EPA's Risk-Screening Environmental Indicators (RSEI) EasyRSEI dashboard to view the national trend in RSEI hazard and RSEI score, or use the Dashboard's filter capabilities to view RSEI information for a specific chemical or location of interest.

Air Releases

Air emissions reported to TRI continue to decline, serving as a primary driver of decreased total releases. Air releases include both fugitive air emissions and point source air emissions. This graph shows the trend in the pounds of chemicals released to air.



From 2007 to 2017:

- Air releases declined significantly, serving as a primary driver of decreases in total releases.
- Air releases decreased by 57% (757 million pounds).
    - Hydrochloric acid, sulfuric acid, hydrogen fluoride, methanol, toluene, and styrene were the chemicals with the greatest reductions in air releases since 2007.
    - The decrease is driven by electric utilities due to: decreased emissions of Hazardous Air Pollutants (HAPs), such as hydrochloric acid; a shift from coal to other fuel sources (e.g., natural gas); and the installation of control technologies at coal-fired power plants. Note that only those electric utilities that combust coal or oil to generate power for distribution into commerce are covered under TRI reporting requirements. Therefore, electric utilities that shift from combusting

coal or oil to entirely using other fuel sources (such as natural gas) no longer report to TRI.

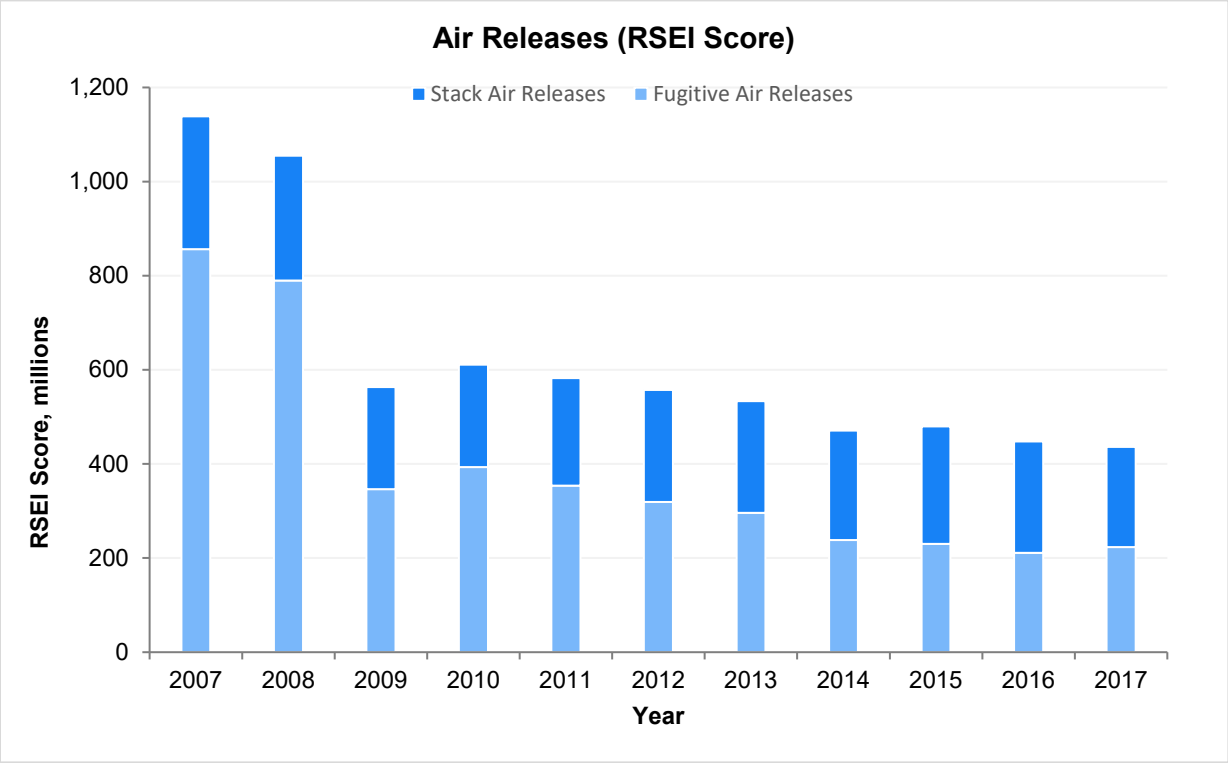
  - Electric utilities accounted for 92% of nationwide reductions in air releases of hydrochloric acid and sulfuric acid from 2007 to 2017.

- Air releases of Occupational Safety and Health Administration (OSHA) carcinogens also decreased; see the Air Releases of OSHA Carcinogens figure.
- Air releases of other chemicals of special concern, including lead and mercury, also decreased; see the Chemicals of Special Concern section.
- Air releases are often regulated by other programs as well, such as under Title V of the Clean Air Act, which requires major sources of air pollutants to obtain and comply with an operating permit.

In 2017:

- Ammonia, followed by methanol, accounted for the greatest air releases of TRI chemicals.
- Since 2016, air releases decreased by 2%.

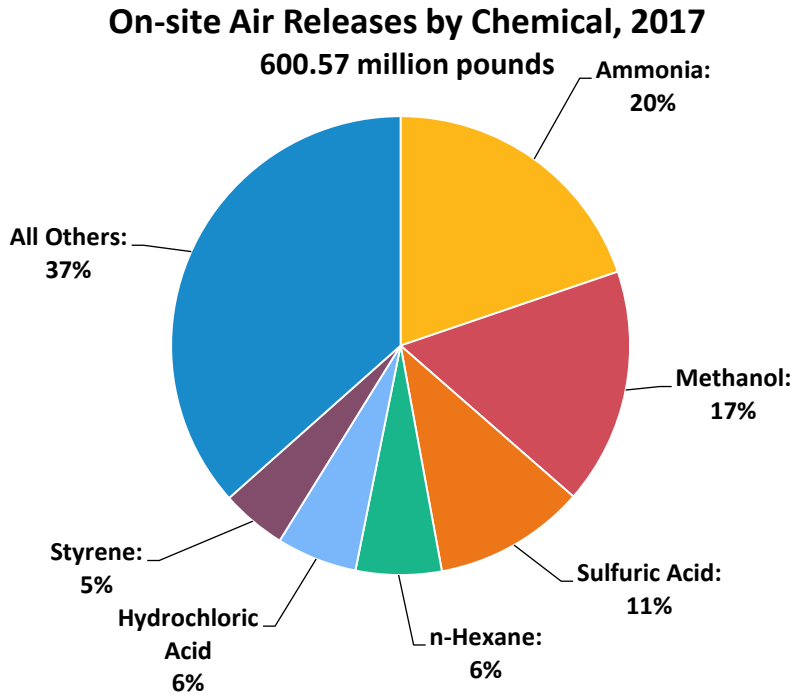
This graph shows the trend in the RSEI Score for air releases.



- The top chemicals by RSEI score for air releases were chromium and ethylene oxide.
- Stack air releases tend to contribute relatively less to the RSEI score than fugitive releases because chemicals released through stacks tend to get dispersed over a wider area than fugitive air releases, resulting in lower average concentrations.
- For a complete, step-by-step description of how RSEI models air releases and derives RSEI Scores from stack air emissions and fugitive air emissions, see "Section 5.3 Modeling Air Releases" in Chapter 5 ("Exposure and Population Modeling") of *EPA's Risk-Screening Environmental Indicators (RSEI) Methodology, RSEI Version 2.3.6.*
- For general information on how RSEI Scores are estimated, see Hazard and Potential Risk of TRI Chemicals.

Air Releases by Chemical

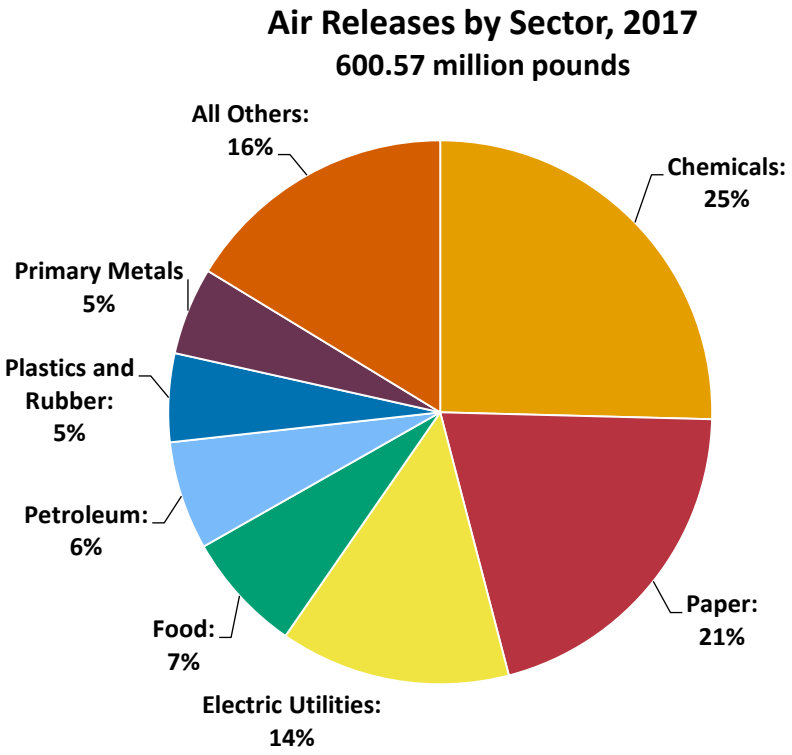
This pie chart shows which TRI chemicals were released to air in the greatest quantities during 2017.



- Facilities manufacturing nitrogen fertilizers accounted for about one third of the air releases of ammonia reported to TRI for the past five years.
- Air releases of methanol are primarily from pulp, paper, and paperboard mills and have decreased by 24% since 2007.
- Thirty-four percent of hydrochloric acid and 79% of sulfuric acid emissions result from generating electricity from combustion of coal and oil. Air releases of these two chemicals reported to TRI have decreased consistently since 2007. One reason for the decrease in air releases of these chemicals is the increase in the use of natural gas as a fuel for electricity generation. Natural gas power plants are not required to report to TRI.

Air Releases by Industry

This pie chart shows the TRI-covered industry sectors that reported the greatest releases of TRI chemicals to air during 2017.

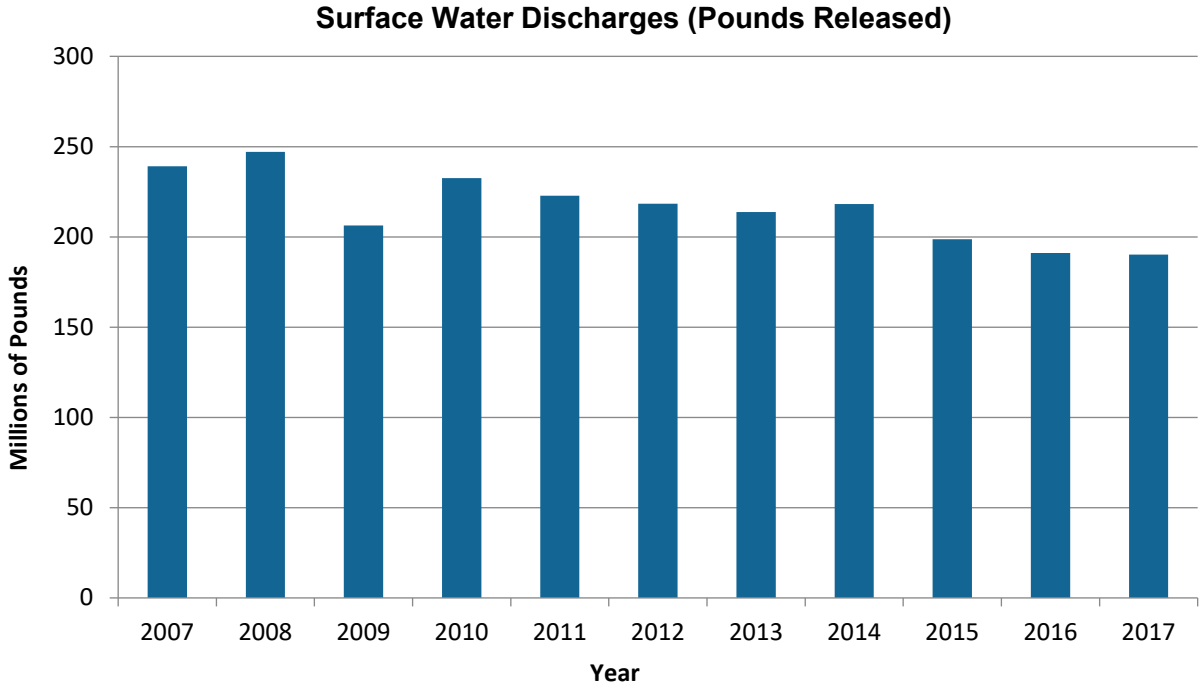


Note: Percentages may not sum to 100% due to rounding.

- Chemical manufacturing, paper manufacturing, and the electric utility sectors accounted for the greatest releases to air in 2017. Air releases in these three industries have decreased since 2016:
    - Chemicals: 4% decrease (7.1 million pounds)
    - Paper: 2% decrease (2.5 million pounds)
    - Electric utilities: 5% decrease (4.4 million pounds)

Water Releases

Facilities are required to report the quantity of Toxics Release Inventory (TRI) chemicals they release to receiving streams or other water bodies. The following graph shows the trend in the pounds of chemicals released to water bodies as reported to TRI.



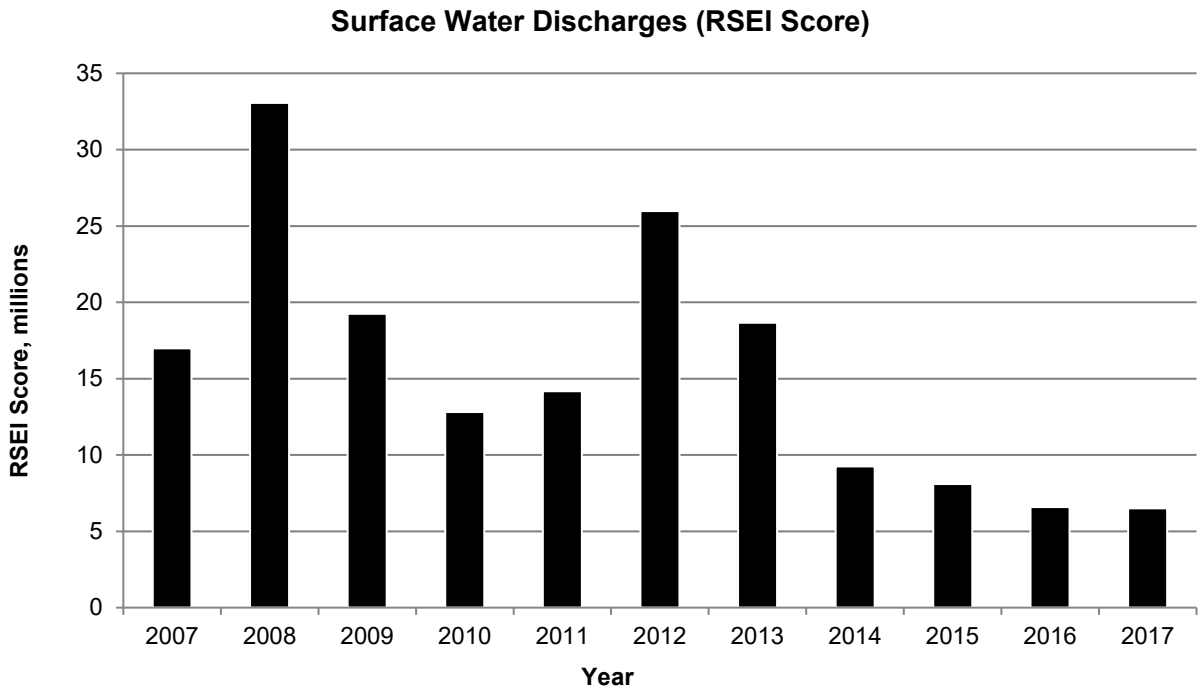
From 2007 to 2017:

- Surface water discharges decreased by 20% (49 million pounds). Most of this decline is due to reduction in releases of nitrate compounds to water, which decreased by 21% (44 million pounds).
    - Nitrate compounds are often formed as byproducts during wastewater treatment processes such as when nitric acid is neutralized, or when nitrification takes place to meet standards under EPA's effluent guidelines. Nitrate compounds are released to water in quantities that are larger than any other TRI chemical released to water.
- Surface water discharges are often regulated by other programs and require permits such as the Clean Water Act National Pollutant Discharge Elimination System (NPDES) permits.

In 2017:

- Nitrate compounds alone accounted for 90% of the total quantity of all TRI chemicals discharged to surface waters.

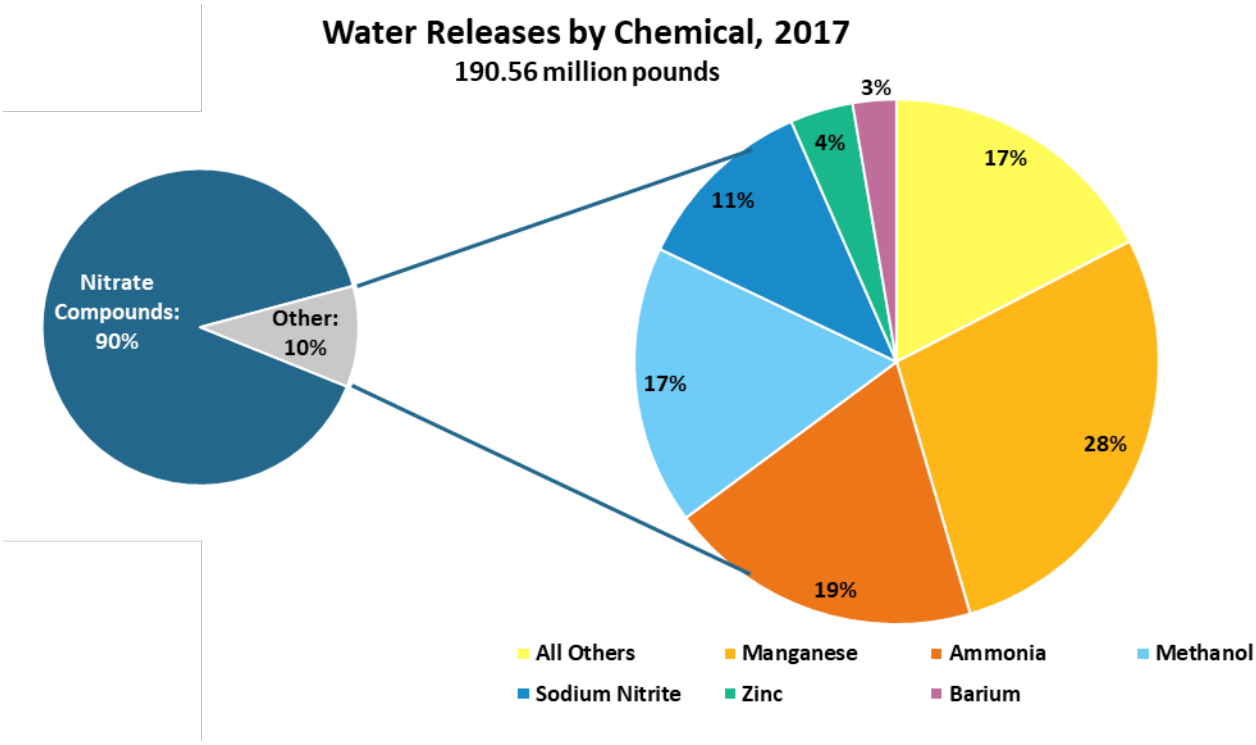
The following graph shows the trend in the RSEI Scores for chemicals released to water bodies as reported to TRI.



- The biggest contributor to RSEI water scores is arsenic compounds.
- The high RSEI score for water discharges in 2008 includes a large one-time release of arsenic compounds due to a coal fly ash slurry spill, and a release of benzidine, which has a relatively high toxicity.
- For a complete, step-by-step description of how RSEI derives RSEI Scores from surface water discharges of TRI chemicals see "Section 5.4 Modeling Surface Water Releases" in Chapter 5 ("Exposure and Population Modeling") of *EPA's Risk-Screening Environmental Indicators (RSEI) Methodology, RSEI Version 2.3.6.*
- For general information on how RSEI Scores are estimated, see Hazard and Potential Risk of TRI Chemicals.

Water Releases by Chemical

This pie chart shows which TRI-listed chemicals were released to water bodies in the greatest quantities during 2017.



Note: In this chart, metals are combined with their metal compounds, although metals and compounds of the same metal are usually listed separately on the TRI list (e.g. lead is listed separately from lead compounds).

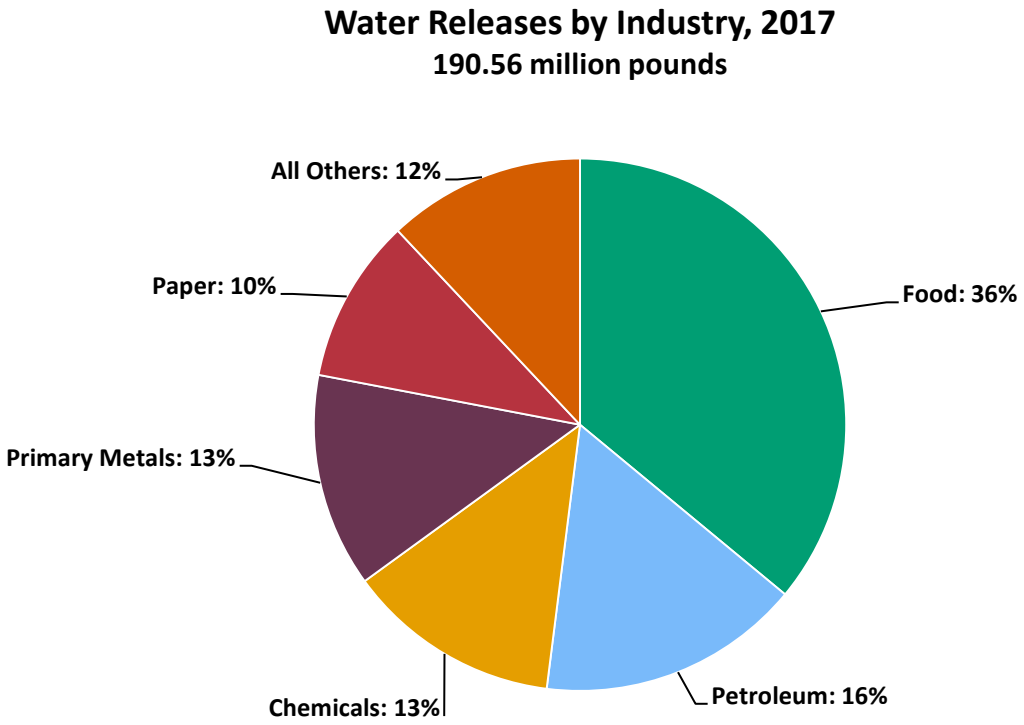
Note: Percentages may not sum to 100% due to rounding.

- Nitrate compounds accounted for 90% of the total quantities of TRI chemicals released to water in 2017. Nitrate compounds are soluble in water and commonly formed as part of facilities' on-site wastewater treatment processes. The food manufacturing sector contributed 40% of total nitrate compound releases to water, due to the treatment required for large quantities of biological materials in wastewaters from meat processing facilities.
    - While nitrate compounds are less toxic to humans than many other TRI chemicals, in nitrogen-limited waters, nitrates have the potential to cause increased algal growth leading to eutrophication in the aquatic environment. See EPA's Nutrient Pollution webpage for more information about the issue of eutrophication.

- Manganese and manganese compounds, ammonia, and methanol are the next most commonly released chemicals, and, in terms of combined mass quantities, account for 7% of releases to water.

Water Releases by Industry

This pie chart shows the TRI-covered industry sectors that reported the greatest releases of TRI chemicals to water bodies during 2017.



- The food manufacturing sector accounted for 36% of the total quantities of TRI chemicals released to water during 2017, which is similar to its contribution over the past 10 years.
- Nitrate compounds accounted for 99% of the total quantities of TRI chemicals released to water from the food manufacturing sector. Nitrate compounds are relatively less toxic to humans than many other TRI chemicals discharged to surface waters but are formed in large quantities by this sector during wastewater treatment processes due to the high biological content of wastewater.
- Surface water discharges are often regulated by other EPA programs, such as the program established under the Clean Water Act that issues National Pollutant Discharge Elimination System (NPDES) permits.

Wastewater Treatment Methods

In 2017, one-third of TRI facilities reported that their operations generated wastewater. Importantly, facilities treat their wastewater prior to discharging it into nearby waterways or sending it to publicly owned treatment works (POTWs) where further treatment occurs. The treatment techniques they use are designed to reduce the concentration of chemicals in the wastewater and can even eliminate chemicals in discharges altogether. Facilities reporting to TRI are required to provide details on the types of treatment techniques they use and to also estimate the removal or destruction efficiency of treatment.

In 2017:

- Eighteen different types of physical, chemical, and biological treatment methods were reported, with two-thirds of facilities reporting they used multiple treatment methods (up to 11) for the same waste stream.
- The most common wastewater treatment methods were:
    - physical separation techniques (settling or clarification and phase separation), which remove both solids and TRI chemicals from the wastewater;

- chemical treatment such as neutralization, which alters extreme pH values, rendering the wastewater less acidic or alkaline and thus less damaging to the ecosystems of receiving waters and biological treatment systems at POTWs; and
- biological treatment, during which bacteria are used to digest and break down organic chemicals.

The types and efficacy of wastewater treatment methods used by each industry sector differ according to the chemicals and other pollutants in the wastewater. For example, neutralization was the most prevalent type of treatment in the Food Processing sector, likely due to operations that involve neutralizing the acids (e.g., nitric acid) used for cleaning and sanitation. In contrast, wastewater from Petroleum Refining is more often subject to phase separation and air or steam stripping, two processes that involve physically separating chemicals and other pollutants from the wastewaters generated during removal of water from crude petroleum.

