



Introduction to the 2015 TRI National Analysis

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

The Toxics Release Inventory (TRI) is a publically available database maintained by EPA's TRI Program that tracks the management of certain [toxic chemicals](#) that may pose a threat to human health and the environment. This information is submitted by U.S. facilities 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 their toxic chemical releases for the prior calendar year to EPA by July 1 of each year. The [Pollution Prevention Act](#) also requires facilities to submit information on pollution prevention and other waste management activities of TRI chemicals. Nearly 22,000 facilities submitted TRI data for calendar year 2015.

This year's Toxics Release Inventory shows significant reductions in releases of toxic chemicals into the air from 2005 to 2015. During this timeframe, air releases of toxic chemicals from U.S. industrial facilities covered by the TRI Program decreased by 56% (851 million pounds). Additionally, in 2015, of the nearly 26 billion pounds of total chemical waste managed at TRI-covered industrial facilities (excluding metal mines), approximately 92% was not released into the environment due to the use of preferred waste management practices such as recycling, energy recovery, and treatment.

What is the TRI National Analysis?

[Watch this video for an overview of the TRI National Analysis.](#)



Quick Facts for 2015	
Number of TRI Facilities	21,849
Production-Related Waste Managed	27.24 billion lb
Recycled	11.91 billion lb
Energy Recovery	3.10 billion lb
Treated	8.83 billion lb
Disposed of or Otherwise Released	3.41 billion lb
Total Disposal or Other Releases	3.36 billion lb
On-site	2.89 billion lb
Air	0.69 billion lb
Water	0.19 billion lb
Land	2.01 billion lb
Off-site	0.46 billion lb

Note: Numbers do not sum exactly due to rounding.

Users of TRI data should be aware that the quantity of releases is not an indicator of potential health risks posed by the chemicals. Although TRI data generally cannot indicate the extent to which individuals may have been exposed to toxic chemicals, TRI data can be used as a starting point to evaluate exposure and whether TRI chemicals pose risks to human health and the environment. [For more information on the potential hazard and risk posed by disposal or other releases of TRI chemicals, see the Hazard and Risk of TRI Chemicals section.](#)

Note that two metrics shown in the Quick Facts box related to disposal or other releases are similar (3.41 and 3.36 billion pounds), but total disposal or other releases is slightly lower. The reason 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 of the 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 transfer off-site and the on-site disposal.



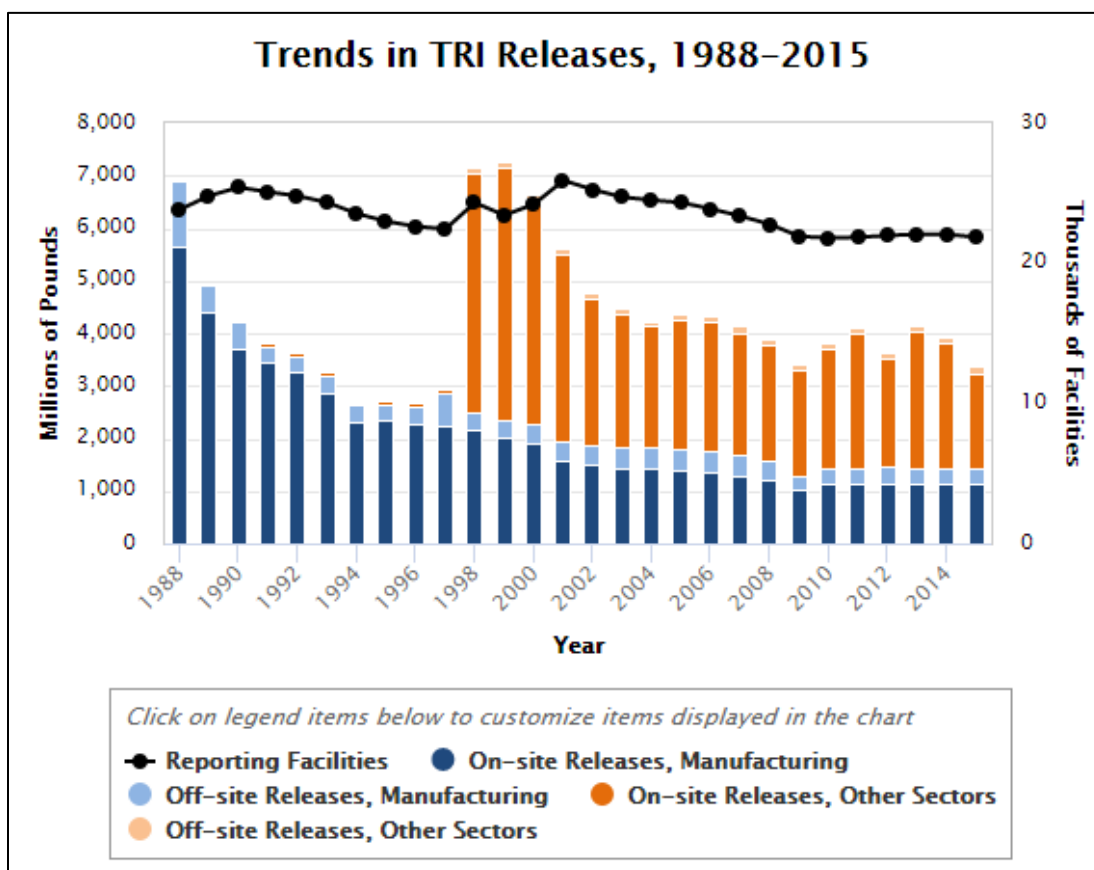
30-Year Anniversary of the TRI Program Slideshow

October 17, 2016 marked the 30th anniversary of the Toxics Release Inventory (TRI) Program's creation under the Emergency Planning and Community Right-to-Know Act (EPCRA). Over that time, the quantities of releases reported to the TRI Program have changed as various aspects of the program have evolved, including the number of chemicals included on the list of reportable chemicals and the types of industry sectors required to comply with TRI reporting. The slideshow below demonstrates how releases have changed over the years, and includes information about significant milestones in the history of the TRI Program.

[Read more about the 30th anniversary of the TRI Program.](#)

30-Year Anniversary Slideshow

To view the full interactive slideshow, [visit the 30-Year Anniversary Slideshow section of the National Analysis](#). Hover over the chart to pause, or use the arrows to navigate through the years. Red boxes indicate changes to TRI reporting requirements, whereas blue boxes indicate changes to the technology used to support TRI reporting and analysis.



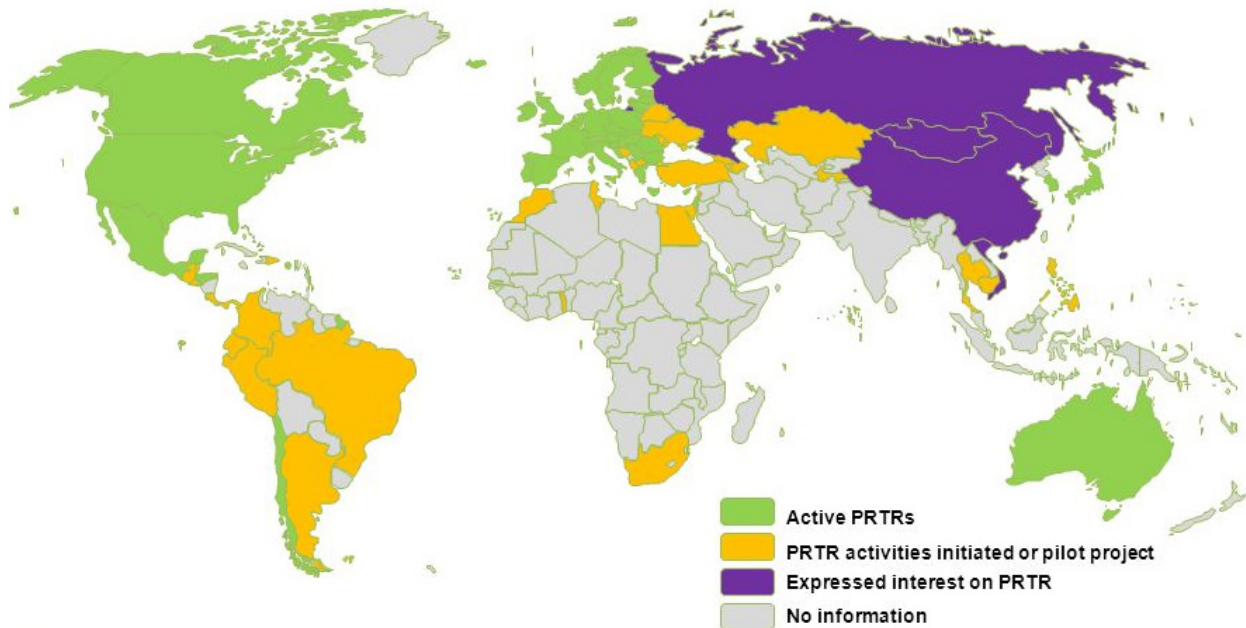
TRI's Influence around the World

Since its beginnings 30 years ago, the TRI Program has influenced the development of other similar Pollutant Release and Transfer Register (PRTR) programs. 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 Central and South American countries.

[Read more about TRI around the world.](#)

The Power of TRI Data

[Short overview of the importance of the information collected in the TRI Program.](#)

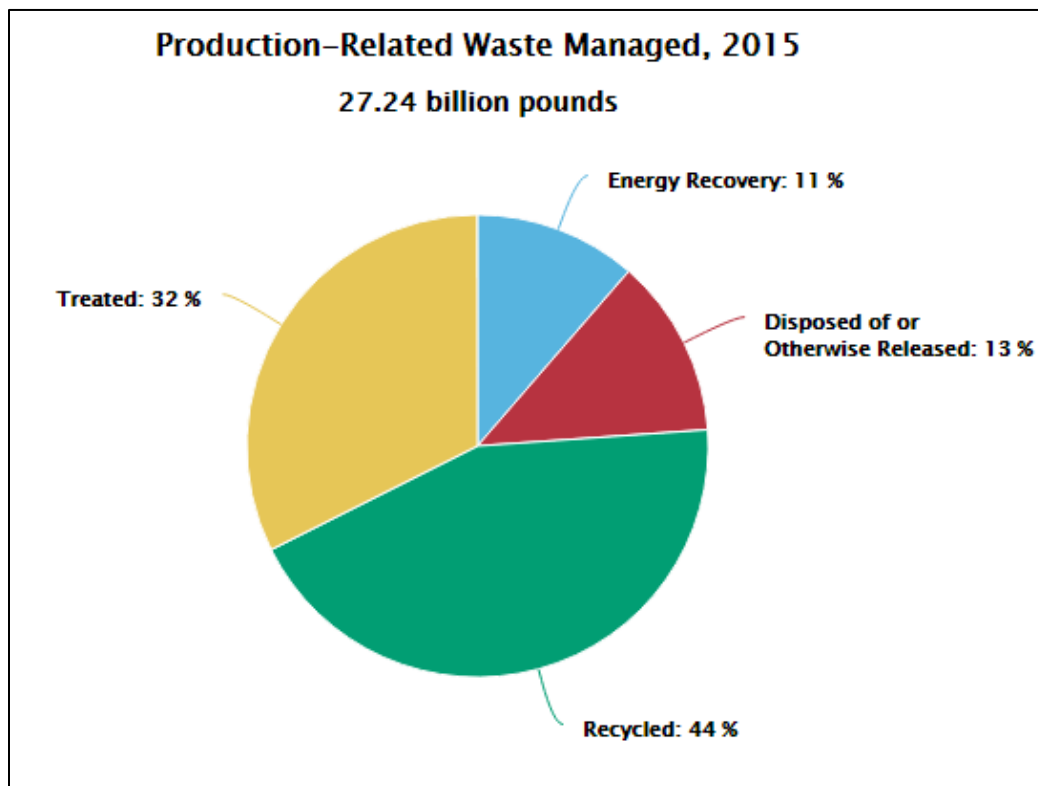


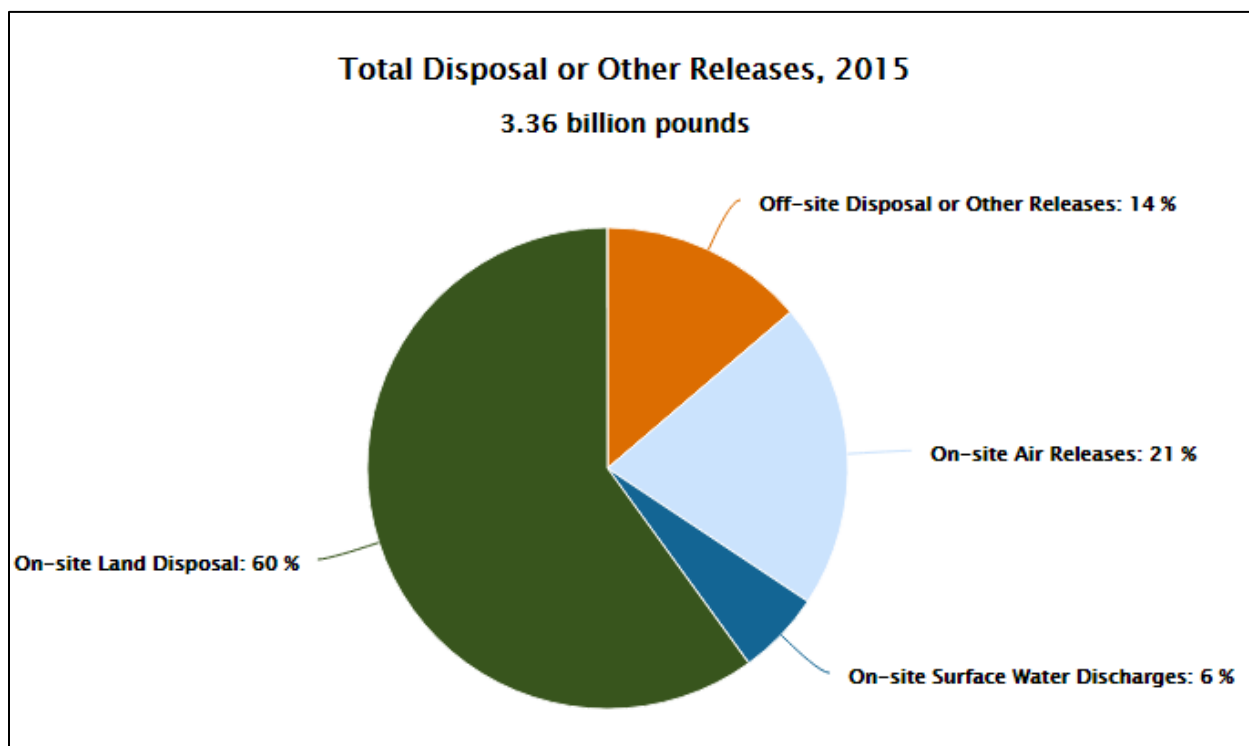
Summary of the 2015 TRI National Analysis

The Toxics Release Inventory (TRI) National Analysis is developed on an annual basis, and the 2015 TRI National Analysis is EPA's summary and interpretation of TRI data reported for activities that occurred at facilities during 2015. It offers a starting point for understanding how the environment and communities may be affected by toxic chemicals, and is presented as a snapshot of the data at one point in time. Any 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. [The most recent data available are accessible from the TRI Data and Tools webpage.](#)

Users of TRI data should be aware that the TRI database includes information on the quantities of many toxic chemicals that are released or otherwise managed as waste by industrial facilities, but it does not contain such information on all toxic chemicals or all industry sectors of the U.S. economy. Additionally, covered facilities report the quantities of chemicals to TRI using their best-available data. [Each year, EPA conducts an extensive data quality investigation before publishing the National Analysis.](#) During the data quality review, potential errors are identified and investigated to help ensure that accurate and useful information is presented in the National Analysis and TRI database.

The two pie charts below show: 1) how facilities reporting to TRI managed their toxic chemical waste; and 2) the disposition of the waste that was disposed of or otherwise released.



**In 2015:**

- 21,849 facilities reported to the TRI Program.
- Facilities reported managing 27.24 billion pounds of toxic chemicals in production-related waste. This is the quantity of toxic chemicals in waste that is recycled, burned for energy recovery, treated, disposed of or otherwise released. In other words, it encompasses the toxic chemicals in waste generated in the regular production processes and operations of the facilities that reported to TRI.
 - Of this total, 87% (23.84 billion pounds) was recycled, burned for energy recovery, or treated, and 13% was disposed of or otherwise released to the environment, as illustrated in the Production-Related Waste Managed pie chart.
- For chemical wastes that were disposed of or otherwise released, facilities also reported where wastes were released – to air, water, or land, on-site or off-site. As shown in the Disposal or Other Releases pie chart, most were disposed of on-site to land (including landfills, other land disposal, and underground injection).

[A current list of the chemicals reportable to the TRI Program is available on the TRI chemicals webpage.](#) The list of 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 2015 include all chemicals reportable in 2015 and may be slightly different from results in trend analyses that include 2015 and previous years.

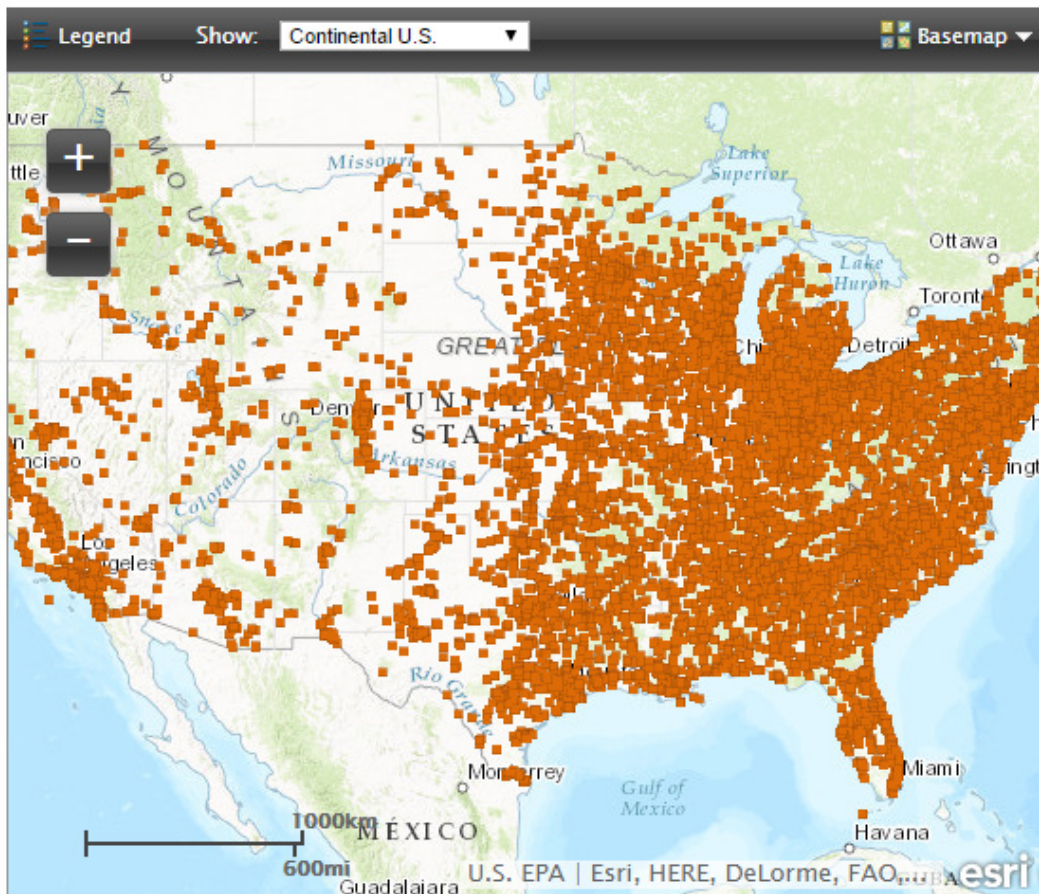
Additional information is presented in the following chapters of the TRI National Analysis:

- [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 toxic chemicals.
- [Releases of Chemicals](#) presents trends in releases of toxic chemicals to air, water, and land, including a focus on selected chemicals of special concern.
- [Industry Sectors](#) highlights toxic chemical waste management trends for five industry sectors: manufacturing, food processing, chemical manufacturing, metal mining, and electric utilities.
- [Where You Live](#) presents analyses of the quantities of TRI chemicals specific to: state, city, county, zip code, metropolitan area or 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 with other EPA data, such as greenhouse gas emissions, providing a more complete picture of national trends in chemical use, management, and releases of the chemicals, and overall environmental performance by facilities.

To conduct your own analysis of TRI data, use one of EPA's [TRI data access and analysis tools available to the public from the TRI Data and Tools webpage](#).

Map of Facilities in the 2015 TRI National Analysis

This map shows facilities that reported to EPA's Toxics Release Inventory (TRI) Program for 2015.



The facilities that report to the TRI Program are primarily from industry sectors involved in manufacturing, metal mining, electric power generation, and hazardous waste treatment; have ten or more employees; and manufacture, process, or otherwise use TRI chemicals in quantities above established reporting thresholds. [Federal facilities](#) are also required to report to the TRI Program, most recently by [Executive Order 13693](#).

For more information about facilities in your community that report to the TRI Program, [visit the Where You Live section of the National Analysis](#).

TRI Story Map

See EPA's [story map](#) about who lives near TRI facilities.

- 1 2014 TRI National Analysis
- 2 Who Lives near a TRI Facility?
- 3 Who Lives near a TRI Facility in Your County?
- 4 TRI Facilities in Your Neighborhood
- 5 Next Steps



Exploring Demographic Information within the TRI National Analysis

Almost 59 million people live within one mile of at least one of the many facilities that reported to the TRI Program for 2015. As part of the TRI National Analysis, EPA has developed a Story Map to provide information on community demographics across the country.

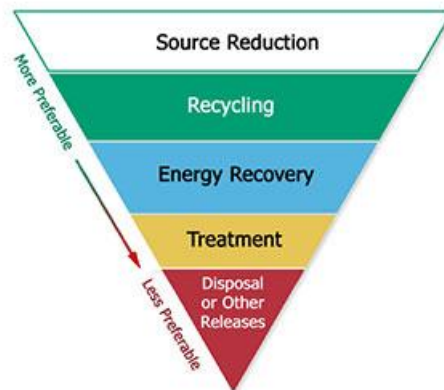
[The Story Map includes interactive maps showing facility locations and the demographic patterns of the communities around them](#), particularly the percentage of the population living below the poverty line and the population of minority status, based on U.S. Census data. You can search for your own community to learn more about the facilities that are located in your neighborhood that report to the TRI Program.

Pollution Prevention and Waste Management in the 2015

TRI National Analysis

The Toxics Release Inventory (TRI) collects information from facilities on the quantities of toxic chemicals they recycle, combust for energy recovery, treat for destruction, and dispose of or otherwise release on- and off-site. These quantities, in aggregate, are collectively referred to as the quantity of production-related waste managed.

Looking at production-related waste managed over time helps track progress in reducing waste generation and moving toward preferred waste management practices. EPA encourages facilities to first eliminate waste at its source. For waste that is generated, the most preferred management method is recycling, followed by burning for energy recovery, treating, and, as a last resort, disposing of or otherwise releasing the waste into the environment. These waste management priorities



are illustrated in the waste management hierarchy established by the Pollution Prevention Act (PPA) of 1990. The goal is that, when possible, facilities will shift over time from disposal or other releases toward the preferred techniques in the waste management hierarchy.

Sections in this chapter

[Source Reduction/Pollution Prevention](#)

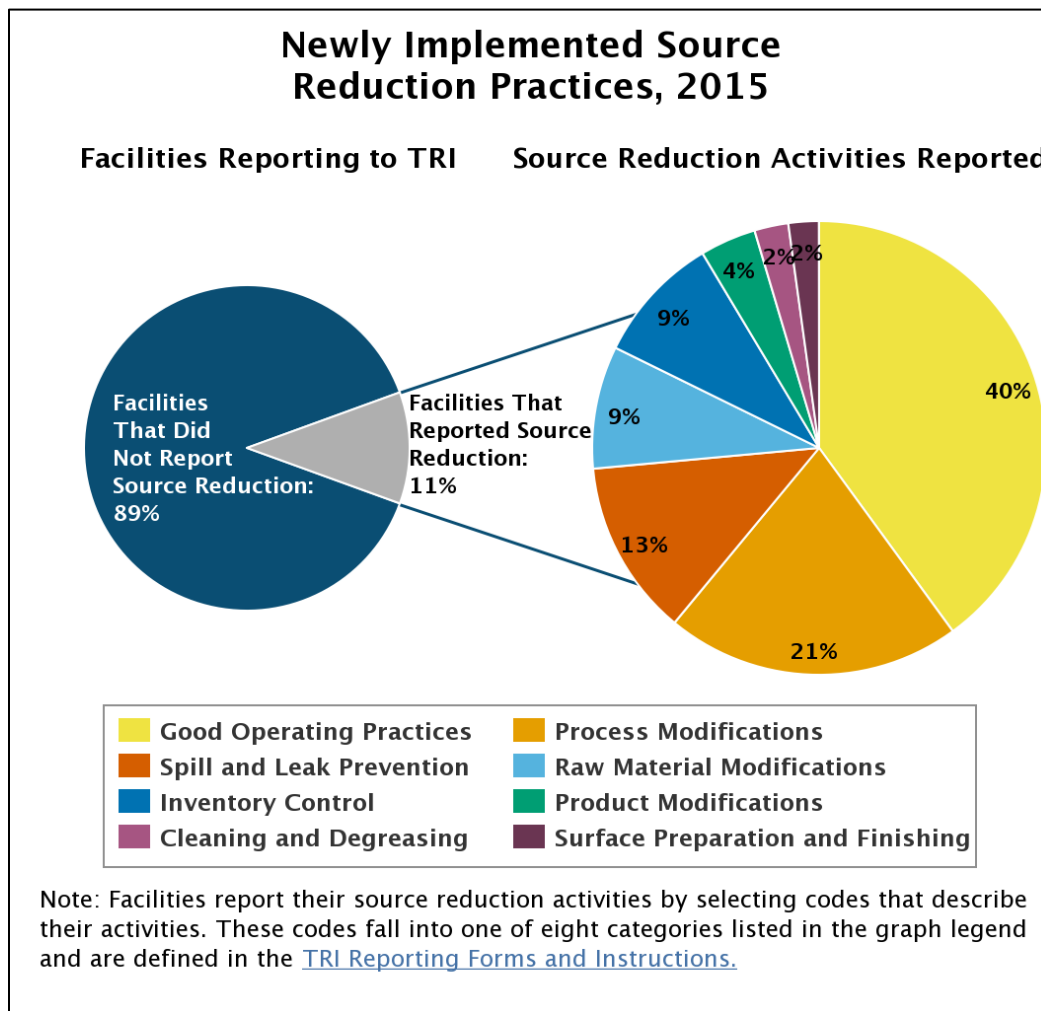
[Waste Management Trends](#)

[Waste Management by Chemical and Industry](#)

[Waste Management by Parent Company](#)

Source Reduction Activities Reported

Facilities report the source reduction activities that they implemented during the year. Source reduction includes activities that eliminate or reduce the generation of chemical waste, whereas other waste management practices (e.g., recycling) refer to how chemical waste is managed after it is generated.