Land Disposal

This graph shows the trend in the pounds of chemicals reported to TRI as disposed of to land. The metal mining sector accounts for most of the TRI chemical quantities disposed of to land.

From 2007 to 2017:

- On-site land disposal increased by 35% (from 2.0 to 2.7 billion pounds).
- Recent fluctuations are primarily due to changes in TRI chemical quantities disposed of to land on site by metal mines.
- "All Other land disposal" in the figure includes disposal: in landfills and surface impoundments that are not regulated under RCRA Subtitle C; to soil (land

treatment/application farming); and any other land disposal. Most of the TRI chemical quantities reported as "other land disposal" are from the disposal of waste rock at metal mines.

- Disposal to land is often regulated by other programs such as the Resource Conservation and Recovery Act (RCRA).

In 2017:

- Land disposal trends are largely driven by the metal mining sector, which accounted for 72% of land disposal quantities. Select the "Land Disposal, Excluding Metal Mining" button to view the land disposal trend with metal mines excluded from the analysis.
    - Most of these quantities were made up of either lead and lead compounds (35%) or zinc and zinc compounds (23%).

Helpful Concepts

What is underground injection?

Underground injection involves placing fluids underground in porous formations through wells.

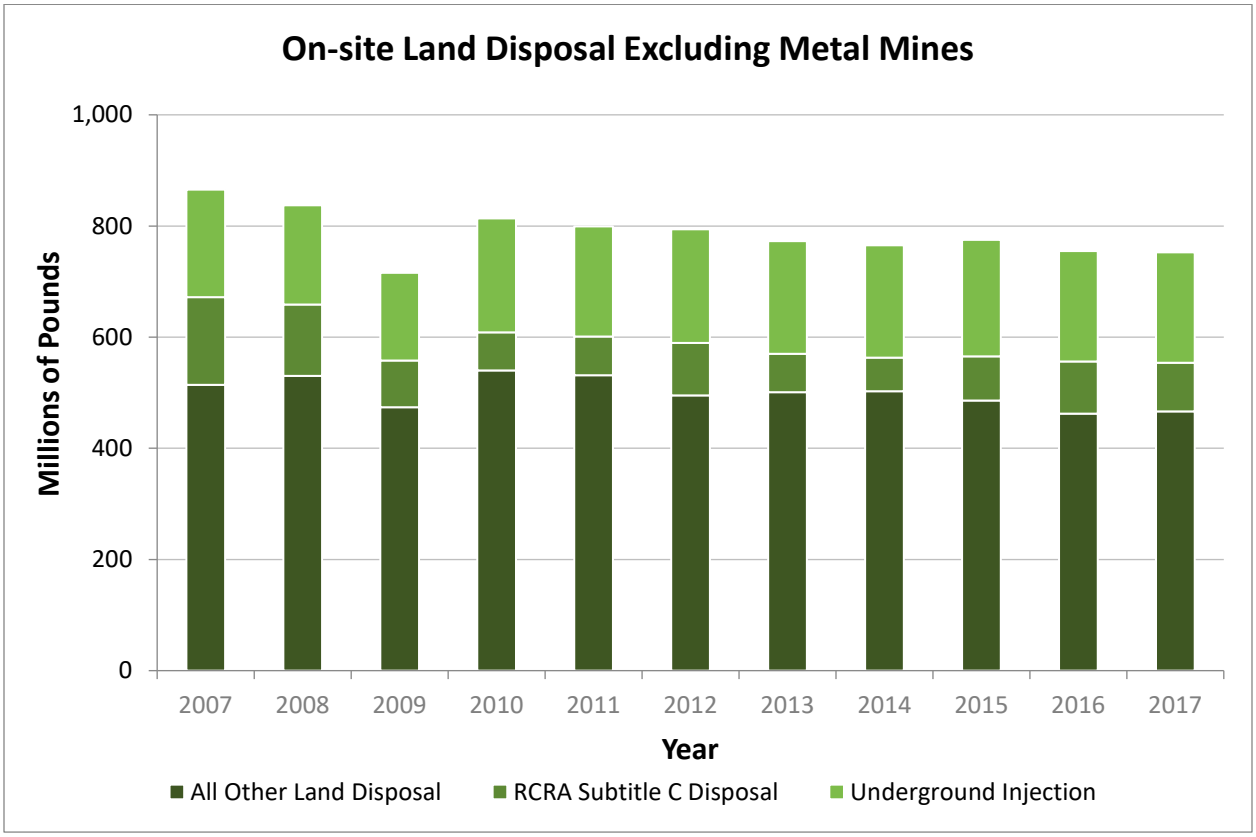
What is RCRA Subtitle C disposal?

The RCRA Subtitle C Disposal category in TRI includes disposal to landfills and surface impoundments authorized to accept hazardous waste under the Recourse Conservation and Recovery Act (RCRA). RCRA design standards include a double liner, a leachate collection and removal system, and a leak detection system. Operators must also comply with RCRA inspection, monitoring, and release response requirements.

Metal mining facilities typically handle large volumes of material. In this sector, even a small change in the chemical composition of the mineral deposit being mined can lead to big changes in the amount of TRI-listed chemicals reported. In recent years mines have cited changes in production of waste rock, changes in the chemical composition of waste rock, and the closure of a heap leach pad as the primary reasons for the reported variability in land disposal of TRI chemicals. Changes in waste rock composition can have an especially pronounced effect on TRI reporting because of a regulatory exemption that applies based on a chemical's concentration in the rock, regardless of total chemical quantities generated.

Regulations require that waste rock, which contains contaminants, be placed in engineered piles, and may also require that waste rock piles, tailings impoundments, and heap leach pads be stabilized and re-vegetated to provide for productive post-mining land use.

For more information on the mining industry, see the Metal Mining sector profile.



From 2007 to 2017:

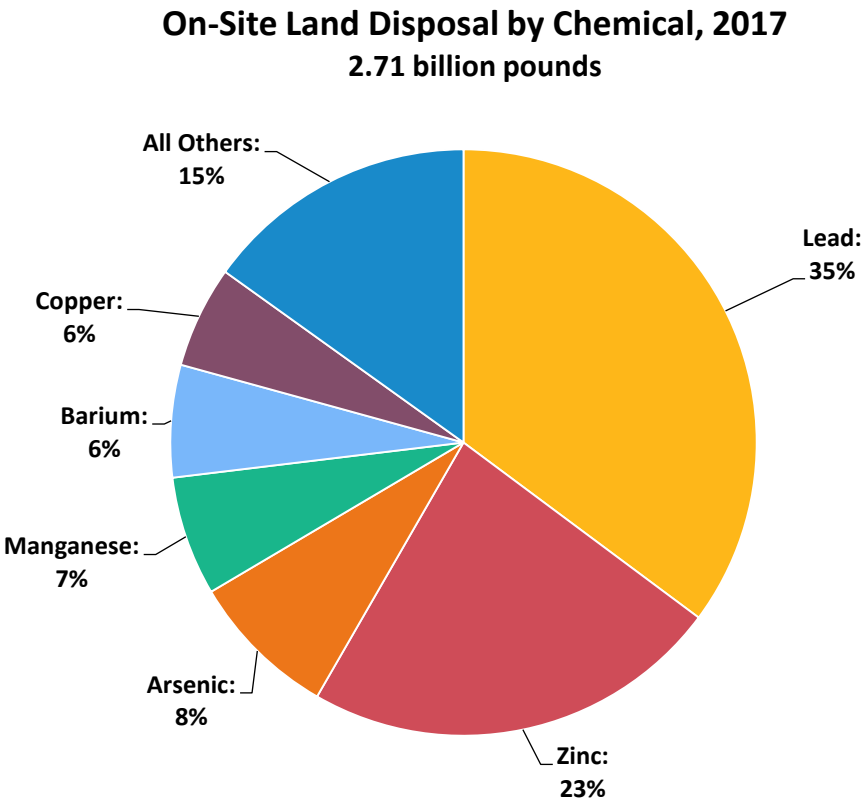
- Total on-site land disposal for all industries other than metal mining decreased by 13%.

In 2017:

- Excluding releases reported by metal mines, the chemicals disposed of to land in the largest quantities are: barium and barium compounds (18%), manganese and manganese compounds (13%), and zinc and zinc compounds (11%).
- While disposal to land has decreased in many sectors, the metal mining sector drives overall land disposal trends. See the graphic Land Disposal by Industry for more information.

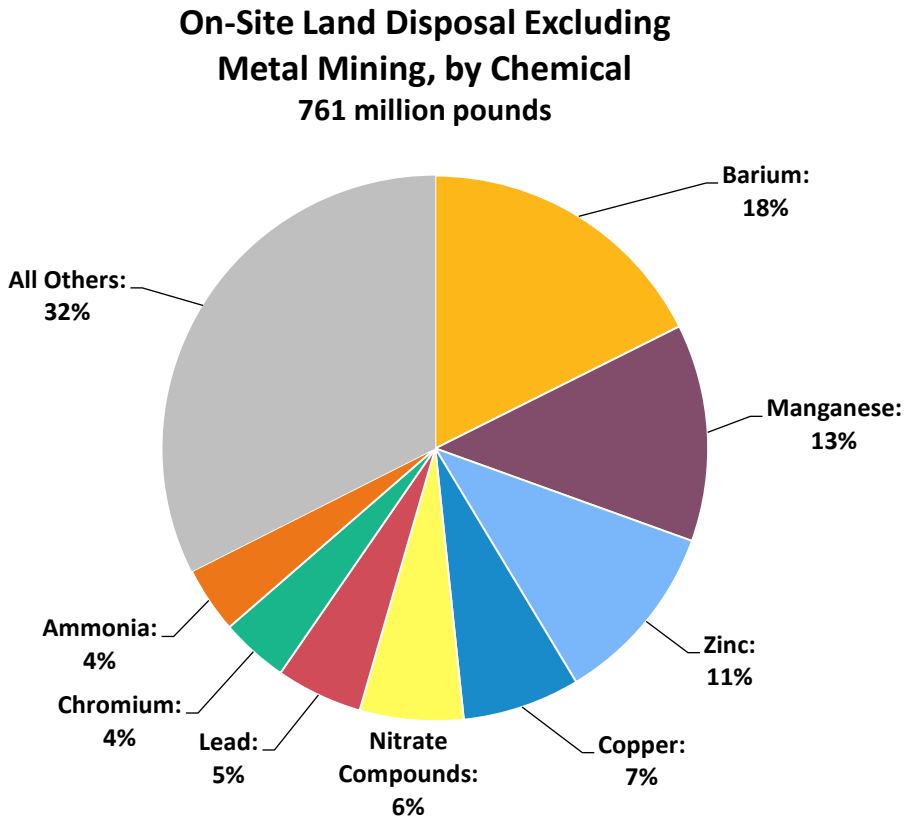
Land Disposal by Chemical

This pie chart shows the chemicals disposed of to land on site in the greatest quantities during 2017.



Note: In this chart, metals are combined with their metal compounds, although metals and compounds of the same metal are usually listed separately on the TRI list (e.g. lead is listed separately from lead compounds).

The metal mining sector alone was responsible for 87% of the total quantities of zinc and 96% of the total quantities of lead disposed of to land in 2017. Annual fluctuations occur in land disposal quantities reported by metal mines because even a small change in the chemical composition of the mineral deposit being mined can lead to big changes in the amount of TRI-listed chemicals reported nationally.



Note: In this chart, metals are combined with their metal compounds, although metals and compounds of the same metal are usually listed separately on the TRI list (e.g. lead is listed separately from lead compounds).

From 2007 to 2017:

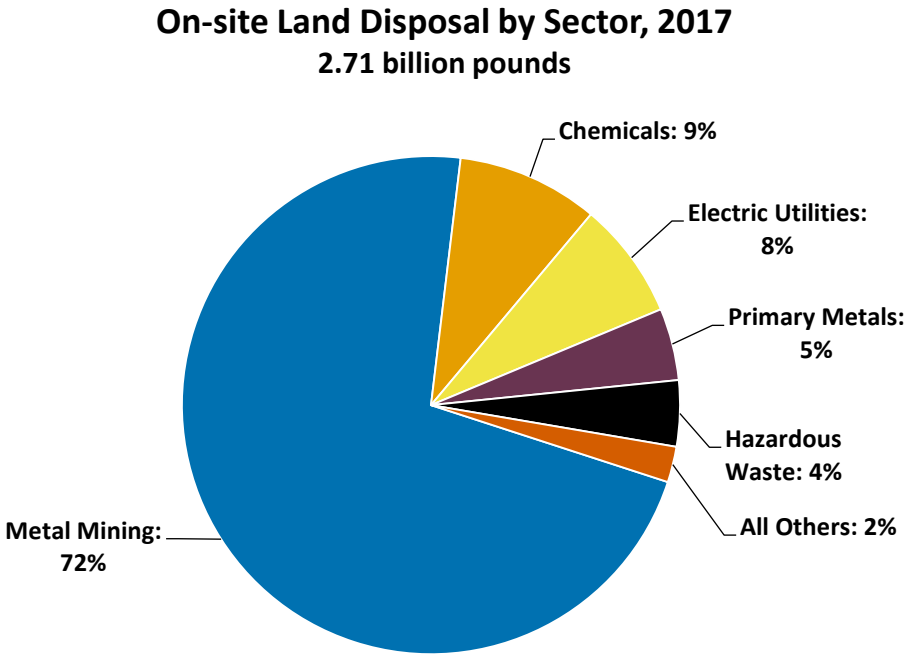
- Barium: Releases decreased 28%.
- Manganese: Releases decreased 5%.
- Zinc: Releases decreased 10%.

In 2017:

- When the metal mining sector is excluded, a wider variety of chemicals contribute to most of the land releases. Excluding metal mining, eight different chemicals comprised 68% of land releases, as opposed to three chemicals comprising a comparable 66% of releases when mining is included.

Land Disposal by Industry

This pie chart shows the TRI-covered industry sectors that reported the greatest quantities of TRI chemicals disposed of to land on site during 2017.



- The metal mining sector accounted for most of the TRI chemicals disposed of to land in 2017, mostly due to chemicals contained in waste rock.
- The relative contribution by each industry sector to on-site land disposal has not changed considerably in recent years.

Chemicals of Special Concern

In this section, we take a closer look at some Toxics Release Inventory (TRI) chemicals that are of special concern: 1) persistent, bioaccumulative, and toxic (PBT) chemicals; and 2) known or suspected human carcinogens.

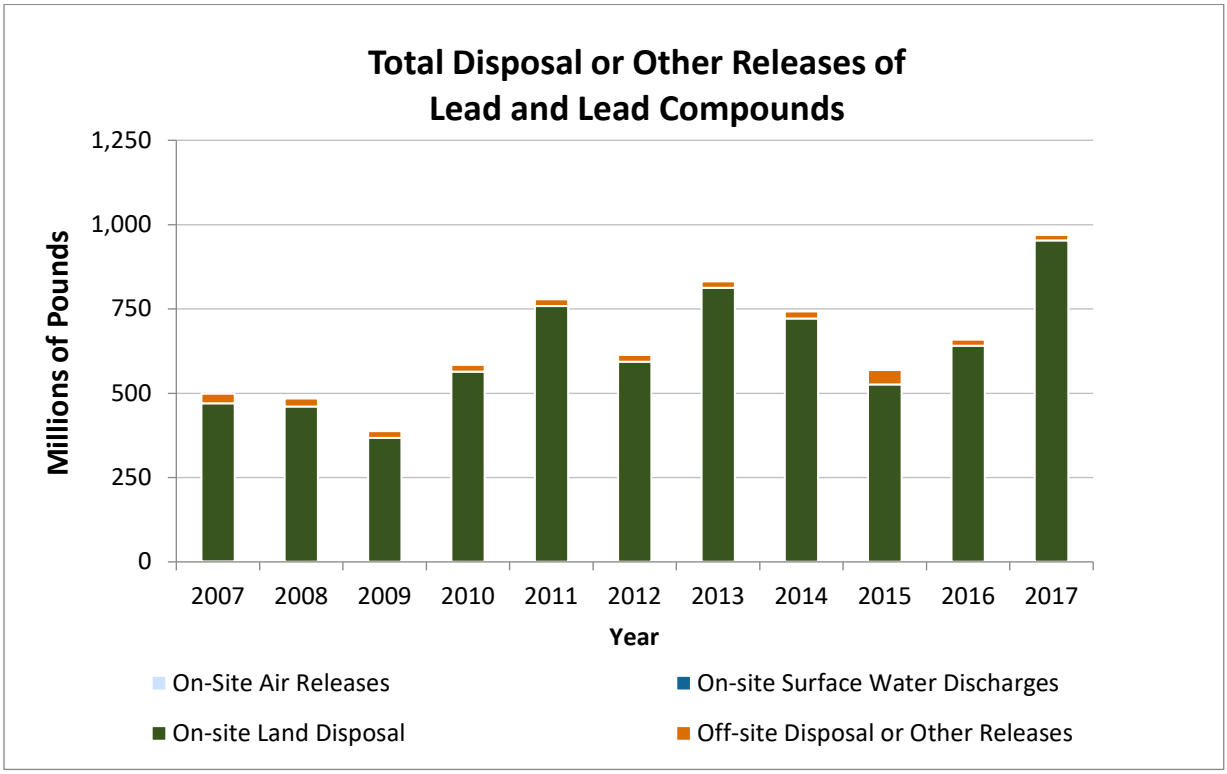
Chemicals designated as PBTs are toxic and remain in the environment for a long time where they tend to build up in the tissue of organisms throughout the food web. These organisms serve as food sources for other organisms, including humans, that are sensitive to the toxic effects of PBT chemicals.

Reporting requirements for the 16 chemicals and 5 chemical categories designated as PBTs on the TRI chemical list for Reporting Year 2017 are more stringent than for other TRI chemicals. This section focuses on the following PBT chemicals: lead and lead compounds; mercury and mercury compounds; and dioxin and dioxin-like compounds.

There are also chemicals included on the TRI chemical list that the Occupational Safety and Health Administration (OSHA) includes on its list of carcinogens. These chemicals also have different TRI reporting requirements. This section presents the trend in air emissions for the OSHA carcinogens reported to TRI. A list of these chemicals can be found on the TRI basis of OSHA carcinogens webpage.

Lead Releases Trend

This graph shows the trend in the pounds of lead and lead compounds disposed of or otherwise released by TRI reporting facilities including manufacturing facilities, metal mines, electric utilities, and hazardous waste treatment and disposal facilities.



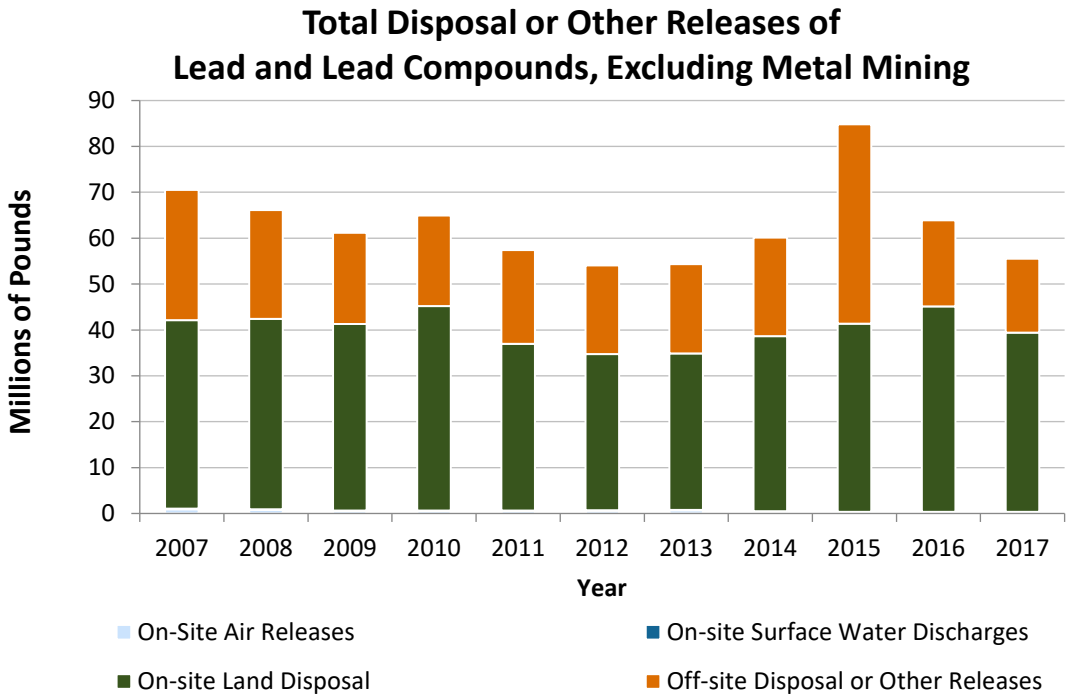
From 2007 to 2017:

- Releases of lead and lead compounds rose and fell between 2007 and 2017, with an overall increase of 94%.
- The metal mining sector accounts for most of the lead and lead compounds disposed of on site to land, driving the overall trend. For 2017, for example, metal mines reported 94% of total lead and lead compound releases.

From 2016 to 2017:

- Total releases of lead and lead compounds increased by 47% (310 million pounds).

This graph shows the trend in lead and lead compounds disposed of or otherwise released, but excludes quantities reported by the metal mining sector.

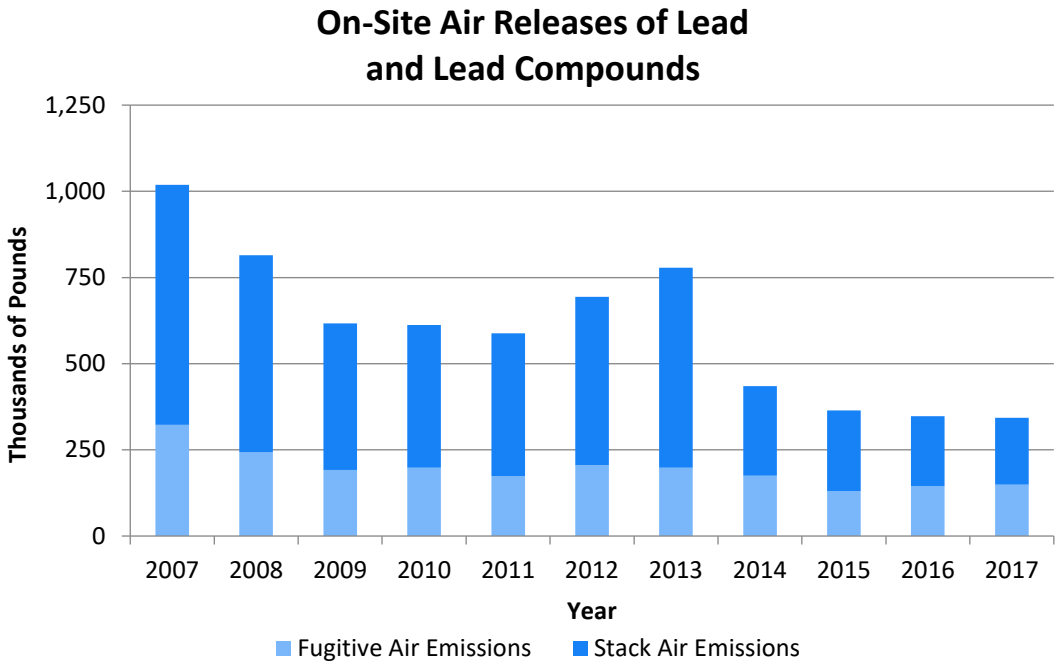


From 2007 to 2017:

- Metal mining accounts for the majority of lead and lead compounds disposed of to land.
- Releases of lead and lead compounds have decreased by 13% (8.4 million pounds) among the other sectors. The increase in 2015 was primarily due to one hazardous waste management facility that reported releases of 24.9 million pounds of lead compounds, compared to less than 0.5 million pounds for 2014 and 2016.

Lead Air Releases Trend

This graph shows the trend in the pounds of lead and lead compounds released to air.



From 2007 to 2017:

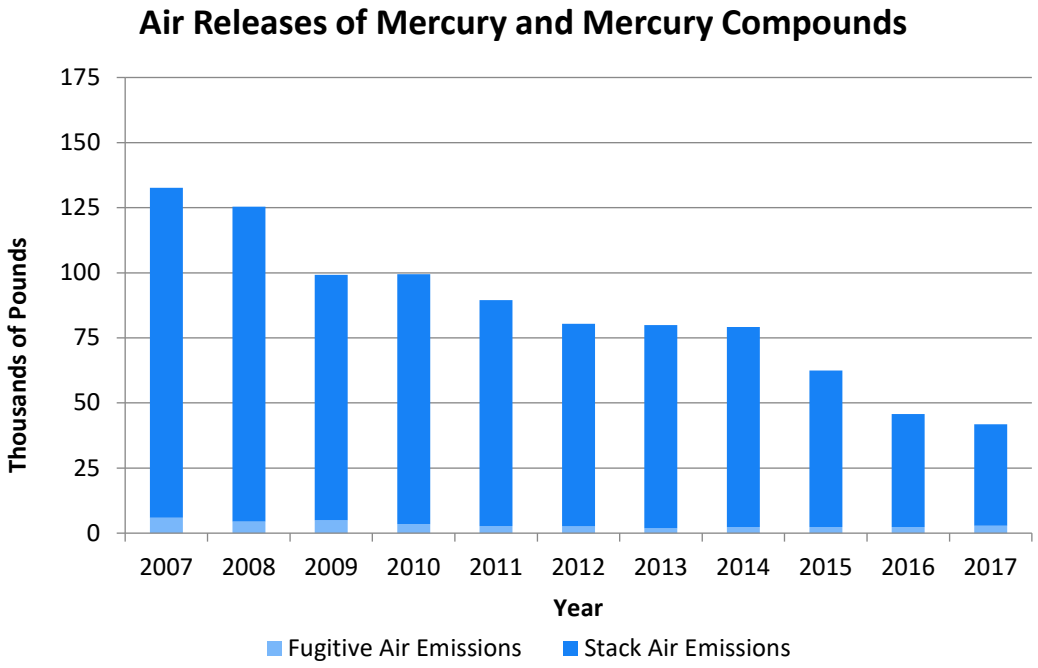
- Air releases of lead and lead compounds decreased by 66%. The primary metals and electric utilities industry sectors have driven this decrease.
- The primary metals sector, which includes iron and steel manufacturers and smelting operations, reported the greatest quantities of releases of lead and lead compounds to air.

From 2016 to 2017:

- Air releases of lead and lead compounds decreased by 1%.
- In 2017, 30% of air releases of lead were from the primary metals industry sector.

Mercury Air Releases Trend

This graph shows the trend in the pounds of mercury and mercury compounds released to air by TRI reporting facilities.



From 2007 to 2017:

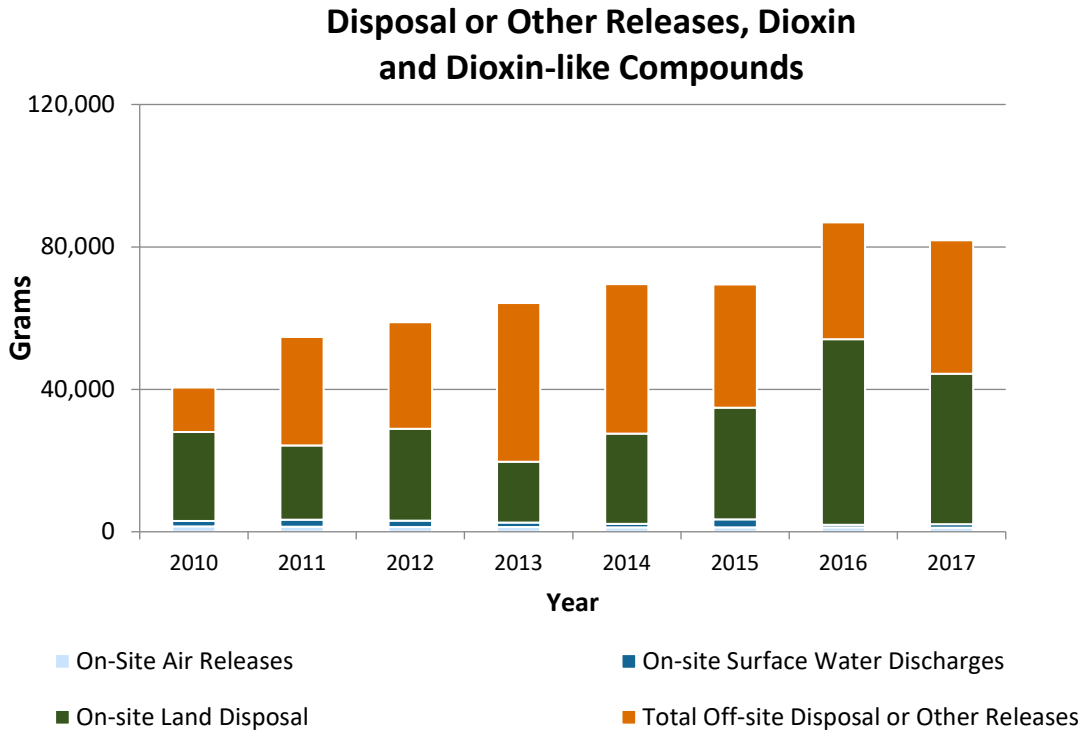
- Releases of mercury and mercury compounds to air decreased by 68%.
- Electric utilities are driving the decline in mercury air emissions, with an 89% reduction (83,000 pounds).

From 2016 to 2017:

- Air releases of mercury and mercury compounds decreased by 9%.
- The primary metals sector, which includes iron and steel manufacturers and smelting operations, accounted for 34% of the air emissions of mercury and mercury compounds reported to TRI for 2017.

Dioxin and Dioxin-like Compound Releases Trend

This graph shows the trend in the grams of dioxin and dioxin-like compounds disposed of or otherwise released by TRI-reporting facilities from 2010 to 2017.



Dioxin and dioxin-like compounds ("dioxins") are persistent, bioaccumulative, and toxic chemicals (PBTs) characterized by EPA as probable human carcinogens. Dioxins are the byproducts of many forms of combustion and several industrial chemical processes.

From 2010 to 2017:

- Since 2010, dioxin releases increased by 102%.
    - This increase in dioxin releases is largely driven by increased on-site land disposal from a non-ferrous metal smelting and refining facility.

From 2016 to 2017:

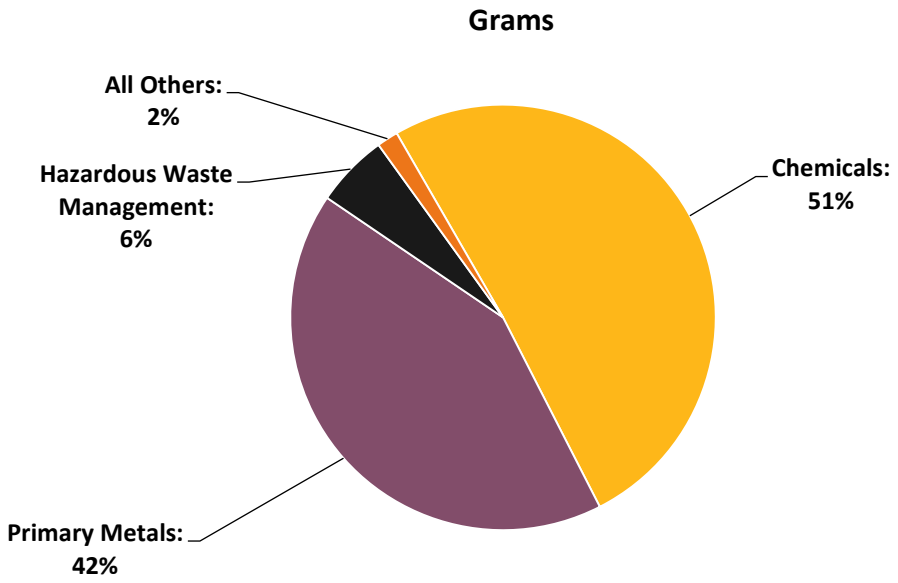
- Releases of dioxins decreased by 6%.
- In 2017, most (52%) of the quantity released was disposed on site to land.

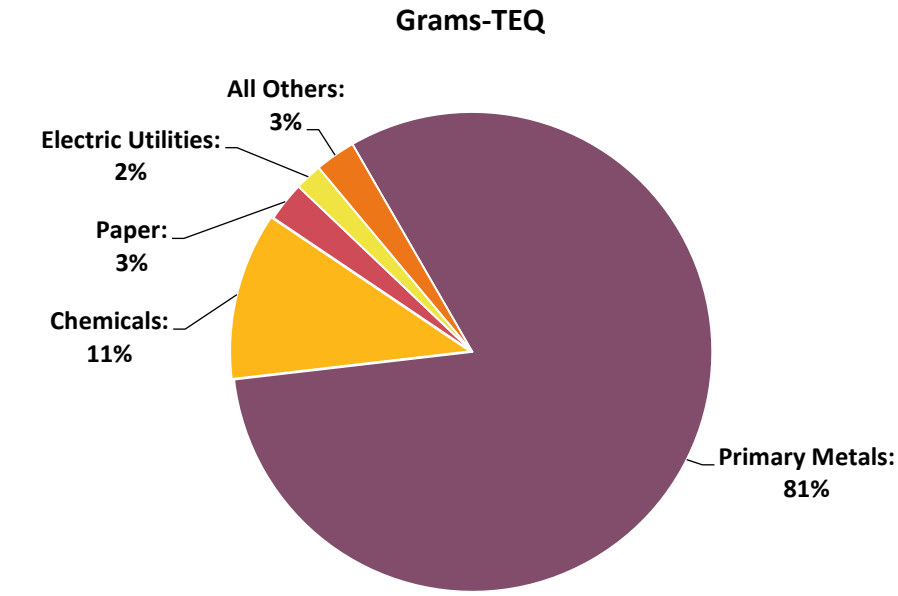
Dioxins Releases by Industry

TRI also requires facilities to report data on 17 types, or congeners, of dioxin. These congeners have a wide range of toxic potencies. The mix of dioxins from one source can have a very different level of toxicity than the same total amount, but different mix, from another source. These varying toxic potencies can be taken into account using Toxic Equivalency Factors (TEFs), which are based on each congener's toxic potency. EPA multiplies the total grams of each congener reported by facilities by the associated TEF to obtain a toxicity weight and sums all congeners for a total of grams in toxicity equivalents (grams-TEQ). Analyzing dioxins in grams-TEQ is useful when comparing disposal or other releases of dioxin from different sources or different time periods, where the mix of congeners may vary.

The following two pie charts show: 1) the TRI-covered industry sectors that reported the greatest releases of dioxin and dioxin-like compounds in *grams*, compared to 2) the industry sectors that reported the greatest releases of grams in toxicity equivalents (*grams-TEQ*). Note that only those TRI reports that included the congener detail for calculating grams-TEQ are included in these charts.

Releases of Dioxin and Dioxin-like Compounds by Industry, 2017



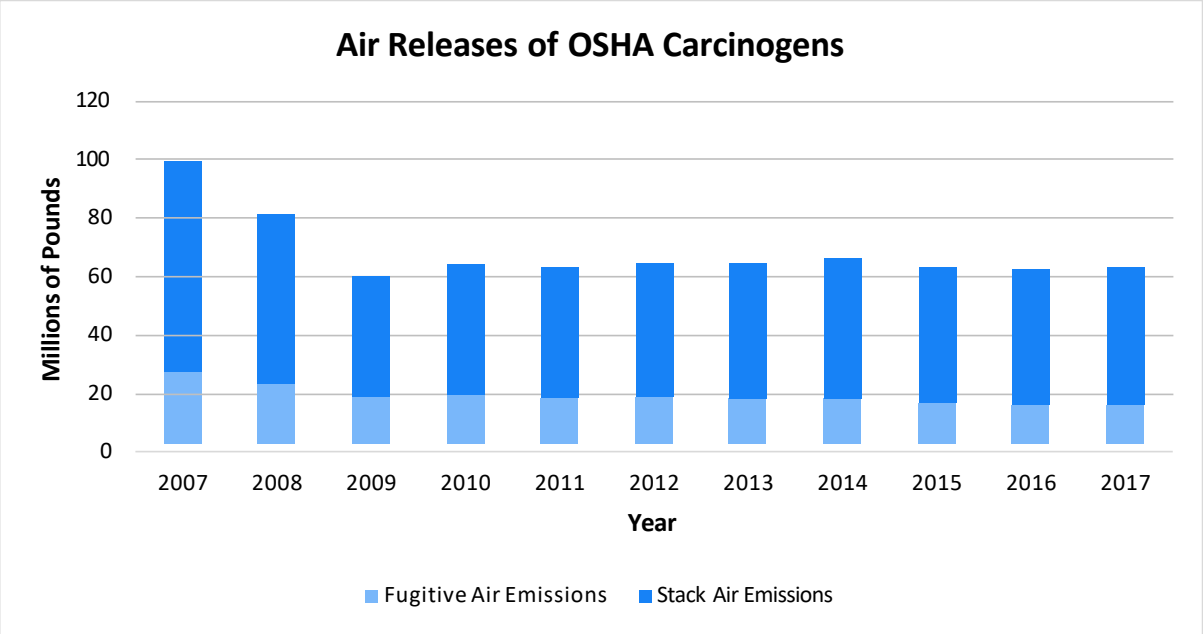


Note: Percentages may not sum to 100% due to rounding.

- Various industry sectors may dispose of or otherwise release very different mixes of dioxin congeners.
- The chemical manufacturing industry accounted for 51% and the primary metals sector for 42% of total grams of dioxins released.
- However, when TEFs are applied, the primary metals sector accounted for 81% and the chemical manufacturing sector for just 11% of the total grams-TEQ released.

Occupational Safety and Health Administration (OSHA) Carcinogens Air Releases

Among the chemicals that are reportable to the TRI Program, some are also included on OSHA's list of carcinogens. EPA refers to these chemicals as TRI OSHA carcinogens. This graph shows the trend in the pounds of TRI chemicals that are OSHA carcinogens released to air.

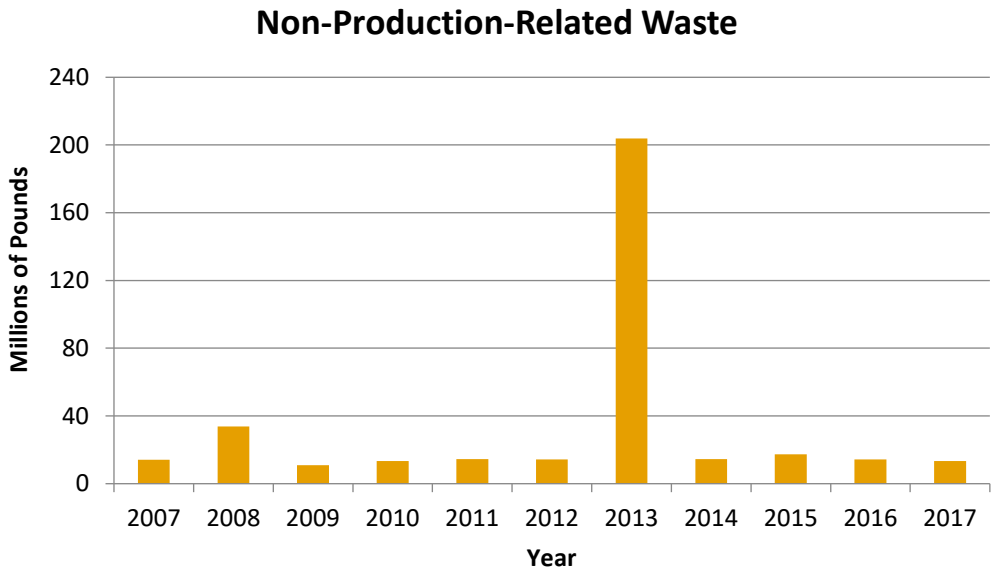


From 2007 to 2017:

- Air releases of these carcinogens decreased by 37%.
- The long-term decreases in air releases of OSHA carcinogens were driven mainly by decreases in releases of styrene to air from the plastics and rubber and transportation equipment industries.
- In 2017, air releases of OSHA carcinogens consisted primarily of styrene (43% of the air releases of all OSHA carcinogens), acetaldehyde (13%) and formaldehyde (8%).

Non-Production-Related Waste

Non-production-related waste refers to quantities of Toxics Release Inventory (TRI) chemicals disposed of or released, or transferred off site, as the result of one-time events, rather than due to standard production activities. These events may include remedial actions, catastrophic events, or other one-time events not associated with normal production processes. Non-production-related waste is included in a facility's total disposal or other releases, but not as part of its production-related waste managed. The following graph shows the annual quantities of non-production-related waste reported to TRI.

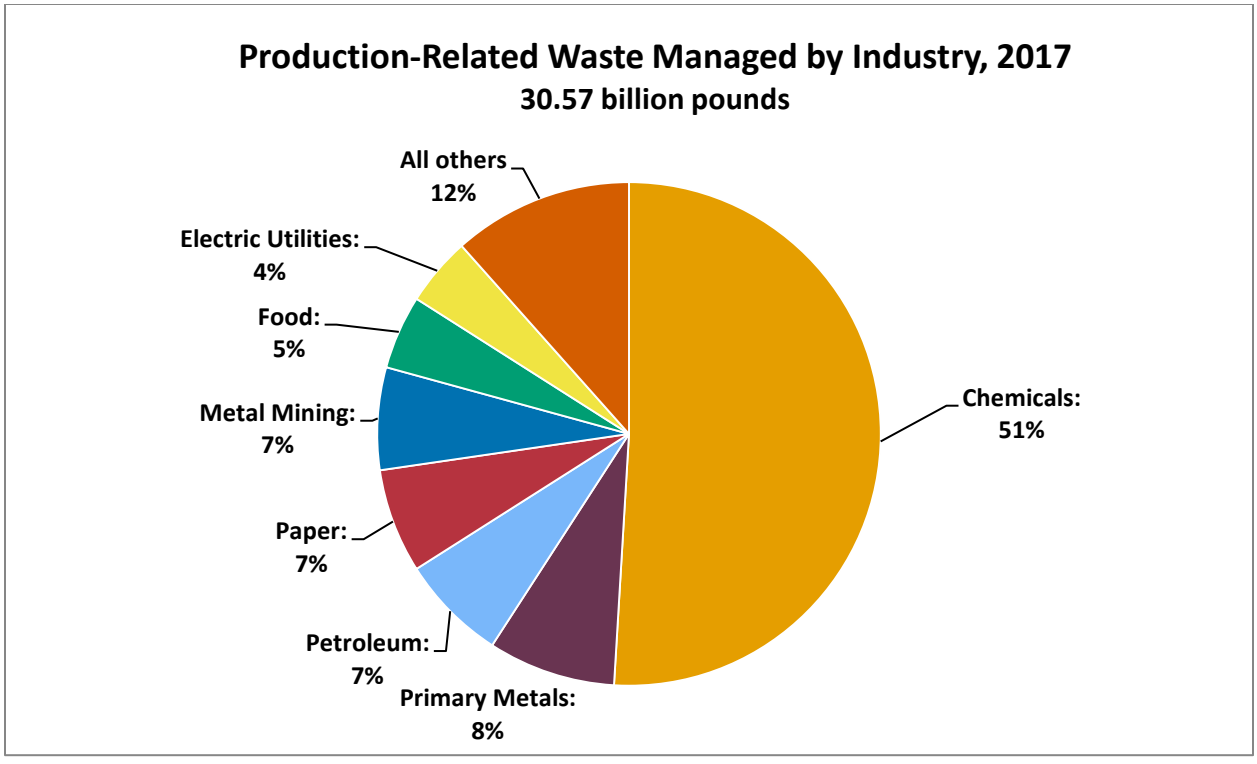


- Non-production-related waste from all facilities was below 35 million pounds in all years except for 2013 when a mining facility reported a one-time release of 193 million pounds. The facility reported zero releases in 2014 and has not reported to TRI since.
- For 2017, facilities reported 13 million pounds of one-time, non-production-related releases of TRI chemicals.

Comparing Industry Sectors

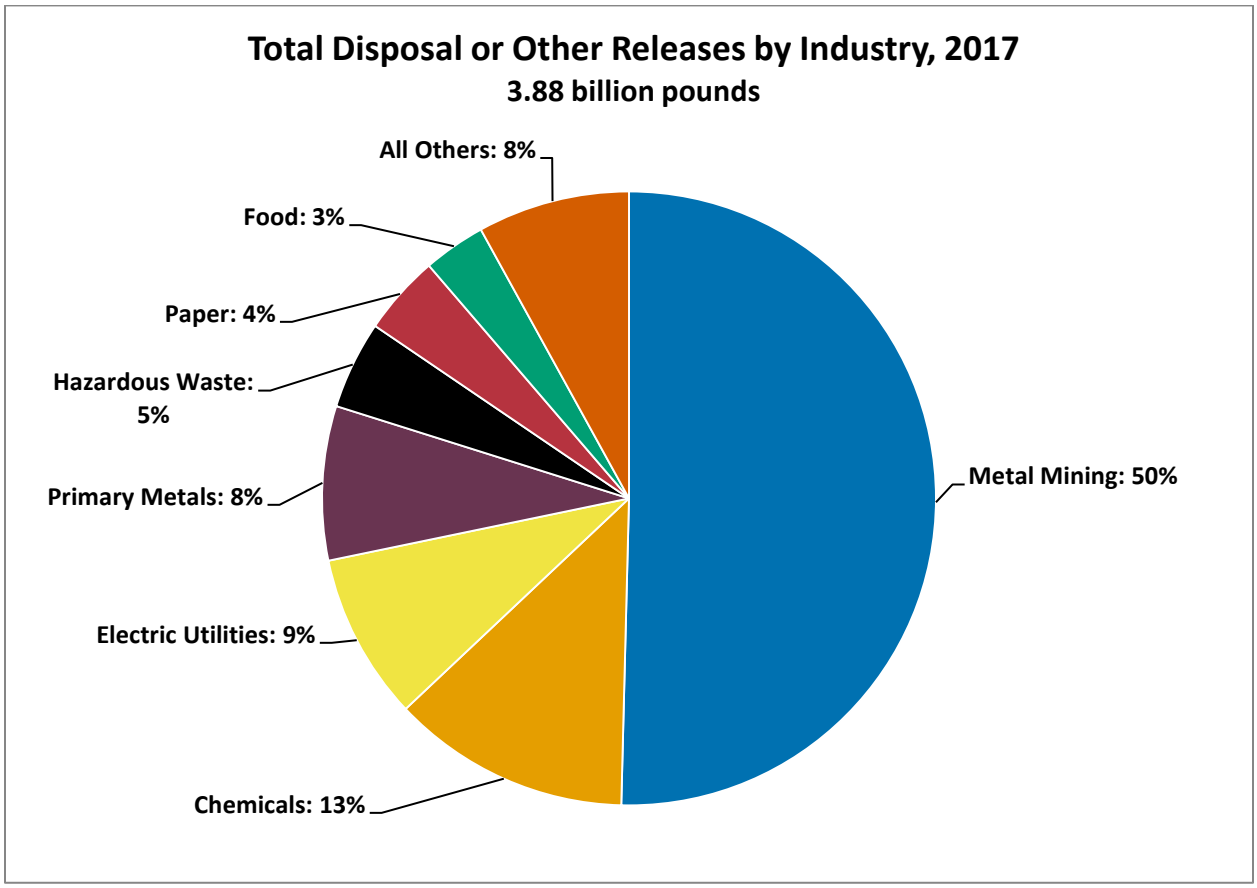
This section examines which sectors contributed the most to production-related waste managed in 2017 and highlights several industry sectors to show trends occurring over time. It also discusses the trends among federal facilities, which report to the Toxics Release Inventory (TRI) regardless of sector. For analysis purposes, the TRI Program has aggregated the North American Industry Classification System (NAICS) codes at the 3- and 4-digit levels, creating 29 industry sector categories. To learn more about which business activities are subject to TRI reporting requirements, see this list of covered NAICS codes.

The industries that are subject to TRI reporting requirements vary substantially in size, scope, and business type. As a result, the amounts and types of chemicals used, generated, and managed by facilities within a given industry sector often differ greatly from those of facilities in other sectors. For facilities in the same sector, however, the processes, products, and regulatory requirements are often similar, resulting in similar manufacture, processing, or other use of chemicals. Looking at chemical waste management trends within a sector can highlight progress made in improving environmental performance, identify emerging issues, and reveal opportunities for better waste management practices.



Note: Percentages may not sum to 100% due to rounding.

Seven industry sectors reported 89% of the quantities of TRI chemicals managed as production-related waste in 2017. A majority of TRI chemical waste managed originated from the chemical manufacturing sector (51%).



This pie chart shows that 80% of the quantities of TRI chemicals disposed of or otherwise released originated from 4 of the 29 industry sectors that are subject to the TRI reporting requirements: metal mining (50%), chemical manufacturing (13%), electric utilities (9%), and primary metals (8%).

For more details on how the amounts and proportions of TRI chemicals managed as waste have changed over time, see the production-related waste managed by industry trend graph.

For more information on the breakdown of these releases by medium, see land disposal by industry, air releases by industry, and water releases by industry.

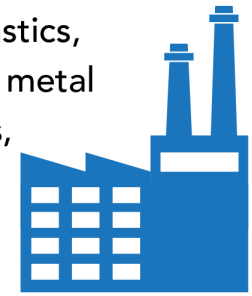
As with any dataset, there are several factors to consider when using the TRI data. Key factors associated with data presented are summarized in the Introduction. For more information see

Factors to Consider When Using Toxics Release Inventory Data. Also note that the list of TRI chemicals has changed over the years. For comparability, trend graphs include only those chemicals that were reportable for all years presented. Figures that focus only on the year 2017 include all chemicals reportable for 2017, therefore, values for a 2017-only analysis may differ slightly from results for 2017 in a trend analysis.

Manufacturing Sectors

What the Sector Does

The manufacturing sectors are goods-producing industries that transform materials into new products. These sectors include businesses involved in the production of food, textiles, paper, chemicals, plastics, petroleum products, metal products, electronics, furniture, vehicles, equipment, and other products.