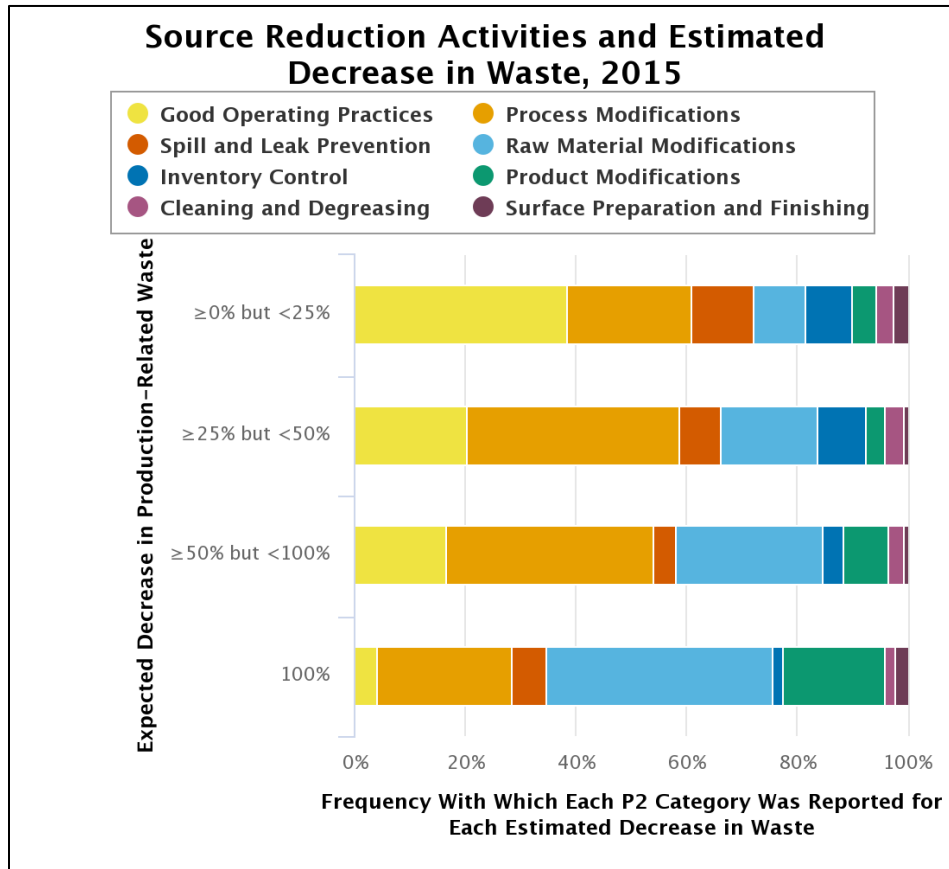


In 2015:

- 2,424 facilities (11% of all facilities that reported to the Toxics Release Inventory (TRI) Program) reported initiating a total of 7,508 source reduction activities.
- Note that facilities may have ongoing source reduction activities initiated in previous years that are not included in the figure. You can [find information on previously implemented source reduction activities by using the TRI Pollution Prevention \(P2\) Search Tool](#).

Estimated Reduction in Production-Related Waste from Source Reduction

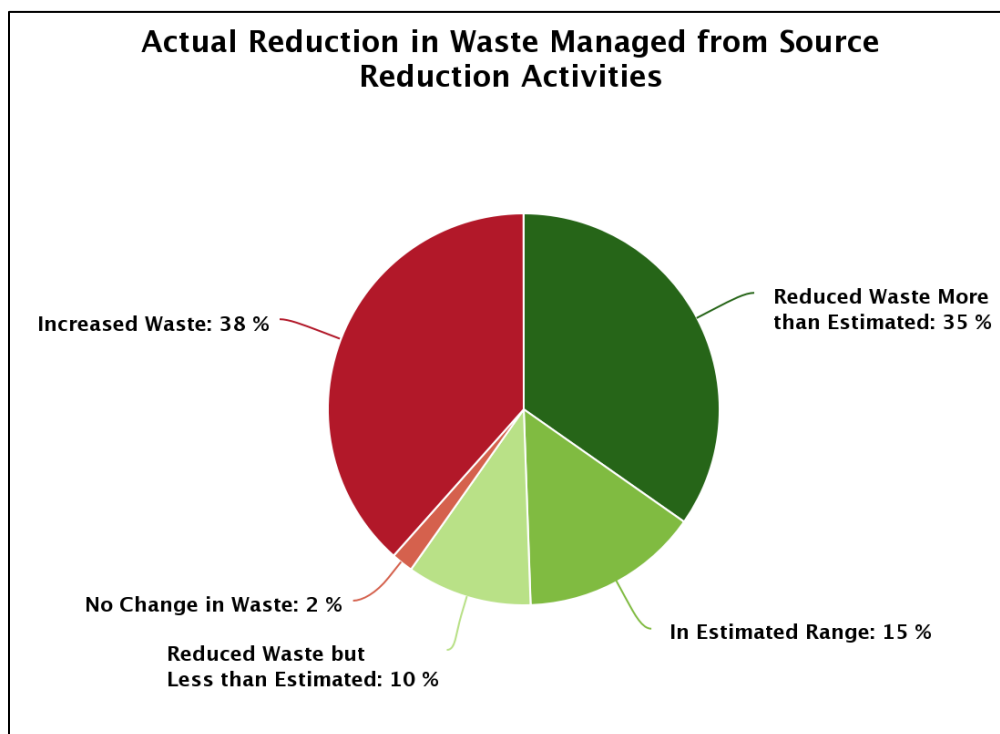
Starting in Reporting Year 2014, for each source reduction activity implemented, facilities may provide an estimate of the expected reduction in quantities of chemical waste managed. This figure shows the association between the source reduction activities implemented in 2015 and the estimated annual reductions in chemical waste that facilities expect to achieve in Reporting Year 2016, which varies by activity:



- 41% of the activities reported that were estimated to achieve 100% reduction (elimination of the chemical) were Raw Material Modifications (e.g. increasing the purity of raw materials).
- 39% of the activities expected to achieve less than a 25% reduction were reported as Good Operating Practices.

Actual Reduction in Production-Related Waste from Source Reduction

The Toxics Release Inventory (TRI) Program looked at what facilities estimated would be their reduction in chemical waste based on their source reduction activities from the 2014 TRI data and compared it to their actual waste management quantities in the 2015 data.



Almost half of facilities that reported a newly implemented source reduction activity in 2014 also estimated the resulting waste reduction for the following year. This figure shows the actual reduction facilities reported in 2015, normalized by production, compared to the estimated reduction in chemical waste managed reported in 2014.

From 2014 to 2015:

- For 50% of source reduction activities, facilities successfully reduced waste within the estimated range reported OR reduced waste more than estimated.
- For 10% of source reduction activities, facilities successfully reduced their waste, but less than estimated.
- For 38% of source reduction activities, not only did facilities *not* meet their estimated reduction but they also increased their waste in 2015.



Example of pollution prevention information related to estimating waste reduction:

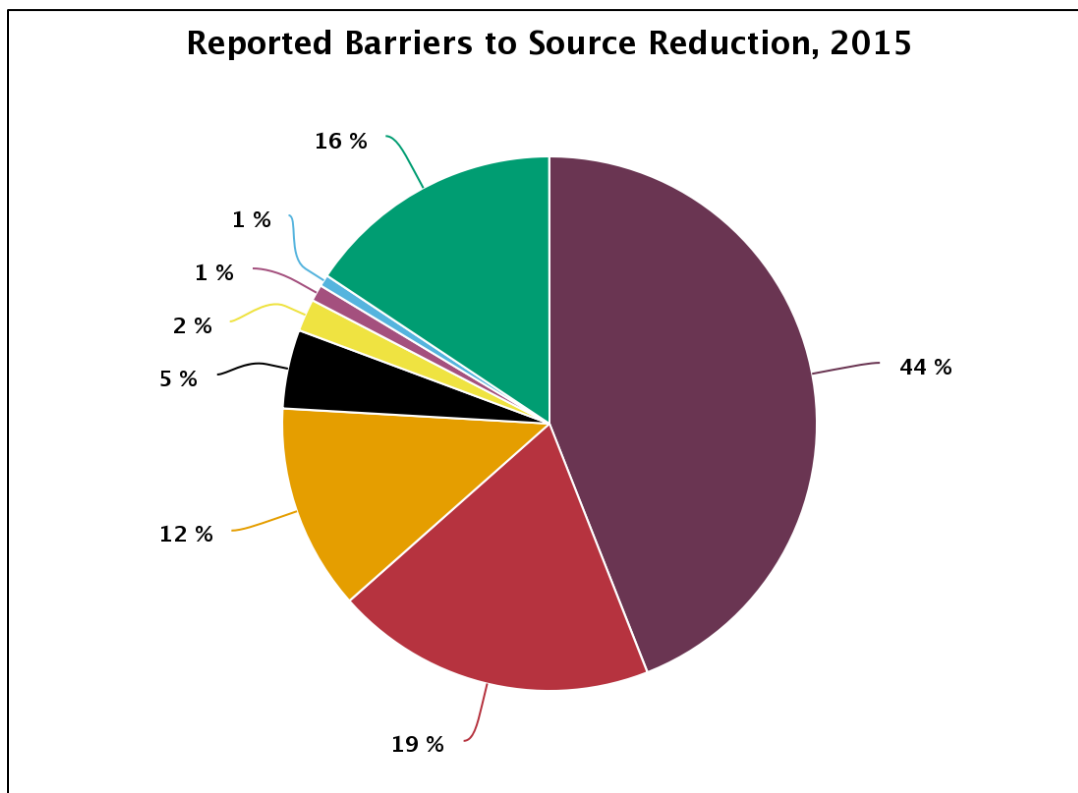
- An electronic connector manufacturer made improvements to its processes in 2014 that use product (lead) more efficiently and estimated a reduction in lead compound waste by 10%. In 2015, they reported a reduction of 25% in production-related waste (normalized for production). [[Click to view facility details in the Pollution Prevention \(P2\) Tool!](#)]

Reported Barriers to Source Reduction

If a facility did not implement new source reduction activities, they can optionally provide information about barriers they faced to source reduction.

In 2015:

- Barriers were reported for 263 chemicals.
- The most common barriers were:
 - the lack of a substitute or alternative for a chemical or process; and
 - previous implementation of source reduction with additional reductions not feasible.





See the list below for examples of reported barriers to source reduction.

No known substitutes or alternative technologies (44%)

Example:

A hardwood flooring manufacturer is unable to eliminate lead waste because trace lead is found naturally in the trees they use as a raw material. [[Click to view facility details in the Pollution Prevention \(P2\) Tool](#)]

Pollution prevention previously implemented - additional reduction does not appear technically or economically feasible (19%)

Example:

A fabricated metal manufacturer had previously implemented several source reduction activities to reduce chromium waste including storm water pollution prevention practices, inventory control, scrap minimization, and engineering design changes to optimize raw material usage. [[Click to view facility details in the P2 Tool](#)]

Concern that product quality may decline as a result of source reduction (12%)

Example:

An aircraft instrument facility found that lead-free solder forms tin whiskers on their circuit cards, which compromises product performance of flight critical hardware. [[Click to view facility details in the P2 Tool](#)]

Insufficient capital to install new source reduction equipment or implement new source reduction activities/initiatives (5%)

Example:

An electroplating facility releases lead compounds from anode dissolution during the chrome plating process. The alternative technology, platinum anodes, are cost prohibitive and have not been shown to increase product quality. [[Click to view facility details in the P2 Tool](#)]

Specific regulatory/permit burdens (2%)

Example:

In order to comply with air permit limits, a food manufacturing facility uses ammonia to reduce NOx emissions from their boiler stacks. [[Click to view facility details in the P2 Tool](#)]

Require technical information on pollution prevention techniques applicable to specific production processes (1%)

Example:

A diagnostic substances manufacturer plans to implement a Green Chemistry team to research alternatives to dichloromethane. [[Click to view facility details in the P2 Tool](#)]

Source reduction activities were implemented but were unsuccessful (1%)

Example:

A paint and coating manufacturer uses a component raw material that contains xylene. In previous years, the facility implemented source reduction by improving operating procedures, but the effort did not yield any measured reduction. The facility was also unsuccessful in getting suppliers to make modifications. [[Click to view facility details in the P2 Tool](#)]

Other, including customer demand (16%)

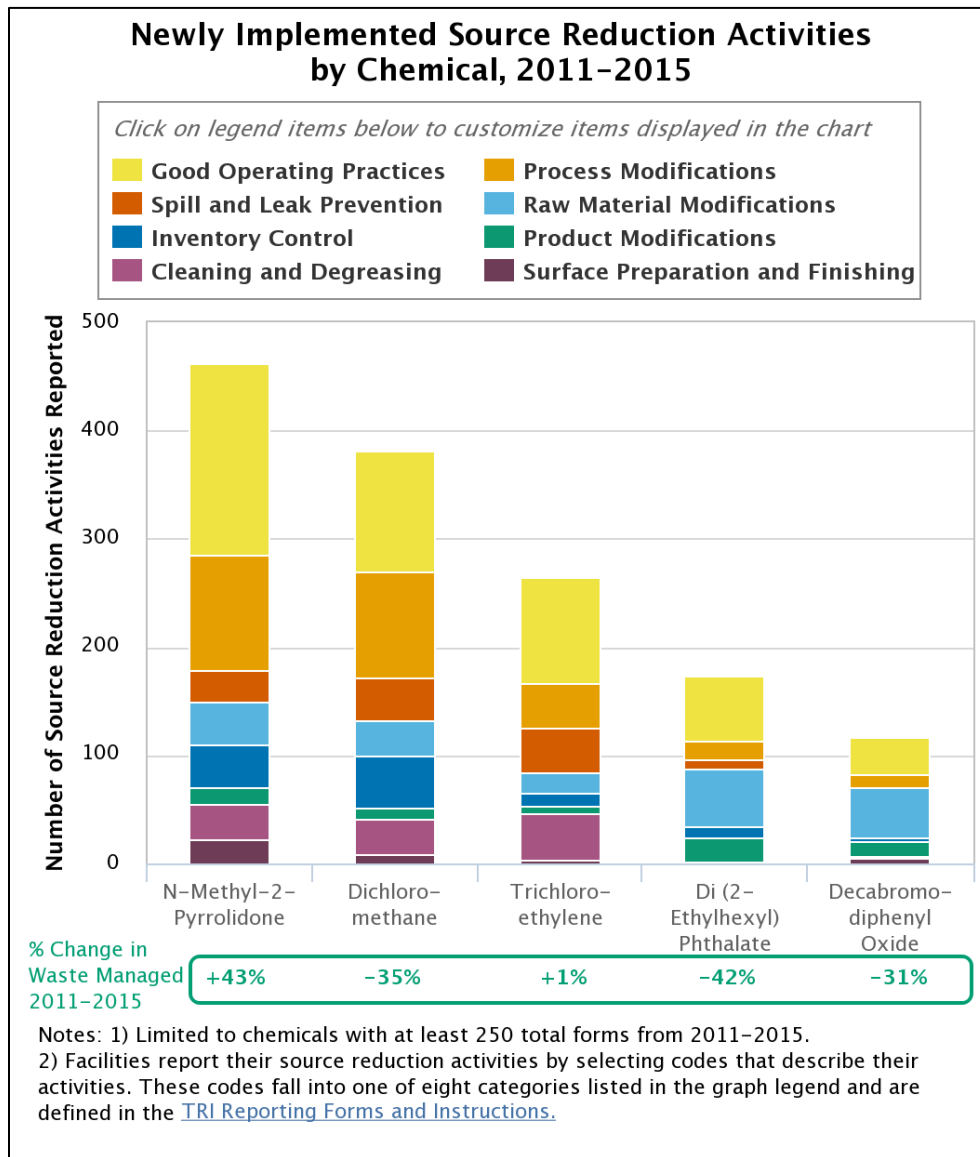
Example:

A piano string manufacturer generates copper waste when the facility recycles the old strings that customers send them for the facility to duplicate and replace. [[Click to view facility details in the P2 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 types of activities implemented, and the percent change in the quantity of waste managed.



From 2011 to 2015:

- Chemicals with the highest source reduction reporting rate were: N-methyl-2-pyrrolidone, dichloromethane, trichloroethylene, di (2-ethylhexyl) phthalate, and decabromodiphenyl oxide.
- 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 modification** is commonly reported as a source reduction activity to reduce waste of [di \(2-ethylhexyl\) phthalate](#) (DEHP), a plasticizer, and [decabromodiphenyl oxide](#) (decaBDE), a flame retardant. Many facilities report that they are in the process of replacing both chemicals with environmentally preferable alternatives.
- **Cleaning and degreasing**, including changing to aqueous cleaners, is implemented for common industrial solvents such as [trichloroethylene](#) (TCE), [dichloromethane](#) (DCM, also known as methylene chloride), and [N-methyl-2-pyrrolidone](#) (NMP).
- The quantity of waste managed over the last 5 years decreased considerably for DCM, DEHP, and decaBDE. For the other chemicals shown in the figure, waste quantities have increased. While quantities of waste managed overall increased by 15% over this post-recession time period, the increases in quantities of NMP managed exceeded the average increase in quantity of chemical waste managed. Use of NMP expanded in recent years as a substitute for chlorinated solvents such as DCM.

Facilities may also report additional details to the Toxics Release Inventory (TRI) Program about their source reduction, recycling, or pollution control activities.

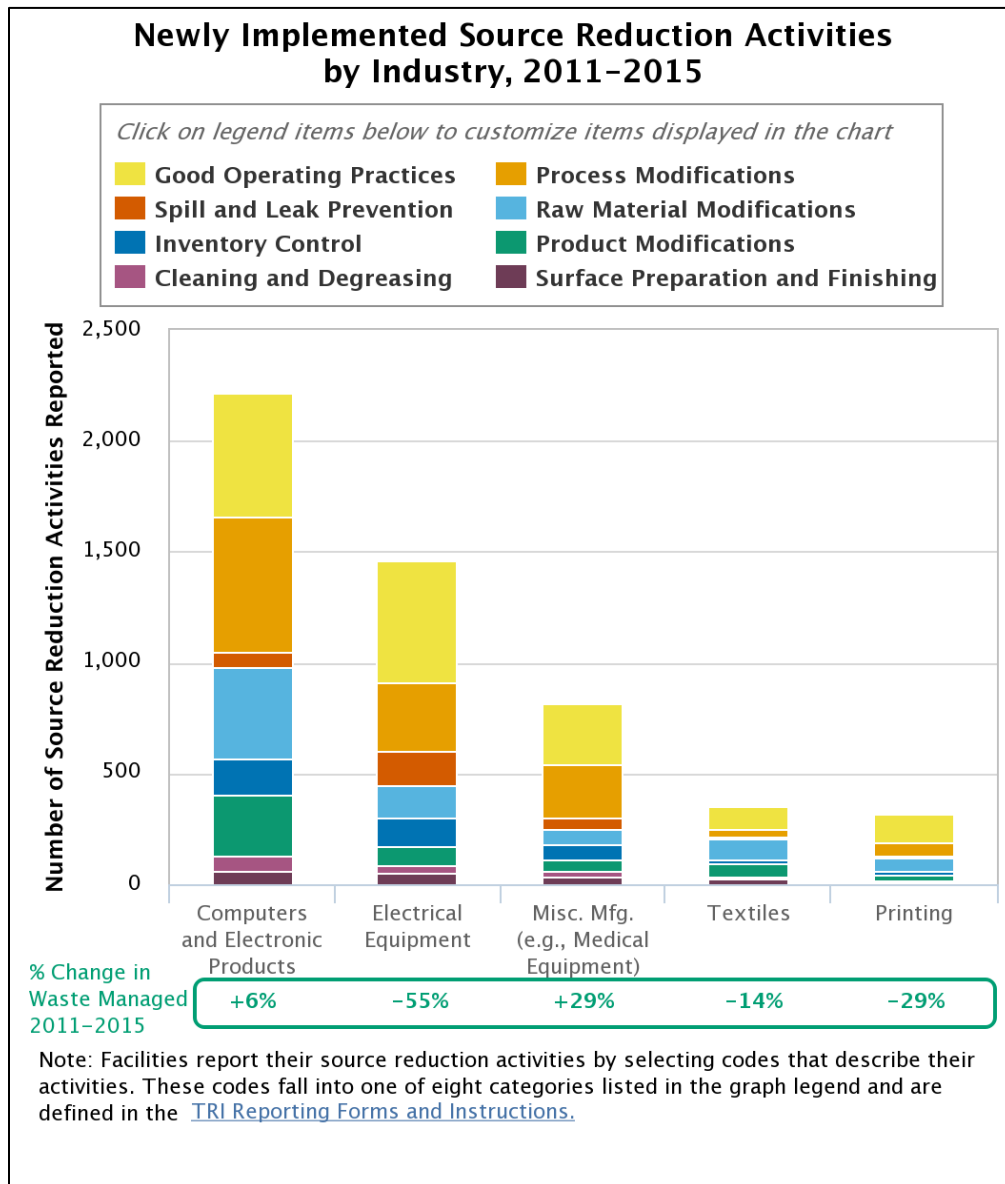
Examples of additional pollution prevention-related information for 2015:

- **[N-methyl-2-pyrrolidone](#)**: A motor vehicle parts manufacturer eliminated use of the chemical as a reducing solvent and when possible started using paints that do not contain N-methyl-2-pyrrolidone. [[Click to view facility details in the Pollution Prevention \(P2\) Tool](#)]
- **[Dichloromethane](#)**: A pesticide manufacturer validated their rinse procedures to minimize the number of dichloromethane rinse cycles required. [[Click to view facility details in the P2 Tool](#)]
- **[Trichloroethylene](#)**: A fabricated metal manufacturer purchased a vacuum vapor degreasing system after evaluating its solvent usage, and they expect to eliminate use of trichloroethylene completely by the end of 2016. [[Click to view facility details in the P2 Tool](#)]
- **[Di \(2-ethylhexyl\) phthalate](#)**: A rubber product manufacturer has been replacing di (2-ethylhexyl) phthalate with more environmentally friendly alternatives for its rubber formulations. [[Click to view facility details in the P2 Tool](#)]
- **[Decabromodiphenyl oxide](#)**: An adhesive manufacturer decreased their decabromodiphenyl oxide waste despite increased production after initiating a product reformulation that replaced the chemical. [[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](#).

Source Reduction Activities for Top Industry Sectors

For the industry sectors with the highest source reduction reporting rates over the last 5 years, this figure shows the types of activities implemented, and the percent change in the quantity of waste managed.



From 2011 to 2015:

- The five industry sectors with highest source reduction reporting rates are computers and electronic products, electrical equipment, miscellaneous manufacturing (e.g., medical equipment), textiles, and printing.



- For almost all 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, electrical equipment and computers and electronic products manufacturers frequently reported modifications to their raw materials and product, often associated with the elimination of lead solder.

Facilities may also report additional details to the Toxics Release Inventory (TRI) Program about their source reduction, recycling, or pollution control activities.

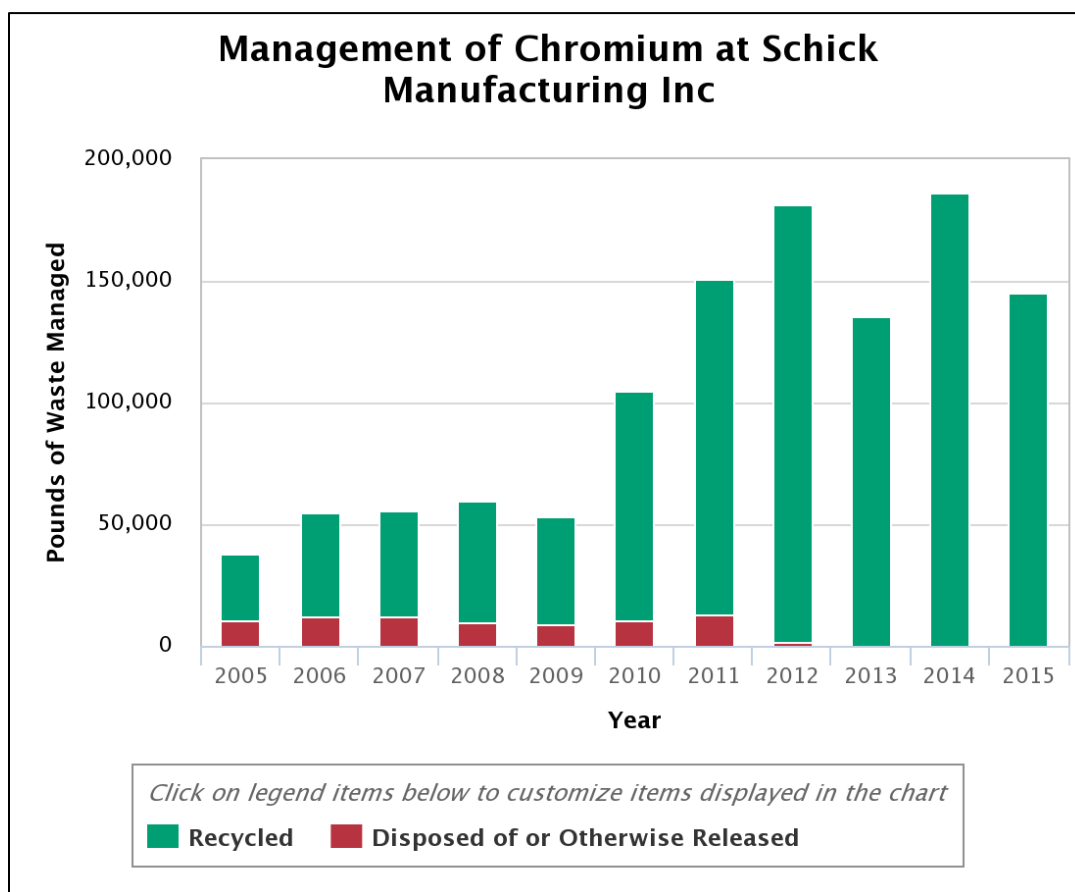
Examples of additional pollution prevention-related information for 2015

- **Computers and Electronic Products:** A circuit assembly manufacturer decreased [lead](#) releases by 78% after educating customers on the benefits of lead-free assemblies. [[Click to view facility details in the Pollution Prevention \(P2\) Tool](#)]
- **Electrical Equipment:** A battery manufacturer upgraded its conveyor system to prevent blockage and loss of [cobalt](#) material due to contamination. [[Click to view facility details in the P2 Tool](#)]
- **Miscellaneous Manufacturing:** A sporting and athletics goods facility decreased [xylene](#) waste by implementing procedures to improve yield and avoid quality problems such as preventing overmixing of paint. [[Click to view facility details in the P2 Tool](#)]
- **Textiles:** A textile finishing mill is continuing to replace [methanol](#) with water-based solvents and in 2015 decreased waste relative to production. [[Click to view facility details in the P2 Tool](#)]
- **Printing:** A gravure printing facility reduced [certain glycol ethers](#) waste by replacing several solvent-based digital ink printers with UV cured ink and latex ink printers that use either no glycol ethers or lowered amounts. [[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](#).