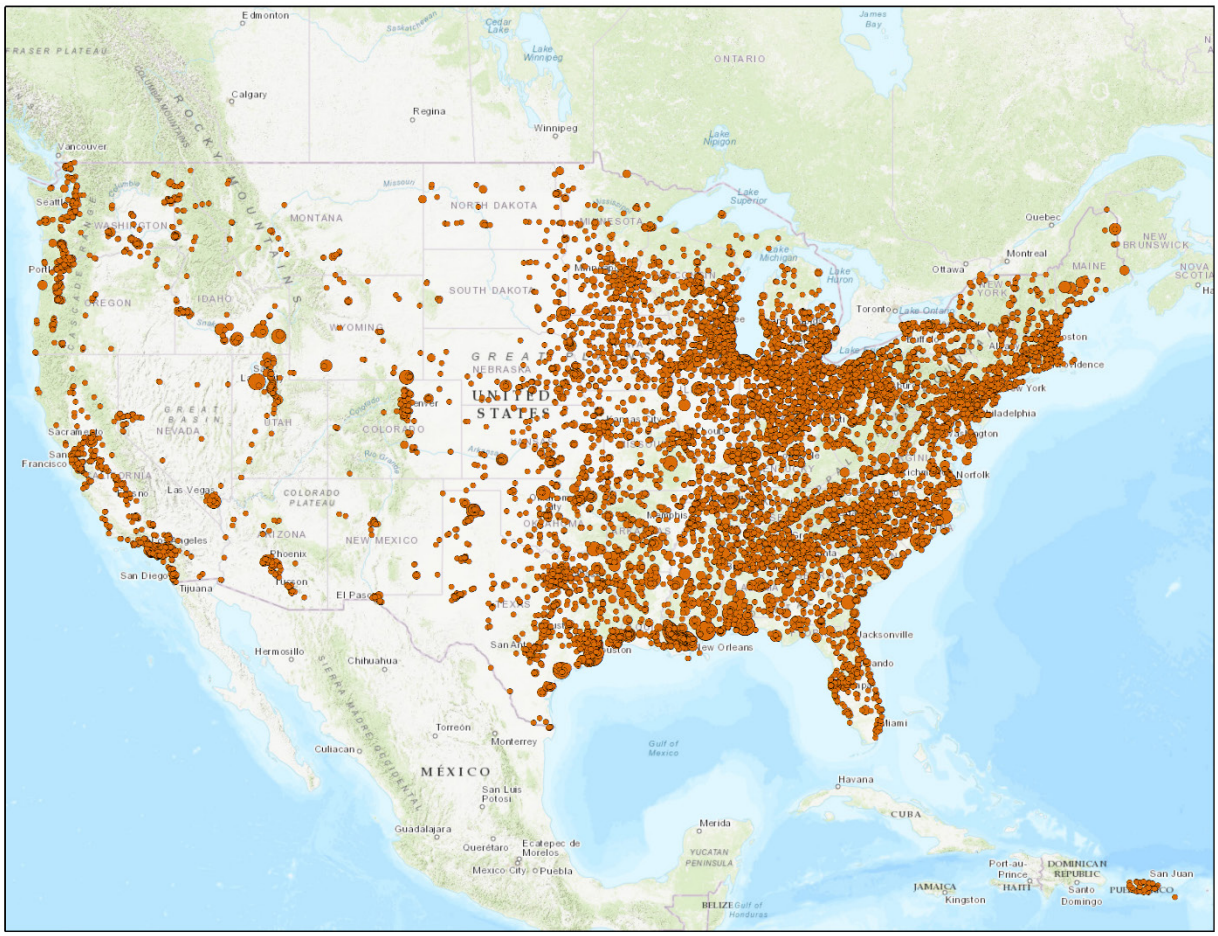
THE SECTOR EMPLOYS 11.1 MILLION PEOPLE

U.S. Census Annual Survey of Manufactures 2016 data

THE SECTOR CONTRIBUTES $2.4 TRILLION TO U.S. GDP

In value-added. U.S. Census Annual Survey of Manufactures 2016 data

This map shows the locations of the manufacturing facilities that reported to TRI for 2017. Click on a facility for details on their TRI reporting.



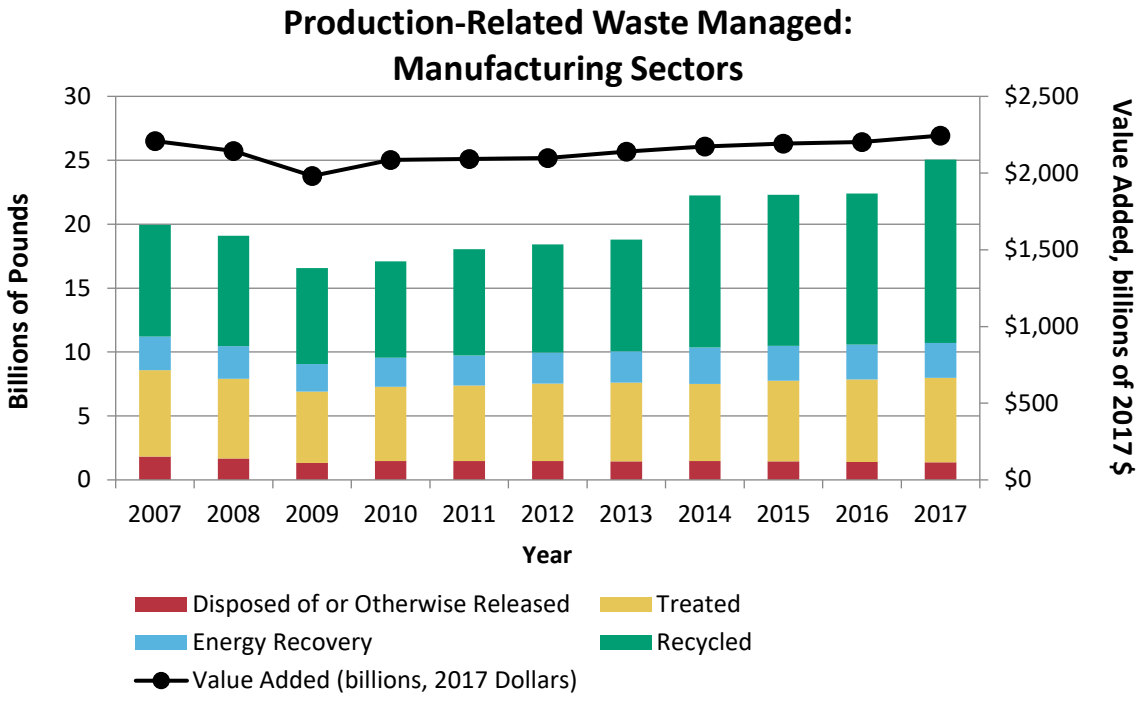
Manufacturing Facilities Reporting to TRI, 2017

For 2017, nearly 90% of the facilities that reported to TRI were in a manufacturing sector. The manufacturing sector accounted for most (86%) of the 30.6 billion pounds of TRI production-related waste reported to TRI for 2017. Two of the manufacturing sectors (paint and coating and chemicals) are highlighted in more detail later in this section.

The TRI-covered industry sectors not categorized under manufacturing include metal mining, coal mining, electric utilities, chemical wholesalers, petroleum terminals, hazardous waste management, and others.

Waste Management Trend

The following graph shows the annual quantities of TRI chemicals managed as waste by the manufacturing sectors.



From 2007 to 2017:

- Production-related waste managed by the manufacturing sectors decreased through 2009, following the trend of reduced production resulting from the economic recession. Since 2009, quantities of waste managed have increased.
    - Quantities of waste released and treated decreased, while the quantity of waste combusted for energy recovery and waste recycled increased.
- It is important to consider the influence the economy has on production and production-related waste generation. This figure also includes the trend in manufacturing sectors' "value added" (represented by the black line as reported by the Bureau of Economic Analysis, Value Added by Industry). Value added is a measure of production that is defined as the contribution of these manufacturing sectors to the national gross domestic product.

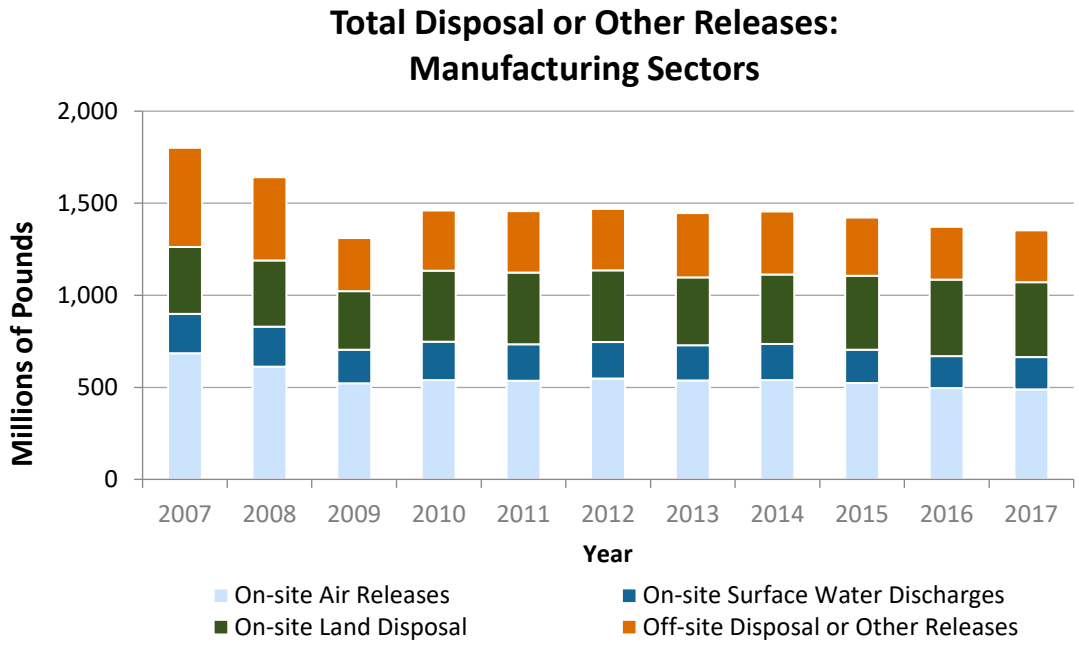
- Production-related waste managed by the manufacturing sectors increased by 26%, while value added by the manufacturing sectors increased by 2%. The large increase in recycled waste starting in 2014 was primarily due to an increase in the quantity of cumene recycled by one facility and dichloromethane recycled by another facility. Excluding these amounts, the total quantities of the manufacturing sectors' production-related waste decreased by 1% since 2007, even as value added increased.

From 2016 to 2017:

- Production-related waste managed increased by 12% (2.65 billion pounds). This increase is largely due to a single facility that reported recycling 1.5 billion pounds of dichloromethane on site in 2017. This facility did not previously report recycling this chemical on site. Excluding this amount for 2017, the total quantity of the manufacturing sectors' production-related waste increased by 5%.
- In 2017, only 6% of the manufacturing sectors' waste was released into the environment, while the rest was managed through treatment, energy recovery, and recycling.

Manufacturing Releases Trend

The following graph shows the annual quantities of TRI chemicals released by the manufacturing sectors.



From 2007 to 2017:

- Total releases by the manufacturing sectors decreased by 25%. This is primarily due to a reduction in air emissions and off-site disposal or other releases.
- Releases to water also declined, while on-site land disposal increased by 12%.

From 2016 to 2017:

- Total releases decreased by 1% (18 million pounds).
- On-site land disposal, releases to air, and off-site disposal or other releases all decreased.

Source Reduction in the Manufacturing Sectors:

In 2017, 8% of manufacturing facilities initiated more than 3,500 source reduction activities to reduce TRI chemical use and waste generation. The most commonly reported types of source reduction activitites were good operating practices and process modifications. For example:

- A writing products manufacturing facility installed a level detection device such that transfer pumps will shut down in case of high levels in the butanol tank, which decreases the chances for spills and overflows. [Click to view facility details in the Pollution Prevention (P2) Tool]
- A plastics and resin manufacturing facility reduced its methanol usage by changing its mold release solvent and cleaning solvent from methanol to isopropyl alcohol. [Click to view facility details in the P2 Tool]

You can learn more about pollution prevention opportunities in this sector by using the TRI Pollution Prevention (P2) Search Tool.

Paint and Coating Manufacturing

What the Sector Does

The paint and coating sector manufactures products that protect and beautify the surfaces to which they are applied – from homes, cars, and manufactured products to bridges and other structures.

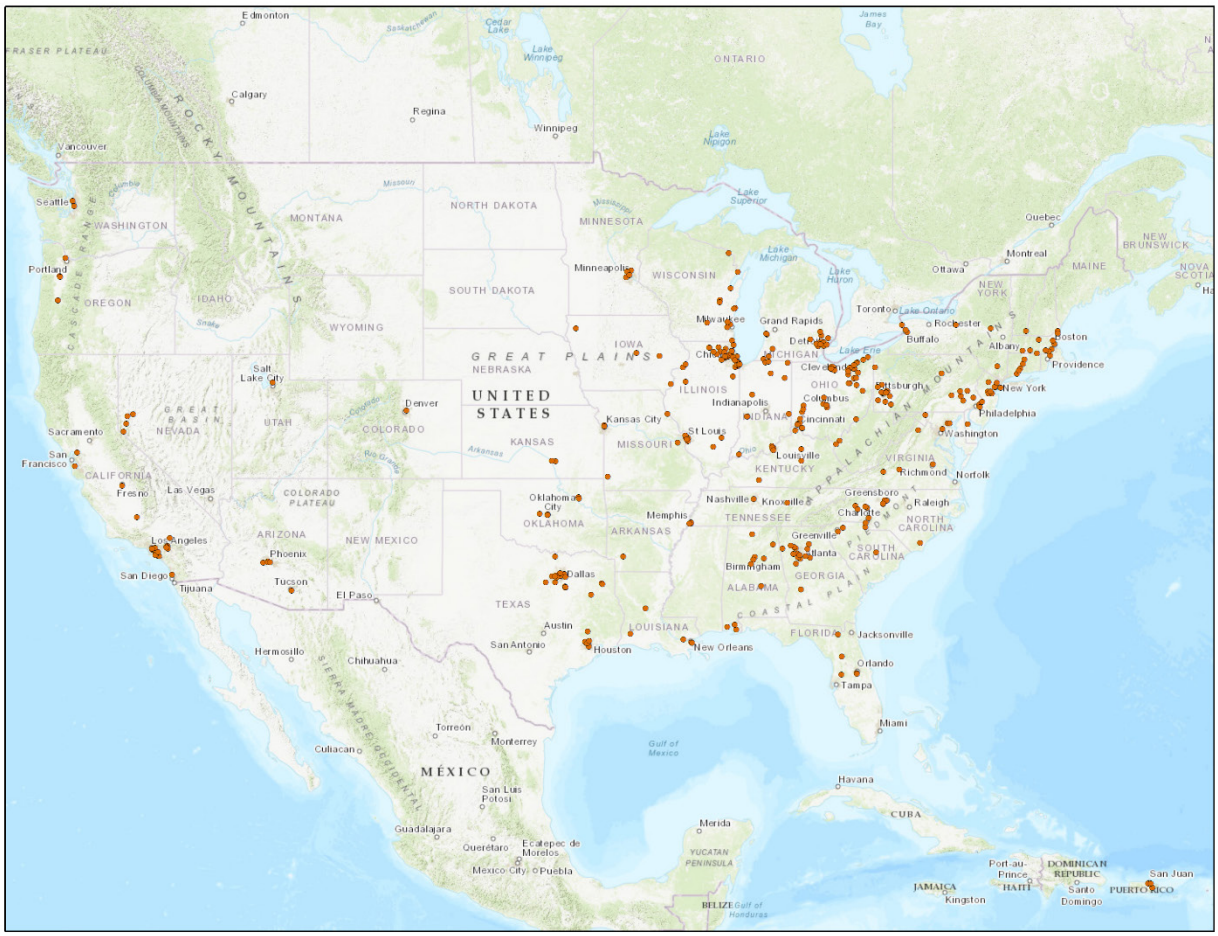
THE SECTOR EMPLOYS 34,000 PEOPLE

U.S. Census Annual Survey of Manufactures 2016 data

THE SECTOR CONTRIBUTES $13 BILLION TO U.S. GDP

In value-added. U.S. Census Annual Survey of Manufactures 2016 data

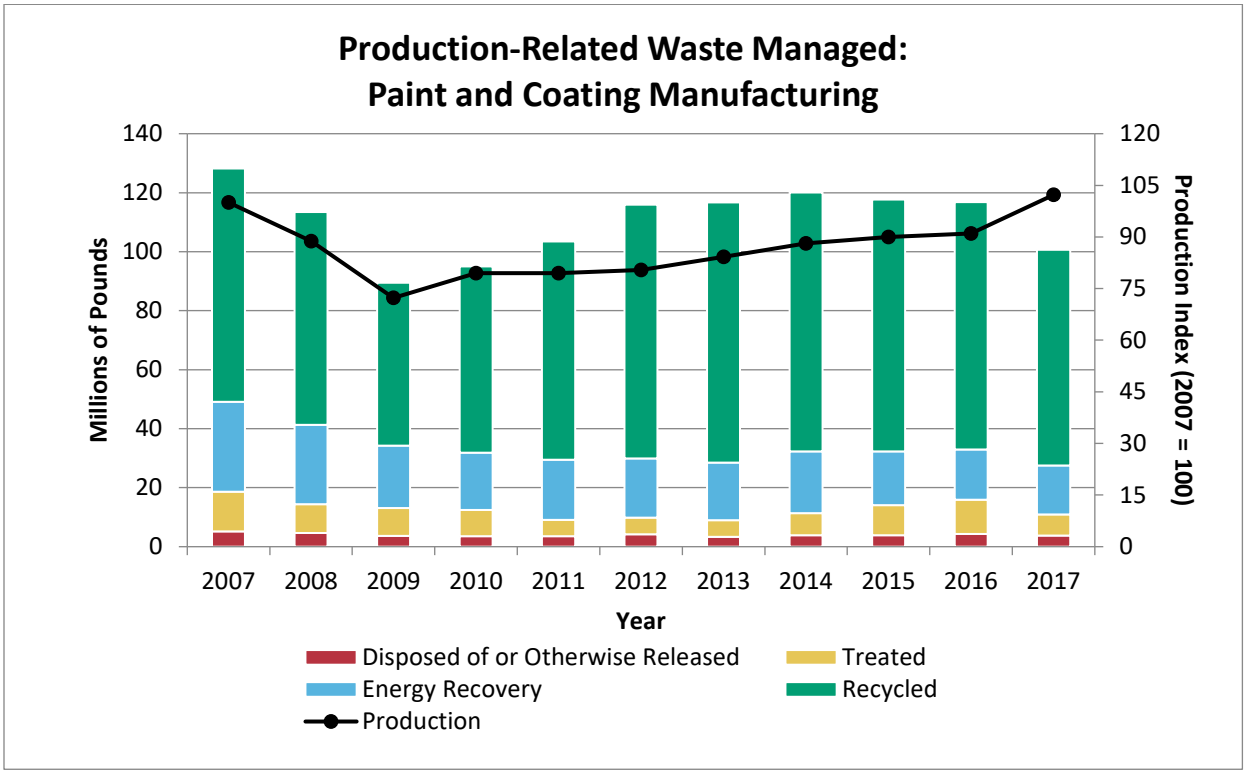
This map shows the locations of the paint and coating manufacturing facilities that reported to TRI for 2017. Click on a facility for details on their TRI reporting.



Paint and Coating Manufacturing Facilities Reporting to TRI, 2017

Paint and Coating Manufacturing Waste Management Trend

The following graph shows the annual quantities of TRI chemicals managed as waste by the paint and coating manufacturing industry.



From 2007 to 2017:

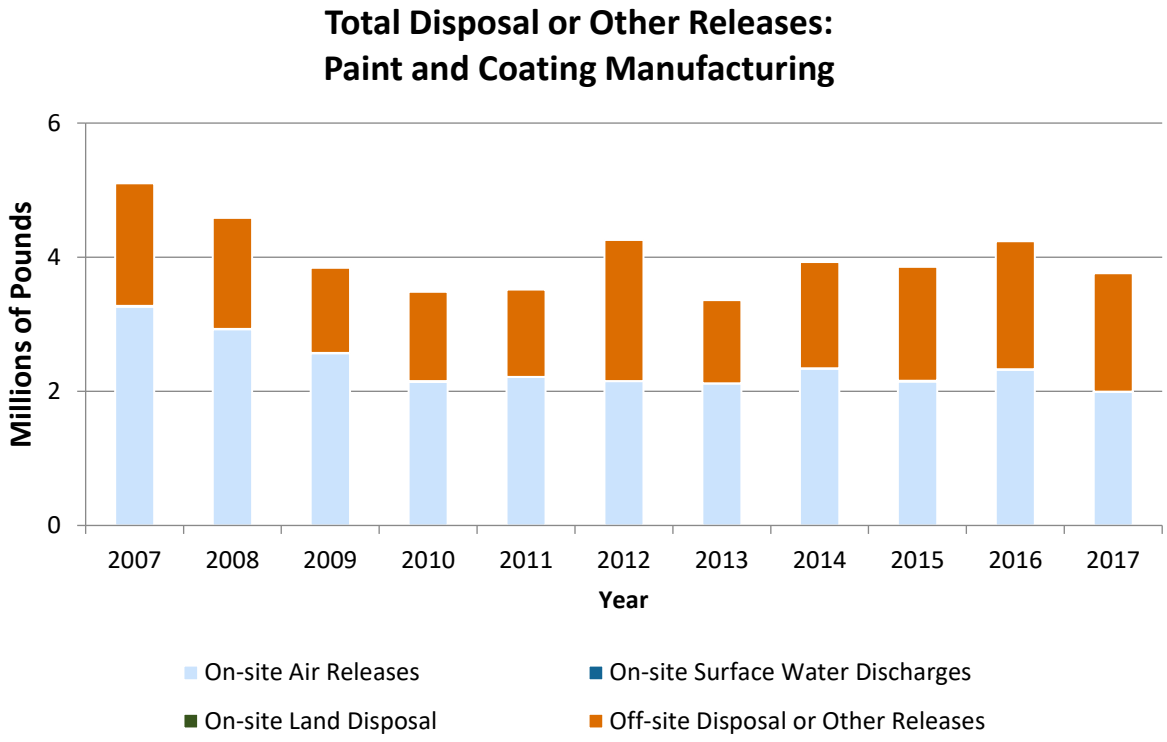
- Production-related waste managed by the paint and coating sector decreased from 2007 through 2009, following the trend of reduced production resulting from the economic recession. Since 2009, quantities of waste managed increased through 2014, at which point production-related waste began to decrease. Overall, waste quantities have decreased by 22%.
- Production (represented by the black line as reported by the Federal Reserve Board, Industrial Production Index) increased by 2%.

From 2016 to 2017:

- Production-related waste decreased by 14% (16 million pounds). This is driven by one facility that reported no recycling of methanol for 2017 but had reported over 15 million pounds recycled per year in prior years.
- In 2017, only 4% of the sector's waste was released into the environment, while the rest was managed through treatment, energy recovery, and recycling.

Paint and Coating Manufacturing Releases Trend

The following graph shows the annual quantities of TRI chemicals released by the paint and coating manufacturing industry.



From 2007 to 2017:

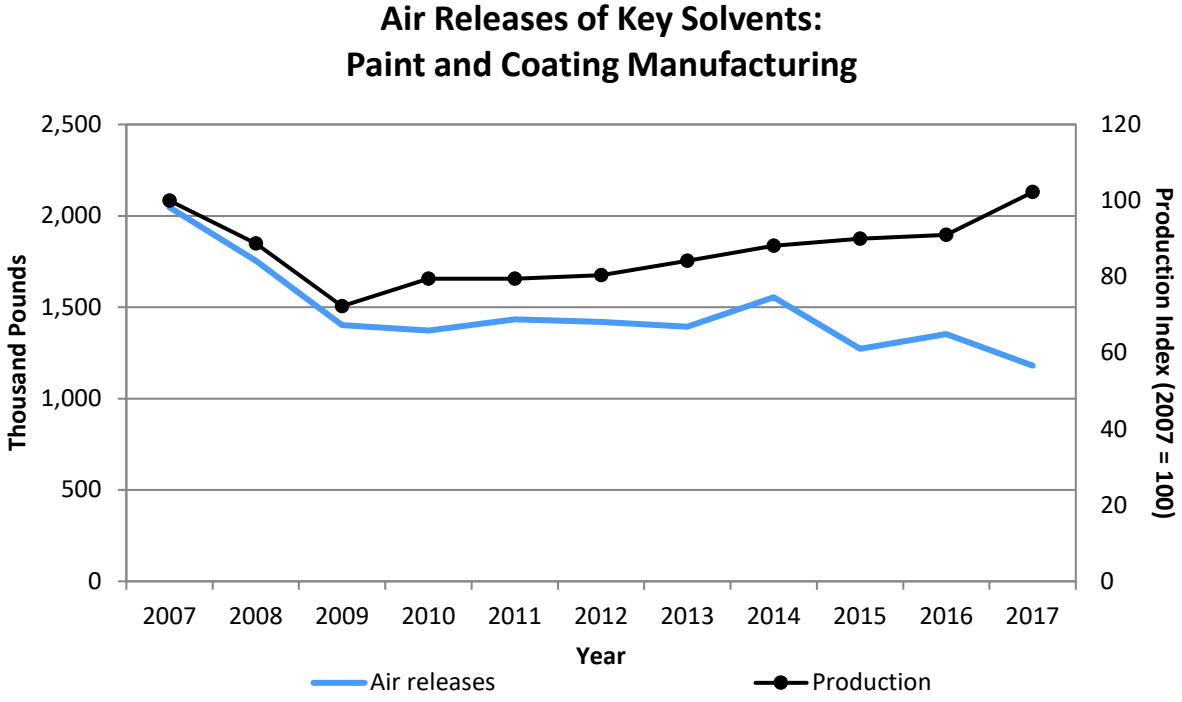
- The sector's total disposal or other releases decreased by 26% (1.3 million pounds) since 2007. This is primarily due to reductions in releases to air.

From 2016 to 2017:

- Total releases decreased by 11% (0.5 million pounds), driven by continued reductions in air emissions.

Solvent Use in the Paint and Coating Manufacturing Sector

Certain volatile organic chemicals (VOCs) are used in the paint and coating sector as solvents. Solvents are used to dissolve or suspend other chemicals, such as pigments in paint. Organic solvents are often used because they dry quickly when exposed to air, a property desirable for most paint and coating applications. Many organic solvent chemicals used by the Paint and Coating Manufacturing sector are included on the TRI chemical list. For years, the sector has been implementing efforts to reduce the use and release of solvents. This graph shows the trend in air releases of five solvents that this sector reported releasing in the largest quantities.