Example of a "Zero Releaser"

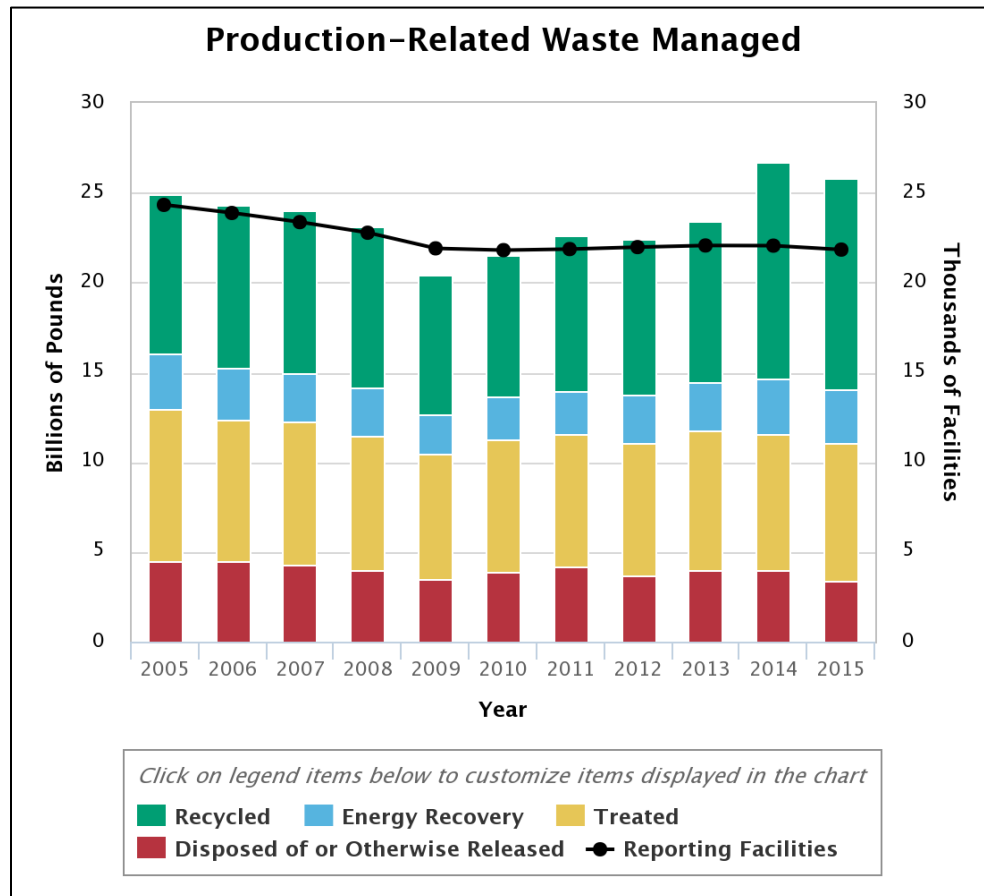
The waste management hierarchy emphasizes the preferred waste management techniques that facilities can utilize to reduce the quantities of toxic chemicals they release or otherwise manage as waste. For example, some facilities may be able to completely eliminate all releases of Toxics Release Inventory (TRI) reportable chemicals while still managing other production-related waste. These "zero releasers" are able to do so by implementing a variety of alternative waste management techniques. An example of a facility that followed the waste management hierarchy and no longer releases certain chemicals is shown below. This example illustrates one of the many ways that facilities can improve current pollution prevention and waste management practices. [Find additional examples for chemicals or sectors by using the TRI Pollution Prevention \(P2\) Search Tool.](#)



[Schick Manufacturing Inc. \(owned by Edgewell Personal Care Co.\) manufactures razor blades.](#) In 2012, the facility implemented a new process change that would eliminate the generation of chromium releases by allowing more material to be recycled, while also reducing use of energy, water, and other chemicals. By 2013, releases of chromium had been reduced to zero and all chromium waste results from recycling stainless steel scrap off-site.

Waste Management Trends

Facilities report the quantities of toxic chemicals they recycle, combust for energy recovery, treat for destruction, and release on- and off-site. This figure shows the trend in these quantities, collectively referred to as the production-related waste managed.



From 2005 to 2015:

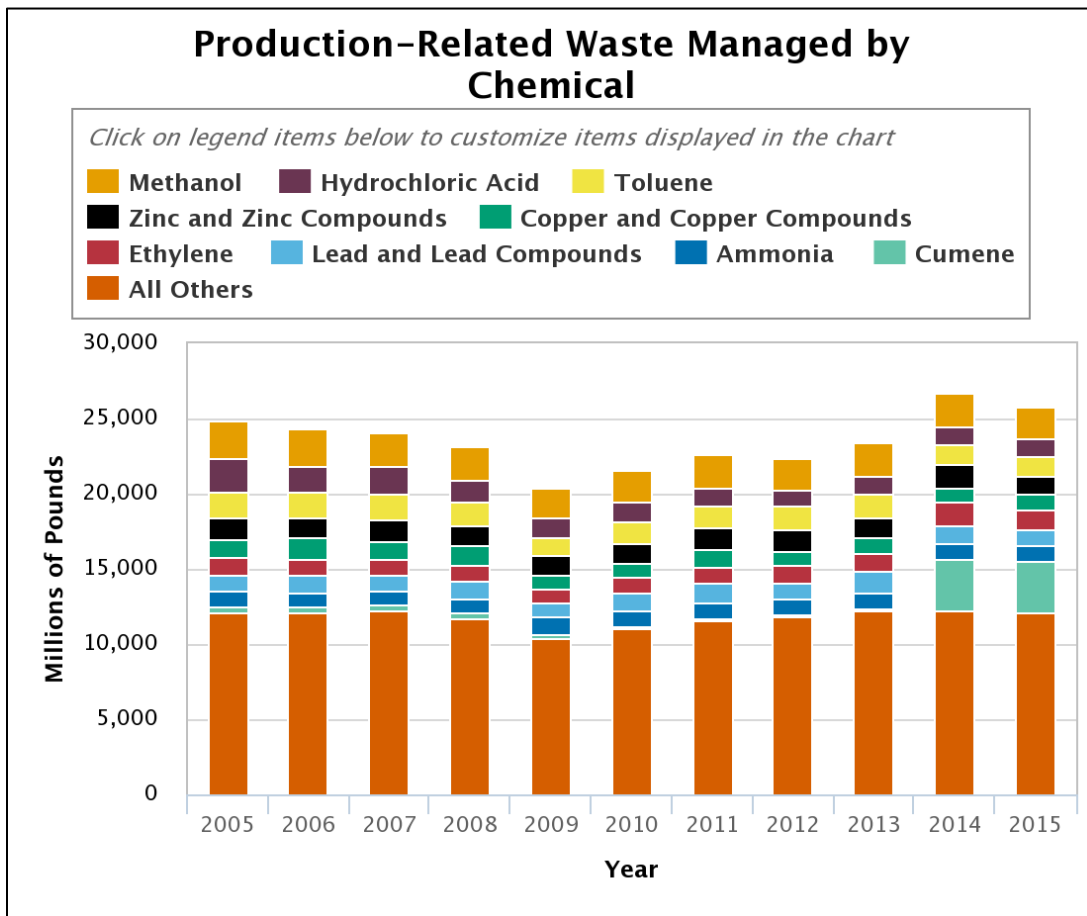
- Production-related waste managed increased by 952 million pounds (4%).
- Disposal and other releases decreased by 1.1 billion pounds (-25%).
- Treatment decreased by 796 million pounds (-9%).
- Energy recovery decreased by 126 million pounds (-4%).
- Recycling increased by almost 3 billion pounds (34%), a trend mostly driven by one facility reporting over 3.4 billion pounds of cumene recycled in 2014 and in 2015 [[Click to view facility details in the Pollution Prevention \(P2\) Tool](#)].



- The number of facilities that report to the Toxics Release Inventory (TRI) Program declined by 10% since 2005, although the count has remained steady at about 21,800 facilities since 2010.
- Since 2009, production-related waste managed has generally been increasing as the U.S. economy has improved.

Production-Related Waste Managed by Chemical

This figure shows the chemicals that were managed as waste in the greatest quantities from 2005-2015.



From 2005 to 2015:

- Most of the top chemicals contributing to production-related waste managed have remained relatively constant since 2005.
- Of the chemicals shown above, facilities reported increased quantities of waste managed for three: cumene, ethylene, and [ammonia](#).
 - Cumene increased by 628%, mostly driven by one facility reporting over 3.4 billion pounds of cumene recycled in 2014 and 2015 [[Click to view facility details in the Pollution Prevention \(P2\) Tool](#)]
 - Ethylene increased by 21%
 - Ammonia held steady, increasing by only 1%

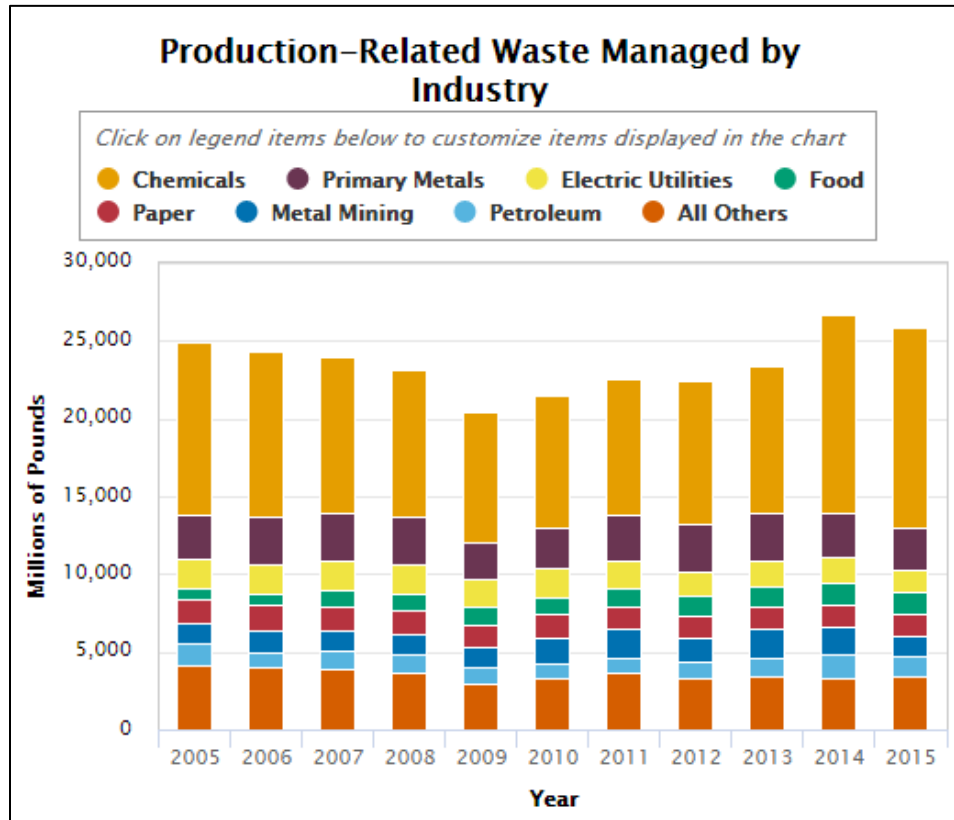


From 2014 to 2015:

- Facilities reported the greatest decreases in overall waste quantities for these chemicals:
 - Zinc and Zinc Compounds, decreased by 364 million pounds (-23%)
 - Lead and Lead Compounds, decreased by 160 million pounds (-13%)

Production-Related Waste Managed by Industry

This figure shows the industry sectors that managed the most waste from 2005-2015.



From 2005 to 2015:

- The contribution of each of the top sectors to production-related waste managed has remained relatively constant since 2005.
- Of the sectors shown in the graph, three increased their quantity of waste managed: chemicals, food, and metal mining.
- Generated waste in some industries fluctuates considerably from year to year, due to changes in production or other factors (e.g., quantities reported by metal mining facilities can change significantly based on changes in the composition of waste rock).

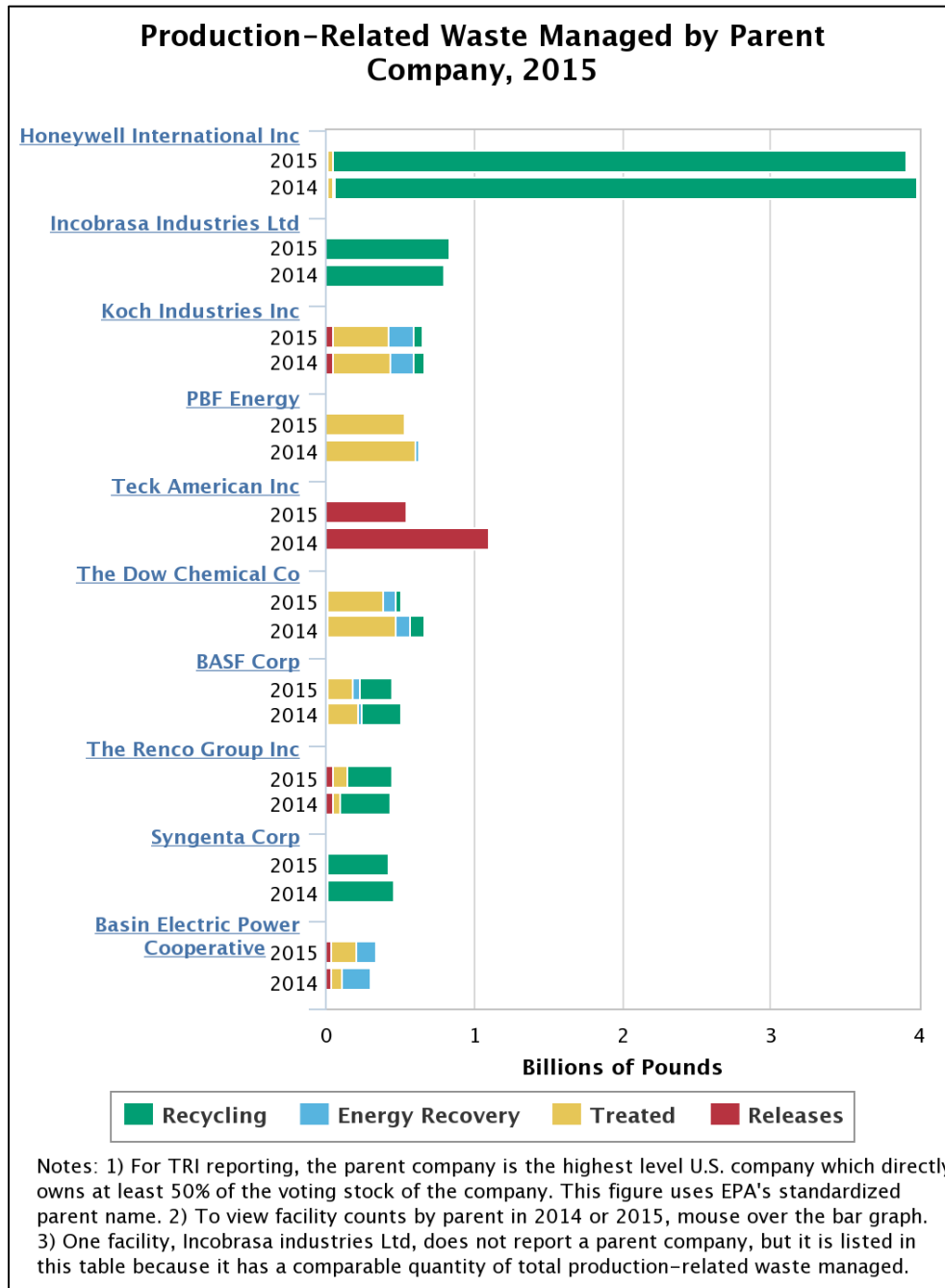
From 2014 to 2015:

- Industry sectors with the greatest reported changes in overall waste quantities are:
 - Metal mining, decreased by 503 million pounds (-27%)
 - Electric utilities, decreased by 245 million pounds (-14%)
 - Petroleum, decreased by 180 million pounds (-12%)



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 2015. Production-related waste quantities reported for 2014 are also shown for reference.





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

- Metal mining: Teck American
- Soybean processing: Incobrasa
- Multiple sectors, e.g. pulp and paper, petroleum refining, and chemicals: Koch Industries
- Chemical manufacturing: Dow Chemical, Syngenta, BASF, Honeywell International, Basin Electric
- Petroleum refining: PBF Energy
- Metal smelting: The Renco Group

The quantity reported by Honeywell International Inc. can be ascribed primarily to cumene recycling at a facility owned by Honeywell International in Reporting Year 2015. This facility uses cumene as a feedstock to manufacture phenol, a widely used TRI-covered chemical that is produced in very large quantities. This facility is among the largest manufacturers of phenol in North America and has implemented a number of steps to increase its recovery and recycling of cumene.

Most of these top parent companies reported implementing one or more new source reduction activities in 2015. Some of these companies also reported additional (optional) information to TRI about their pollution prevention or waste management activities.

Examples of additional pollution prevention-related information for 2015:

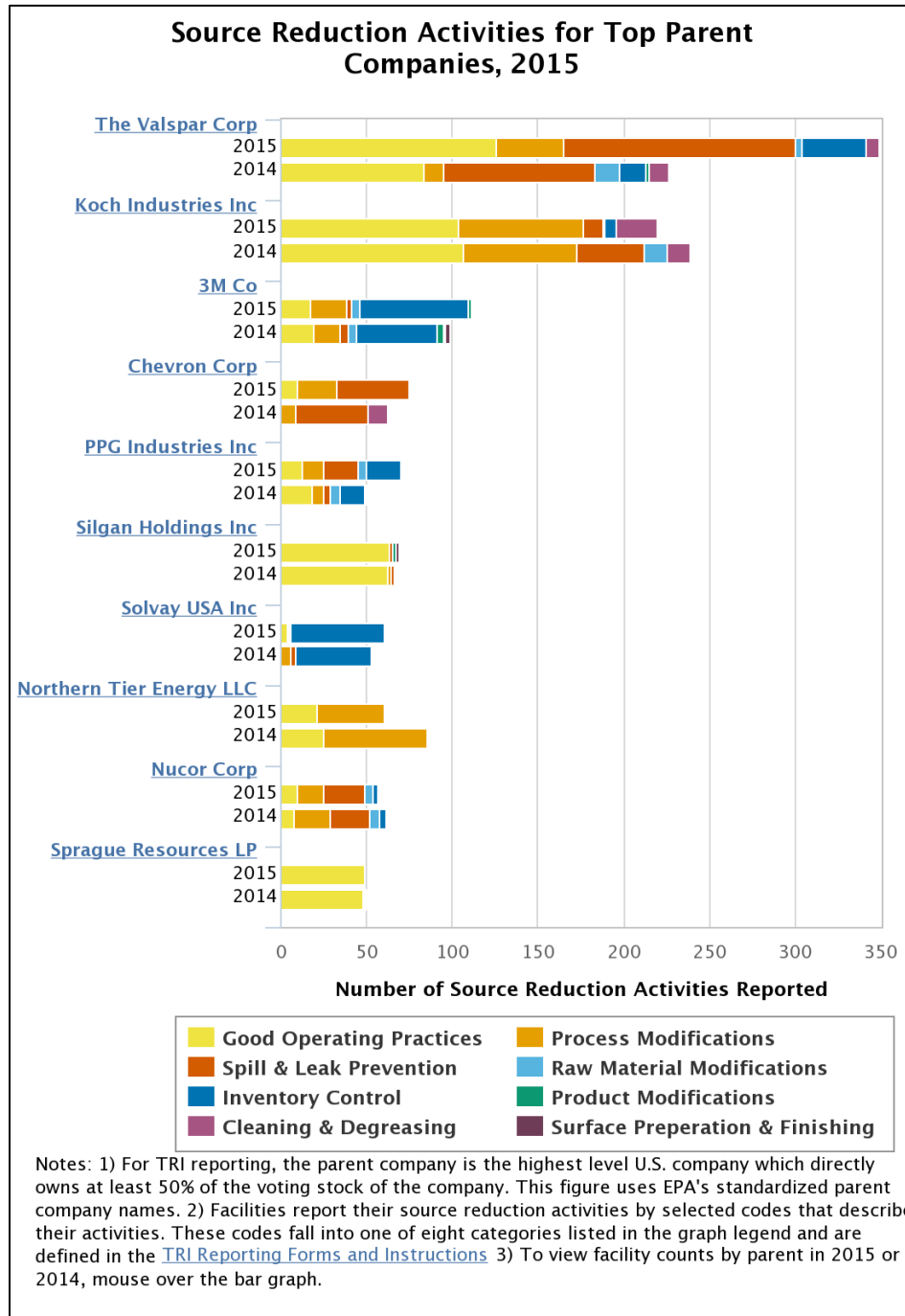
- A Dow Chemical facility decreased [dichloromethane](#) waste after modifying their reactions to reduce excess chemical. (Process Modification) [[Click to view facility details in the Pollution Prevention \(P2\) Tool](#)]
- A Syngenta facility that manufactures pesticides was able to decrease their waste management of [propiconazole](#) by changing production schedule in order to decrease the need for tank washings (Good Operating Practices) [[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 graph shows the parent companies that implemented the most source reduction activities in 2015. The number of source reduction activities reported in 2014 is also shown for reference.





The parent companies' facilities that reported to the Toxics Release Inventory (TRI) Program primarily operate in the following industries:

- Chemical manufacturing sector: Valspar, Solvay, PPG Industries and 3M
- Multiple sectors, e.g. pulp and paper, petroleum refining, and chemicals: Koch Industries
- Multiple petroleum-related sectors, e.g. petroleum refining, bulk petroleum, chemicals: Chevron
- Metal containers: Silgan Holdings
- Petroleum refining: Northern Tier Energy
- Steel manufacturing: Nucor
- Bulk petroleum industry (store and distribute crude petroleum and petroleum products): Sprague Resources

Good operating practices, such as improving maintenance scheduling and installation of quality monitoring systems, are the most commonly reported 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 text to EPA with their TRI reports describing their pollution prevention or waste management activities.

Examples of additional pollution prevention-related information for 2015:

- A PPG Industries coatings facility switched to an alternative raw material for which [n-butyl alcohol](#) is not required for its manufacture. (Raw Material Modification) [[Click to view facility details in the Pollution Prevention \(P2\) Tool](#)]
- A Chevron terminal installed spill kits and drain covers in high-risk areas to prevent spills from leaving through storm water drains. (Spill and Leak Prevention) [[Click to view facility details in the P2 Tool](#)]
- Through an employee recommendation, a 3M paper manufacturer reduced the volume of [methyl isobutyl ketone](#) used by switching to a different process catalyst. (Process Modification) [[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 in the 2015 TRI National Analysis

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. Note that most disposal or other release practices are subject to a variety of regulatory requirements designed to limit harm to human health and the environment. To learn more about what EPA is doing to help limit the release of toxic chemicals to the environment, see [EPA's laws and regulations webpage](#).

Evaluating releases of TRI 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 toxic chemical releases](#) and potential associated risks. However, it is important to consider that the quantity of releases is not an indicator of potential health impacts posed by the chemicals. Human health risks resulting from exposure to toxic chemicals are determined by many factors, as discussed further in the [Hazard and Risk of TRI Chemicals section](#) of this chapter.

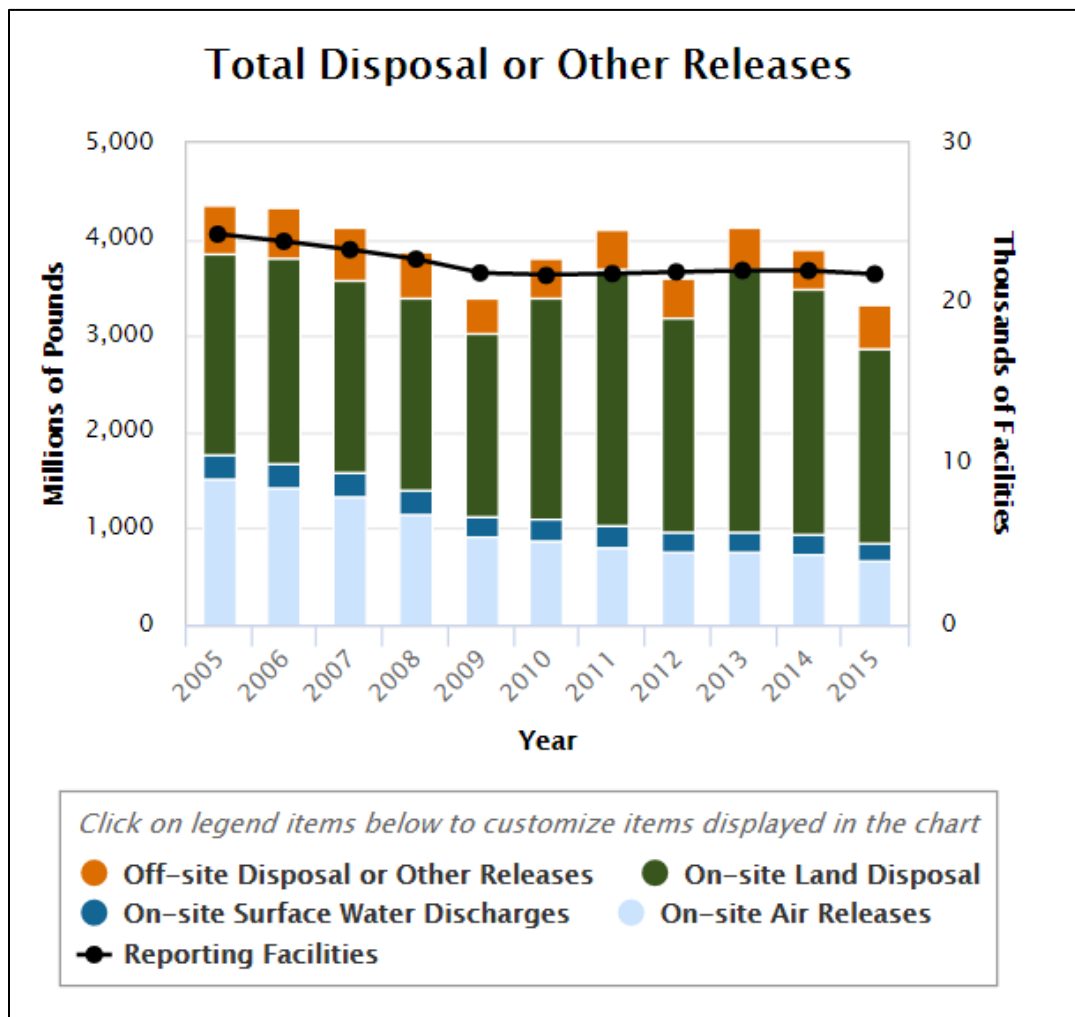
Many factors can affect trends in releases at facilities, including production rates, management practices, the composition of raw materials used, and the installation of control technologies.

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.

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 placed in some type of land disposal unit.



From 2005 to 2015:

- Total disposal or other releases of TRI chemicals decreased by 24%.
- This long-term decrease is driven mainly by declining air releases, down 56% (851 million pounds) since 2005. The decrease is driven by electric utilities due to a shift from coal to other fuel sources and the installation of control technologies at coal-fired power plants, which has led to decreases in hazardous air pollutant (HAP) emissions, such as [hydrochloric acid](#).
- Air emissions also declined during this 10-year period (down from 35% in 2005 to 20% in 2015) while land releases increased (up from 47% in 2005 to 60% in 2015).
- The number of facilities reporting to the TRI Program declined by 10% overall, although the count has remained steady at approximately 22,000 facilities since 2010 (21,849 facilities reported to TRI for 2015).

From 2014 to 2015:

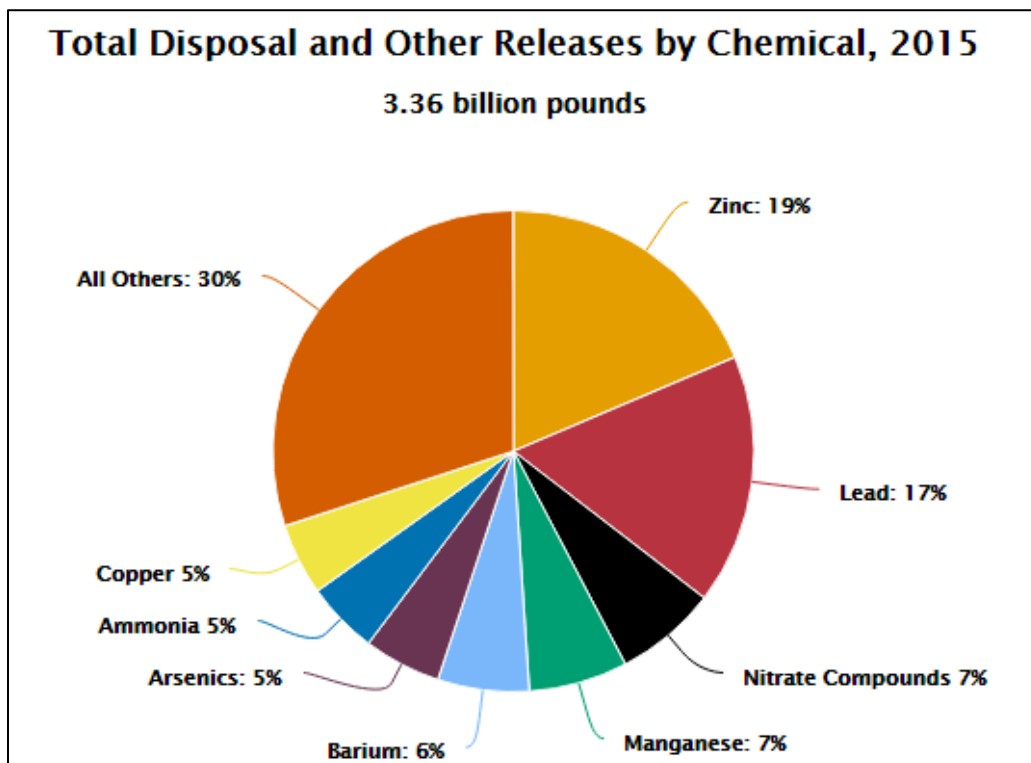
- Total releases decreased by 15% due primarily to decreases in on-site land disposal by the metal mining sector.

Releases in 2015

Use the interactive chart below to explore how total releases of chemicals that occurred in 2015 are associated with different industry sectors, specific chemicals, and geographies. [Visit the full TRI National Analysis Qlik dashboard](#) to explore even more information about releases of chemicals.

Releases by Chemical

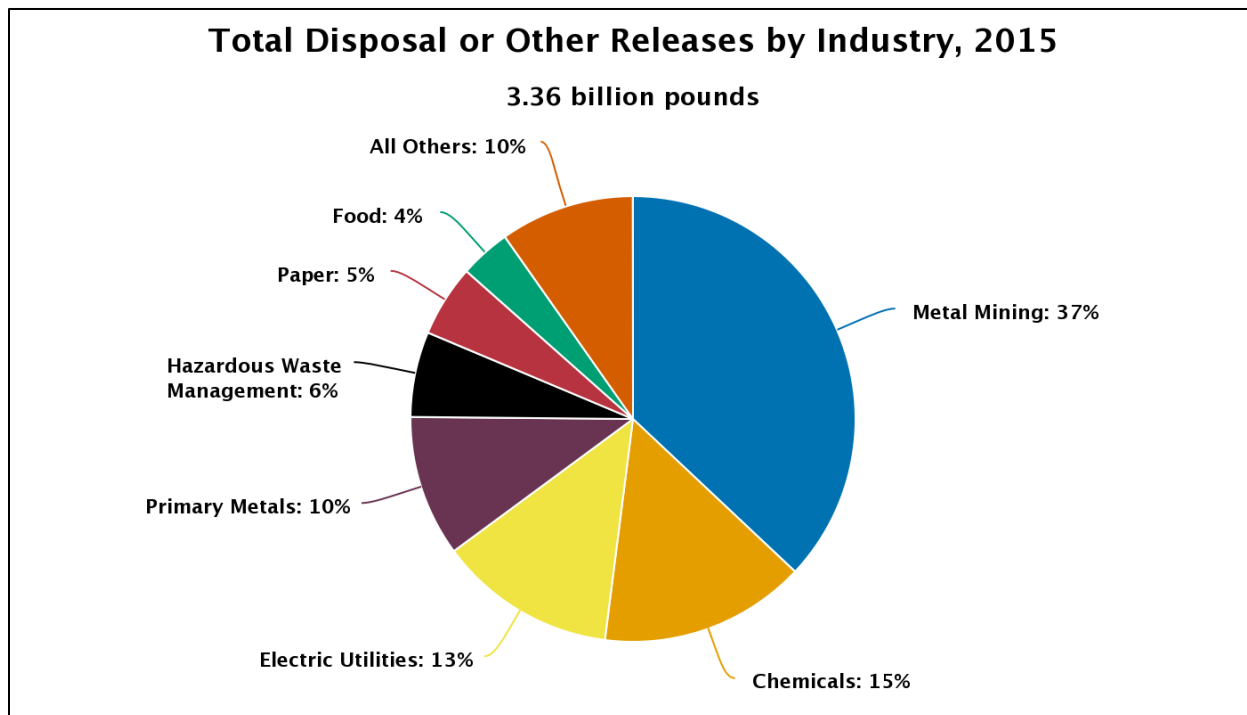
70% of releases are from 8 chemicals.



Note: In this graph, 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).

Releases by Industry

The metal mining sector accounts for 37% of releases (1.24 billion pounds), which were primarily disposed of to land.



Sections in this chapter

[Hazard and Risk of TRI Chemicals](#)

[Air Releases](#)

[Water Releases](#)

[Land Disposal](#)

[Off-site Disposal or Other Releases](#)

[Chemicals of Special Concern](#)

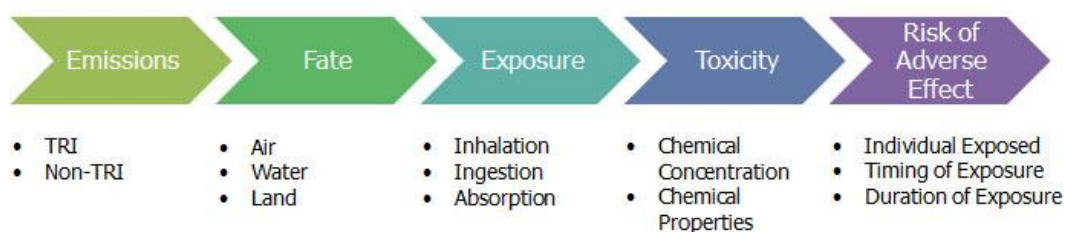
[Non-Production-Related Waste](#)

Hazard and Risk of TRI Chemicals in the 2015 TRI National Analysis

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

The human health risks resulting from exposure to toxic 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 often includes information on a large portion of the toxic chemicals used by industry, it does not cover all facilities, all toxic chemicals, or all sources of TRI chemicals in communities. For example, potential sources of chemical exposure that are not covered 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 publicly available [Risk-Screening Environmental Indicators \(RSEI\) model](#), a screening-level model that uses simplifying assumptions to fill data gaps and reduce the complexity of calculations in order to quickly evaluate large amounts of data. RSEI includes TRI data for on-site releases to air and water, transfers to Publicly Owned Treatment Works (POTWs), and transfers for off-site incineration. RSEI does not currently model other release pathways, such as land disposal.

Helpful Concepts

The *hazard* of a toxic chemical is its ability to cause an increased incidence of adverse health effects (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.



RSEI produces hazard estimates and unitless risk “scores,” which represent relative chronic human health risk. 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.
- RSEI **risk** scores are estimates of potential human risk based on pathway-specific modeling of chemical concentrations at specific points in the environment, like in the air around a facility or in the water downstream from a facility.

RSEI: Risk–Screening Environmental Indicators

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 be used for screening-level activities such as trend analyses that compare relative risk 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.



Top chemicals released⁵ in 2015, ranked in order by...

Pounds Released	RSEI Hazard (toxicity*pounds)	RSEI Score (estimated dose*toxicity*exposed population)
1. Nitrate compounds	1. Chromium and compounds	1. Chromium and compounds
2. Methanol	2. Cobalt and compounds	2. Nickel and compounds
3. Ammonia	3. Arsenic and compounds	3. Cobalt and compounds
4. Sulfuric acid	4. Nitroglycerin	4. 1,3-Butadiene
5. Hydrochloric acid	5. Nickel and compounds	5. Arsenic and compounds

Why are the rankings different?

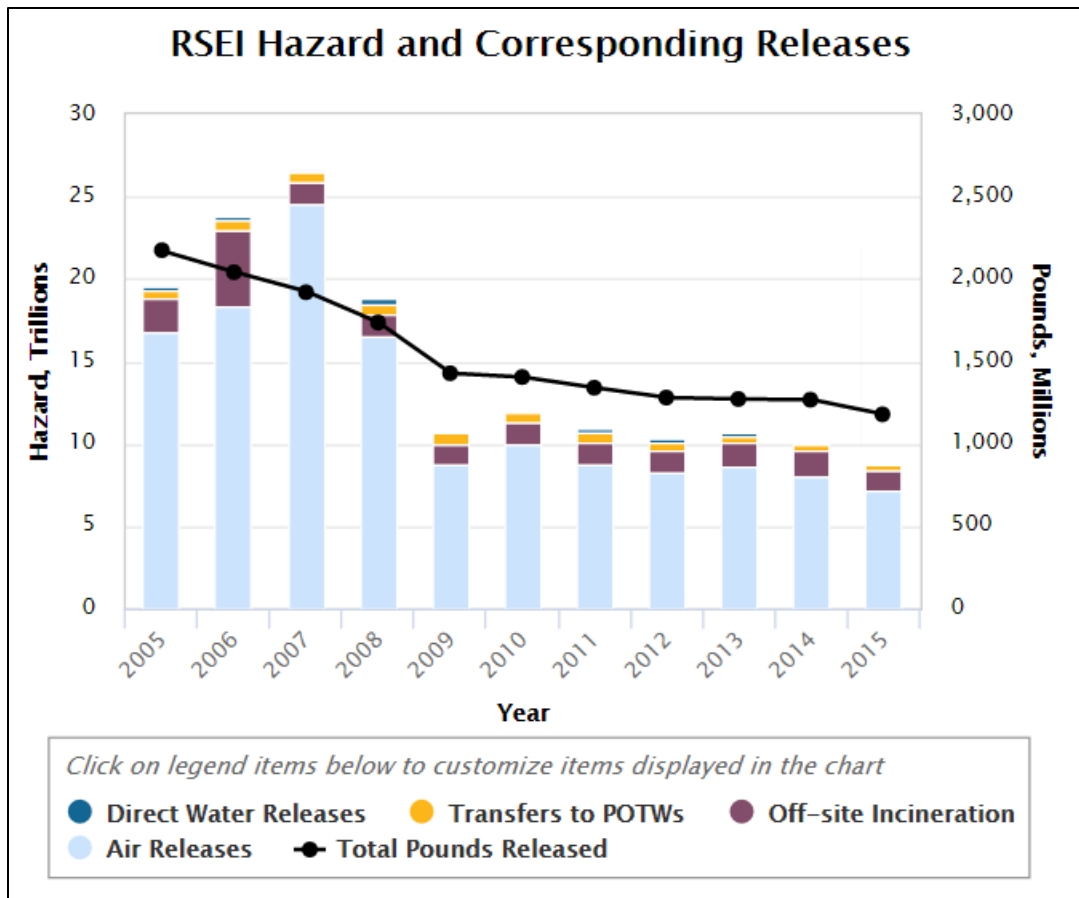
- The top five chemicals by **pounds** are released in large amounts and are comparatively less toxic than the top chemicals by hazard or score. None of them are known carcinogens - cancer effects usually drive RSEI hazard and RSEI scores.
- The top five chemicals by **RSEI hazard** have very high toxicity weights and all of them are carcinogens.
- For a chemical to have a high **RSEI score**, it must be either very toxic, have a large number of people potentially exposed, or have potential for very high exposures (or some combination).
- Nitroglycerin is in the top five chemicals by **RSEI hazard** but not by **RSEI score** because the two releases driving the hazard results are large off-site transfers to wastewater treatment and incineration. **RSEI hazard** is calculated using the pounds transferred, while **RSEI score** uses the amount of the chemical released into the environment after treatment, which is substantially smaller.
- 1,3 Butadiene is in the top five chemicals by **RSEI score** but it is not in the top five chemicals by **RSEI hazard** because of a small number of releases with a large number of people potentially exposed. Exposure is only a component of **RSEI score**.

⁵This includes chemicals released on-site to air and water by TRI facilities, or transferred and released off-site to air and water by POTWs and incinerators.

Note: RSEI is commonly used to quickly screen and highlight situations that may potentially lead to chronic human health risks. More information about the model can be accessed at the [RSEI webpage](#).

Hazard Trend

EPA's Risk-Screening Environmental Indicators (RSEI) model estimates hazard which considers the amounts of chemicals released on-site to air and water by Toxics Release Inventory (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 the RSEI hazard compared to the trend in the corresponding pounds of toxic chemical releases reported to TRI.

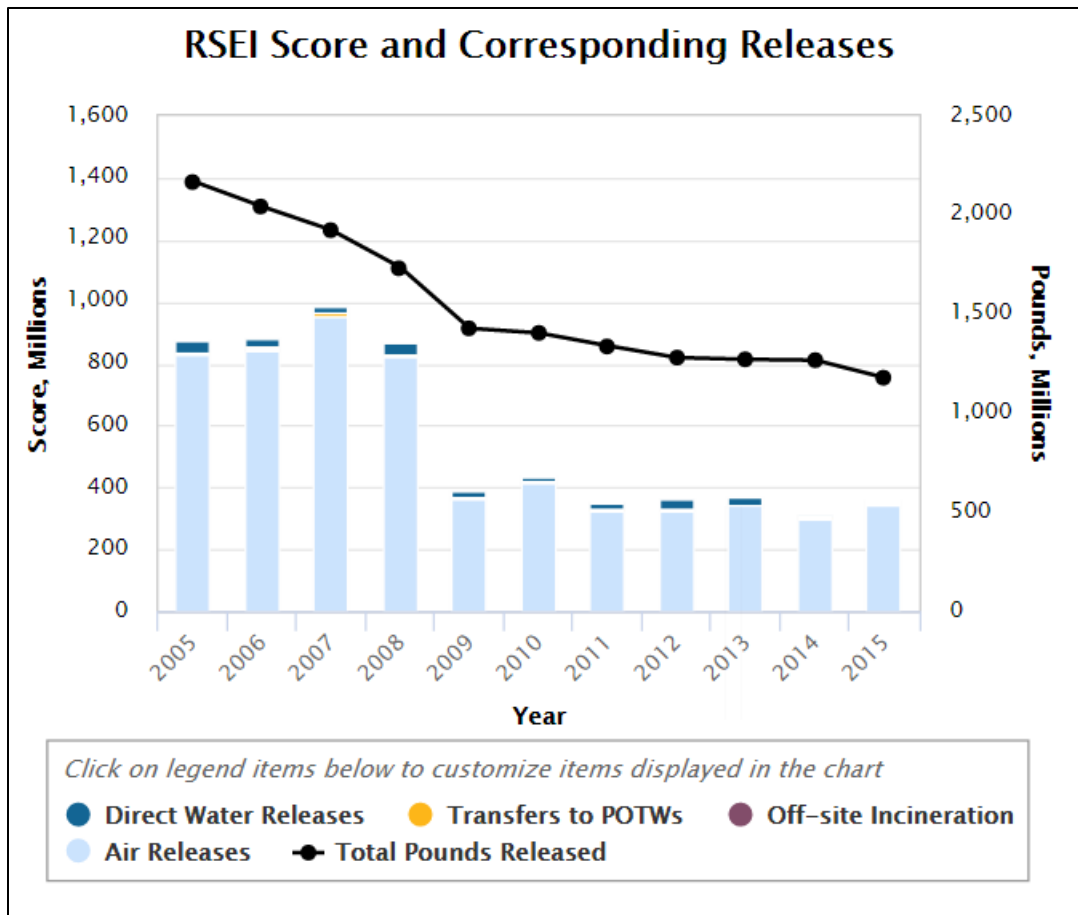


From 2005 to 2015:

- The increase in the hazard estimate from 2005 to 2007 is driven mainly by an increase in chromium releases to air.
- The overall RSEI hazard estimate decreased by 55%, while corresponding pounds released decreased by 46%. This suggests that in recent years TRI reporters may be releasing chemicals that have slightly lower toxicities.

Risk Trend

EPA's Risk-Screening Environmental Indicators (RSEI) model estimates risk "scores" that represent relative chronic human health risk and can be compared to RSEI-generated scores from other years. RSEI scores are different from RSEI hazard estimates because they also 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 toxic chemical releases.

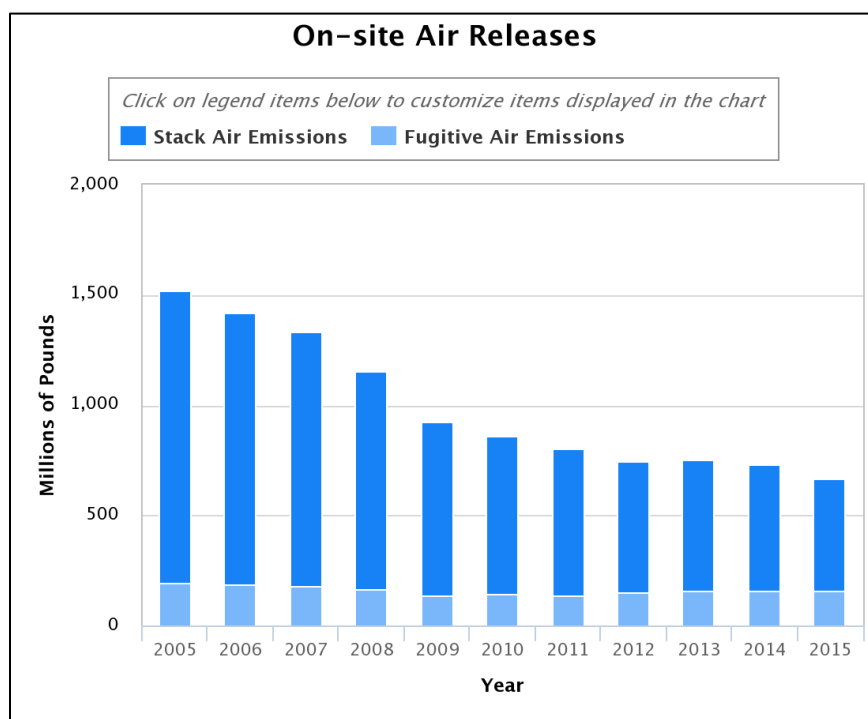


From 2005 to 2015:

- The overall RSEI score estimate decreased by 59%, while corresponding pounds released decreased by 46%. The large decrease in RSEI score between 2007 and 2009 was driven by a large decrease in chromium releases from three facilities. The slight increase in RSEI score from 2014 to 2015 is due to one large fugitive release to air of metal compounds in 2015.

Air Releases

Air emissions 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 toxic chemicals released to air as reported to the Toxics Release Inventory (TRI) Program.



From 2005 to 2015:

- Air releases declined significantly, serving as a primary driver of decreases in total releases.
- Air releases decreased by 56% (851 million pounds).
 - Hydrochloric acid, sulfuric acid, hydrogen fluoride, methanol and toluene were the chemicals with the greatest reductions in air releases since 2005.
 - The decrease is driven by electric utilities due to a shift from coal to other fuel sources, the installation of control technologies at coal-fired power plants, and the implementation of environmental regulations.
 - Coal- and oil-fired electric utilities accounted for more than 90% of nationwide reductions in air releases of hydrochloric acid, sulfuric acid and mercury from 2005 to 2015.



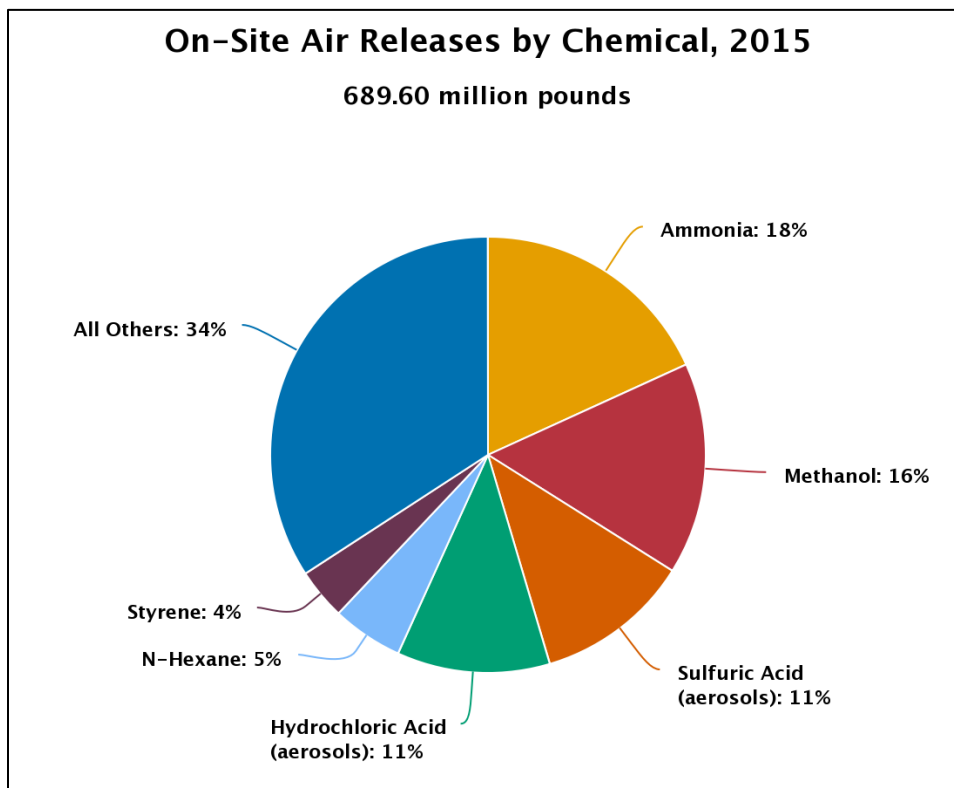
- Air releases of OSHA carcinogens also decreased; see the [Air Releases of OSHA Carcinogens](#) figure.
- Air releases of other chemicals of special concern, including [lead compounds](#) and [mercury](#), also decreased; see the [Chemicals of Special Concern](#) section.
- Air releases are often regulated 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 2015:

- [Ammonia](#), followed by [methanol](#), accounted for the greatest air releases of TRI chemicals.
- Since 2014, air releases decreased by 8%.

Air Releases by Chemical

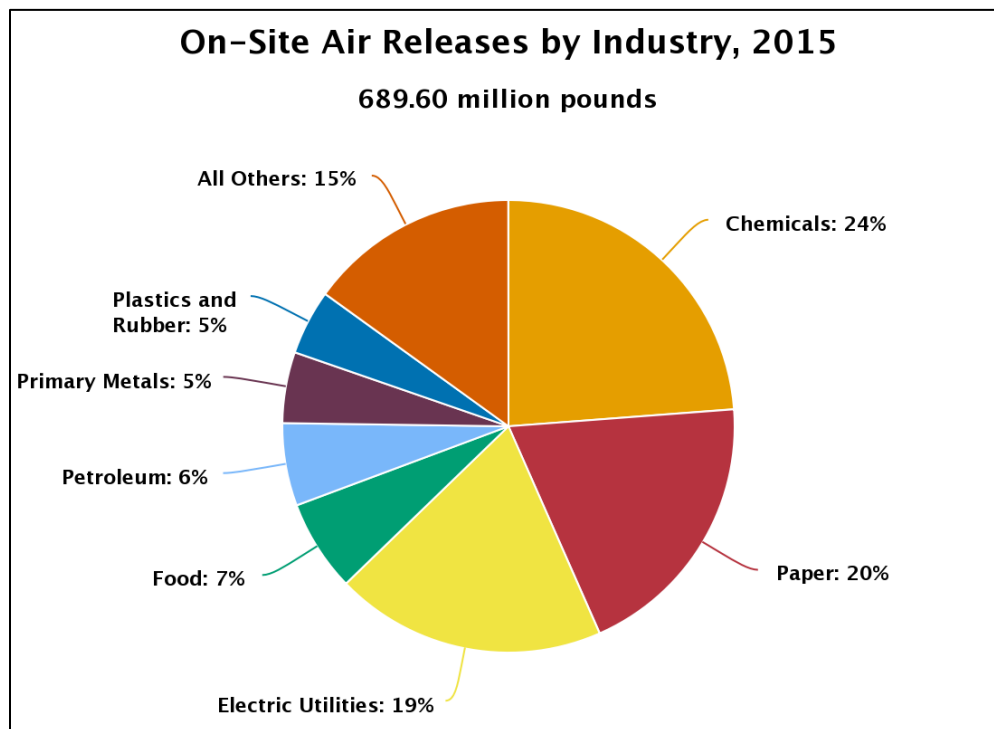
This pie chart shows which toxic chemicals were released to air in the greatest quantities in 2015.



- Air releases of [ammonia](#) are largely due to the manufacture of nitrogen fertilizers in the chemicals industry and have remained relatively constant since 2005.
- Air releases of [methanol](#) are primarily from pulp and paper mills and have decreased by 31% since 2005.
- The majority of air releases of [hydrochloric acid](#) and [sulfuric acid](#) result from generating electricity from fossil fuels. Air releases of these two chemicals have decreased consistently since 2005.

Air Releases by Industry

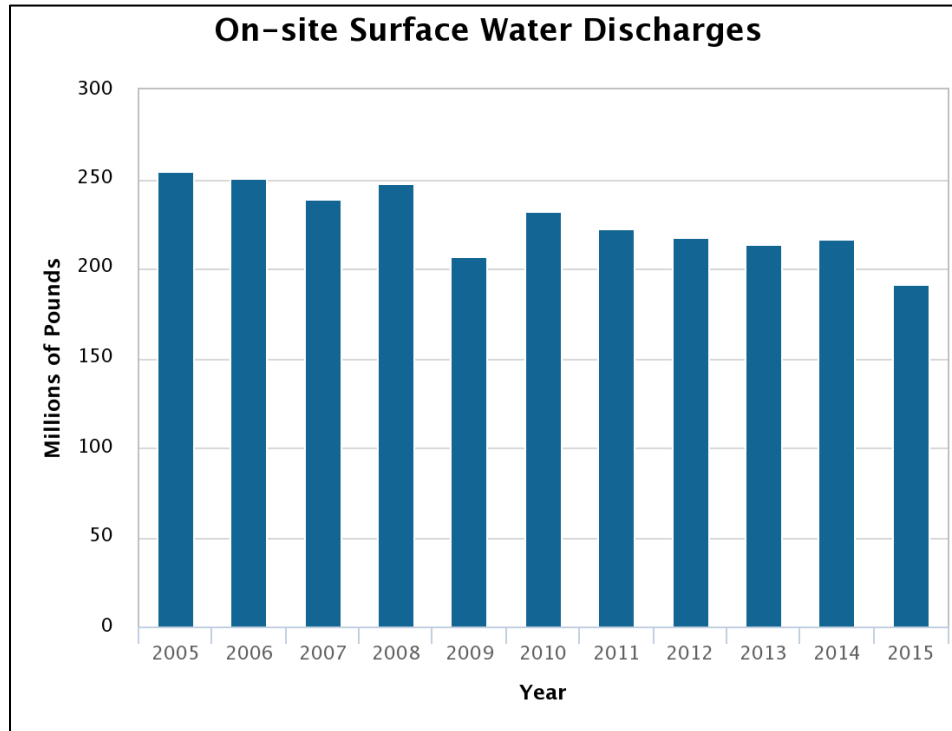
This pie chart shows the industry sectors that reported the greatest releases of toxic chemicals to air in 2015.



- Chemicals, paper, and the electric utility industry sectors accounted for the greatest releases to air in 2015. Together, these three industries contributed almost two-thirds of total air releases.
- Air releases in these three industries have decreased since 2014:
 - Chemicals: 4% decrease (6.8 million pounds)
 - Paper: 4% decrease (6.3 million pounds)
 - Electric utilities: 27% decrease (49.7 million pounds)

Water Releases

Facilities are required to report the total 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 toxic chemicals released to water bodies as reported to the TRI Program.



From 2005 to 2015:

- Surface water discharges decreased by 25% (64 million pounds). Most of this decline is due to reduction in water releases of [nitrate compounds](#), which decreased by 25% (57 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. More nitrate compounds are released to water than any other TRI chemical.
- Surface water discharges are often regulated by other programs as well, such as under [Clean Water Act National Pollutant Discharge Elimination System \(NPDES\) permits](#). A NPDES permit is typically a license for a facility to discharge a specified amount of a pollutant into a receiving body of water under certain conditions.