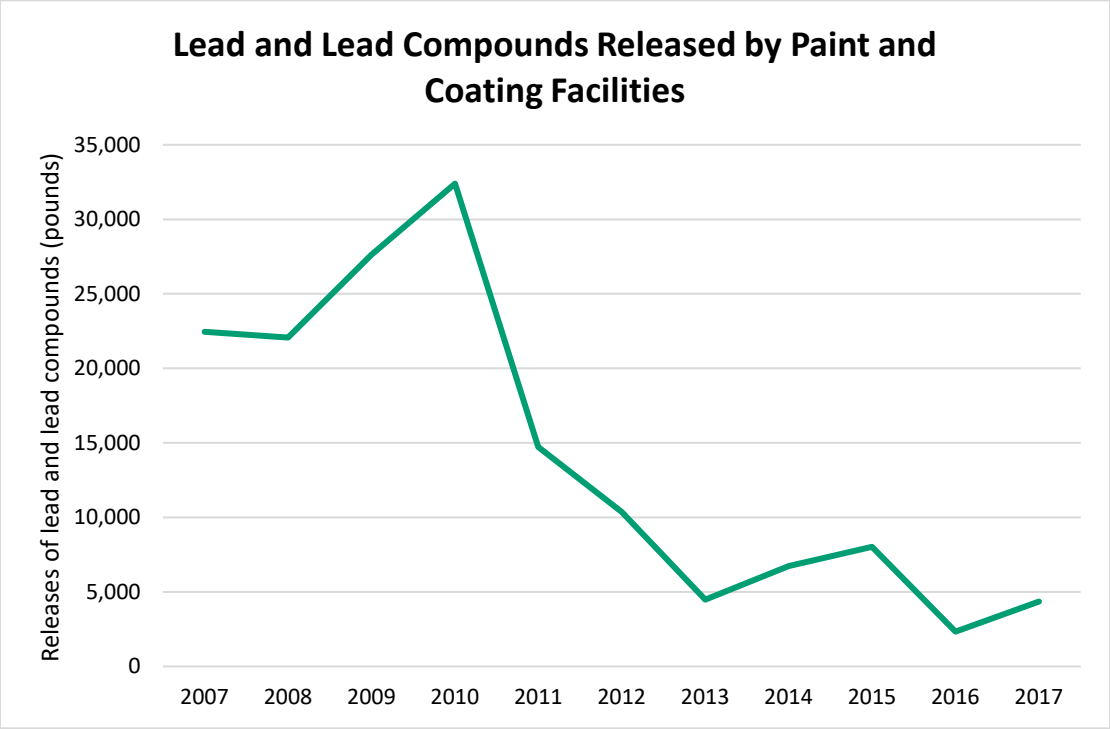


Includes releases of xylene (mixed isomers), toluene, methanol, n-butyl alcohol, and 1,2,4-trimethylbenzene.
Production Index source: Federal Reserve Board

- Total releases of these five key solvents from the paint and coating industry have dropped by 842 thousand pounds (37%) since 2007. This is largely due to a reduction in air releases, which decreased 42% since 2007.
- Many facilities in this industry reported changing cleaning solvents or reformulating products to reduce their use of TRI-reportable hazardous solvents. Facilities gave various reasons for these changes, including VOC regulations, industry trends toward lower-VOC products, and a continuing desire to reduce toxics in their products.

Lead in the Paint and Coating Manufacturing Sector

Although lead was banned from consumer paints in the U.S. in 1978, it may still be used in some paints and coatings, such as those for industrial use. Lead use by the paint and coating sector has greatly declined over several decades, with continuing reductions in recent years.



From 2007 to 2017:

- Releases of lead and lead compounds by the paint and coating industry have decreased by 18 thousand pounds (81%).
- The increase in releases in 2010 was due to a large one-time release by one facility and a large transfer to a hazardous waste facility by another facility. The increase from 2016 to 2017 was driven by increased off-site transfers for disposal from one facility which permanently closed in 2017.
- The decline in lead releases by the paint and coating industry reflects efforts by several companies that have voluntarily stopped using lead in their paints and coatings or have begun phasing it out, including AkzoNobel, the world's largest paint manufacturer, which had completely removed lead pigments and drying agents from its products by 2011.

In 2017:

- 59% of all lead releases in the sector were from facilities owned by PPG. PPG has announced plans to phase out lead from its industrial paints by 2020.

Source Reduction in the Paint and Coating Sector:

Eleven percent of paint and coating manufacturing facilities initiated source reduction activities in 2017. The most commonly reported types of source reduction activitites were process modifications and good operating practices. For example:

- A paint manufacturing facility reduced the amount of solvent used in its raw materials and replaced it with more environmentally friendly material. [Click to view facility details in the Pollution Prevention (P2) Tool]
- A coating manufacturer has seen decreases in its releases of lead compounds as it has moved customers away from the use of leaded pigments. [Click to view facility details in the P2 Tool]

You can learn more about pollution prevention opportunities in this sector by using the TRI Pollution Prevention (P2) Search Tool.

Chemical Manufacturing

What the Sector Does

Chemical manufacturers convert raw materials into thousands of different products, including basic chemicals, products used by other manufacturers (such as synthetic fibers, plastics, and pigments), pesticides, and cosmetics, to name a few.

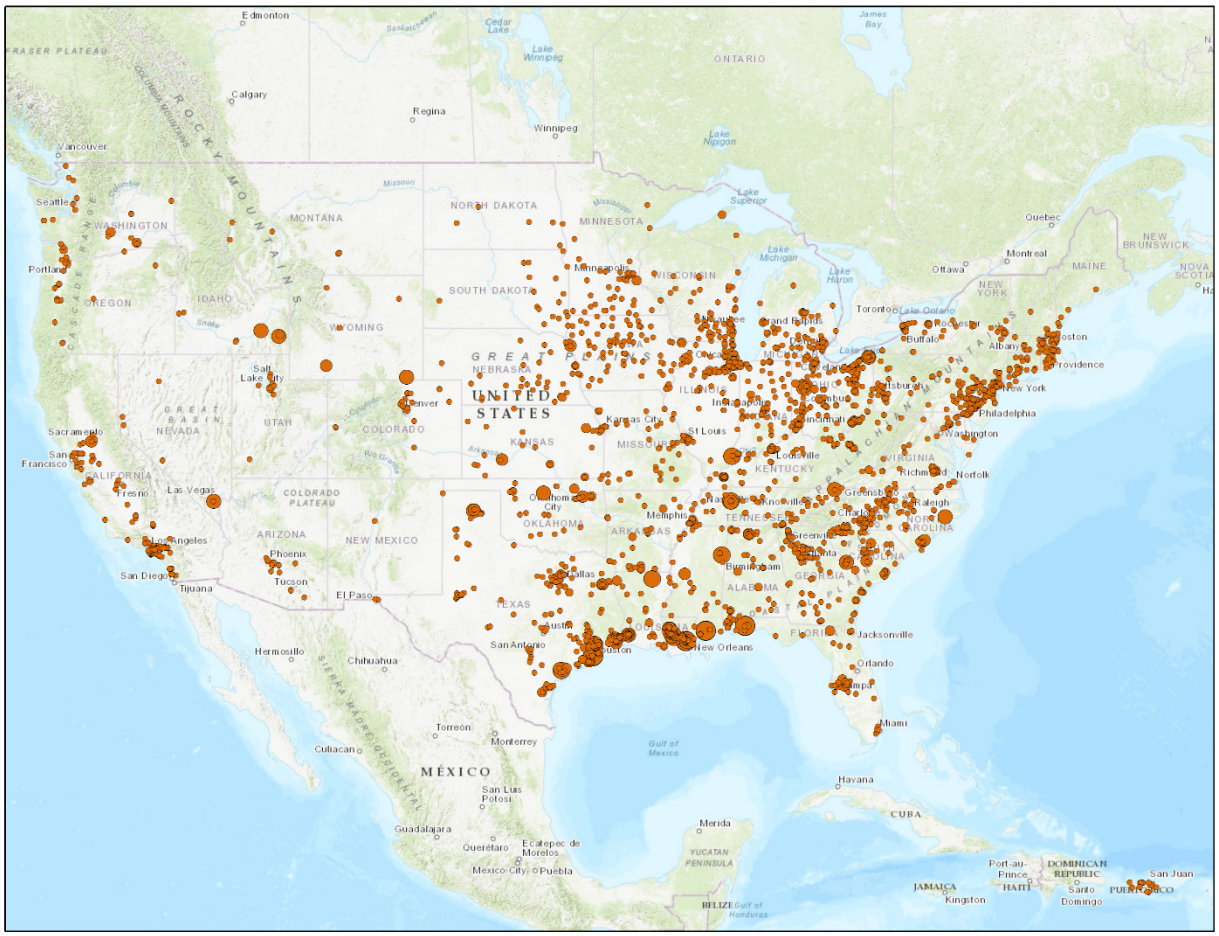
THE SECTOR EMPLOYS 745,000 PEOPLE

U.S. Census Annual Survey of Manufactures 2016 data

THE SECTOR CONTRIBUTES $400 BILLION TO U.S. GDP

In value-added. U.S. Census Annual Survey of Manufactures 2016 data

This map shows the locations of the chemical manufacturing facilities that reported to TRI for 2017. Click on a facility for details on their TRI reporting.

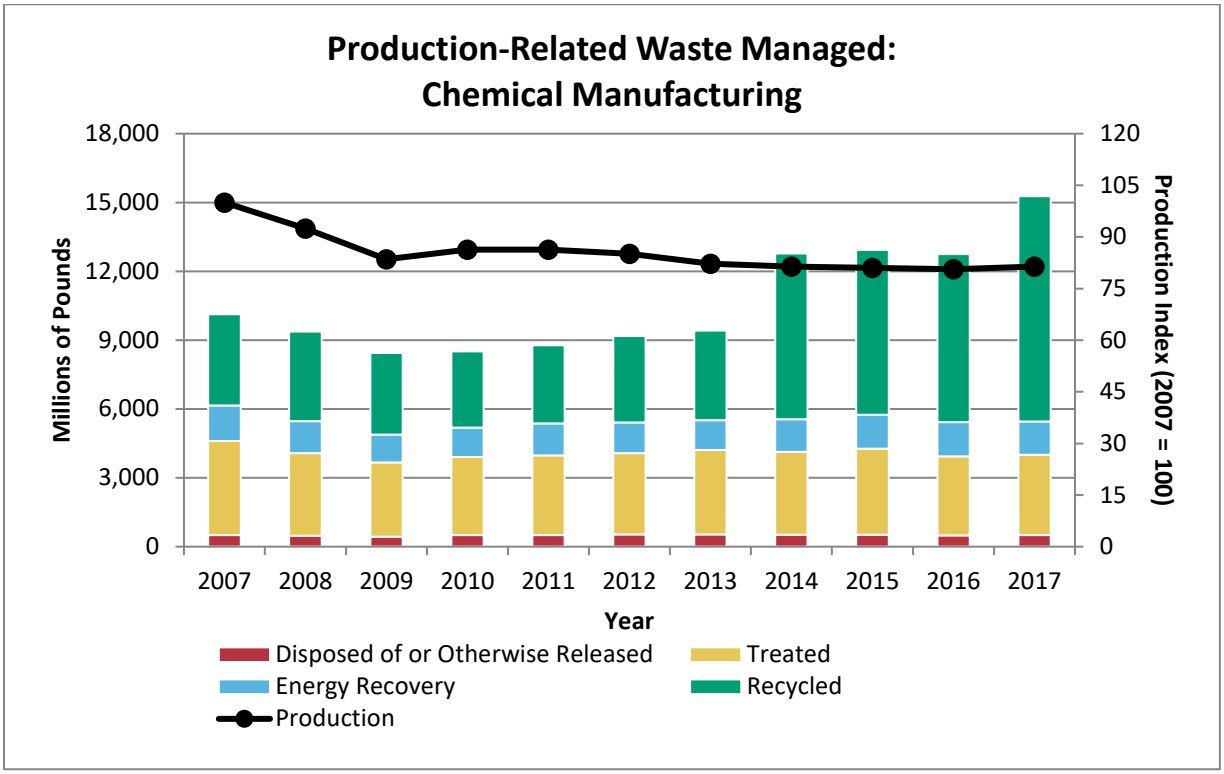


Chemical Manufacturing Facilities Reporting to TRI, 2017

For 2017, the chemical manufacturing sector had the most facilities (3,449, 16% of facilities that reported for 2017) report to the Toxics Release Inventory (TRI) and reported 51% of all production-related waste managed, more than any other sector.

Chemical Manufacturing Waste Management Trend

The following graph shows the annual quantities of TRI chemicals managed as waste by the chemical manufacturing industry.



From 2007 to 2017:

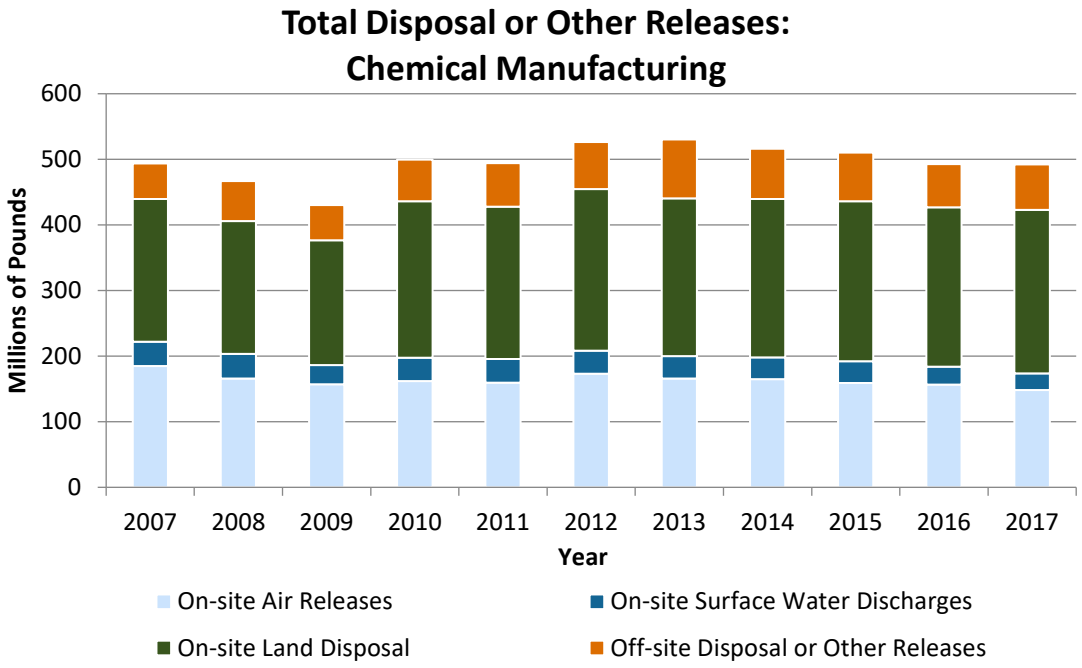
- Production-related waste managed by the chemical manufacturing sector increased by 51%, while production (represented by the black line as reported by the Federal Reserve Board, Industrial Production Index) decreased by 19%.
    - The large increase in recycled waste starting in 2014 was primarily due to an increase in the quantity of cumene recycled by one facility and dichloromethane recycled by another facility.
    - Excluding those two facilities, total production-related waste managed by the sector decreased by 6%.
- Quantities of TRI chemicals released, treated, or combusted for energy recovery decreased, while the quantities of TRI chemicals recycled increased.

From 2016 to 2017:

- Production-related waste managed at chemical manufacturing facilities increased by 2.5 billion pounds (20%), largely due to a 1.5 billion pound increase in the quantity of dichloromethane recycled by one plastics manufacturing facility.
- In 2017, only 3% of this sector's waste was released into the environment, while the rest was managed through treatment, energy recovery, and recycling.

Chemical Manufacturing Releases Trend

The following graph shows the annual quantities of TRI chemicals released by the chemical manufacturing industry.



From 2007 to 2017:

- Total releases by the chemical manufacturing sector decreased by less than 1%.
- The distribution of releases has changed during this time period with reduced releases to air and increased disposal to land. This change has been driven largely by decreased air releases of common chemicals including methanol, carbonyl sulfide, and hydrochloric acid, and increased land disposal of many metal compounds such as barium compounds and zinc compounds.

From 2016 to 2017:

- Total releases decreased by 0.5 million pounds (<1%).
- For 2017, the chemical manufacturing sector reported larger air release quantities than any other sector, accounting for 25% of all reported quantities of TRI chemicals emitted to air.

Source Reduction in the Chemical Manufacturing Sector:

Although chemical manufacturing has consistently been the sector with the most production-related waste managed, 10% of facilities (over 300 facilities) in this sector initiated source reduction activities in 2017 to reduce their TRI chemical use and waste generation. The most commonly reported types of source reduction activities were good operating practices and process modifications. For example,

- An artificial and synthetic fibers and filaments manufacturing facility reduced waste by changing from soft water to demineralized water in a process solution bath. The previous water supply was found to be high in sulfates, which interfered with reactivity and catalysis, and the change improved bath solution quality and efficiency. [Click to view facility details in the Pollution Prevention (P2) Tool]
- A synthetic dye and pigment manufacturing facility reduced its nitrate compound use by developing a new dissolution process replacing nitric acid with hydrochloric acid. [Click to view facility details in the P2 Tool]

Resources

EPA's Smart Sectors Program is partnering with chemical manufacturing trade associations to develop sensible approaches that better protect the environment and public health.

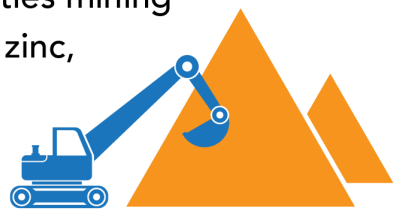
TRI's Pollution Prevention Search Tool can help you learn more about pollution prevention opportunities in this sector.

For more information on how this and other industry sectors can choose safer chemicals, visit EPA's Safer Choice Program pages for Alternatives Assessments and the Safer Choice Ingredients List.

Metal Mining

What the Sector Does

The metal mining sector extracts and processes ores (metal-bearing rock) to refine the valuable target metals. The portion of the metal mining sector covered by TRI reporting requirements includes facilities mining copper, lead, zinc, silver, gold, and several other metals.



THE SECTOR
EMPLOYS 38,000 PEOPLE

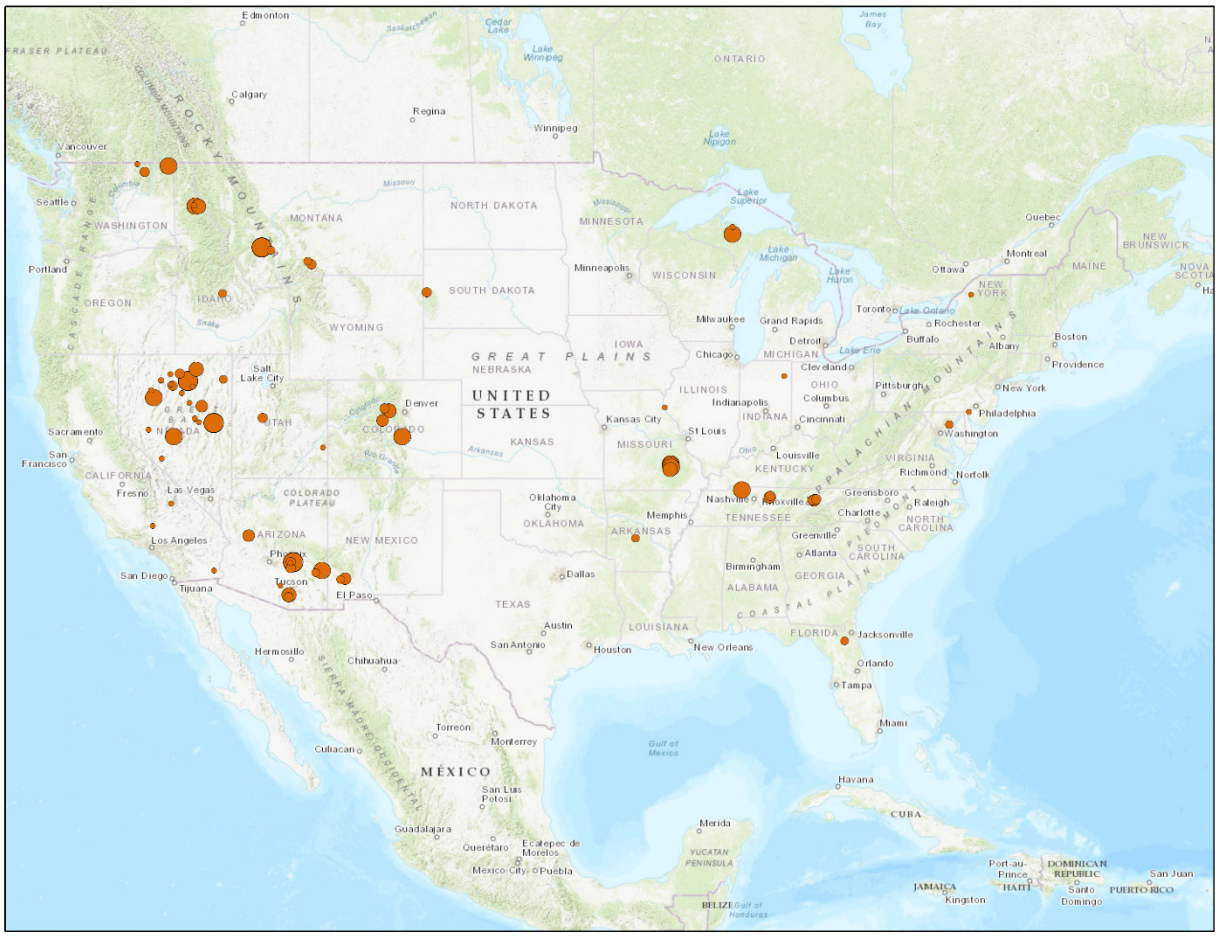
U.S. Census County Business Patterns 2016 data

VALUE OF MINE
PRODUCTION $26 BILLION

USGS Mineral Commodities Summary 2017 data

Note: Both metrics include all metal mining sectors; not limited to those covered by TRI.

This map shows the locations of the metal mining facilities that reported to TRI for 2017. Click on a facility for details on their TRI reporting. Mines are shown on this map based on their longitude/latitude which may be miles from the city on the mine's TRI reporting forms. Mines can qualify their location relative to the city by noting the distance in the street address data field of their TRI reports.

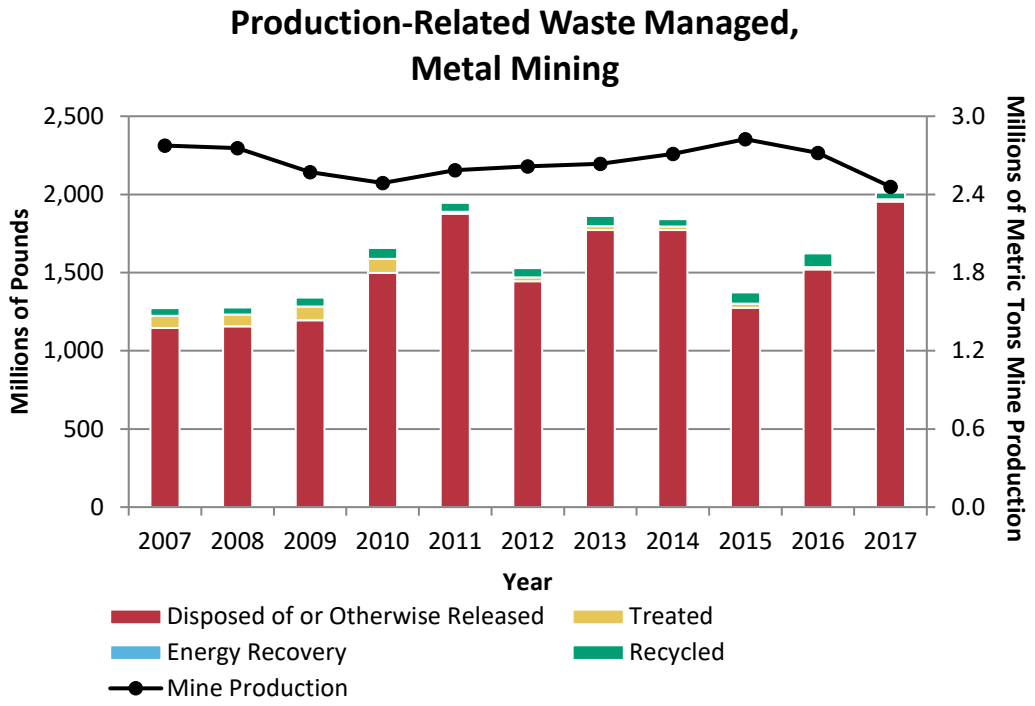


Metal Mines Reporting to TRI, 2017

For 2017, 85 metal mining facilities reported to TRI. They tend to be in western states where most of the copper, silver, and gold mining occurs; however, zinc and lead mining tend to occur in Missouri and Tennessee, as well as Alaska. Metals generated from U.S. mining operations are used in a wide range of products, including automobiles and electric and industrial equipment, as well as jewelry and decorative objects. The extraction and beneficiation or other processing of these minerals generate large amounts of on-site land disposals, primarily of metals included on the TRI list of chemicals contained in the ore and waste rock. Metal mining operations are subject to federal and state regulations.

Metal Mining Waste Management Trend

The following graph shows the annual quantities of TRI chemicals managed as waste by the metal mining industry from 2007 to 2017, mainly in the form of on-site land disposal.