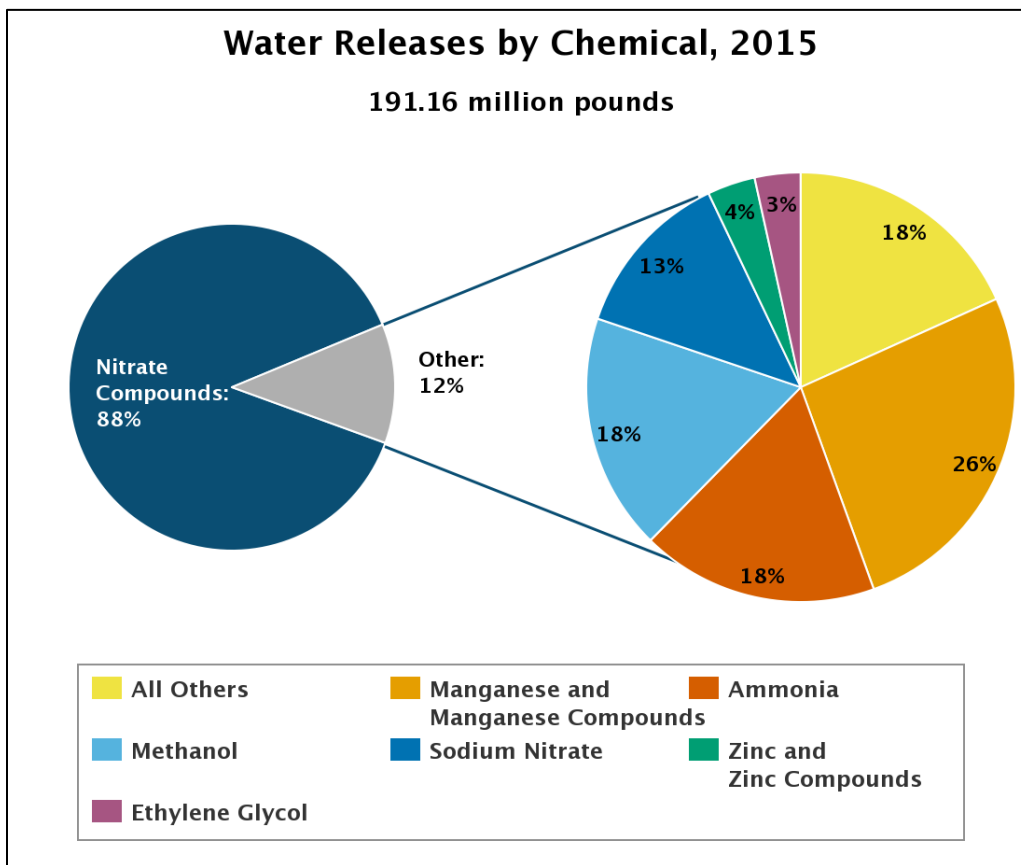
- Surface water discharges of other TRI chemicals, many of which are more toxic to humans than nitrate compounds, have been decreasing at a faster rate. Releases to water are discussed further in the next few figures starting with [water releases by chemical](#).

In 2015:

- Nitrate compounds alone accounted for 88% of the total quantity of all TRI chemicals discharged to surface waters.

Water Releases by Chemical

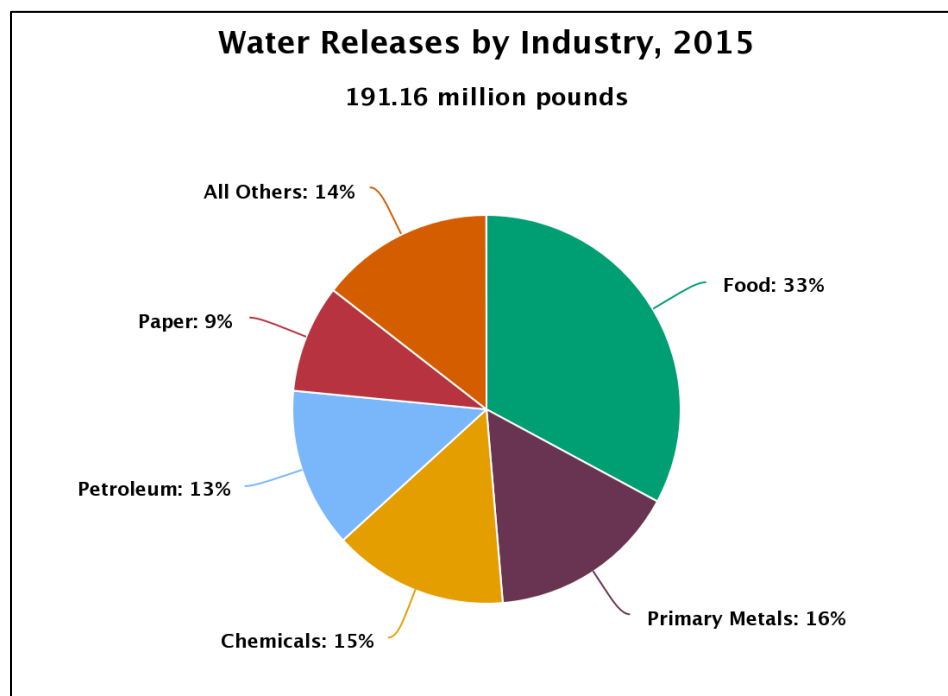
This pie chart shows which toxic chemicals were released to water bodies in the greatest quantities in 2015.



- [Nitrate compounds](#) accounted for 88% of the total quantities of TRI chemicals released to water in 2015. Nitrate compounds are soluble in water and commonly formed as part of the wastewater treatment process. The food manufacturing sector contributed 36% 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.
- [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

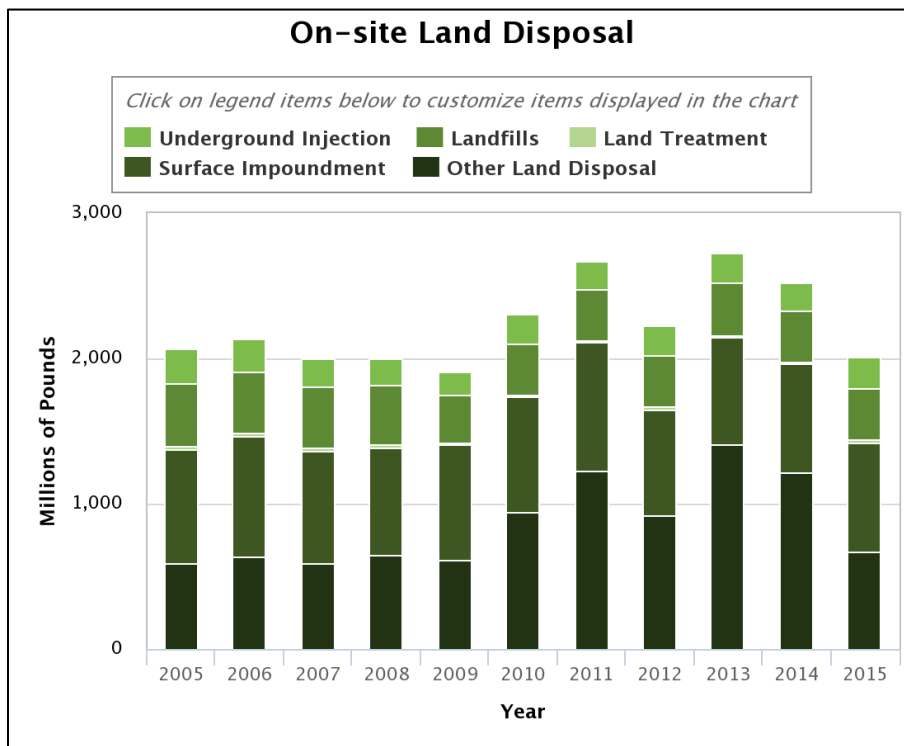
This pie chart shows the industry sectors that reported the greatest releases of toxic chemicals to water bodies in 2015.



- The food manufacturing sector accounted for approximately one-third of water releases in 2015, which is similar to its contribution over the past 10 years.
- [Nitrate compounds](#) accounted for 98% of the releases 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 as well, such as the program established under the Clean Water Act that issues [National Pollutant Discharge Elimination System \(NPDES\) permits](#). A NPDES permit is typically a license for a facility to discharge a specified amount of a pollutant into a receiving body of water under certain conditions.

Land Disposal

The metal mining sector accounts for most of the TRI chemical waste disposed of to land. This graph shows the trend in the pounds of toxic chemicals disposed of to land at the reporting facility's site.



From 2005 to 2015:

- On-site land disposal decreased by 3% (from 2.07 to 2.01 billion pounds).
- Recent fluctuations are primarily due to changes in waste quantities reported to the TRI Program as "other land disposal," which can include chemical waste disposed of in waste piles and spills or leaks.
- "Other land disposal" increased by 13%, while all other types of on-site land disposal decreased. Most of the toxic chemical waste reported as other land disposal is contained in waste rock at metal mines.
- Disposal to land is often regulated by other programs as well, such as under the [Resource Conservation and Recovery Act \(RCRA\)](#).



In 2015:

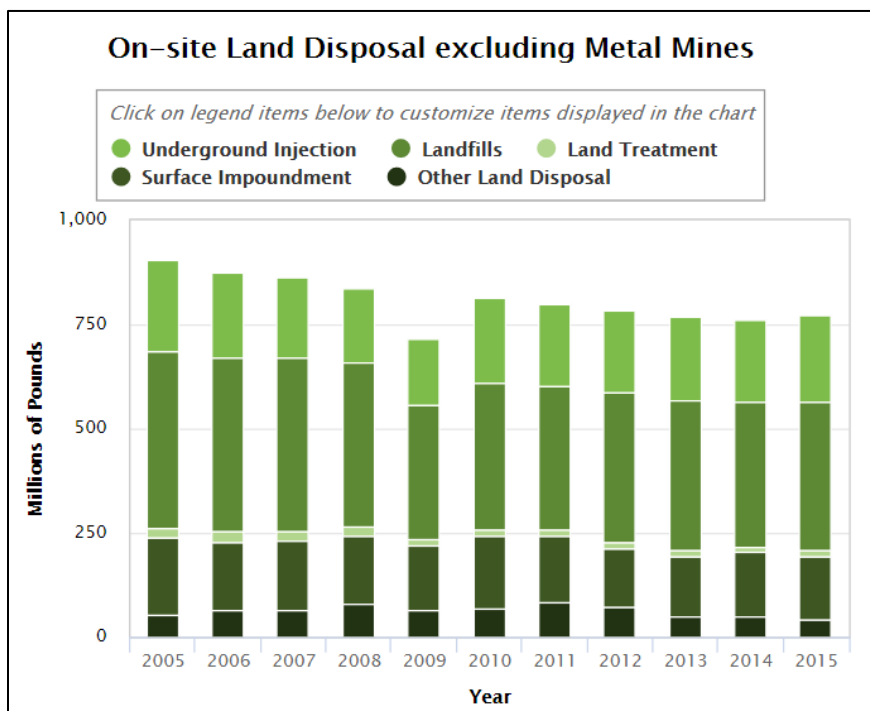
- Land disposal trends are largely driven by the metal mining sector, which accounted for 61% of land disposal quantities. Click the button under the figure above to view the land disposal trend with metal mines excluded from the analysis.
- Most of these quantities are made up of either [lead](#) and [lead compounds](#) (39%) or [zinc](#) and [zinc compounds](#) (33%).

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 toxic chemicals reported nationally. In recent years mines have cited changes in production of waste rock, changes in the 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.

Federal and state agencies require that waste rock be placed in engineered structures that contain contaminants. Federal and state land management agencies also require that waste rock and tailings piles and heap leach pads be stabilized and re-vegetated to provide for productive post-mining land use.

For more information on waste management by the mining industry, see the [Metal Mining sector profile](#).

This graph shows the trend in the pounds of toxic chemicals disposed of to land, excluding metal mining.



From 2005 to 2015:

- Total on-site land disposal for all industries other than metal mining decreased by 14%.
- Disposal to landfills, which accounts for the greatest percentage of land disposal when metal mining is excluded, decreased by 16%.

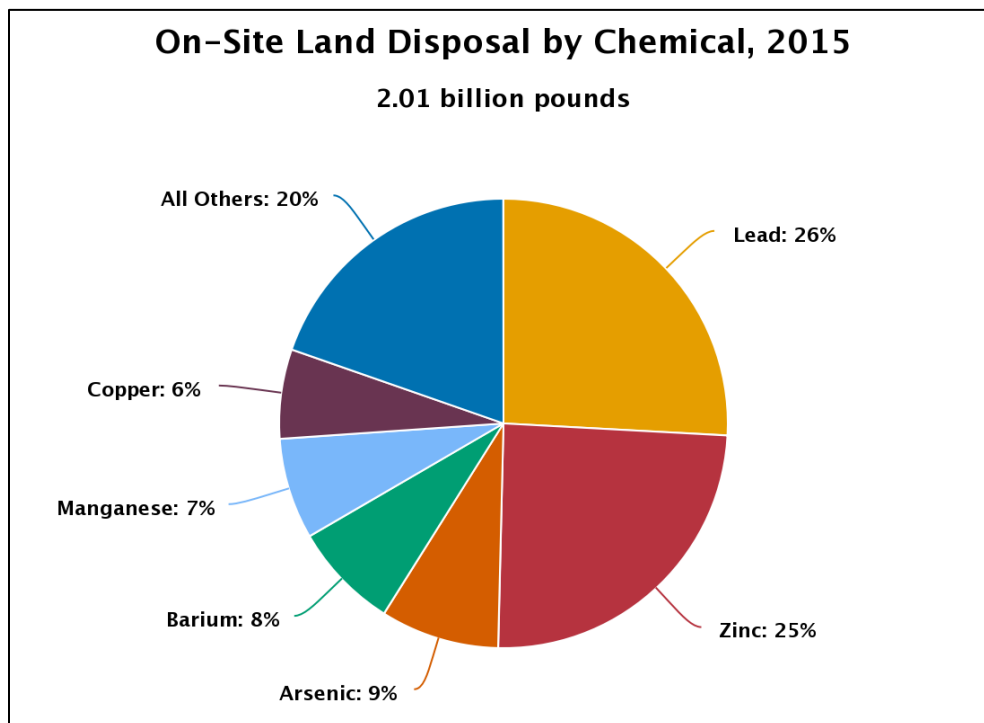
In 2015:

- Excluding metal mining releases, chemicals disposed to land in the largest quantities are: [barium](#) and [barium compounds](#) (20%), [manganese](#) and [manganese compounds](#) (13%), and [zinc](#) and [zinc compounds](#) (11%).

While releases to land have decreased in many sectors, releases by metal mining drive overall land disposal trends. See the graphic, [Land Disposal by Industry](#), for more information.

Land Disposal by Chemical

This pie chart shows which toxic chemicals were disposed of to land on-site in the greatest quantities in 2015.

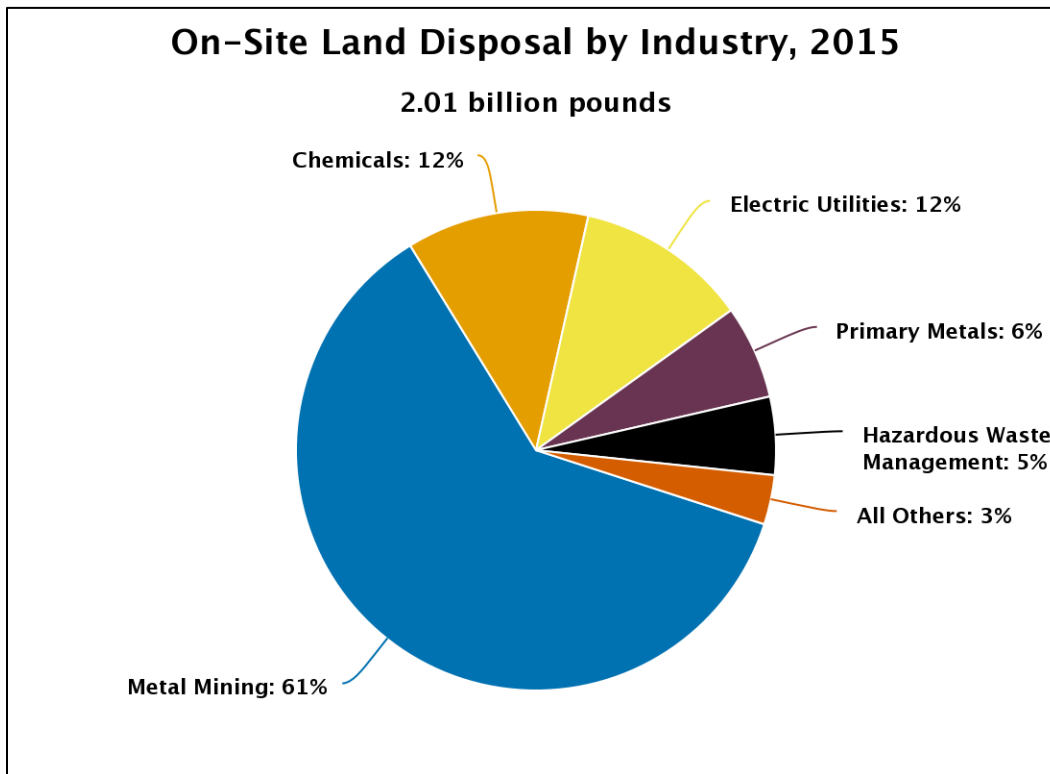


Note: Metals are combined with their metal compounds.

The metal mining sector alone is responsible for 87% of the total quantities of zinc and lead disposed of to land in 2015. Land disposal quantities of these chemicals have not changed significantly in the past 10 years but large fluctuations have occurred from 2010 through 2015. 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 toxic chemicals reported nationally.

Land Disposal by Industry

This pie chart shows the industry sectors that reported the greatest quantities of toxic chemicals disposed of to land on-site in 2015.

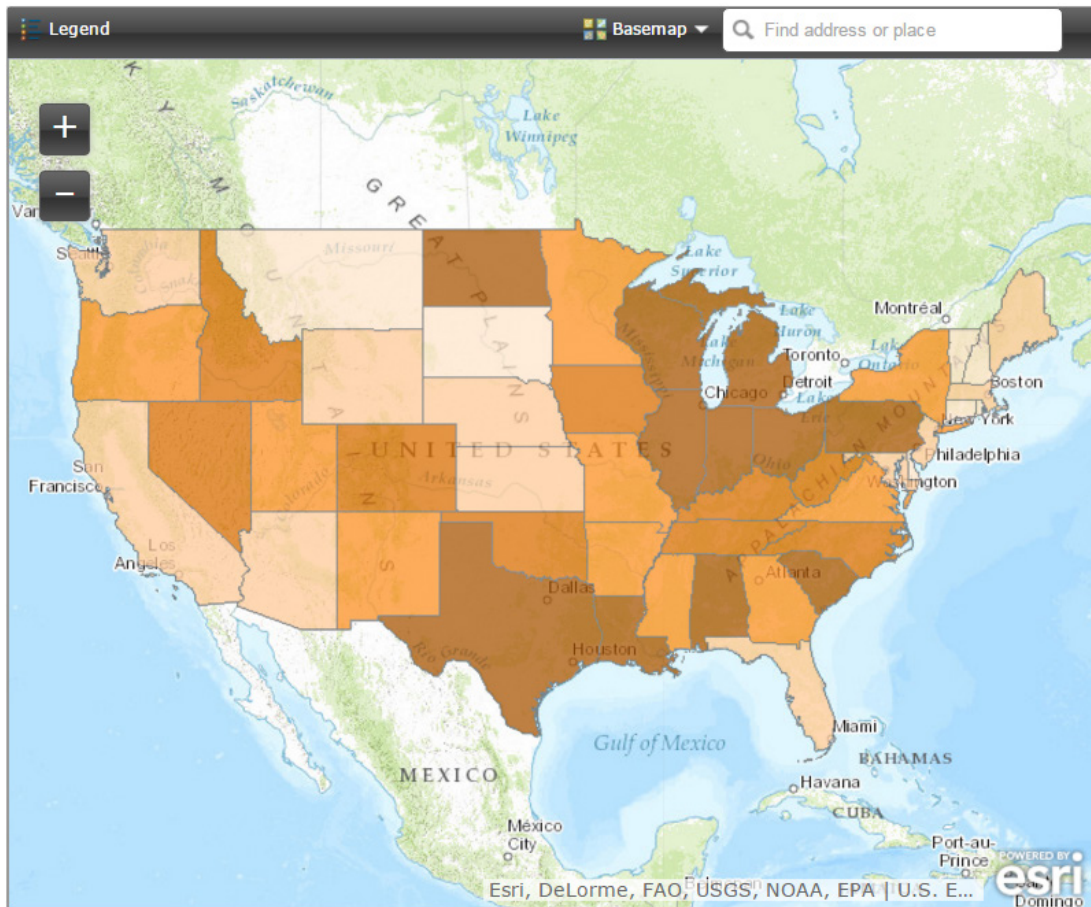


- The metal mining sector accounted for the majority of releases to land in 2015, mostly due to chemicals contained in waste rock.
- The relative contribution by each industry sector to on-site land disposal has not changed considerably in recent years.

Off-Site Disposal or Other Releases

Off-site Disposal or Other Releases, by State Receiving Transfer

TRI facilities report the quantities of chemicals that they transfer off-site for disposal or further waste management. This map shows the quantities of TRI waste received for disposal by state, where the darker shading indicates greater waste quantities.



Note: The transfers shown do not include transfers to Publicly Owned Treatment Works (POTWs) and, thus, reflect only a portion of total TRI transfers.

In 2015:

- Nationally, 83% of the total quantities of off-site transfers for disposal of TRI chemicals were metals and metal compounds.
- Metals transferred for disposal: [zinc](#), [manganese](#), [barium](#), [lead](#), [copper](#), and their compounds were the top five.
- Of other chemicals transferred for disposal, [methanol](#), [nitrate compounds](#), [ammonia](#), [nitric acid](#), and [N-methyl-2-pyrrolidone](#) were the top five.



Top States Ranked by Receiving Transfers of TRI Chemicals for Disposal in 2015

State Ranking	Total Transfers	Metal Transfers	Non-Metal Transfers
1	Indiana	Indiana	Texas
2	Pennsylvania	Pennsylvania	Ohio
3	Texas	Illinois	Michigan
4	Ohio	Ohio	Louisiana
5	Illinois	Michigan	Pennsylvania

- The top five states for total transfers received 48% of off-site disposal or other releases.
- 44 of the 50 U.S. states were their own largest sources of transfers for disposal; that is, facilities sent chemical waste for disposal to other sites within their state borders.
- A large number of transfers were from neighboring states (states with directly adjoining borders). Overall, 91% of TRI transfers for disposal came from either the receiving state or from neighboring states.



Chemicals of Special Concern

In this chapter, we take a closer look at some 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 not only toxic, but also 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 that are sensitive to the toxicities the chemicals cause.

Reporting requirements for the sixteen specific chemicals and four chemical categories designated as PBT chemicals on the Toxics Release Inventory (TRI) list of toxic chemicals are more stringent than for other TRI chemicals. See TRI's [PBT webpage](#) for the full list of PBT chemicals.

Use these links or the dropdown menu above to find out more about specific PBTs: [lead](#) and [lead compounds](#); [mercury](#) and [mercury compounds](#); and [dioxin and dioxin-like compounds](#).

There are also about 180 chemicals included on the TRI chemical list that are known or suspected carcinogens, which EPA refers to as Occupational Safety and Health Administration (OSHA) carcinogens. These chemicals also have different TRI reporting requirements. A full list of these chemicals can be found on the [TRI basis of OSHA carcinogens webpage](#). Select a graphic from the dropdown menu above to see how the volume of OSHA carcinogens released to air has changed over time.

Graphics in this section

[Total Releases of Lead and Lead Compounds](#)

[Air Releases of Lead and Lead Compounds](#)

[Air Releases of Mercury and Mercury Compounds](#)

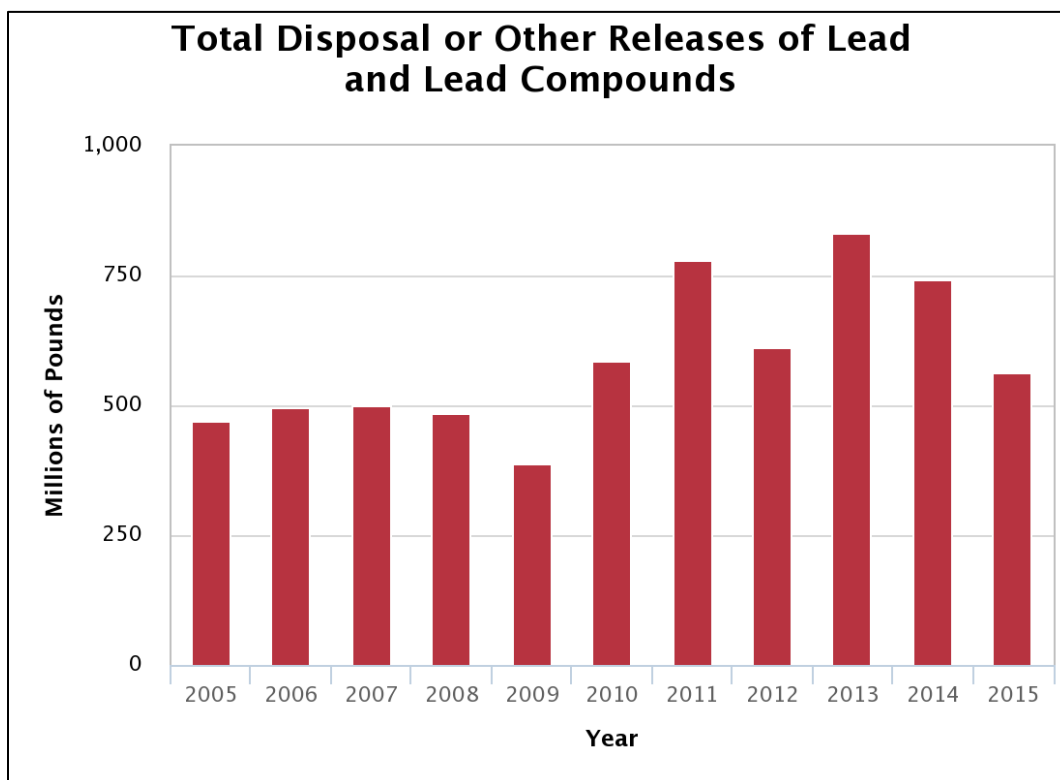
[Releases of Dioxin and Dioxin-like Compounds](#)

[Releases of Dioxin and Dioxin-like Compounds by Industry](#)

[Air Releases of OSHA Carcinogens](#)

Lead Releases Trend

This graph shows the trend in the pounds of [lead](#) and [lead compounds](#) disposed of or otherwise released.



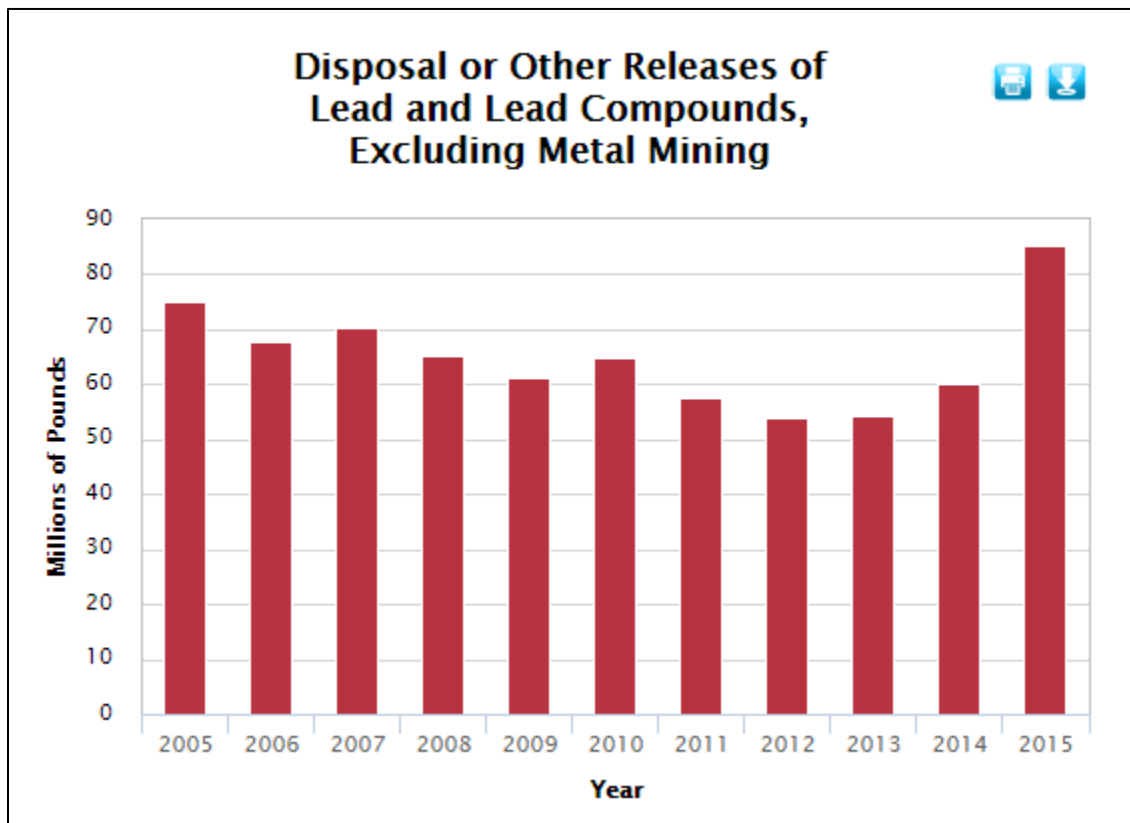
From 2005 to 2015:

- Total releases of [lead](#) and [lead compounds](#) rose and fell between 2005 and 2015, with an overall increase of 20%.
- Total releases especially fluctuated between 2010 and 2015. The metal mining sector accounts for most of the disposal of lead and lead compounds, driving the overall trend. For example, metal mines reported 85% of total lead and lead compound releases in 2015.