From 2007 to 2017:

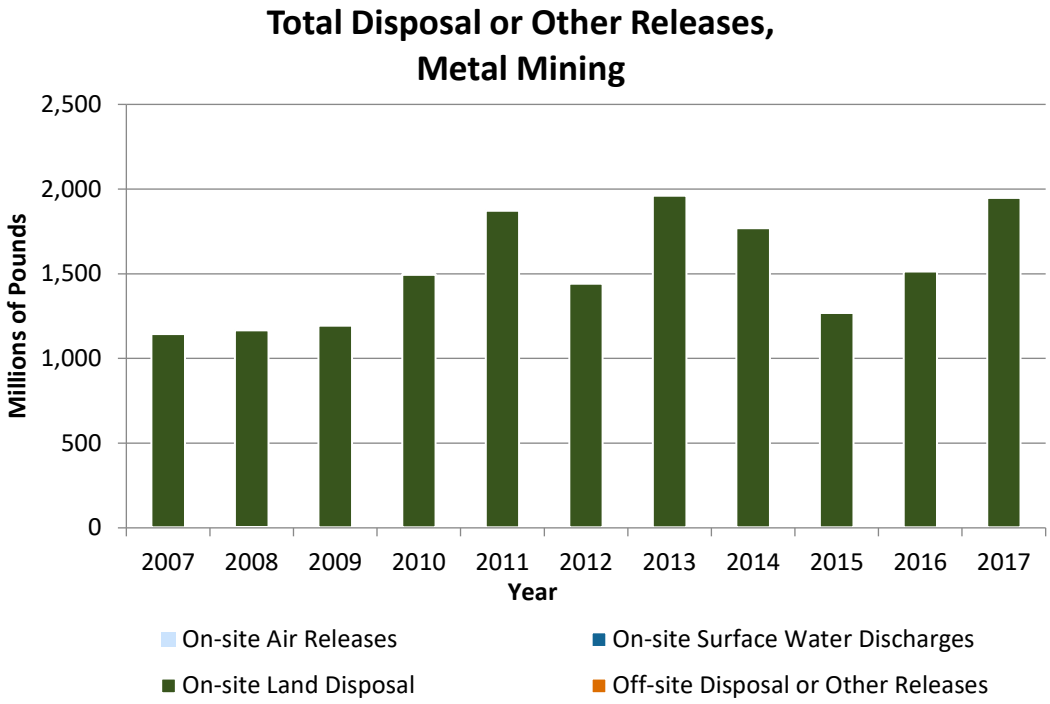
- While metal mining production (as reported in the United States Geological Survey) remained relatively steady, the quantity of waste managed fluctuated.
- Besides production, one factor commonly cited by facilities as a contributor to the changes in quantities of waste managed is the chemical composition of the extracted ore and waste rock, which can vary substantially from year to year. In some cases, small changes in the waste rock's composition can impact whether chemicals in waste rock qualify for a concentration-based exemption from TRI reporting in one year but not in the next year or vice versa.

From 2016 to 2017:

- The quantity of TRI chemical waste disposed of or otherwise released by this sector increased by 434 million pounds (29%) between 2016 and 2017, largely driven by a 326 million pound increase reported by one facility.
- During 2017, 97% of the metal mining sector's production-related waste was disposed of or otherwise released. The majority of this waste consisted of metals, which were primarily disposed of to land on site.

Metal Mining Releases Trend

The following graph shows the annual quantities of TRI chemicals released by the metal mining industry, primarily through on-site land disposal.



From 2007 to 2017:

- More than 99% of the metal mining sector's releases were in the form of on-site land disposal. The quantity of on-site land disposal by metal mines has fluctuated in recent years.
- Several mines have reported that changes in production and changes in the chemical composition of the deposit being mined are the primary causes of fluctuations in the amount of chemicals reported as disposed of on site.
- Metal mining facilities typically handle large volumes of material, and even a small change in the chemical composition of the deposit being mined can lead to big changes in the amount of TRI chemicals reported.
- The quantity of TRI chemicals released is not an indicator of health risks posed by the chemicals as described in the Introduction. For more information, see the TRI document, Factors to Consider When Using Toxics Release Inventory Data.

In 2017:

- The metal mining sector reported the largest quantity of total disposal or other releases, accounting for 50% of total TRI releases and 72% of on-site land disposal for all industries.

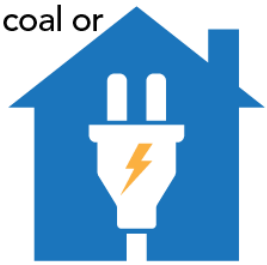
Source Reduction in the Metal Mining Sector:

None of the 85 metal mining facilities reported initiating source reduction activities for TRI chemicals in 2017. Unlike manufacturing, the nature of mining—the necessary movement and disposal of TRI chemicals present in large volumes of earth to access the target ore—does not lend itself to source reduction. TRI's Pollution Prevention Search Tool can help you learn more about pollution prevention opportunities in this sector.

Electric Utilities

What the Sector Does

Electric utilities generate, transmit, and distribute electric power. Electric-generating facilities use a variety of fuels to generate electricity; however, only those electricity generating facilities that combust coal or oil to generate power for distribution in commerce are subject to TRI reporting requirements.



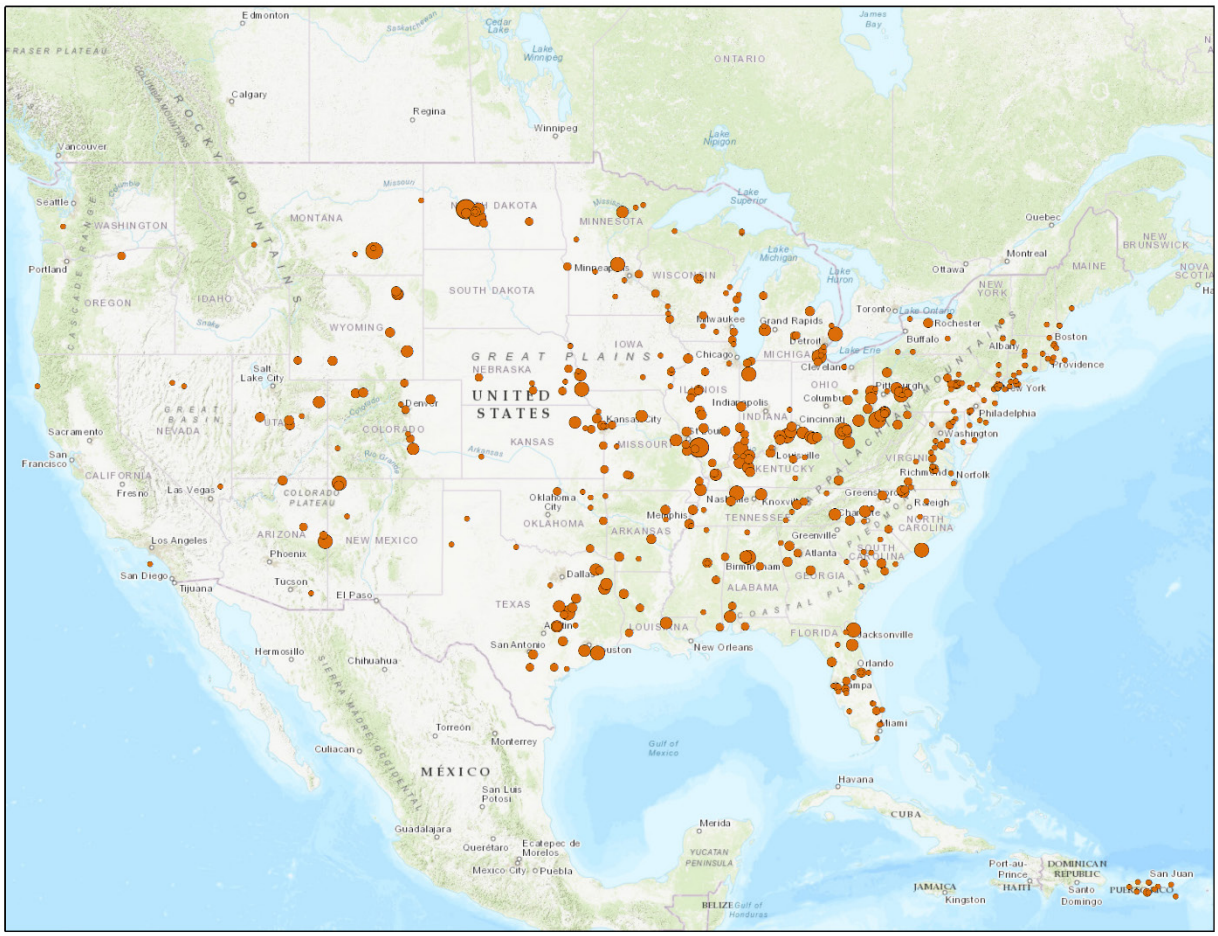
THE SECTOR **EMPLOYS 507,000** PEOPLE

U.S. Census County Business Patterns 2016 data. Includes all fuel types for electricity generation; not limited to those fuels covered by TRI

THE SECTOR **GENERATES 909 MILLION** MWh

U.S. Department of Energy 2017 data by electric utilities that combust coal or oil for electricity generation

This map shows the locations of the electric utilities that combust coal or oil to generate power for distribution in commerce and reported to TRI for 2017. Click on a facility for details on their TRI reporting.

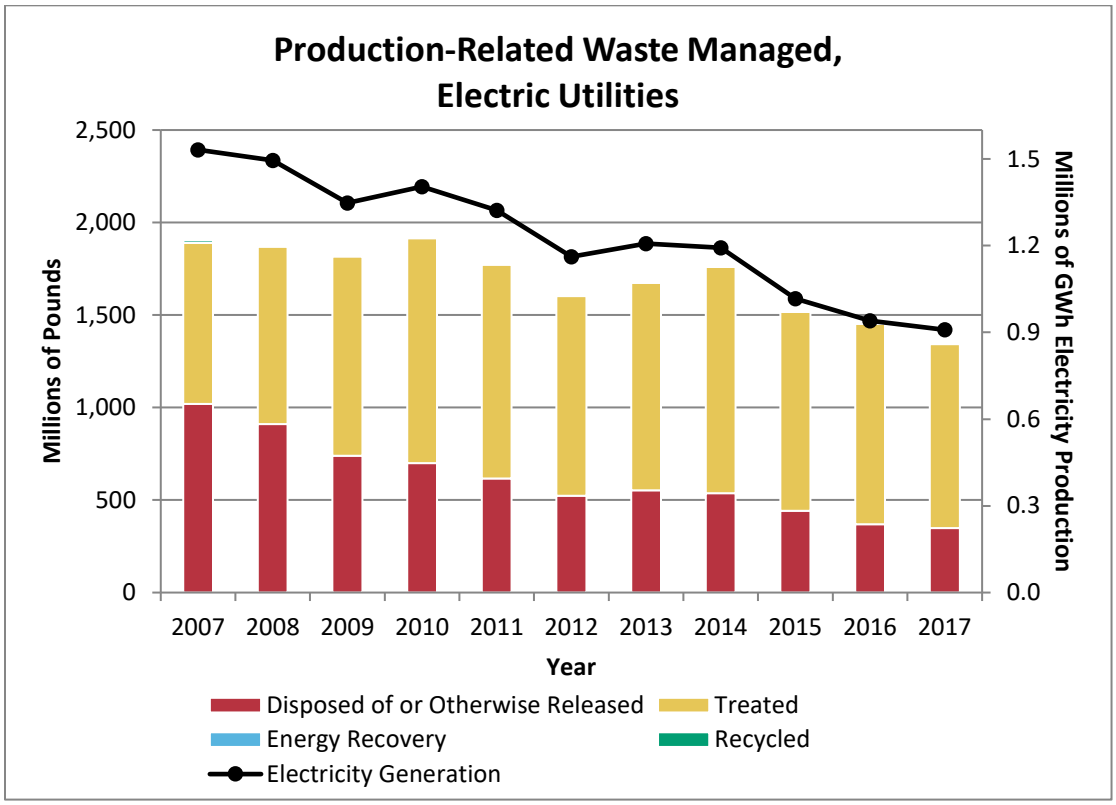


Electric Utilities Reporting to TRI, 2017

For 2017, 474 electricity generating facilities that combust coal or oil reported to TRI.

Electric Utilities Waste Management Trend

The following graph shows the annual quantities of TRI chemicals electric utility facilities manage as waste.



From 2007 to 2017:

- Production-related waste managed decreased by 557 million pounds (29%) since 2007, driven by reduced releases.
- Net electricity generation decreased by 41% (in terms of electricity generated by electric utilities using coal and oil fuels as reported by the U.S. Department of Energy's Energy Information Administration). The recent production decrease (beginning in 2014) was driven by the industry's transition to natural gas, as only facilities that combust coal or oil to produce power are covered under TRI reporting requirements.

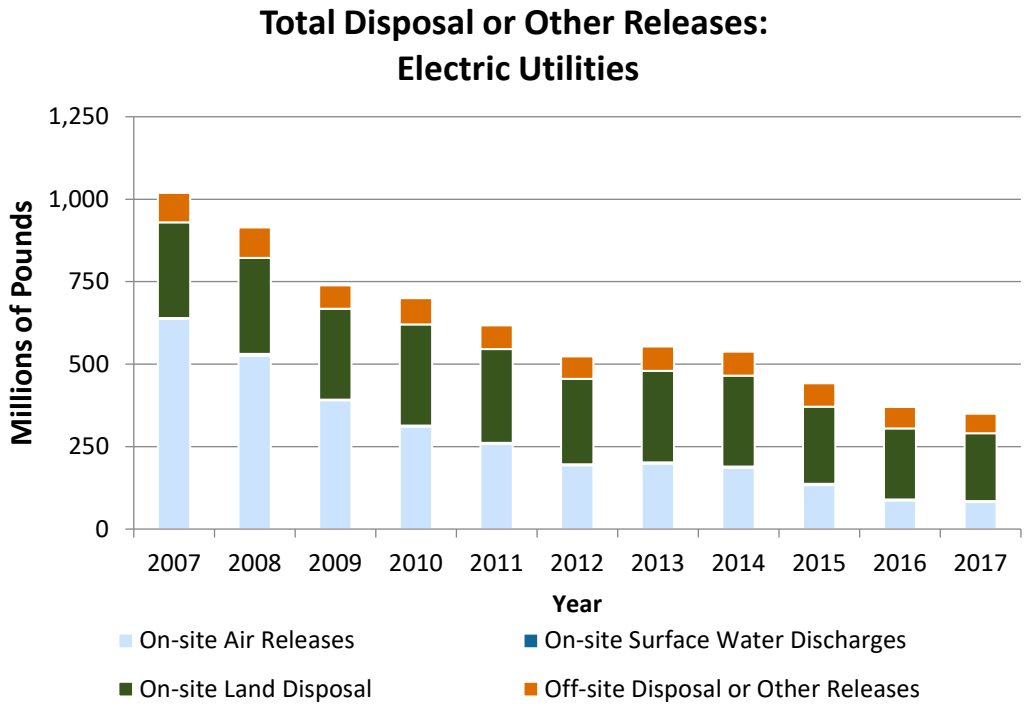
In 2017:

- Approximately three-quarters of the production-related waste was treated, while one-quarter was released to the environment.

- This is in contrast to 2007, when over half of the waste was released. This trend is largely due to an increase in scrubbers at electric utilities that treat (or destroy) TRI-reportable acid gases that would otherwise be released on site to the air.

Electric Utilities Releases Trend

The following graph shows the annual quantities of TRI chemicals electric utility facilities released or disposed.



From 2007 to 2017:

- Releases from the electric utilities sector decreased by 66%. This decrease was driven by an 87% decrease in on-site air releases. On-site land disposal, on-site surface water discharges, and off-site disposal also decreased, but to a lesser extent.

From 2016 to 2017:

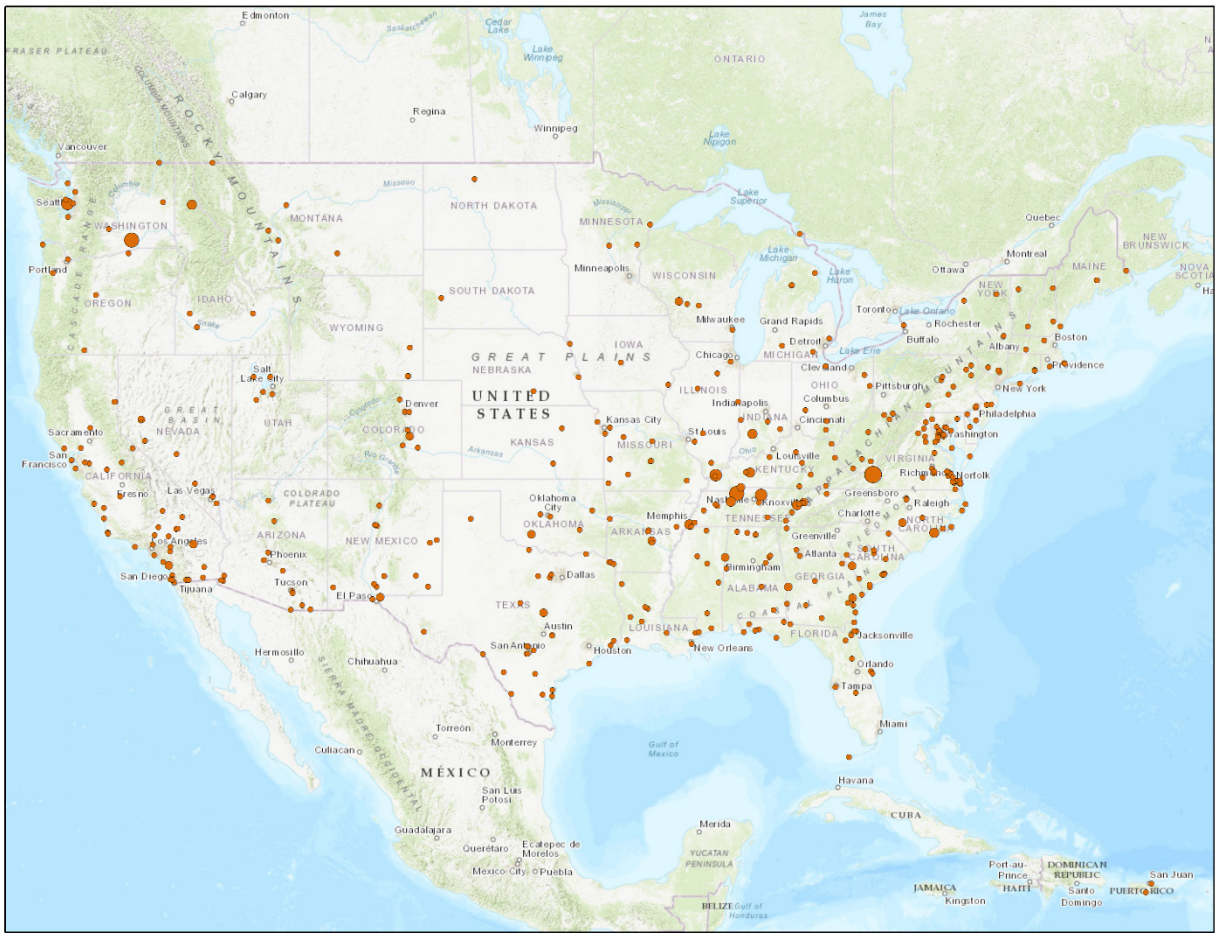
- Releases by electric utilities decreased by 6% (20 million pounds). This decrease was driven by reductions in on-site land disposal, off-site disposal, and continued reductions in air emissions.

Source Reduction in the Electric Utilities Sector:

In the electric utilities sector, 10 facilities (2% of the electric utility facilities reporting to TRI) initiated source reduction activities in 2017 to reduce their use of TRI chemicals and generation of wastes that contain TRI chemicals. Note that adding treatment equipment is considered a control technology for TRI chemical waste that is generated, and is not a source reduction activity that prevents waste from being generated. The most commonly reported types of source reduction activities for this sector were good operating practices and spill and leak prevention. TRI's Pollution Prevention Search Tool can help you learn more about pollution prevention opportunities in this sector.

Federal Facilities

This map shows the locations of the federal facilities that reported to Toxics Release Inventory (TRI) in 2017. Click on a facility for details on their TRI reporting.

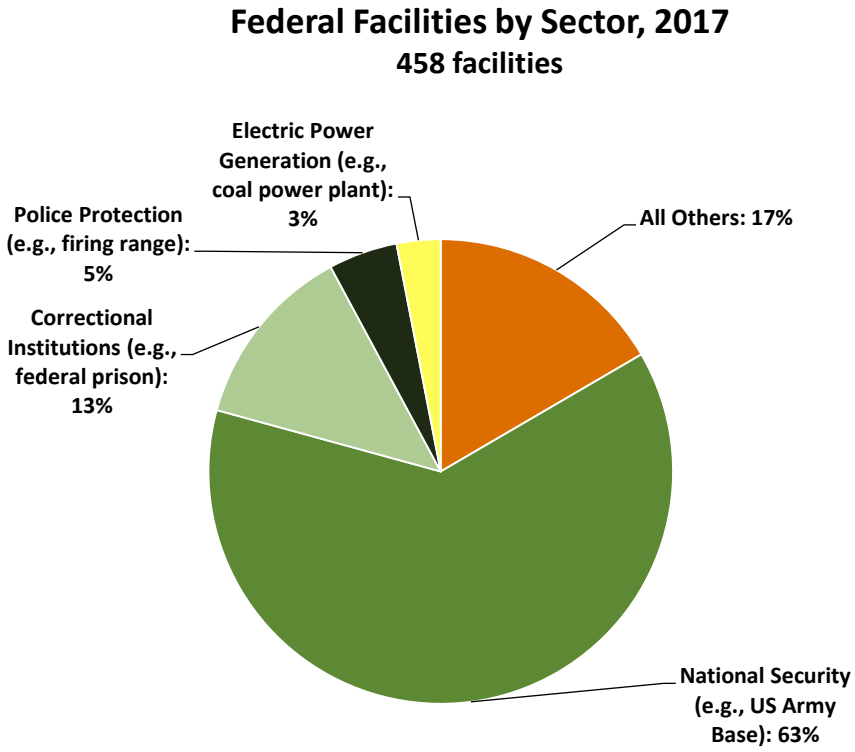


Federal Facilities Reporting to TRI, 2017

The 1993 Executive Order 12856, "Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements," established the requirement that all federal facilities, including facilities operated by the U.S. EPA, are subject to the Toxics Release Inventory (TRI) reporting requirements, regardless of the type of operations at the facility as described by their NAICS code. This executive order has been reaffirmed by subsequent administrations.

Federal Facilities by Industry

The following chart shows the number of federal facilities reporting to TRI by sector for 2017.



Note: Percentages may not sum to 100% due to rounding.

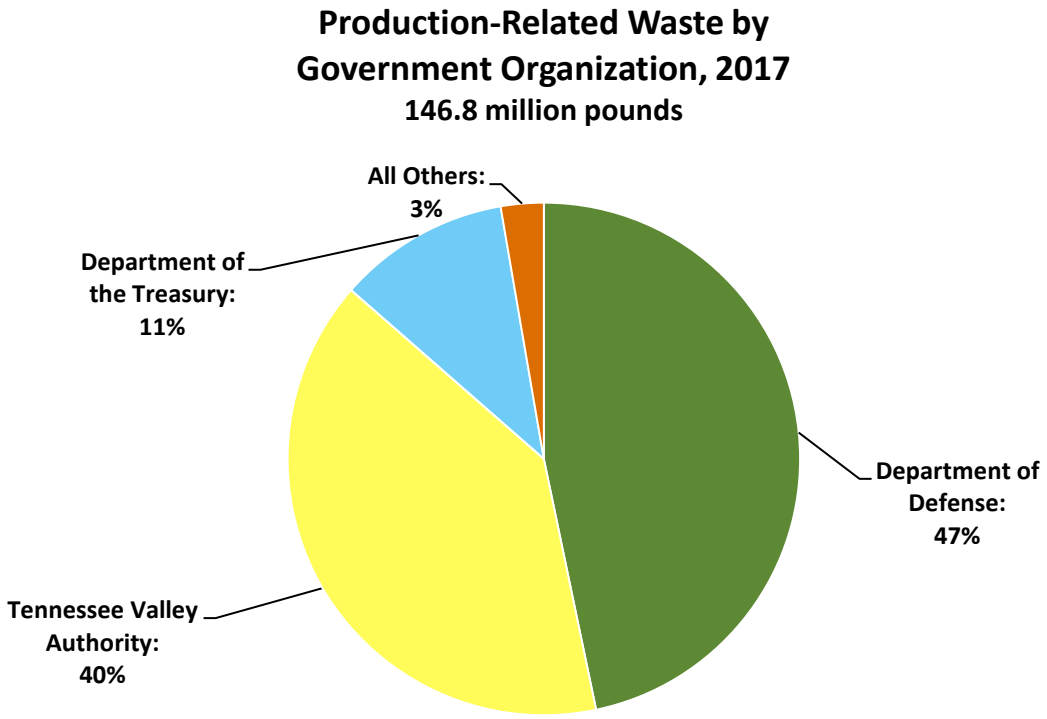
For 2017, 458 federal facilities in 39 different types of operations (based on their 6-digit NAICS codes) reported to TRI. Almost two-thirds of these facilities were in the National Security sector, which includes Department of Defense facilities such as Army and Air Force bases. All federal facilities are subject to TRI reporting requirements regardless of their sector. Therefore, for some industry sectors, the TRI database only includes data from federal facilities. More than three-quarters of federal facilities are in such sectors, including Military Bases (63%); Correctional Institutions (13%); and Police Protection, such as training sites for Border Patrol stations (5%).

As with non-federal facilities, activities at federal facilities drive the types and quantities of waste managed that is reported. Some of the activities at federal facilities that are captured by

TRI reporting are similar to those at non-federal facilities, such as hazardous waste treatment. In other cases, federal facilities may report waste managed from specialized activities that are not usually performed by non-federal facilities. For example, all of the federal facilities included under Police Protection and Correctional Institutions only reported for lead and lead compounds, likely due to the use of lead ammunition on firing ranges at these facilities.

Waste Management by Federal Facilities

The following pie chart shows the percentages of TRI chemicals managed as waste by federal government organizations in 2017.



Note: Percentages may not sum to 100% due to rounding.

- The types of waste reported by federal facilities vary by the type of operation.
    - The Tennessee Valley Authority (TVA) is a government-owned electric utility that provides power to southeastern states. Out of the 18 TVA facilities that reported to TRI for 2017, virtually all of the TRI production-related waste comes from the fossil fuel plants that report in the Fossil Fuel Electric Power Generation sector. Nearly 80% of their reported waste was hydrochloric and sulfuric acid aerosols which were mostly treated on site.
    - The Department of the Treasury facilities reporting to TRI are mints for manufacturing currency and, accordingly, they report metals (e.g., copper and nickel) to TRI. All of their metal waste is recycled off site.