From 2014 to 2015:

- Total releases of lead and lead compounds decreased by 24% (178 million pounds).

This graph shows the trend in the pounds of [lead](#) and [lead compounds](#) disposed of or otherwise released, but excludes the metal mining sector.

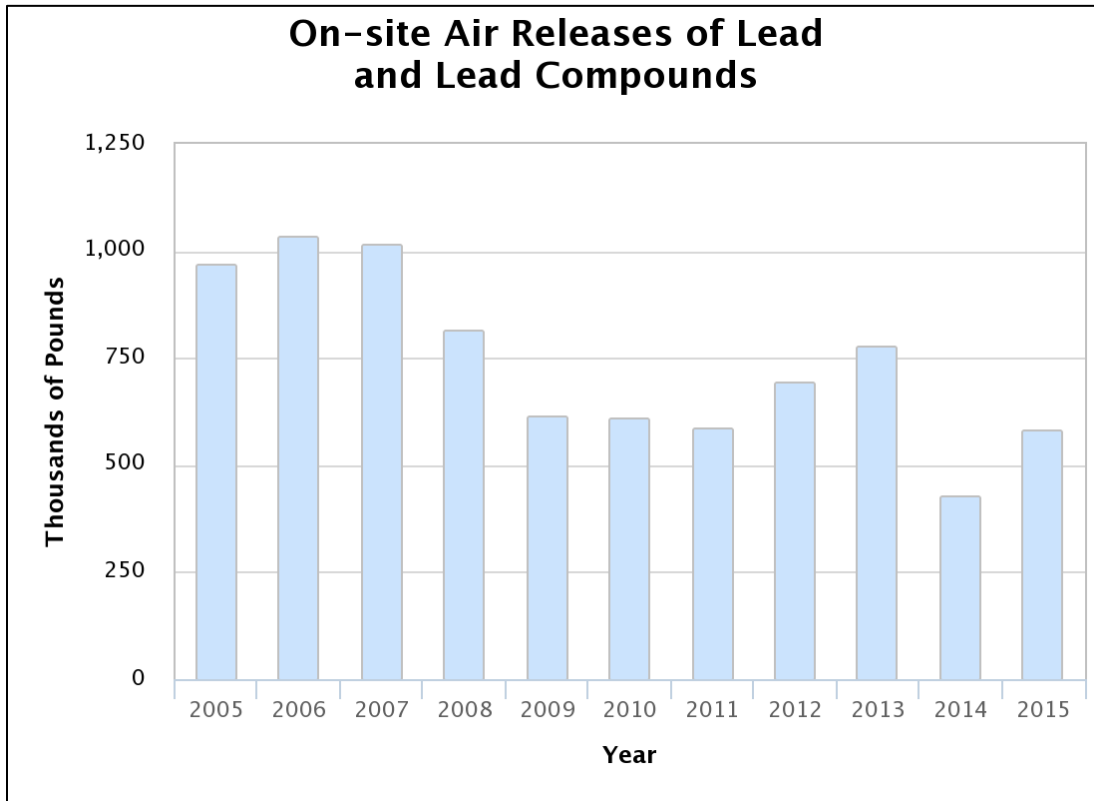


From 2005 to 2015:

- Metal mining accounts for the majority of releases of [lead](#) and [lead compounds](#).
- Other sectors increased the release of lead by 14% (10 million pounds).
 - This is primarily due to one [hazardous waste management facility](#) that reported releases of 24.9 million pounds of lead compounds in 2015 compared to 0.2 million pounds in 2014.

Lead Air Releases Trend

This graph shows the trend in the pounds of [lead](#) and [lead compounds](#) released to air.



From 2005 to 2015:

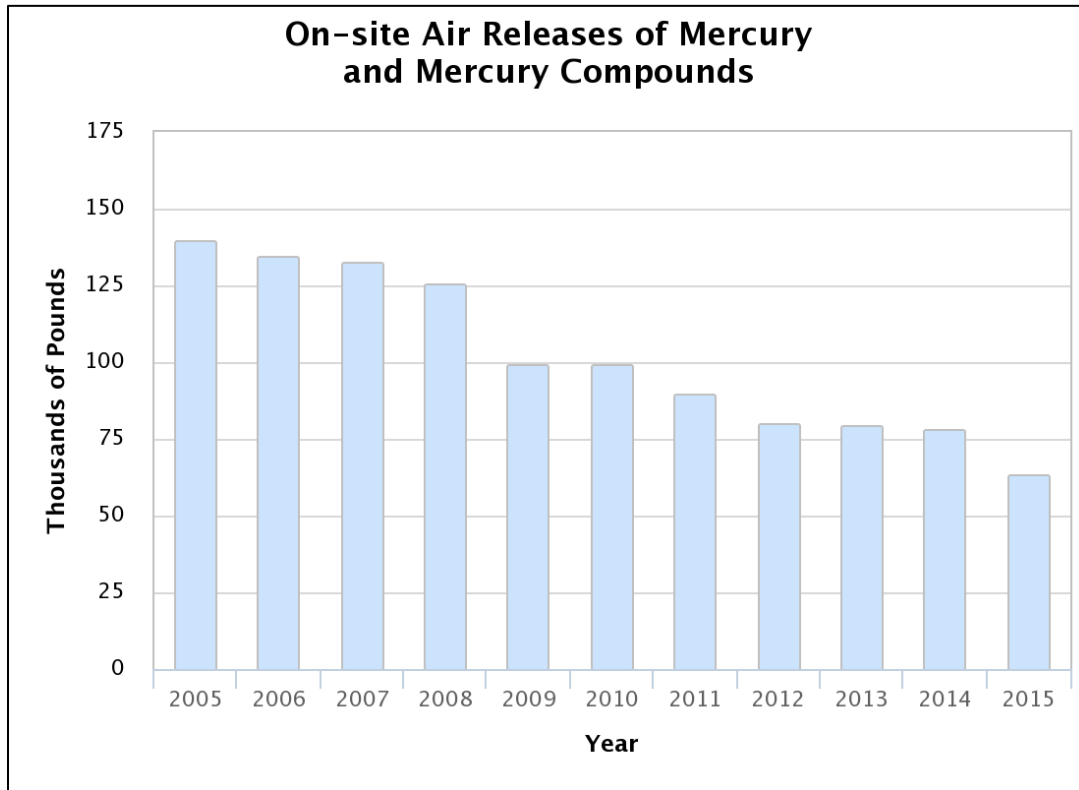
- Air releases of [lead](#) and [lead compounds](#) decreased by 40%. The electric utility and primary metals industry sectors have driven this decrease—both sectors have decreased air releases of lead and lead compounds by approximately 70%.
- The sector with the greatest quantity of lead and lead compound air releases is the primary metals sector, which includes iron and steel manufacturers and smelting operations.

From 2014 to 2015:

- Air releases of lead and lead compounds increased by 35% due to releases from a [motor vehicle metal stamping facility](#) that reported for the first time in 2015.

Mercury Air Releases Trend

This graph shows the trend in the pounds of [mercury](#) and [mercury compounds](#) released to air.



From 2005 to 2015:

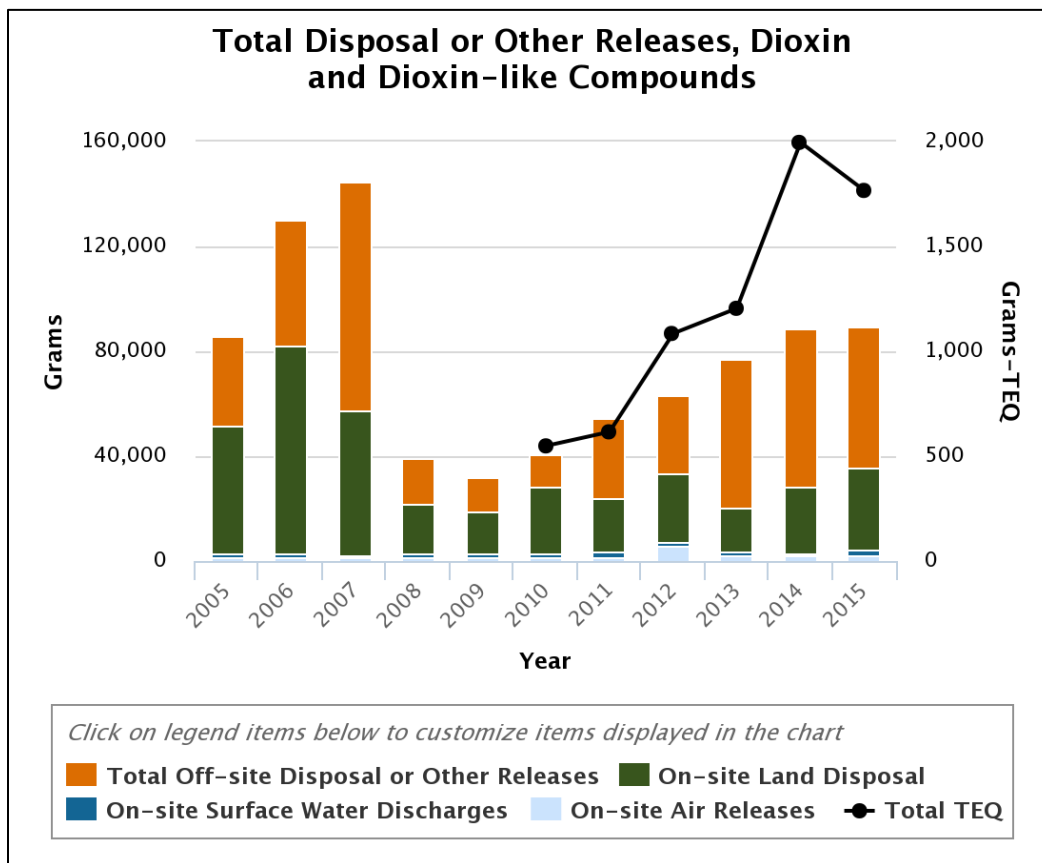
- Releases of [mercury](#) and [mercury compounds](#) to air decreased by 55%.
- Electric utilities are driving the decline in mercury air emissions, with a 69% reduction. Reasons for this decrease include a shift from coal to other fuel sources and installation of control technologies at coal-fired power plants.

In 2015:

- Electric utilities, which include coal- and oil-fired power plants, accounted for 48% of the mercury and mercury compounds air emissions reported to TRI.

Dioxins Releases Trend

This graph shows the trend in the pounds of [dioxin and dioxin-like compounds](#) disposed of or otherwise released.



[Dioxin and dioxin-like compounds](#) (dioxins) are Persistent, Bioaccumulative, and Toxic chemicals (PBTs) characterized by EPA as probable human carcinogens. Dioxins are the unintentional byproducts of many forms of combustion and several industrial chemical processes. TRI requires facilities to report on 17 types, or congeners, of dioxin. Congener information was first collected in 2010.

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.



From 2005 to 2015:

- Releases of dioxins increased by 5%, with a decrease in on-site land disposal and increase in off-site disposal or other releases.

From 2010 to 2015:

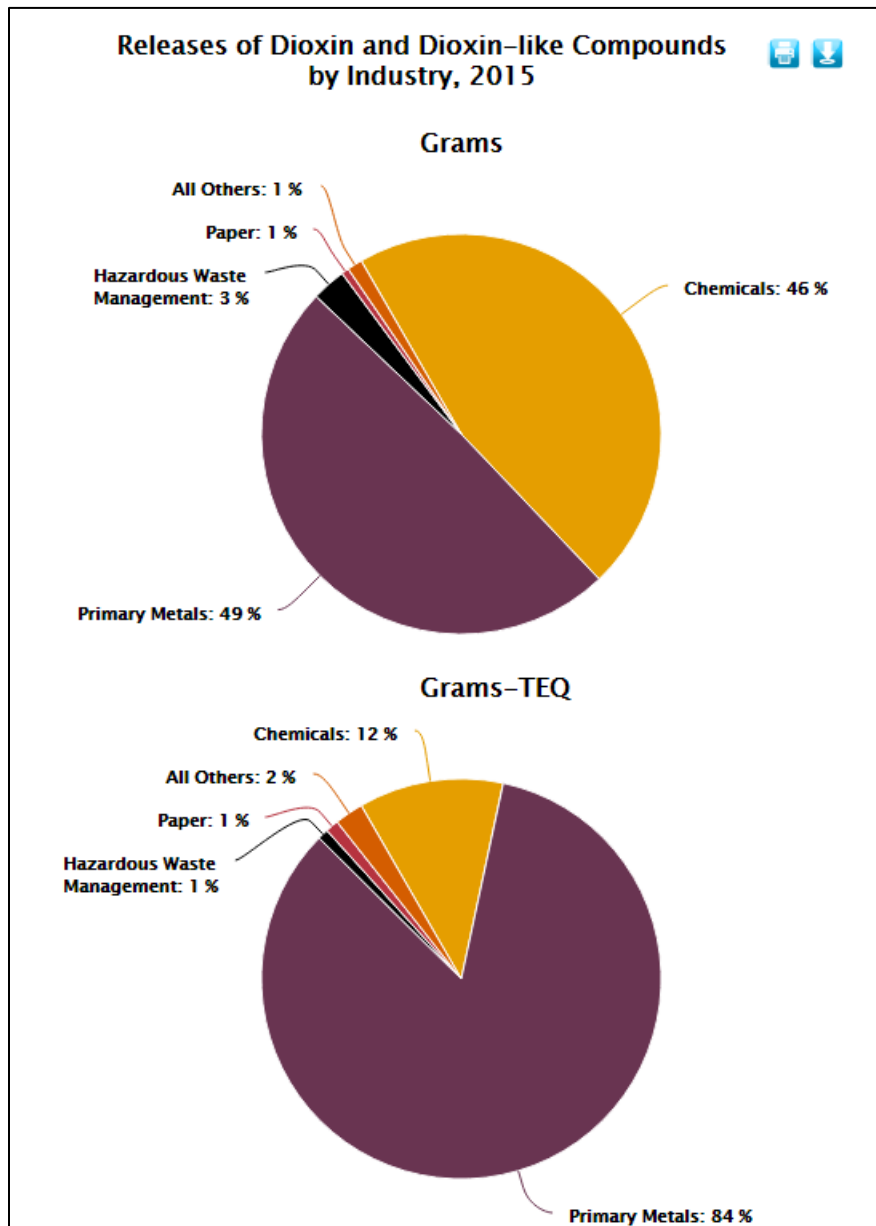
- Since 2010, grams-TEQ increased by 222%, while dioxin grams released increased by 121%.
 - This suggests that releases of the more toxic congeners have increased at a faster rate than releases of dioxins overall, causing grams-TEQ of dioxins to increase at a higher rate than overall grams.

From 2014 to 2015:

- Releases of dioxins increased by 1%, but grams-TEQ decreased by 11%.
- In 2015, most (60%) of the quantity released was disposed of off-site.

Dioxins Releases by Industry

The following two pie charts show: 1) the 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*).



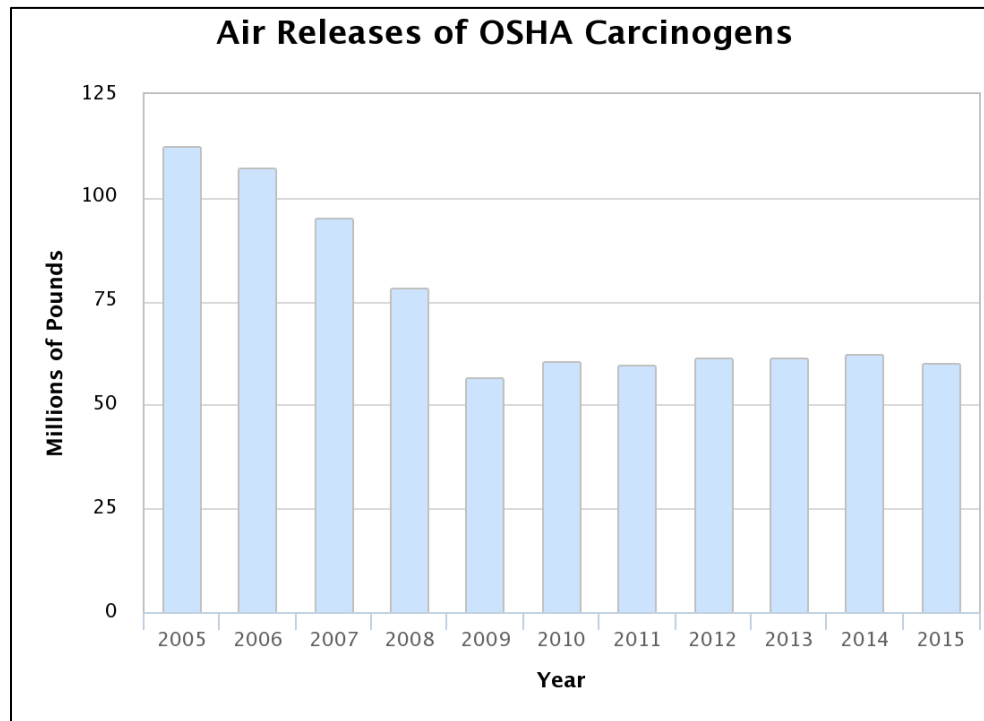
- Various industry sectors may dispose of or otherwise release very different mixes of dioxin congeners.
- In 2015, four industry sectors accounted for most of the grams and grams-TEQ of dioxins released.



- The chemical manufacturing industry accounted for 46% and the primary metals sector for 49% of total grams of dioxins released.
- However, when TEFs are applied, the primary metals sector accounted for 84% and the chemical manufacturing sector for just 12% of the total grams-TEQ released.

OSHA Carcinogens Air Releases Trend

Among the chemicals that are reported to the Toxics Release Inventory (TRI) Program, there are about 180 known or suspected carcinogens, which EPA refers to as OSHA carcinogens. This graph shows the trend in the pounds of OSHA carcinogens released to air.

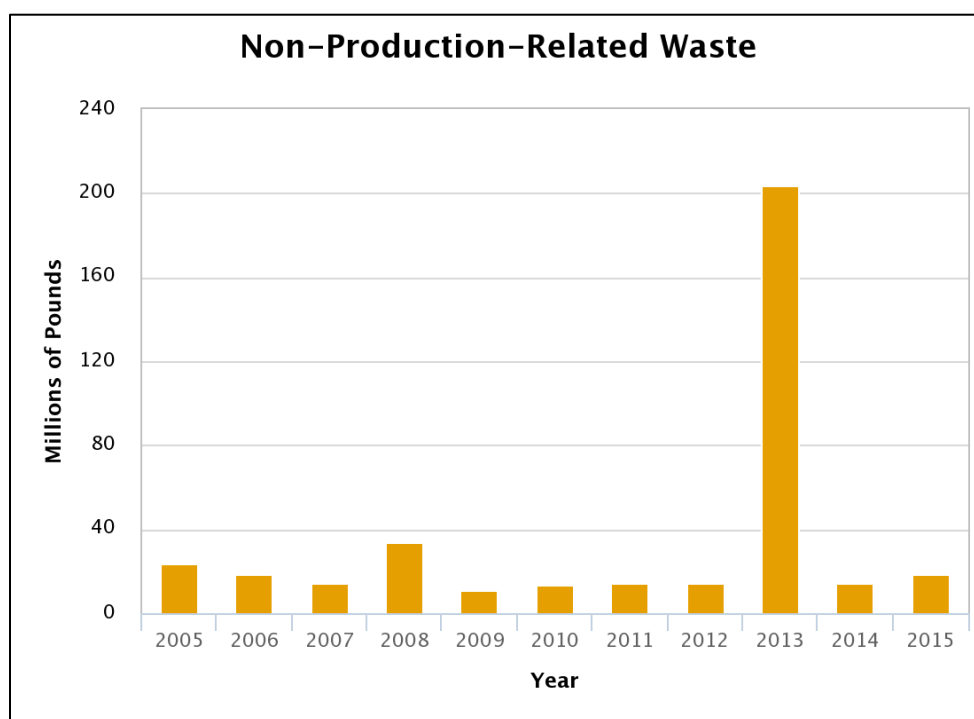


From 2005 to 2015:

- Air releases of these carcinogens decreased by 46%.
- The long-term decreases in air releases of OSHA carcinogens were driven mainly by decreases in [styrene](#) air releases from the plastics and rubber and transportation equipment industries.

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, such as decommissioning a heap leach pad, 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, which may account for discrepancies between the two figures. The following graph shows the annual quantities of non-production-related waste reported to the TRI Program.



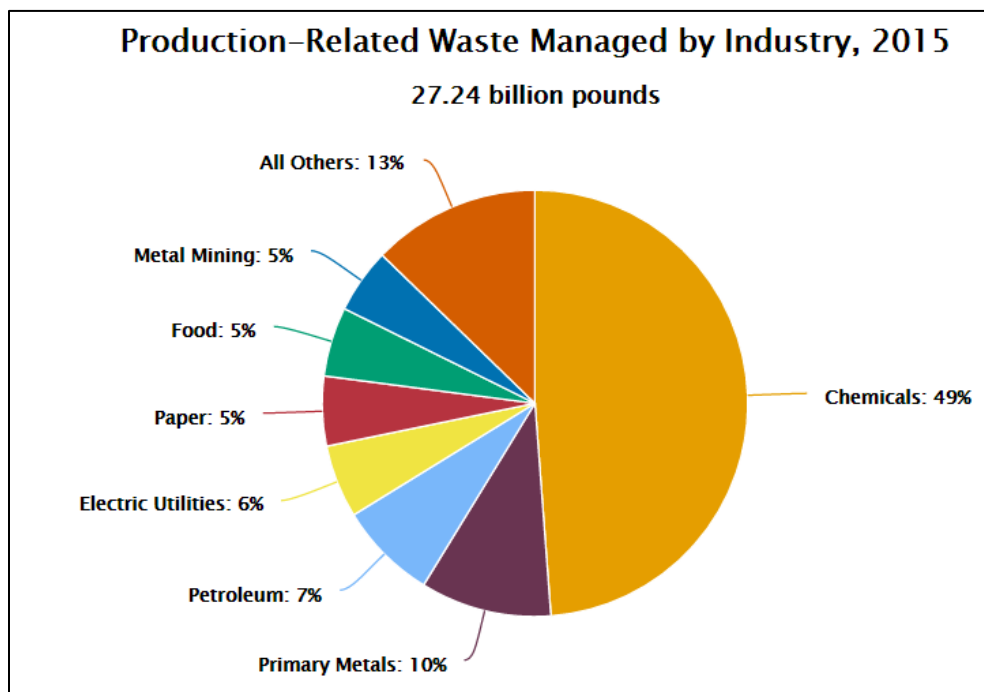
Non-production-related waste from all facilities was below 35 million pounds in all years but 2013 when a [mining facility](#) reported a one-time only release of 193 million pounds due to decommissioning a heap leach pad. The facility reported zero releases in 2014 and did not report in 2015.

- In 2015, facilities reported 18 million pounds of one-time releases, of which 51% (9.3 million pounds) was reported from the federal cleanup of an old [nuclear weapons production site](#). The chemicals released included toluene, lead, xylene, and naphthalene.

Comparing Industry Sectors in the 2015 TRI National Analysis

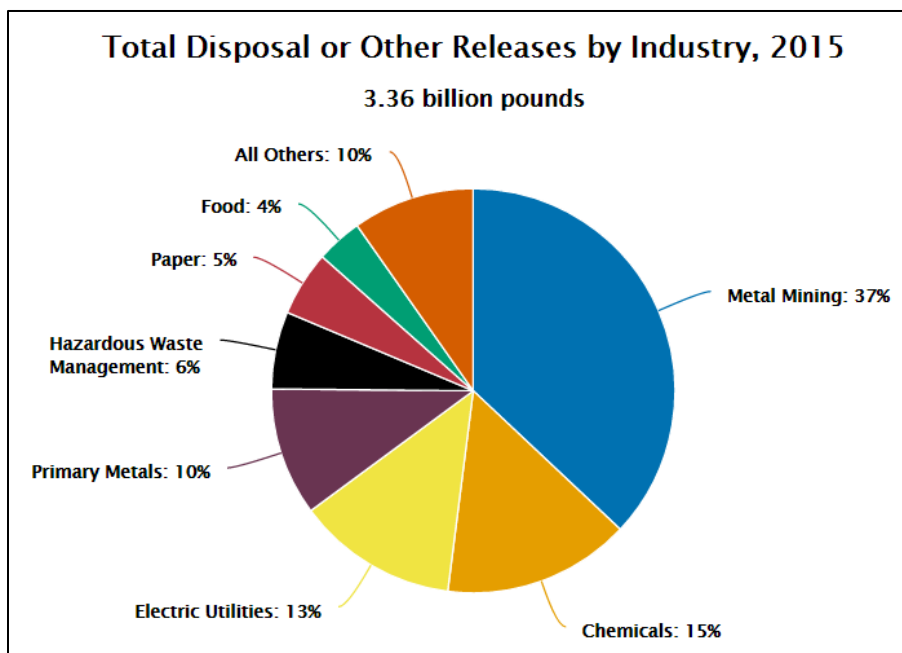
This chapter examines which sectors contributed the most to production-related waste managed and releases in 2015, and highlights several industry sectors to show trends occurring over time. It also discusses the trends among federal facilities, which report to the Toxics Release Inventory (TRI) regardless of industry 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, composition, 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 categorized by the same NAICS code, however, the processes, products, and regulatory requirements are often similar, resulting in similar manufacture, processing, or other use of toxic chemicals. Looking at chemical waste management trends within a sector can identify emerging issues, highlight progress made in improving environmental performance, and reveal opportunities for better waste management practices.



Seven industry sectors reported 87% of the quantities of TRI chemicals managed as production-related waste in 2015. A majority (66%) of TRI chemical waste managed originated

from three sectors: chemical manufacturing (49%), primary metals (10%), and petroleum products manufacturing, primarily from petroleum refineries (7%).



This pie chart shows that 90% of the quantities of TRI chemicals disposed of or otherwise released originated from seven of the 29 TRI industry sectors. Almost two-thirds originated from just three industry sectors: metal mining (37%), chemical manufacturing (15%), and electric utilities (13%). The chemical manufacturing sector is one of the top two sectors for both production-related waste managed and total releases.

- 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](#).

Sections in this chapter

[Manufacturing Sectors](#)

[Food Processing](#)

[Chemical Manufacturing](#)

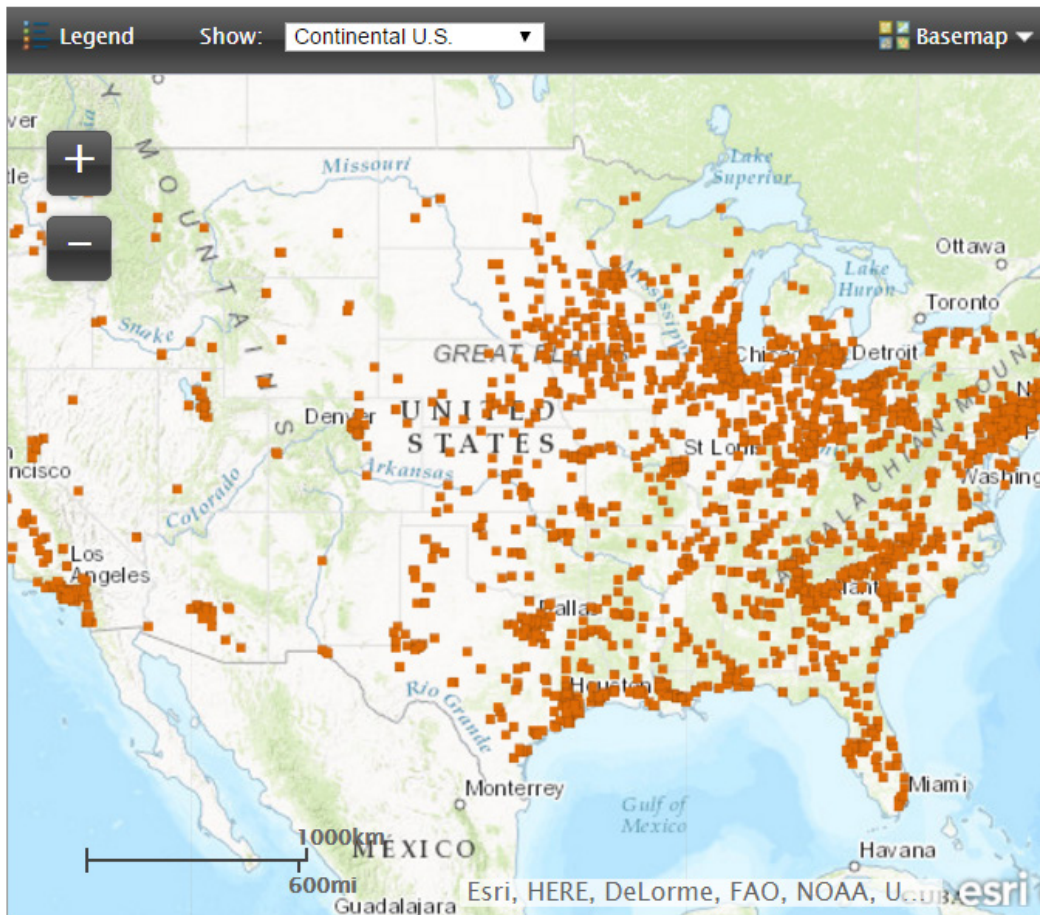
[Metal Mining](#)

[Electric Utilities](#)

[Federal Facilities](#)

Manufacturing Sectors

This map shows the manufacturing facilities that reported to Toxics Release Inventory (TRI) in 2015.



Manufacturing Facilities Reporting to TRI, 2015

Of the 27.2 billion pounds of production-related waste reported to TRI in 2015, most (86%) was from facilities in a manufacturing sector. Similarly, 88% of the facilities reporting to TRI are in a manufacturing sector. The manufacturing sectors are defined by NAICS sector codes 31 through 33 and include a variety of industries involved in the production of food, textiles, paper, chemicals, plastics, electronics, transportation equipment, and other products. Two of the manufacturing sectors (food and chemicals) are highlighted in more detail later in this chapter.

The industries not categorized under manufacturing include [metal mining \(see profile\)](#), coal mining, [electric utilities \(see profile\)](#), chemical wholesalers, petroleum terminals, hazardous waste management, and others.

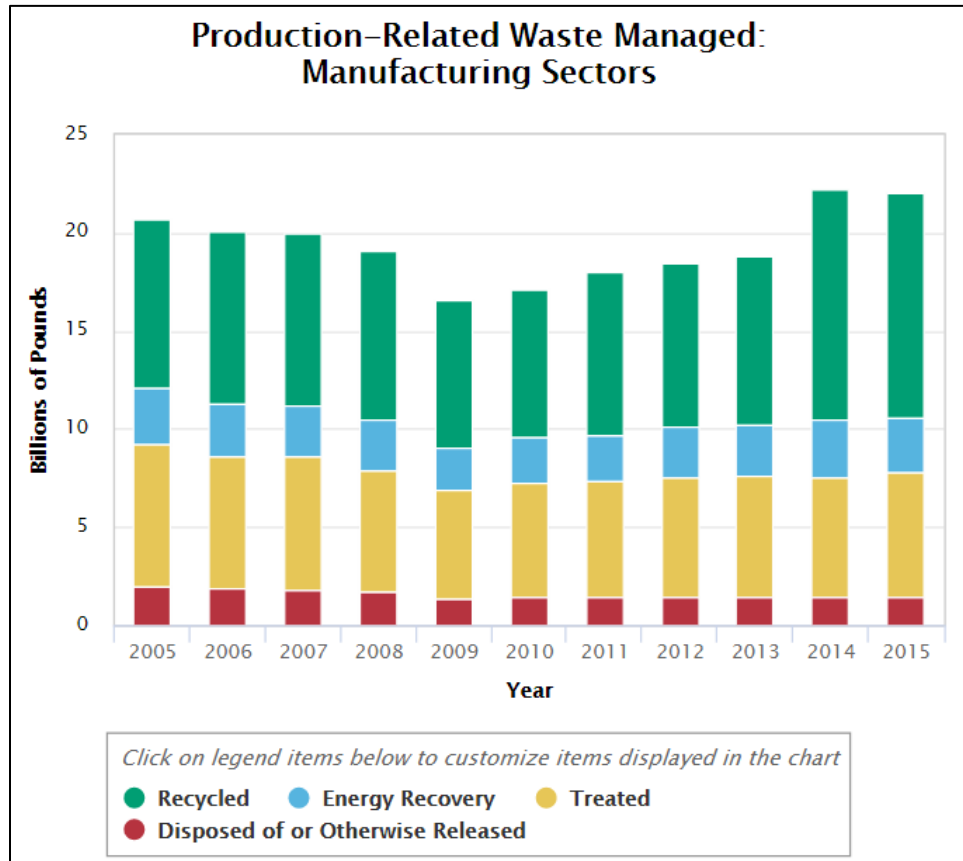


Quick Facts for 2015: Manufacturing Sectors (NAICS 31-33)	
Number of Facilities that Reported to TRI	19,279
Number of Facilities with New Source Reduction Activities	2,301
Production-Related Waste Managed	23,440.8 million lb
Recycled	11,598.4 million lb
Energy Recovery	2,945.5 million lb
Treated	7,434.0 million lb
Disposed or Otherwise Released	1,462.9 million lb
Total Disposal or Other Releases	1,438.3 million lb
On-site	1,123.7 million lb
Air	545.6 million lb
Water	173.1 million lb
Land	405.0 million lb
Off-site	314.6 million lb

Note: Numbers may not sum exactly due to rounding.

Manufacturing Waste Management Trend

The following graph shows the annual quantities of toxic chemicals managed by the manufacturing sectors.



From 2005 to 2015:

- 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, treated, or used in energy recovery decreased, while the quantity of waste recycled increased by 34%.

From 2014 to 2015:

- Production-related waste managed decreased by 0.6% (132.8 million pounds).
- In 2015, 7% of the sector's waste was released into the environment, while the rest was managed through treatment, energy recovery, and recycling.

It is important to consider the influence the economy has on production and production-related waste generation. This figure presents the total pounds in production-related waste managed as reported by the manufacturing sectors and the manufacturing sectors' "value added".

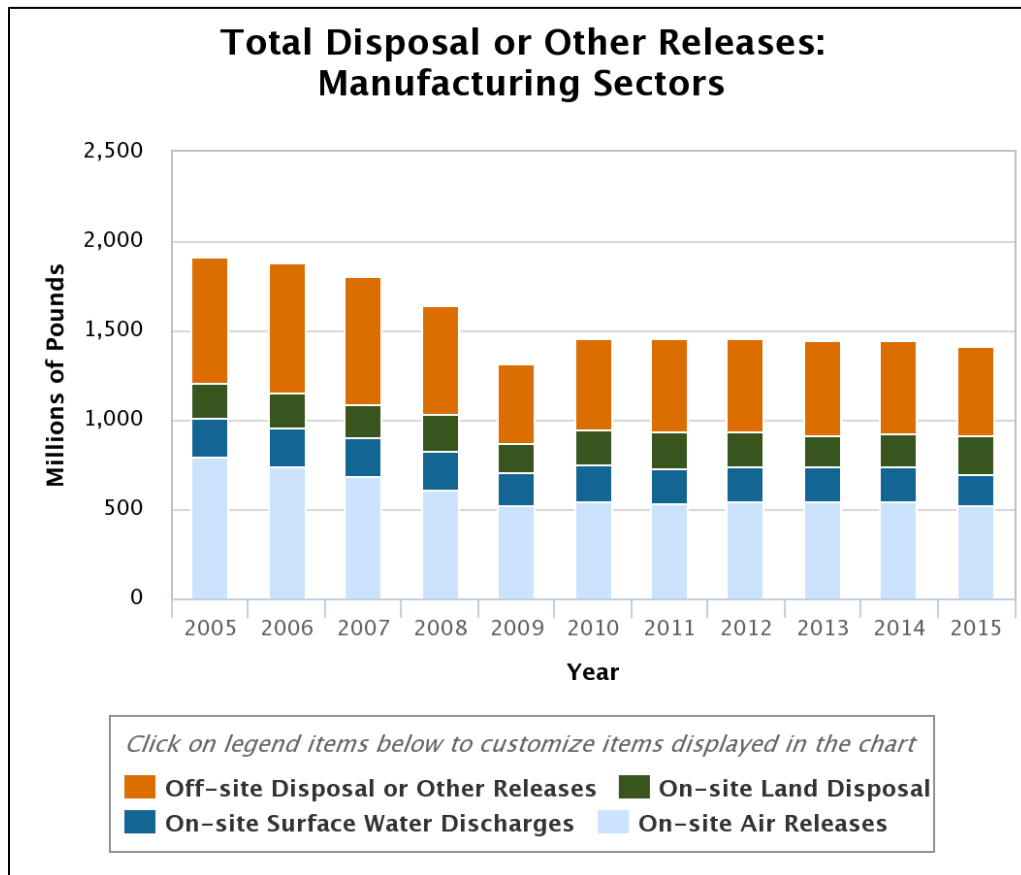


From 2005 to 2015:

- Production-related waste managed by the manufacturing sectors increased by 7%, while value-added by the manufacturing sectors increased by 8% (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.

Manufacturing Releases Trend

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



From 2005 to 2015:

- Total releases by the manufacturing sectors decreased by 26%. This is primarily due to a reduction in air emissions and off-site releases.
- Releases to water also declined, while on-site releases to land increased.

From 2014 to 2015:

- Total releases decreased by 2.3% (33.9 million pounds).
- On-site land disposal increased while on-site releases to air and water decreased.

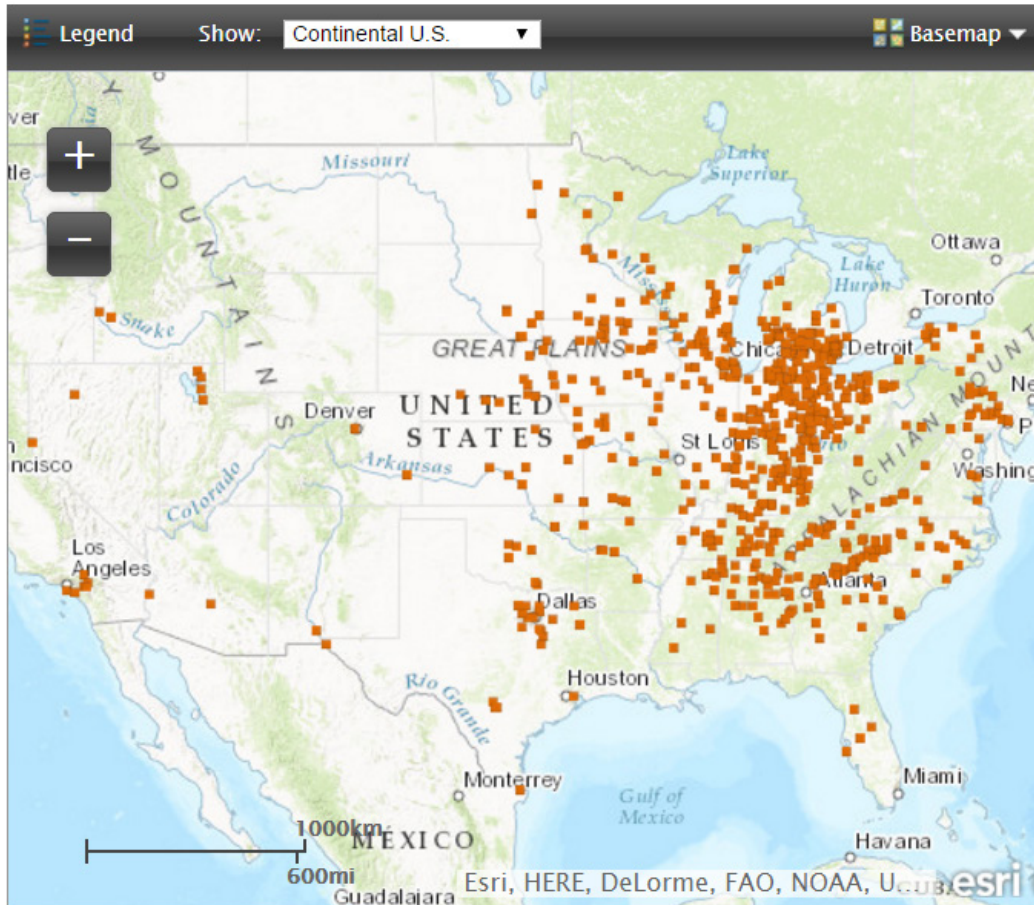


Source Reduction in the Manufacturing Sectors:

Twelve percent of manufacturing facilities initiated source reduction activities to reduce toxic chemical use and waste generation in 2015. The most commonly reported source reduction activities were good operating practices and process modifications. For example, [one facility improved air flow through coating application equipment](#) to reduce spray volume and overspray of solvent-based paints. [TRI's Pollution Prevention Search Tool](#) can help you learn more about pollution prevention opportunities in this sector.

Food Processing

This map shows the food processing facilities that reported to Toxics Release Inventory (TRI) in 2015.



Food Processing Facilities Reporting to TRI, 2015

The food processing sector includes facilities that process livestock and agricultural products into food products for consumption. It includes sectors under NAICS 311 such as those processing meat, dairy, vegetable, and fruit products, but does not include agricultural activities. This sector is highlighted here because it is one of the “national emphasis areas” of EPA’s Pollution Prevention (P2) Program. As a national emphasis area, EPA’s goal for the sector is to implement P2 projects that support more sustainable food manufacturing resulting in reduced hazardous materials generation and use, water usage, greenhouse gas emissions, and/or business costs.

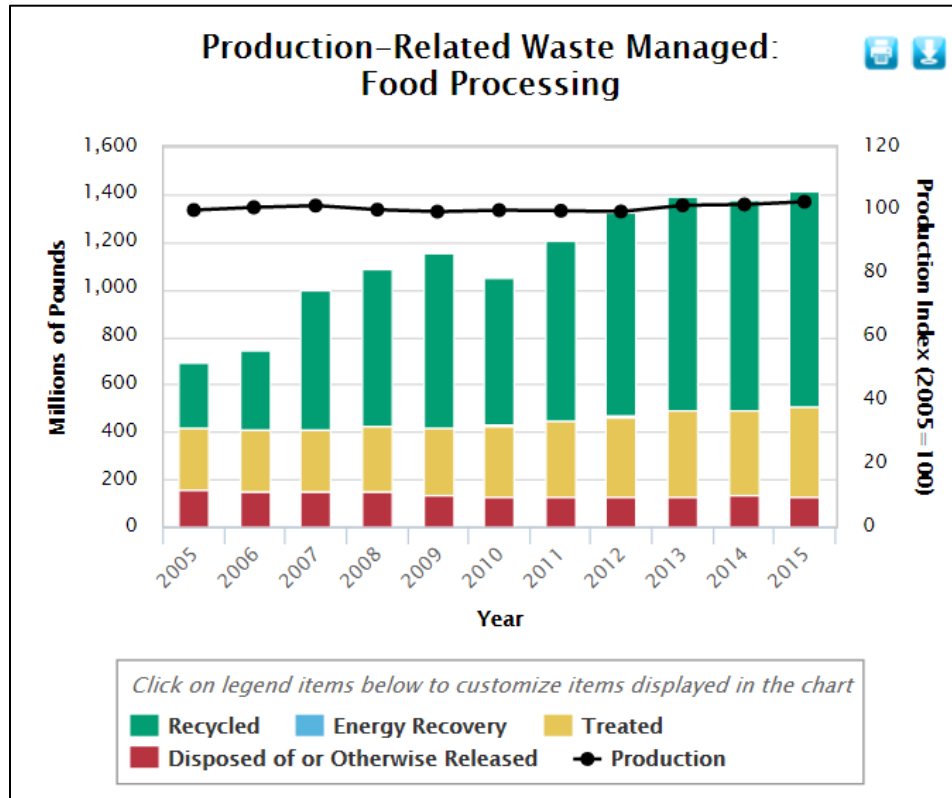


Quick Facts for 2015: Food Processing (NAICS 311)	
Number of Facilities that Reported to TRI	1,571
Number of Facilities with New Source Reduction Activities	135
Production-Related Waste Managed	1,437.4 million lb
Recycled	910.7 million lb
Energy Recovery	0.7 million lb
Treated	395.2 million lb
Disposed or Otherwise Released	130.8 million lb
Total Disposal or Other Releases	123.9 million lb
On-site	117.0 million lb
Air	45.3 million lb
Water	62.8 million lb
Land	8.9 million lb
Off-site	6.9 million lb

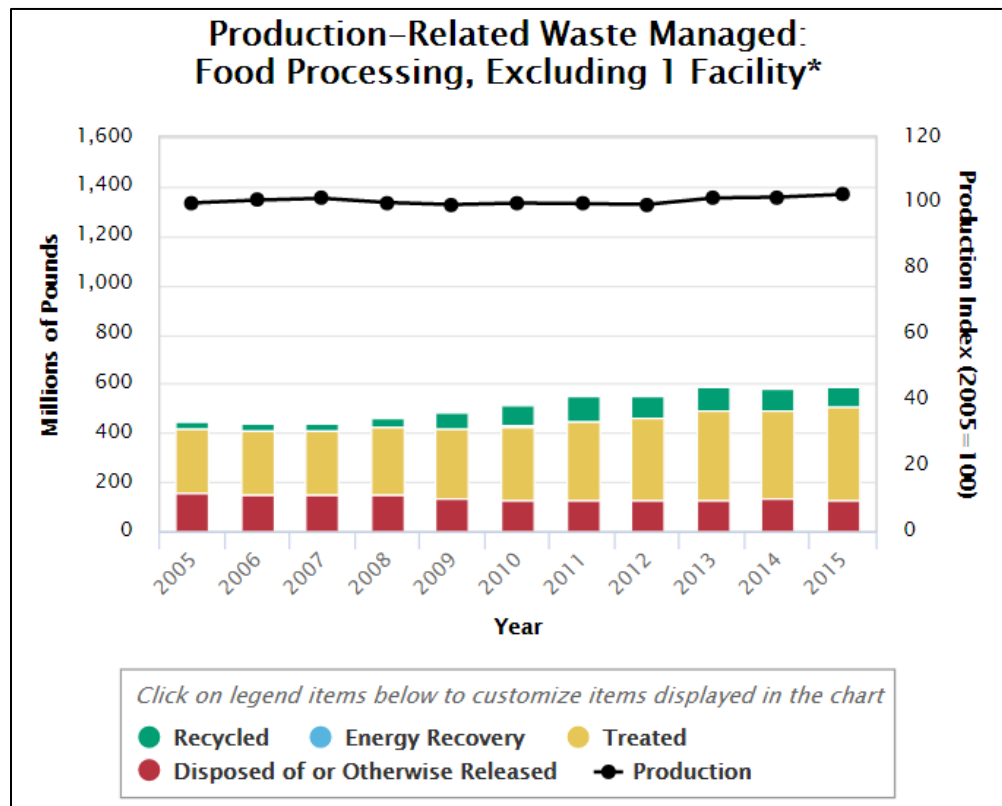
Note: Numbers may not sum exactly due to rounding.

Food Processing Waste Management Trend

The following graph shows the annual quantities of toxic chemicals managed by the food processing industry.



The following graph shows the annual quantities of toxic chemicals managed by the food processing industry, excluding one soybean processing facility.



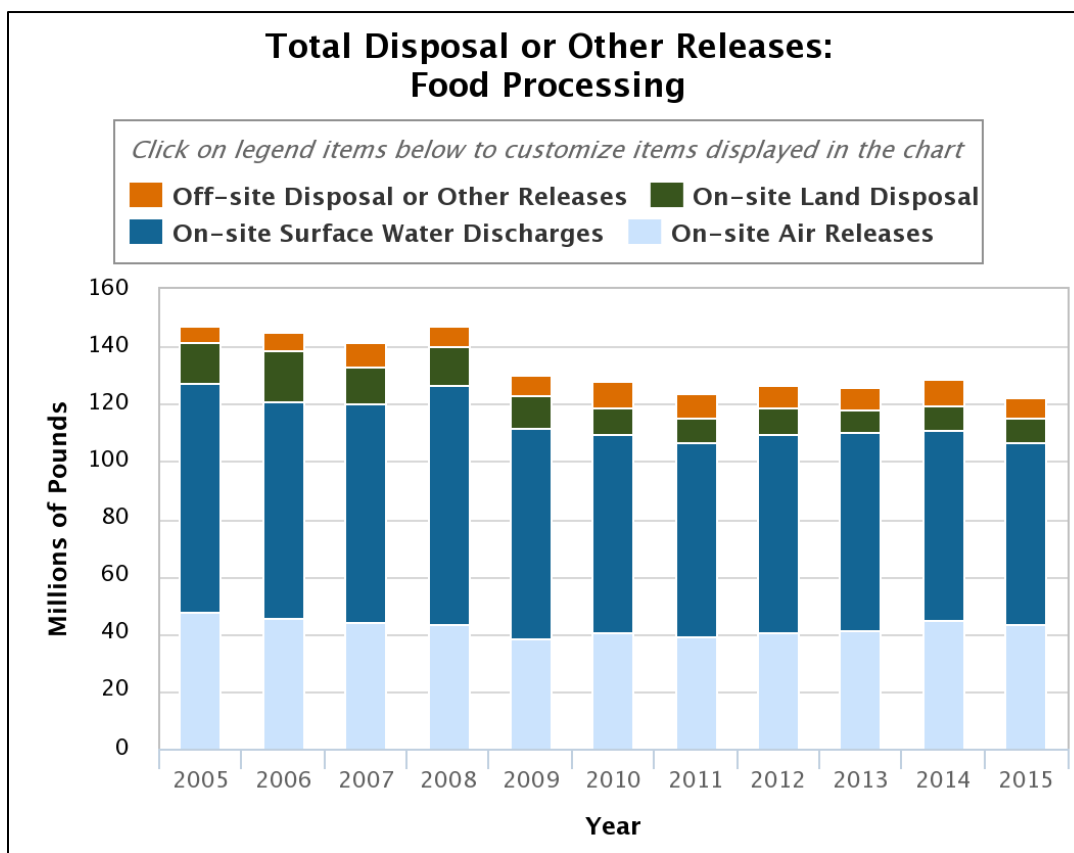
Note: *Excludes 1 soybean processing facility whose quantities of n-hexane recycled drive the sector's trend

From 2005 to 2015:

- Food production increased by 3% (as reported by the Federal Reserve Board, Industrial Production Index for Nondurable Goods).
- While the sector's production levels have remained relatively steady since 2005, production-related waste increased by 105%.
- Trends in quantities of production-related waste are driven by [one soybean processing facility's](#) reported recycled quantity of [n-hexane](#). Excluding this quantity, production-related waste increased by 31%.
- The proportion of managed waste that is recycled increased from 2005, when 40% of total production-related waste was recycled, to 2015, when 64% was recycled.
- Quantities disposed of or otherwise released declined from 22% of total production-related waste in 2005, to 9% in 2015.

Food Processing Releases Trend

The following graph shows the annual quantities of toxic chemical released by the food processing industry.



From 2005 to 2015:

- The food processing sector accounts for more water releases than any other sector.
- The sector's total disposal or other releases decreased by 17%, driven by a 17-million-pound reduction in on-site surface water discharges. This occurred despite a 3% increase in production since 2005.

In 2015:

- Releases of [nitrate compounds](#) to surface water accounted for 49% (61.3 million lb) of the sector's total disposal or other release quantities. Under the TRI reporting requirements, nitrate compounds are reportable only when in solution with water. Nitrate compounds are relatively less toxic to human health than other TRI chemicals discharged to surface waters, but are formed in large quantities by this sector during treatment processes due to the high biological content of wastewater.



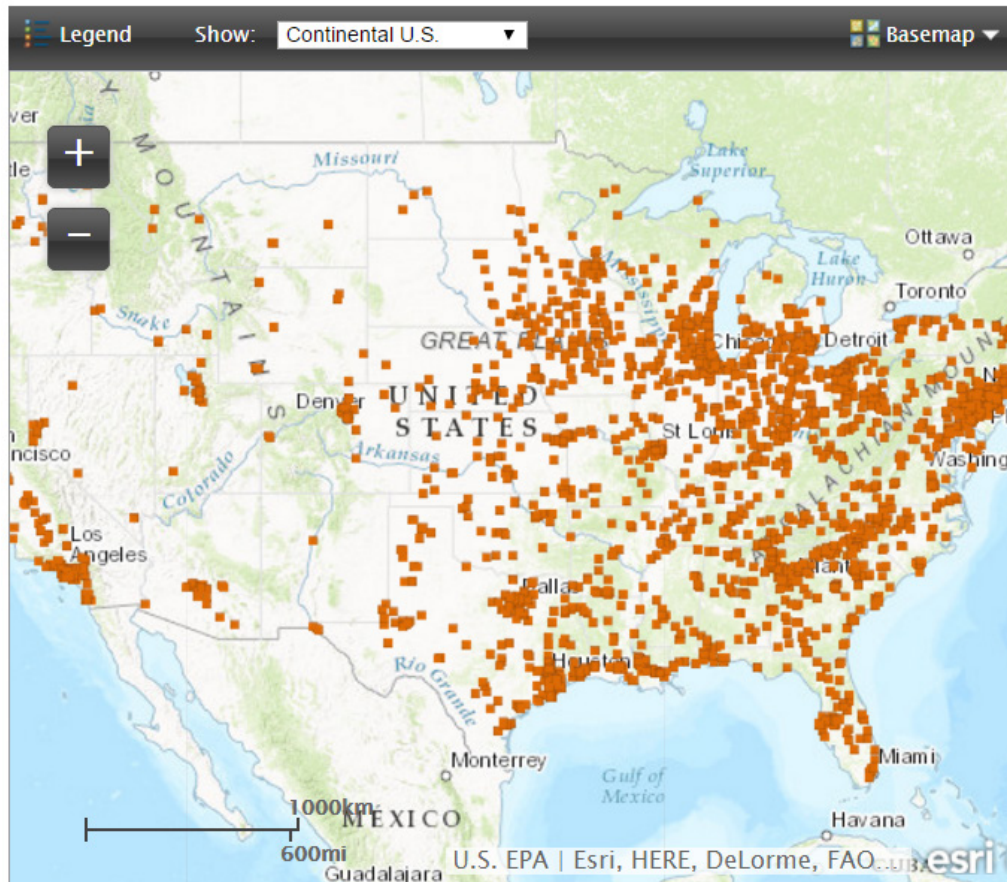
- Note that surface water discharges are often regulated by other EPA programs such as the program established under the [Clean Water Act that issues National Pollutant Discharge Elimination System \(NPDES\) permits](#).
- The food processing sector contributed 36% of total nitrate compound releases to water, due to the large quantities of biological materials in wastewaters from meat processing facilities.
- Other chemicals commonly released by food processing facilities include [ammonia](#), [n-hexane](#) and [nitric acid](#).