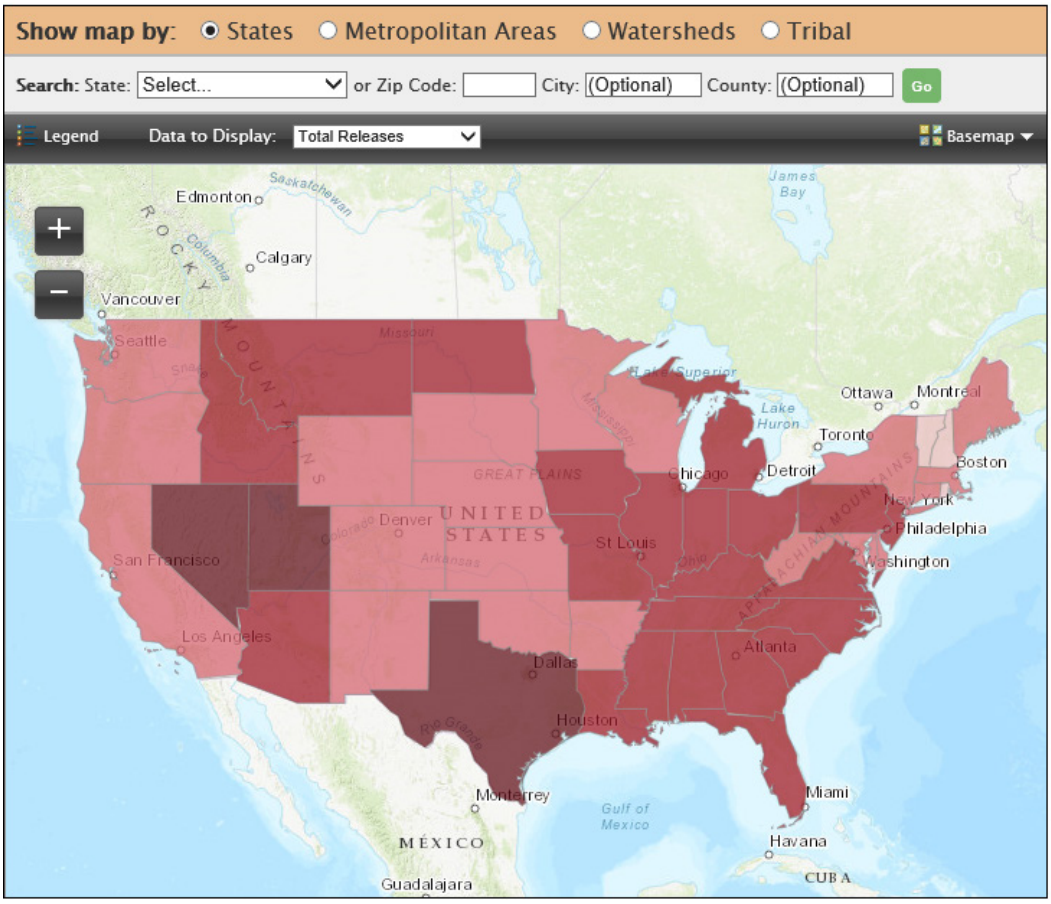
Source Reduction at Federal Facilities:

Since federal facilities are subject to TRI reporting regardless of their industry sector classification, their operations are diverse and few focus on manufacturing processes. Due to their unique functions, some federal facilities may face challenges in implementing source reduction strategies to reduce chemical waste. For the 2017 reporting year, 13 federal facilities (3%) reported implementing source reduction activities.

Federal facilities have often indicated barriers in reducing use of lead because it is contained in ammunition used at National Security and Park Service facilities. In 2017, several federal facilities reported using green ammuntion in accordance with National Park Service policy to use nonlead ammunition where feasible. To find more examples of federal facilities' source reduction activities and the barriers they face to implementing source reduction, visit TRI's Pollution Prevention Search Tool and select industry sectors such as National Security, Correctional Institutions or Police Protection from the dropdown menu under "search criteria."

Where You Live

This section of the National Analysis looks at disposal and other releases of Toxics Release Inventory (TRI) chemicals that occurred at various geographic levels throughout the United States during 2017.



As with any dataset, there are several factors to consider when using the TRI data. Key factors associated with data presented are summarized in the Introduction. For more information see Factors to Consider When Using Toxics Release Inventory Data.

States and Metropolitan Areas

For TRI purposes, "states" includes all U.S. territories. For 2017, all 56 states and territories had facilities that reported releases to the TRI Program. Texas, Ohio, and California had the most facilities that reported to TRI, and together accounted for 20% of total TRI-reporting facilities in 2017.

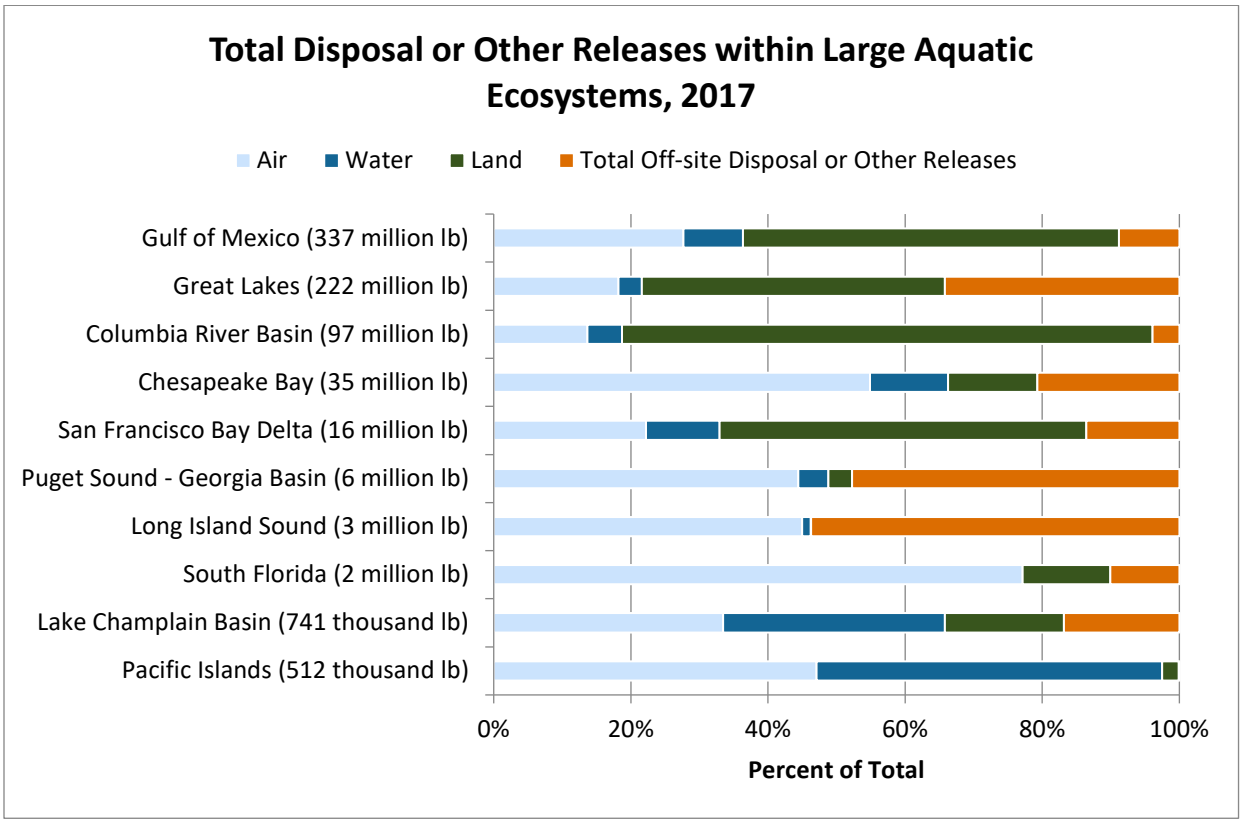
More than 80% of the United States' population and many of the industrial facilities that report to the TRI Program are located in urban areas. "Metropolitan statistical areas" and "micropolitan statistical areas" in the United States are defined by the Office of Management and Budget (OMB) and consist of one or more socially and economically integrated adjacent counties, cities, or towns.

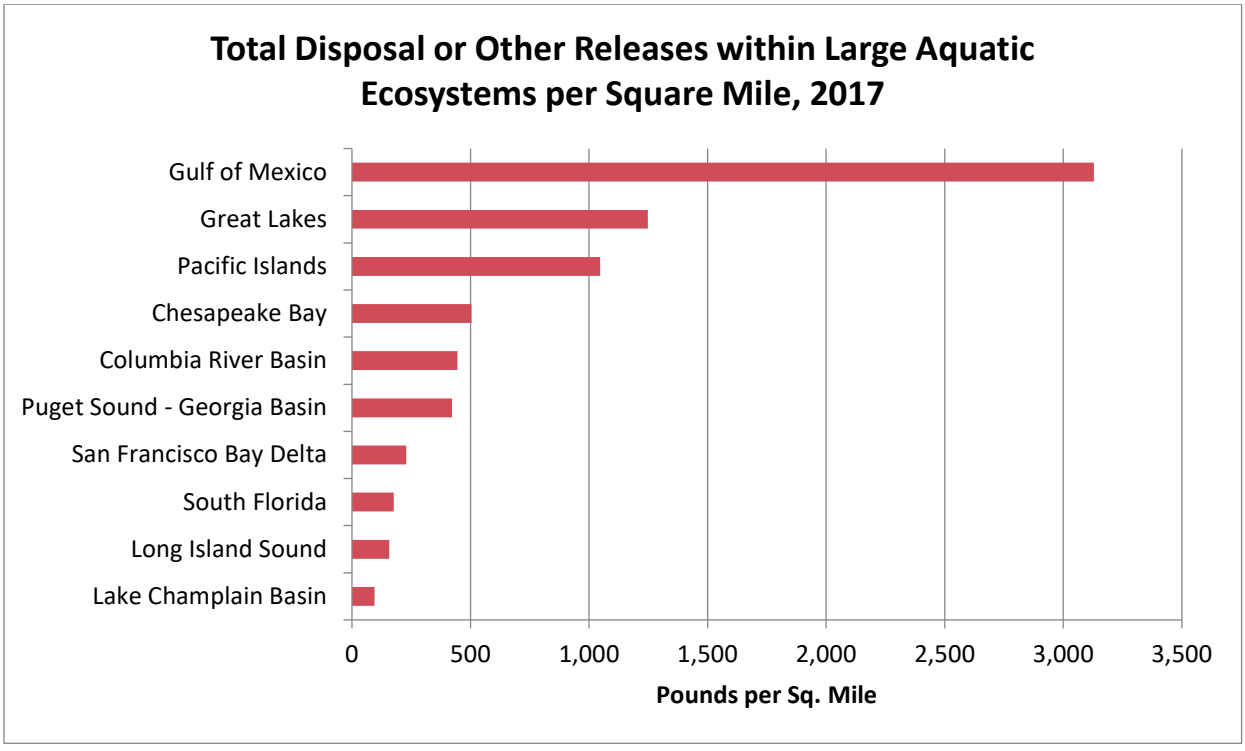
Watersheds

A watershed is the land area that drains to a common waterway. Rivers, lakes, estuaries, wetlands, streams, and oceans are catch basins for the land adjacent to them. Ground water aquifers are replenished based on water flowing down through the land area above them.

Large aquatic ecosystems (LAEs) comprise multiple small watersheds and water resources within a large geographic area. The Large Aquatic Ecosystems Council was created by the U.S. Environmental Protection Agency in 2008 to focus on protecting and restoring the health of critical aquatic ecosystems. Currently, there are 10 LAEs in this program.

Water pollution, surface runoff, contaminated sediment, discharges of chemicals, and air emissions can affect the quality of the land, water, and living resources within an aquatic ecosystem. Persistent, bioaccumulative and toxic chemicals can be especially problematic in aquatic ecosystems because pollutants can accumulate in sediments and may bioaccumulate in aquatic organisms and the tissues of fish and other wildlife within the food chain to concentrations many times higher than in the water or air, which ultimately may cause environmental health problems for humans and wildlife.


Total Disposal or Other Releases within Large Aquatic Ecosystems, 2017
Air
Water
Land
Total Off-site Disposal or Other Releases
Gulf of Mexico (337 million lb)
Great Lakes (222 million lb)
Columbia River Basin (97 million lb)
Chesapeake Bay (35 million lb)
San Francisco Bay Delta (16 million lb)
Puget Sound - Georgia Basin (6 million lb)
Long Island Sound (3 million lb)
South Florida (2 million lb)
Lake Champlain Basin (741 thousand lb)
Pacific Islands (512 thousand lb)
0%
20%
40%
60%
80%
100%
Percent of Total


Total Disposal or Other Releases within Large Aquatic Ecosystems per Square Mile, 2017
Gulf of Mexico
Great Lakes
Pacific Islands
Chesapeake Bay
Columbia River Basin
Puget Sound - Georgia Basin
San Francisco Bay Delta
South Florida
Long Island Sound
Lake Champlain Basin
0
500
1,000
1,500
2,000
2,500
3,000
3,500
Pounds per Sq. Mile

Tribal Communities

Under EPA policy, the Agency works with federally recognized tribes on a government-to-government basis to protect the land, air, and water in Indian country and Alaska Native villages and to support tribal assumption of program authority. Facilities located in Indian country that meet TRI reporting requirements must indicate the appropriate three-digit Bureau of Indian Affairs (BIA) tribal code on annual TRI reporting forms. These codes tell the EPA on which tribal land the facility is located.

In 2017, there were 41 facilities located in the Indian country of 18 different federally recognized tribes. These facilities collectively reported 31 million pounds of production-related waste and 10 million pounds of releases (total disposal or other releases). Of the releases reported, 96% of the TRI releases in Indian country occurred on site, and 90% of these releases were disposal to land reported by electric utilities and metal mining facilities. In 2017, these facilities primarily released metal compounds such as lead and barium. Lead is often present in the mineral ore disposed of by metal mines, and barium is present in coal and oil combusted at electric utilities.

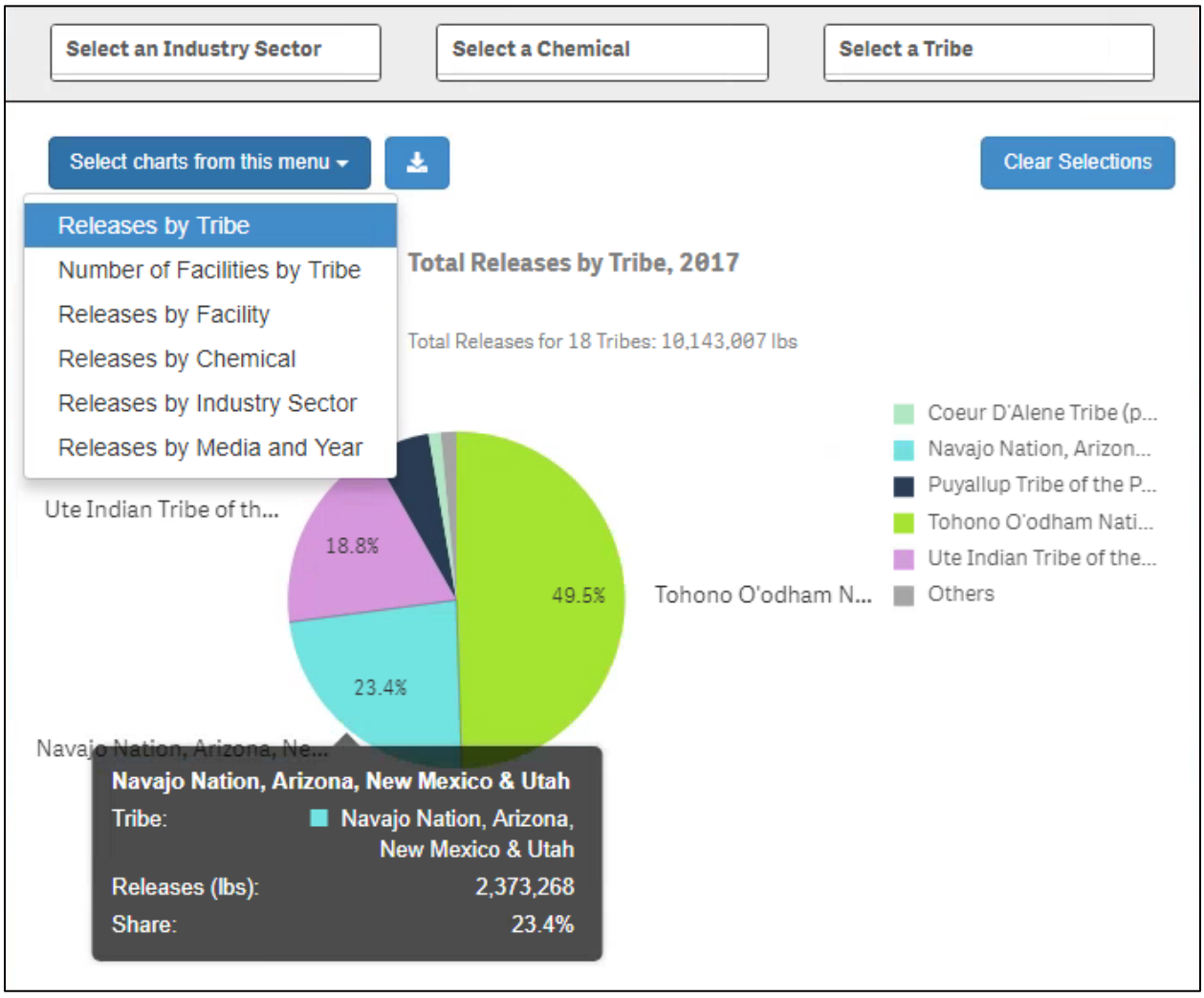
The table below provides more details about various types of releases and waste management reported by facilities on federally recognized tribal lands.

Quick Facts for 2017: Facilities on Tribal Lands

Measure	*Value*
Number of Facilities that Reported to TRI	**41**
Number of Tribes with TRI Facilities	18
Production-Related Waste Managed	**30.84 million lb**
Recycled	12.15 million lb
Energy Recovery	3.19 million lb
Treated	5.36 million lb
Disposed or Otherwise Released	10.14 million lb
Total Disposal or Other Releases	**10.14 million lb**
On-site	**9.76 million lb**
Air	0.60 million lb
Water	1.22 thousand lb

Measure	*Value*
Land	9.16 million lb
Off-site	**0.37 million lb**

The interactive chart below lists the federally recognized tribes with at least one TRI-reporting facility on their lands, and includes various data related to TRI releases by the facilities located on those lands. Use the buttons in the top gray row to filter the data by industry sector, chemical, and/or tribe. The blue dropdown button on the left allows you to view the data differently by changing which chart is displayed. Visit the TRI for Tribal Communities Qlik dashboard to explore even more information about releases of chemicals on or near tribal lands. Additional information about all TRI facilities is also available in the full 2017 TRI National Analysis Qlik dashboard.



The interactive table below lists the federally recognized tribes that had at least one TRI-reporting facility on their lands, along with the total releases reported by facilities, the number of facilities, and a link to a fact sheet with more information about TRI facilities on each tribe's land. Click on a column header to change the sorting of the table.

Total Disposal or Other Releases on Tribal Lands by Tribe, 2017

Tribes with TRI Facilities Located on or Within 10 Miles of Their Tribal Lands in 2017
This table is interactive - click the column headers to change the sorting of the table.

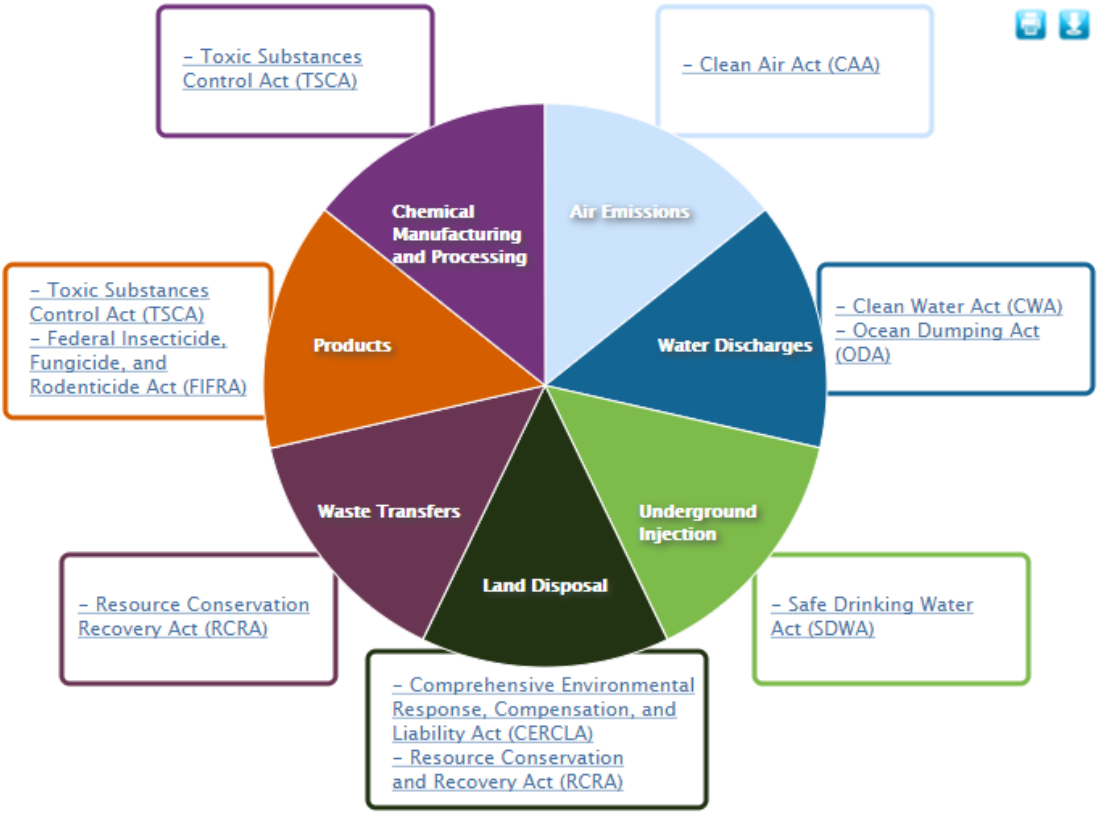
Tribe	Total Releases (lbs)	Number of Facilities	Fact Sheet
Totals	**10,143,007**	**41**	
Tohono O'odham Nation of Arizona	5,021,595	1	Link
Navajo Nation, Arizona, New Mexico & Utah	2,373,268	2	Link
Ute Indian Tribe of the Uintah & Ouray Reservation, Utah	1,911,791	1	Link
Puyallup Tribe of the Puyallup Reservation	565,960	10	Link
Coeur D'Alene Tribe (previously listed as the Coeur D?Alene Tribe of the Coeur D'Alene Reservation, Idaho)	117,441	2	Link
Confederated Tribes and Bands of the Yakama Nation	108,934	3	Link
Eastern Band of Cherokee Indians	37,315	1	Link
Arapaho Tribe of the Wind River Reservation, Wyoming	2,741	1	Link
Saginaw Chippewa Indian Tribe of Michigan	2,437	1	Link
Colorado River Indian Tribes of the Colorado River Indian Reservation, Arizona and California	766	1	Link
Oneida Tribe of Indians of Wisconsin	314	4	Link
Gila River Indian Community of the Gila River Indian Reservation, Arizona	290	7	Link
Salt River Pima-Maricopa Indian Community of the Salt River Reservation, Arizona	118	1	Link
Tulalip Tribes of Washington (previously listed as the Tulalip Tribes of the Tulalip Reservation, Washington)	30	1	Link
Nez Perce Tribe (previously listed as Nez Perce Tribe of Idaho)	6	1	Link
Chickasaw Nation	2	1	Link
Suquamish Indian Tribe of the Port Madison Reservation	0	1	Link
Choctaw Nation of Oklahoma	0	2	Link

Additional resources for tribes are available on the TRI for Tribal Communities webpage. The webpage includes more detailed analyses of TRI data, links to other online tools, and Tribal Program Manager contact information.

TRI and Beyond

The Toxics Release Inventory (TRI) is a powerful resource that provides the public with information about how TRI chemicals are managed by facilities in the United States. However, there are many other programs at EPA that collect information about chemicals and the environment.

The next figure is an overview of some of the laws that EPA implements, and the industrial activities or processes EPA regulates under these laws. While many programs at EPA focus on one area, TRI covers releases of chemicals to air, water, and land; waste transfers; and waste management activities. As a result, TRI data are especially valuable, as they can be utilized with many other datasets to provide a more complete picture of national trends in chemical use, chemical management, environmental release and other waste management practices, and environmental performance.



Note: The Emergency Planning and Community Right-to-Know Act (EPCRA) establishes requirements for emergency planning, preparedness, and reporting on hazardous and toxic chemicals involving air releases, water releases, land disposal, waste transfers, and waste management.

Throughout EPA, offices use TRI data to support their mission to protect human health and the environment. These uses include analyzing TRI data to inform decisions such as when setting program priorities, providing information to stakeholders such as when working with communities toward a common goal, and many other applications.

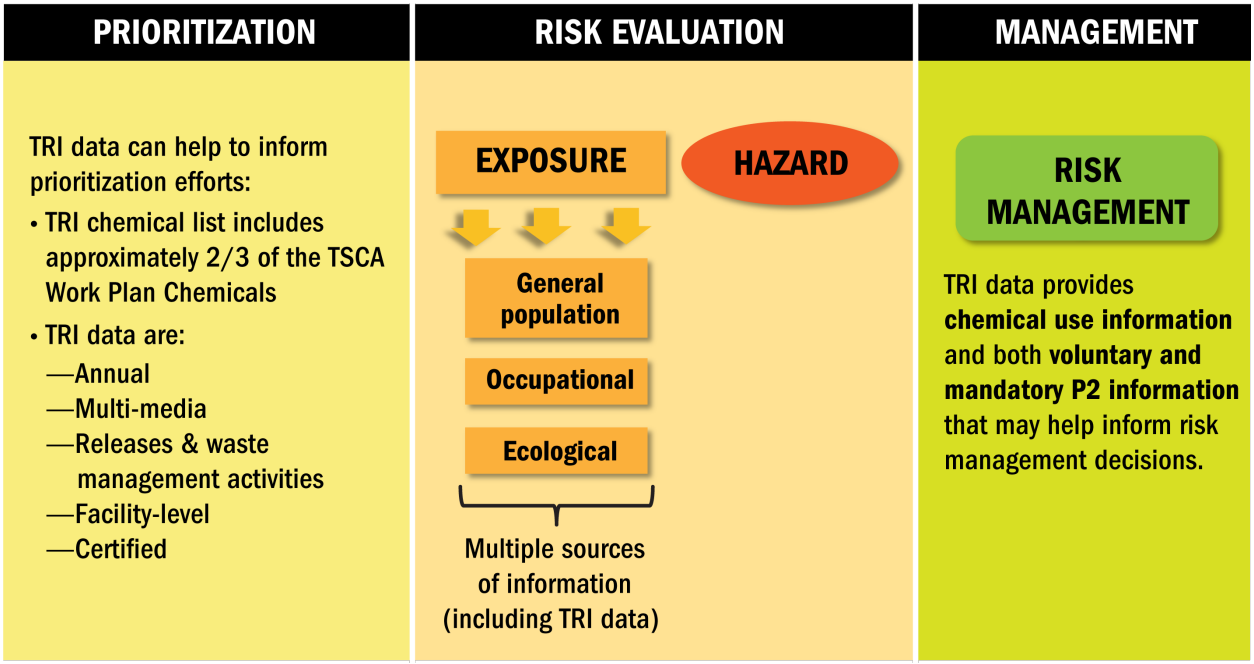
This section of the National Analysis highlights how TRI data complement Toxic Substances Control Act (TSCA) data and risk evaluations, and how TRI has served as a model for other pollutant release and transfer inventories around the world.

As with any dataset, there are several factors to consider when using the TRI data. Key factors associated with data presented are summarized in the Introduction. For more information see Factors to Consider When Using Toxics Release Inventory Data.

TSCA and TRI

The Toxic Substances Control Act (TSCA), as amended by the Frank R. Lautenberg Chemical Safety for the 21st Century Act, is the nation's primary chemicals management law. Under TSCA, existing chemicals in commerce and new chemicals intended for use in commerce are reviewed for safety through a risk-based process with increased public transparency.

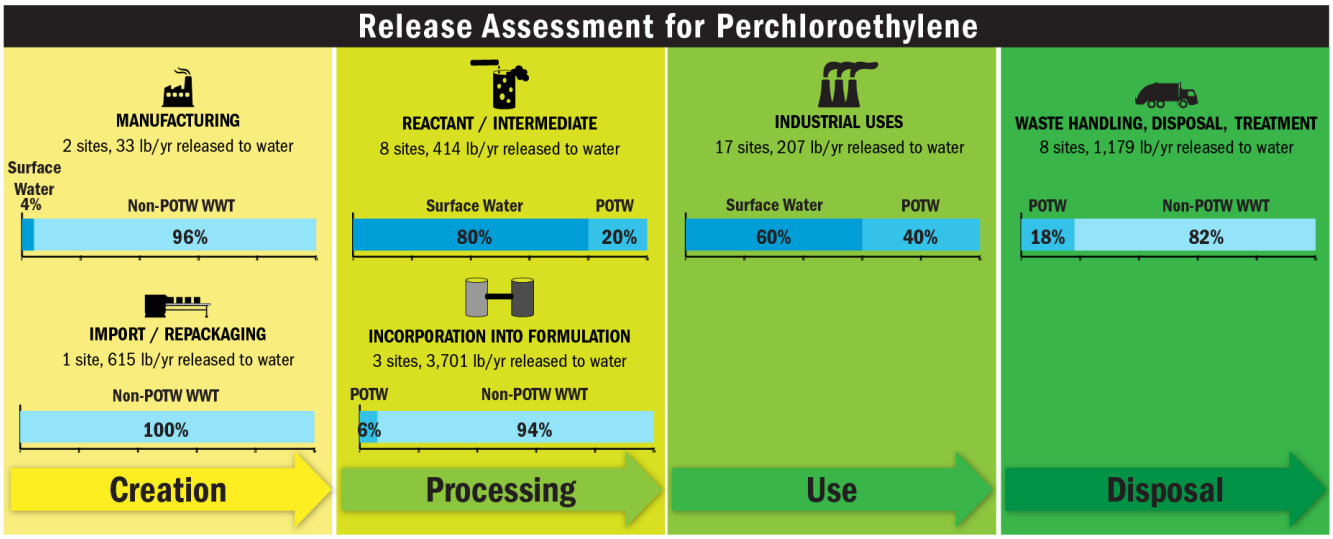
The three stages of EPA's process for evaluating the safety of existing chemicals are prioritization, risk evaluation, and risk management. During both the prioritization and risk evaluation stages of the process, TRI serves as a source of information, as illustrated in the figure below.



Prioritization. Approximately two-thirds of the chemicals identified in the 2014 update of the TSCA Work Plan are also included on the TRI list of chemicals. TRI is well suited to help inform prioritization of chemicals for risk evaluation because TRI data contain information on release quantities of TRI chemicals to air, water and land, and the locations of these releases, and are submitted annually. Note that designation as a TRI chemical by itself does not determine high or low priority for a chemical.

Risk evaluation. A TSCA risk evaluation of a chemical is a comprehensive evaluation of the risk the chemical poses to human health and the environment over the chemical's life cycle. The conditions of use for the chemical are evaluated, which may include manufacturing and import, processing, use, and disposal. During risk evaluation, EPA is required to assess occupational exposure, as well as general population exposure, and exposure to ecological receptors that may be sensitive to the potential hazards posed by the chemical under review. The TRI is a useful source of information for assisting in estimating these exposures, as it contains release quantities of TRI chemicals to air, water, and land, the locations of these releases, as well as information on use and waste management practices that may lead to exposure.

EPA uses TRI data as an information source to estimate and analyze environmental releases from industrial uses of the chemical in the risk evaluation. The figure below provides an example of a water release assessment for a chemical throughout the multiple phases of its industrial life cycle. At each life cycle phase, both the number of sites and quantity released are determined based on the TRI data. The release assessment estimates the amount of the chemical entering the environment, which can subsequently be used to model exposures of general populations and environmental species for each condition of use. To complete the risk evaluation stage, EPA makes a risk determination stating whether a chemical substance presents an unreasonable risk to human health or the environment under its conditions of use.

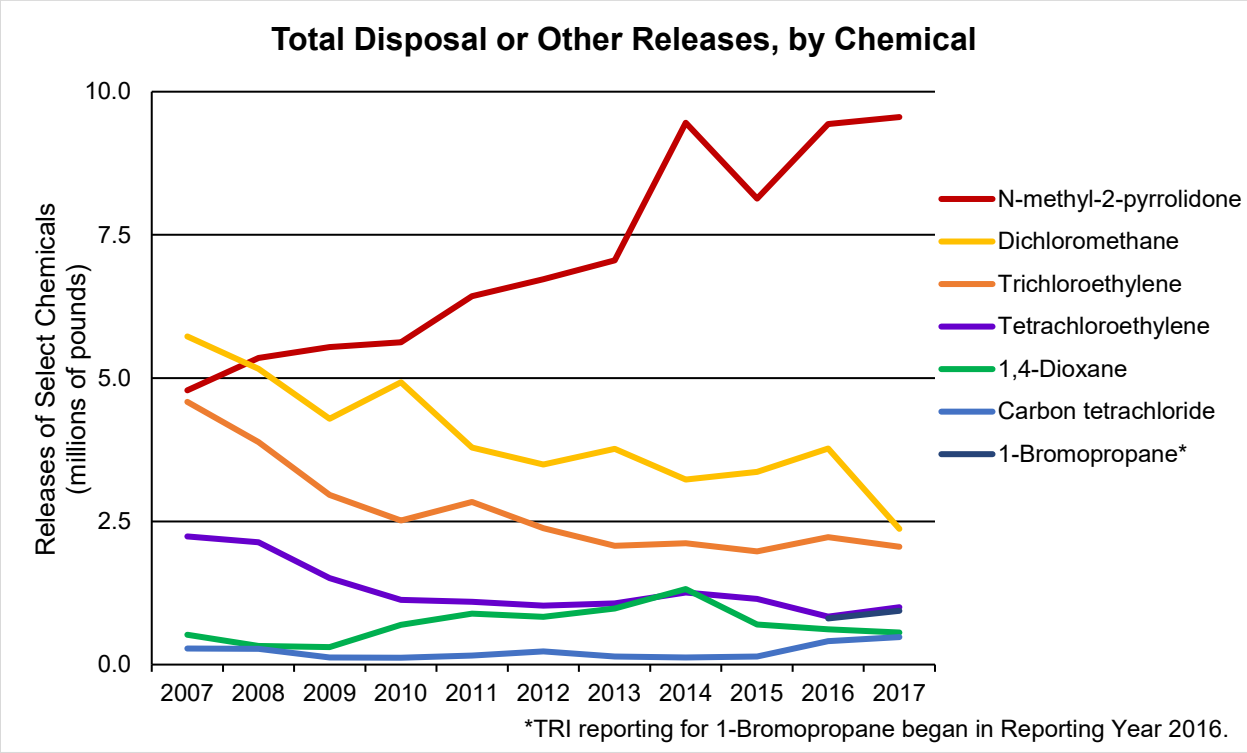


Management. If EPA determines that a chemical presents an unreasonable risk to human health or the environment, EPA will evaluate options for mitigating the risks. EPA is required to implement, via regulation, restrictions on the manufacture, processing, distribution, use and/or disposal of the chemical to eliminate the unreasonable risk. EPA is given a range of risk

management options under TSCA, including labeling, recordkeeping or notice requirements, actions to reduce human exposure or environmental release, or a ban of the chemical or of certain uses of the chemical. TRI data, such as on chemical use and pollution prevention, may be used to inform these risk management decisions.

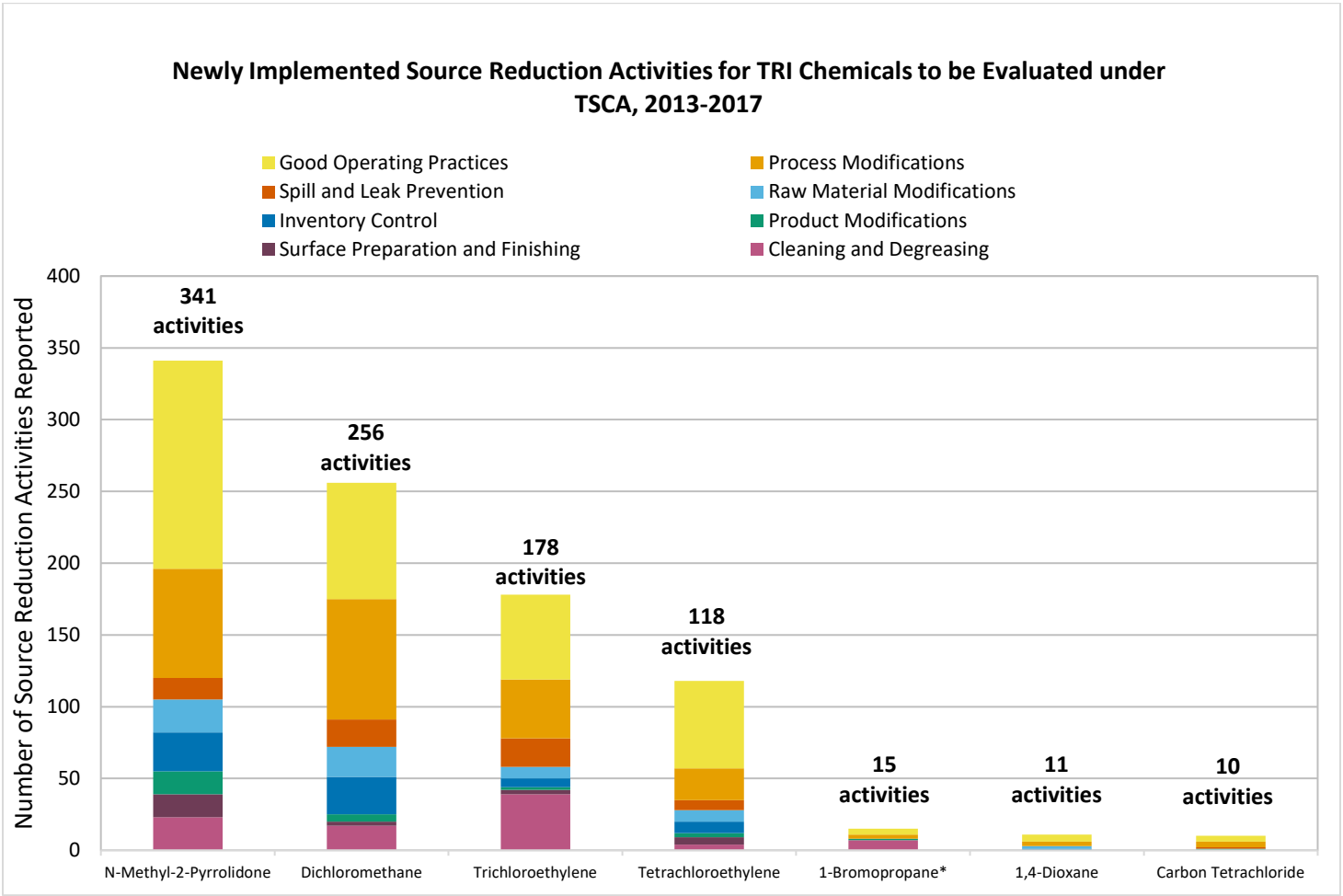
Chemicals to be Evaluated under TSCA

In 2017, EPA published the scope of the risk evaluations to be conducted for the initial ten chemicals undergoing risk evaluation under the amended TSCA. Of these ten chemicals, seven are fully covered on the TRI list of chemicals, two are partially covered by TRI, and one is not on the TRI chemical list. For the TRI-listed chemicals, TRI can provide valuable information to the TSCA assessment process and serves as a tool for tracking the nation's progress toward reduced environmental releases. This figure shows the trend in TRI-reported releases of the TSCA chemicals currently undergoing risk evaluation that are fully TRI-listed.



Source Reduction Activities for Chemicals to be Evaluated under TSCA

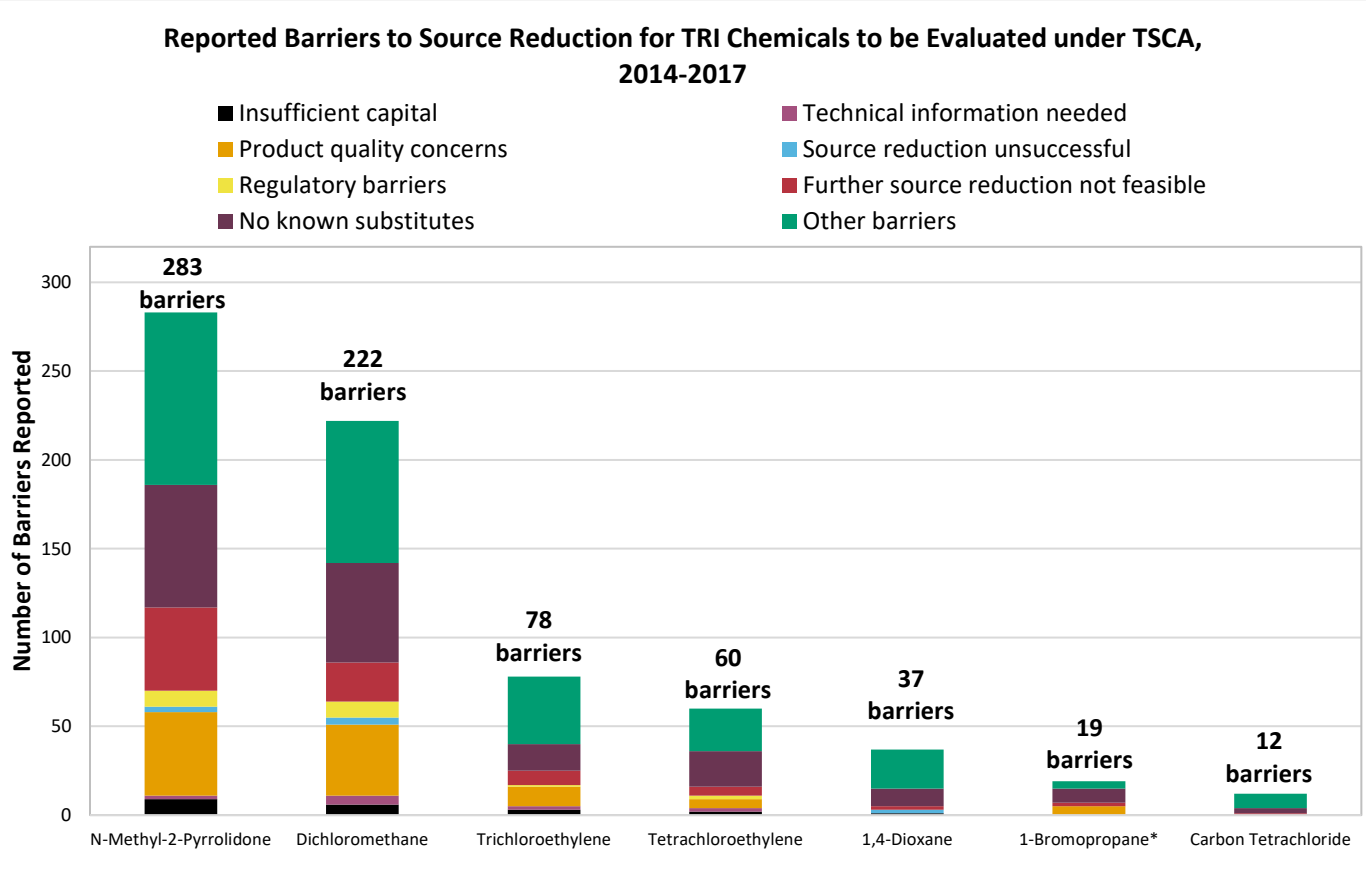
In addition to information on release quantities, TRI contributes information on the types of source reduction activities implemented by facilities to reduce the quantity of the chemical generated as waste. This figure shows the source reduction activities reported to TRI for the initial ten chemicals undergoing risk evaluation under the amended TSCA.



*TRI reporting for 1-Bromopropane began in Reporting Year 2016
Note: Facilities report their source reduction activities by selecting codes that describe their activities. These codes fall into one of eight categories listed in the graph legend and are defined in the TRI Reporting Forms and Instructions.

Barriers to Source Reduction for Chemicals to be Evaluated under TSCA

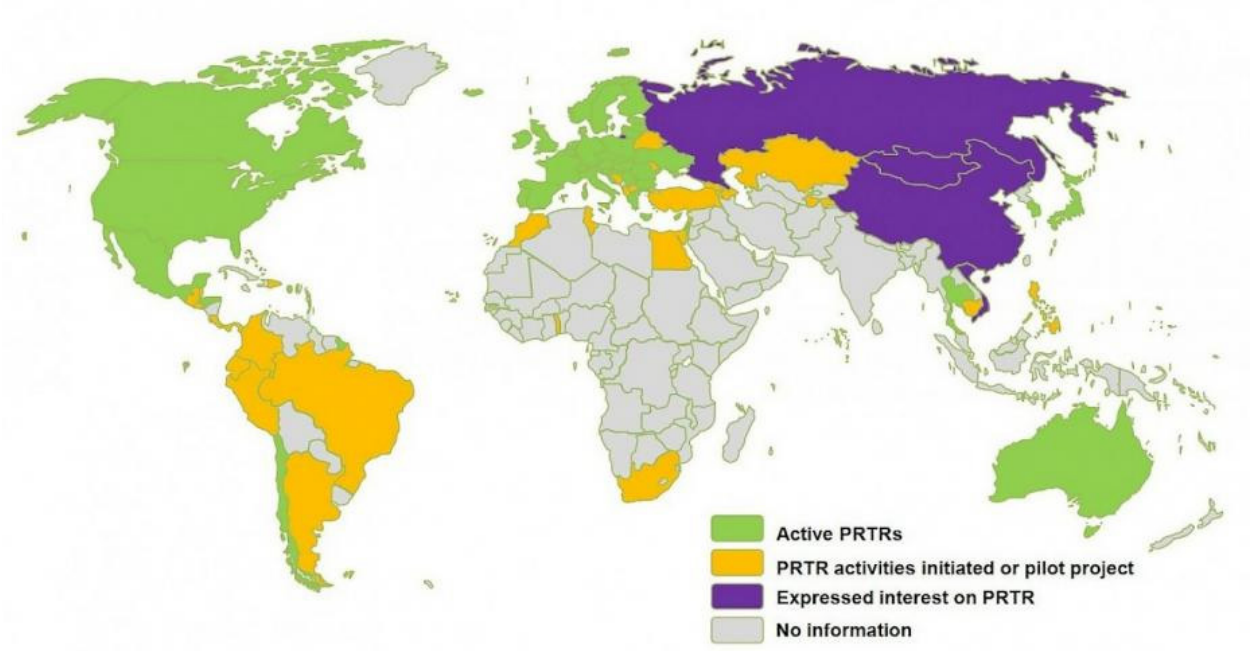
Facilities that report to TRI have the option to describe barriers that have prevented the implementation of source reduction activities. The figure below shows the barriers reported to TRI for the initial ten chemicals undergoing risk evaluation under the amended TSCA.



*TRI reporting for 1-Bromopropane began in Reporting Year 2016
Note: Facilities optionally report their barriers by checking boxes that describe barriers to source reduction that they faced. They may also provide text information related to the barrier.

TRI Around the World

In 1986, the TRI Program was established as the first national Pollutant Release and Transfer Register (PRTR) in the world. Since then, environmental agencies around the world have been increasingly implementing their own PRTR programs with the Toxics Release Inventory (TRI) serving as a model. Currently, at least 50 countries have fully established PRTRs or have implemented pilot programs, as shown in the map below. More are expected to be developed over the coming years, particularly in Asian, South American, and African countries.



Source: United Nations Economic Commission for Europe, 2016

As global PRTR implementation continues to grow, the TRI Program will continue to work with international organizations to:

- Assist in the development of PRTR programs in other countries
- Encourage other countries to develop initiatives aimed at making existing PRTR data more comparable to allow better analysis of the data on a global scale
- Make PRTR data more useful for assessing progress towards sustainability

For information on international PRTR activities, projects and partners, see TRI's International webpage. As an example, the TRI Program is currently working with the Organization for Economic Co-operation and Development (OECD) EXIT on a project to use global PRTR data to assess progress toward the Sustainable Development Goals established in the United Nation's 2030 Agenda for Sustainable Development EXIT, as described in the Project Spotlight below.

International Project Spotlight:
Using PRTR Data to Assess Progress toward the U.N. Sustainable Development Goals

Background. The TRI Program is participating in a project to use global PRTR data to assess progress toward the United Nations' (U.N.) Sustainable Development Goals (SDGs). These goals are designed to "shift the world on to a sustainable and resilient path" by setting targets that encompass the economic, environmental, and social dimensions of sustainability. As countries and stakeholders take action toward achieving the SDGs, the U.N. will measure progress toward the Goals using existing data where possible. One such existing data source for some of the SDGs may be found in countries' established PRTR data.

Project Objectives. The project applies and demonstrates the utility of PRTR data to inform SDGs and has three complementary objectives:

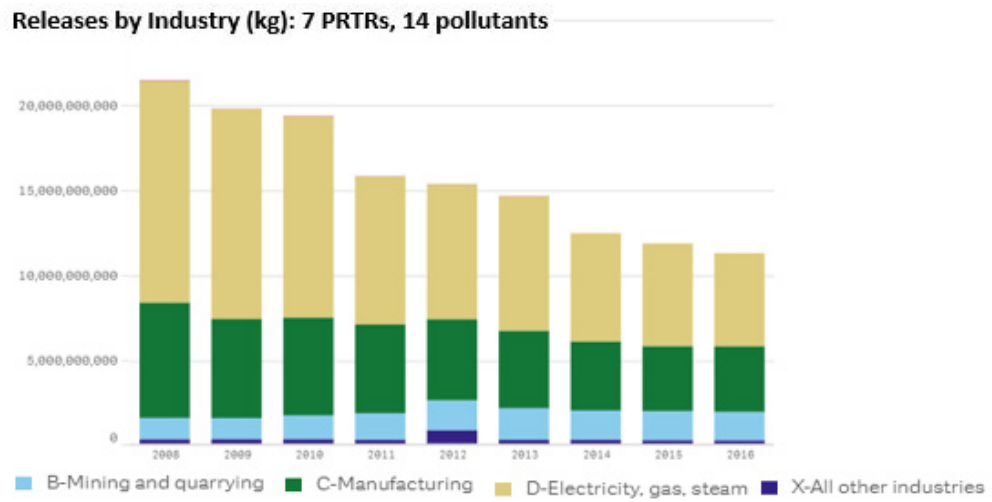
- Developing approaches for using PRTR data for global-scale sustainability analyses,
- Assessing progress towards meeting specific SDG targets through examination of global chemical pollution trends, and
- Accelerating progress towards meeting specific SDG targets by investigating the drivers of observed trends and providing an opportunity for knowledge transfer among countries facing similar chemical pollution challenges.

Initial Focus. The U.N. SDG Target 12.4 was identified as the target most directly relevant to PRTR data and is the focus of this initial phase of the project. This target focuses on reducing chemical releases to the environment.

SDG Target 12.4

By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment.

Project Status. Global analyses of PRTR data are currently underway to aggregate data for multiple chemicals from multiple countries in order to recommend possible metrics to track progress in reducing chemical releases to the environment. A sample figure below shows the trend for 14 pollutants as reported to 7 PRTRs.



Next steps. As the project progresses and the methods and metrics are reviewed and refined, ideally the findings would be included in the next update of the U.N. Sustainable Development Goals Report EXIT.

Read more about the TRI Around the World.