Source Reduction in the Food Processing Sector:

Nine percent of facilities (135) reported initiating source reduction activities to reduce toxic chemical use and waste generation in 2015. The most commonly reported source reduction activities were good operating practices and process modifications. For example, [one facility installed a UV light channel to disinfect waste water](#) rather than using chlorine. [TRI's Pollution Prevention Search Tool](#) or the EPA [data visualization tool for food processing](#) to learn more about pollution prevention opportunities in this sector.

Chemical Manufacturing

This map shows the chemical manufacturing facilities that reported to Toxics Release Inventory (TRI) in 2015.



Chemical Manufacturing Facilities Reporting to TRI, 2015

Chemical manufacturers produce a variety of products, including basic chemicals, products used by other manufacturers (such as synthetic fibers, plastics, and pigments), pesticides, pharmaceuticals, paints, and cosmetics, to name a few. In 2015, the chemical manufacturing sector had the most facilities (3,452, 16% of facilities that reported in 2015) report to TRI and also reported 49% of all production-related waste managed; more than any other sector.

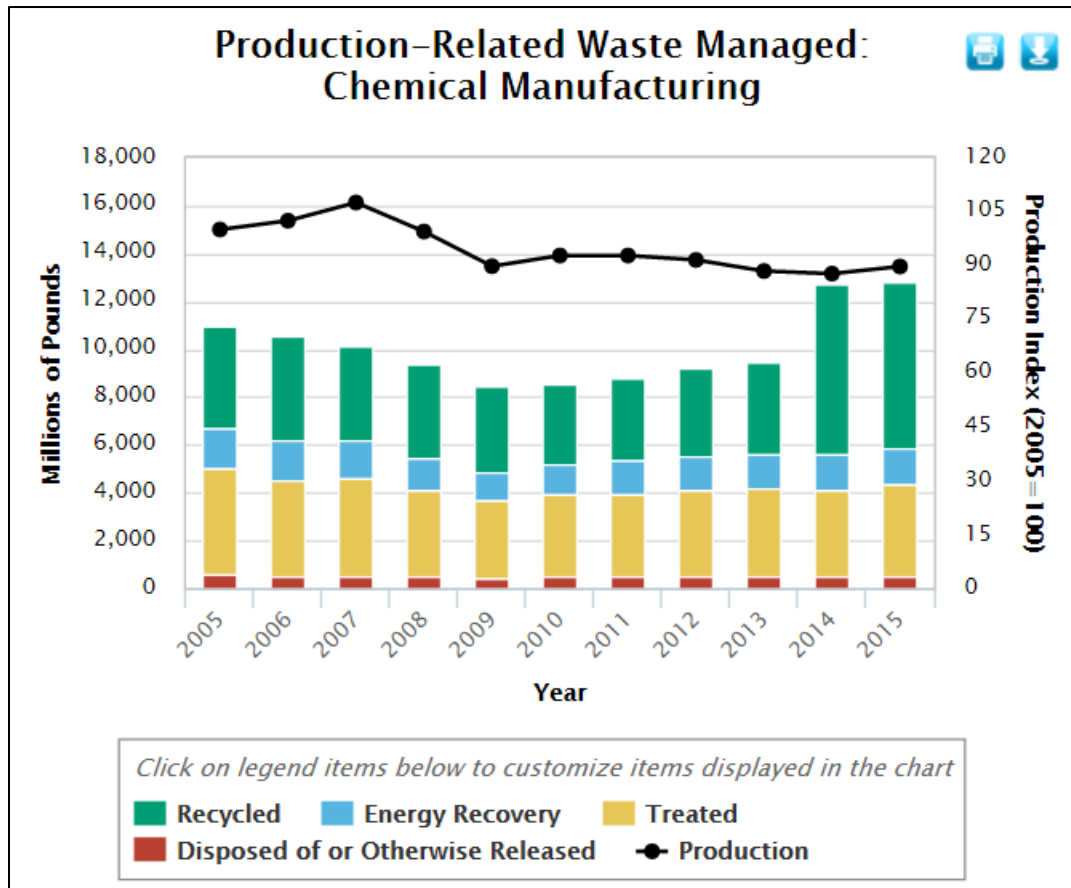


Quick Facts for 2015: Chemical Manufacturing (NAICS 325)	
Number of Facilities that Reported to TRI	3,452
Number of Facilities with New Source Reduction Activities	519
Production-Related Waste Managed	13,295.6 million lb
Recycled	6,978.3 million lb
Energy Recovery	1,711.0 million lb
Treated	4,088.8 million lb
Disposed or Otherwise Released	517.5 million lb
Total Disposal or Other Releases	512.0 million lb
On-site	439.5 million lb
Air	164.2 million lb
Water	27.9 million lb
Land	247.4 million lb
Off-site	72.5 million lb

Note: Numbers may not sum exactly due to rounding.

Chemical Manufacturing Waste Management Trend

The following graph shows the annual quantities of toxic chemicals managed by the chemical manufacturing industry.



From 2005 to 2015:

- Production-related waste managed by the chemical manufacturing sector increased by 16%, while production (represented by the black line as reported by the [Federal Reserve Board, Industrial Production Index for Major Industry Groups](#)) decreased by 10%.
- Quantities of waste released, treated, or used in energy recovery decreased, while the quantity of waste recycled increased by 62%.
- The large increases in recycled waste in 2014 and 2015 are due to [the quantity of recycled cumene reported by one facility](#). Excluding this amount, the total quantities of waste recycled decreased by 16% and production-related waste managed decreased by 14%.

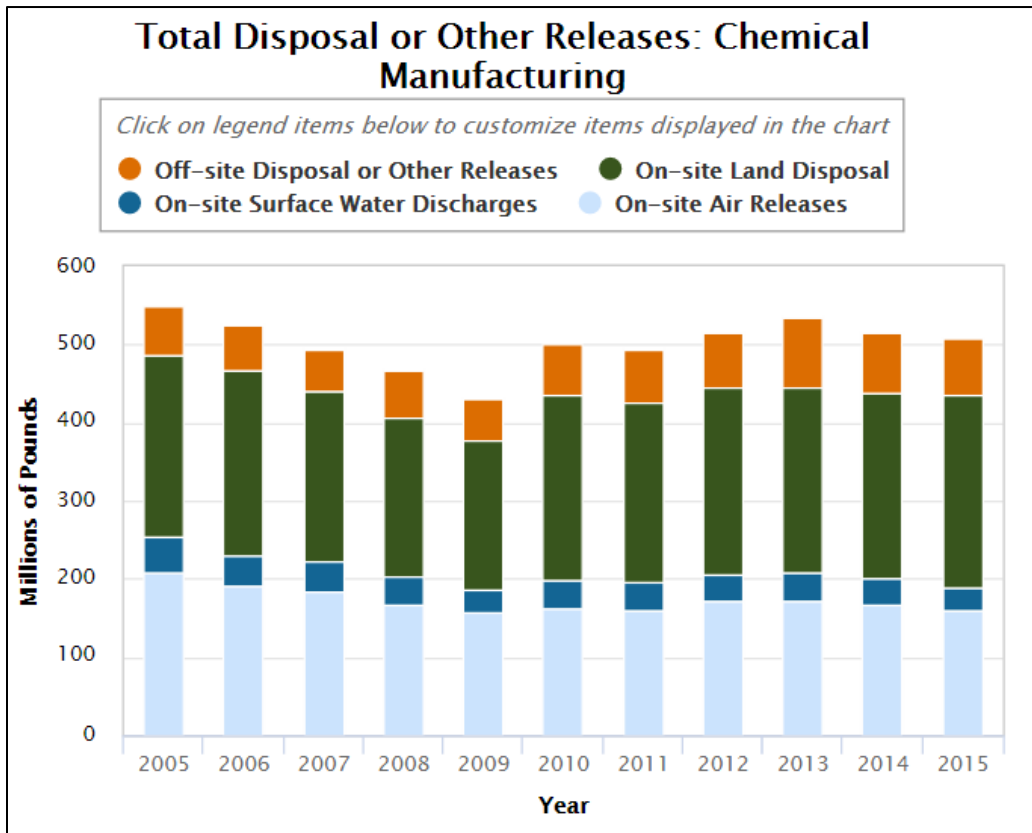


From 2014 to 2015:

- Production-related waste managed increased by 35.4 million pounds (0.3%).
- In 2015, 4% of the 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 toxic chemical released by the chemical manufacturing industry.



From 2005 to 2015:

- Total releases by the chemical manufacturing sector decreased by 8%. This was primarily due to a reduction in air emissions.
- Water releases also declined, while on-site releases to land and off-site disposal increased.

From 2014 to 2015:

- Total releases decreased by 6.7 million pounds (1.3%).
- In 2015, the sector reported more air releases than any other sector, accounting for 24% of all TRI air emissions.



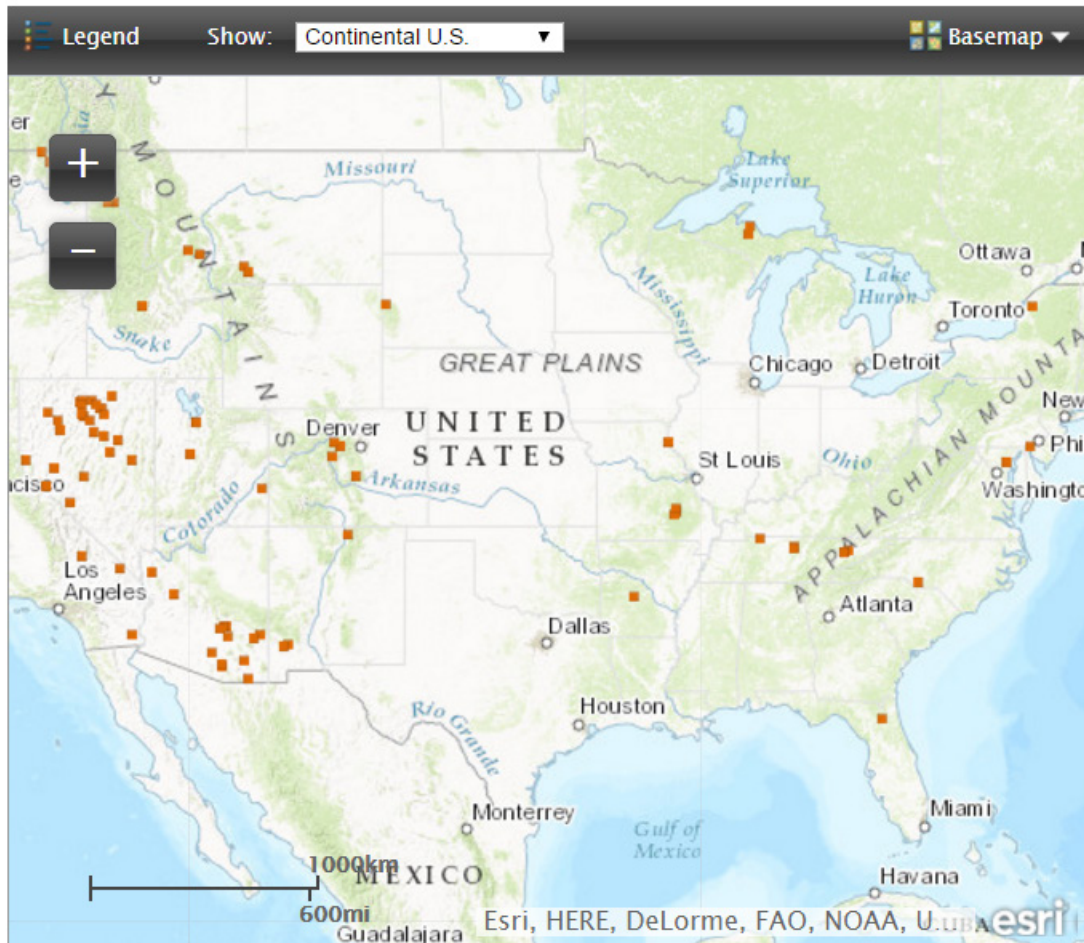
Source Reduction in the Chemical Manufacturing Sector:

Although chemical manufacturing has consistently been the sector with the most production-related waste managed, more than 500 facilities in the sector initiated source reduction activities in 2015 to reduce their toxic chemical use and waste generation. The most commonly reported categories of source reduction activities were good operating practices and spill and leak prevention. For example, [one facility refrigerates acetaldehyde before use](#) in order to reduce its potential to evaporate into the air. [TRI's Pollution Prevention Search Tool](#) can help you learn more about pollution prevention opportunities in this sector.

For more information on how this sector and others can choose safer chemicals, visit EPA's [Safer Choice Program](#) pages for [Alternatives Assessments](#) and the [Safer Choice Ingredients List](#).

Metal Mining

This map shows the metal mining facilities that reported to Toxics Release Inventory (TRI) in 2015.



Metal Mines Reporting to TRI, 2015

The portion of the metal mining sector covered by TRI reporting requirements includes facilities mining copper, lead, zinc, silver, gold, and several other metals. In 2015, 86 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, Tennessee, and Alaska. Metals generated from U.S. mining operations are used in a wide range of products, including automobiles and electric and industrial equipment. The extraction and beneficiation of these minerals generate large amounts of waste.

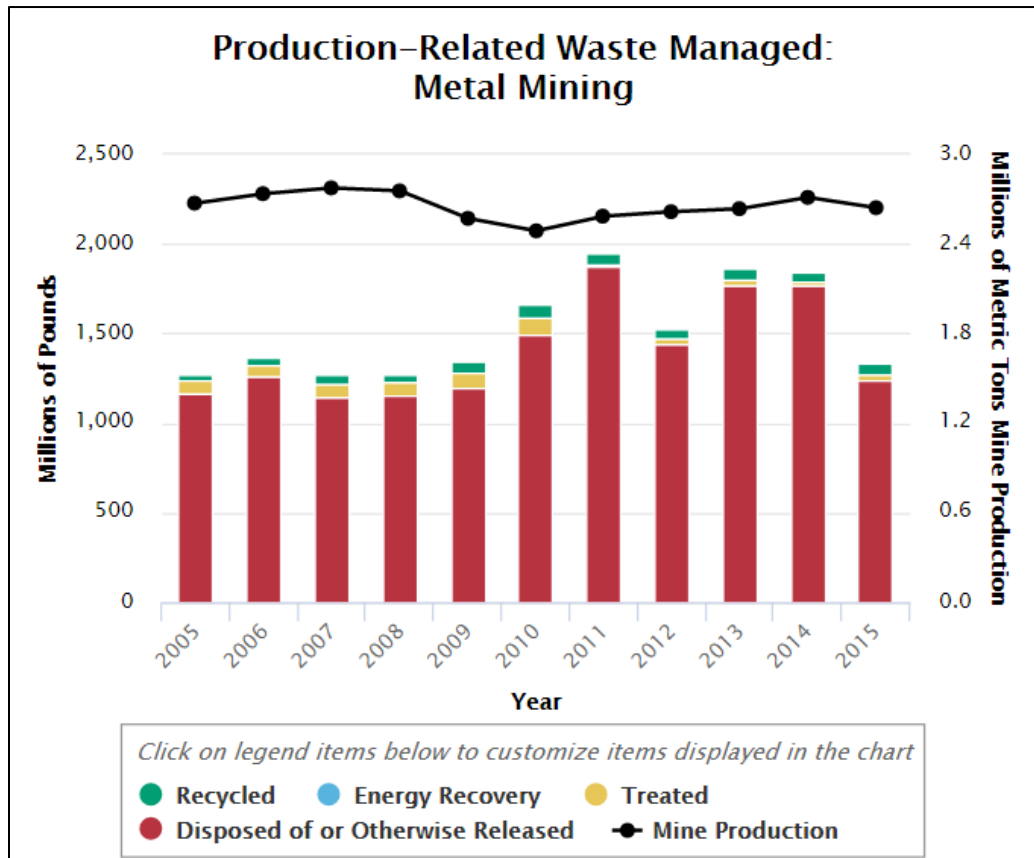


Quick Facts for 2015: Metal Mining (NAICS 2122)	
Number of Facilities that Reported to TRI	86
Number of Facilities with New Source Reduction Activities	6
Production-Related Waste Managed	1,339.7 million lb
Recycled	71.7 million lb
Energy Recovery	0.002 million lb
Treated	25.3 million lb
Disposed or Otherwise Released	1,242.6 million lb
Total Disposal or Other Releases	1,243.1 million lb
On-site	1,236.5 million lb
Air	2.1 million lb
Water	1.4 million lb
Land	1,233.1 million lb
Off-site	6.5 million lb

Note: Numbers may not sum exactly due to rounding.

Metal Mining Waste Management Trend

The following graph shows the annual quantities of toxic chemicals managed by the metal mining industry.



From 2005 to 2015:

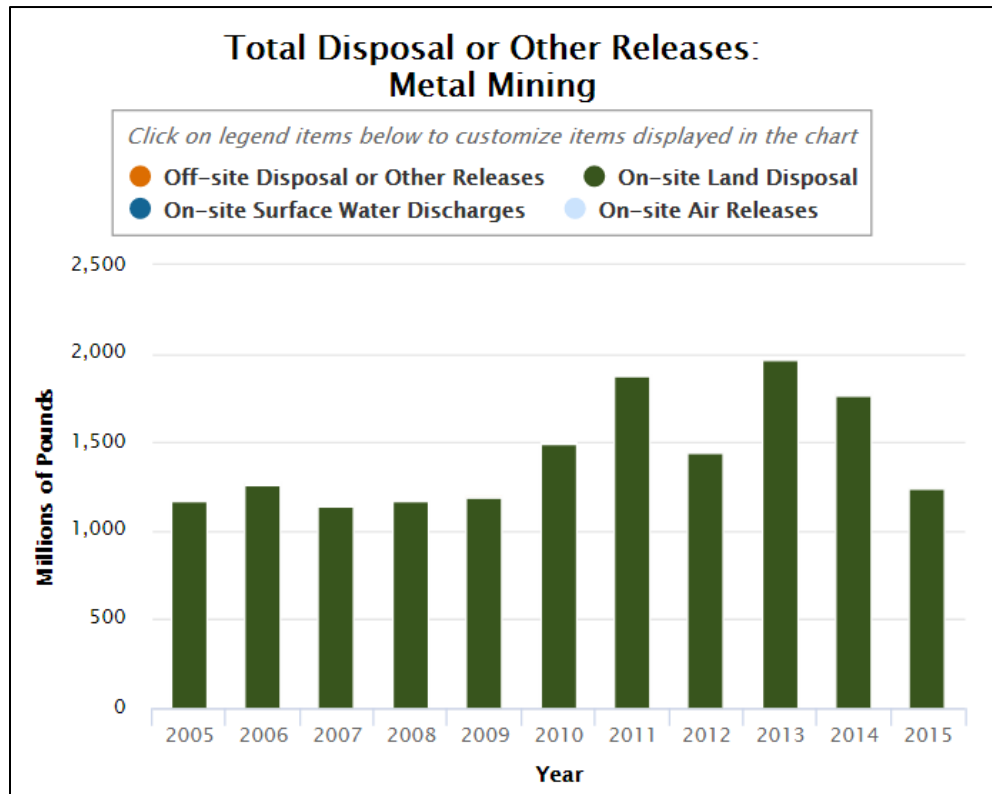
- While metal mining production (as reported in the [United States Geological Survey](#)) remained relatively steady, the quantity of waste managed fluctuated.
 - One factor other than production frequently cited by facilities as a contributor to the changes in quantities of waste managed is the composition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

In 2015:

- 93% of the metal mining sector’s production-related waste managed was disposed of or otherwise released.

Metal Mining Releases Trend

The following graph shows the annual quantities of toxic chemical released by the metal mining industry.



From 2005 to 2015:

- More than 99% of the metal mining sector's releases were on-site land disposal. On-site land disposal by metal mines has fluctuated in recent years, increasing significantly in 2013 and then decreasing in 2014 and 2015.
- 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.
- 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 toxic chemicals reported nationally.



In 2015:

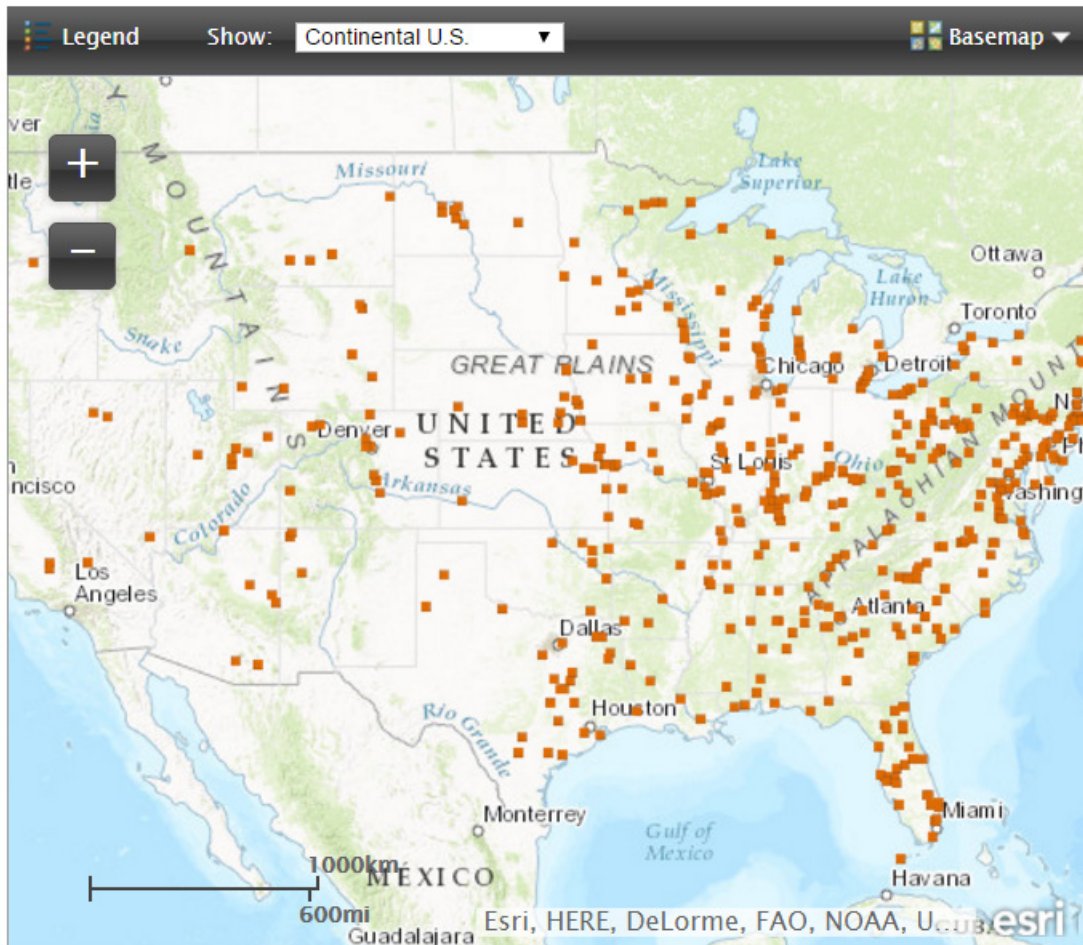
- The metal mining sector reported the largest quantity of total disposal or other releases, accounting for 37% of total releases and 61% of on-site land disposal for all industries.

Source Reduction in the Metal Mining Sector:

Six of the 86 facilities initiated source reduction activities in 2015 to reduce their toxic chemical use and waste generation. Toxic chemical quantities reported by this sector are not especially amenable to source reduction, because they primarily reflect the natural composition of the ore and waste rock. The most commonly reported source reduction activity was good operating practices, which includes activities such as improving maintenance scheduling, recordkeeping, or procedures. [TRI's Pollution Prevention Search Tool](#) can help you learn more about pollution prevention opportunities in this sector.

Electric Utilities

This map shows the electric utilities that reported to Toxics Release Inventory (TRI) in 2015.



Electric Utilities Reporting to TRI, 2015

The electric utilities sector consists of establishments primarily engaged in generating, transmitting, and distributing electric power. Electric-generating facilities use a variety of fuels to generate electricity; however, only the combustion of coal or oil to generate power for distribution in commerce is covered under TRI reporting requirements. In 2015, 554 electricity generating facilities reported to the TRI Program.

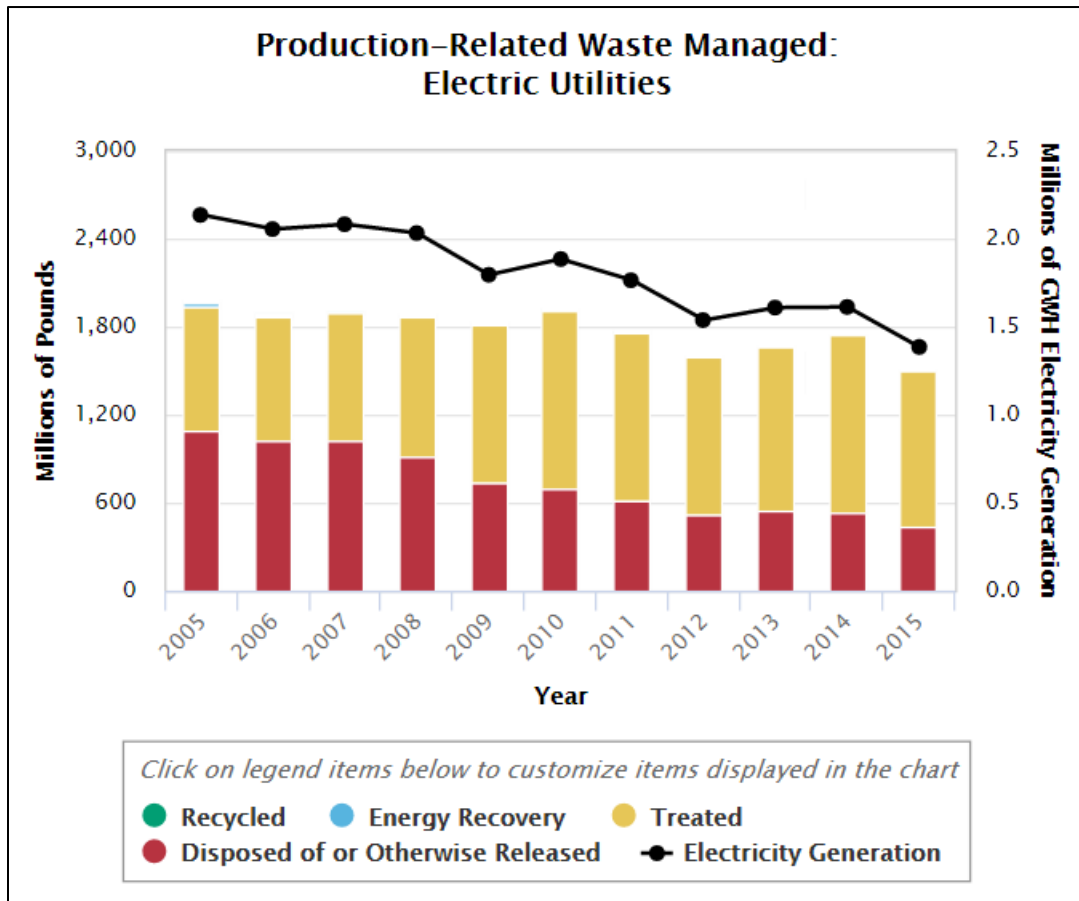


Quick Facts for 2015: Electric Utilities (NAICS 2211)	
Number of Facilities that Reported to TRI:	554
Number of Facilities with New Source Reduction Activities	20
Production-Related Waste Managed	1,506.5 million lb
Recycled	5.4 million lb
Energy Recovery	0.3 million lb
Treated	1,061.9 million lb
Disposed or Otherwise Released	438.9 million lb
Total Disposal or Other Releases	438.2 million lb
On-site	370.6 million lb
Air	133.5 million lb
Water	3.5 million lb
Land	233.6 million lb
Off-site	67.5 million lb

Note: Numbers may not sum exactly due to rounding.

Electric Utilities Waste Management Trend

The following graph shows the annual quantities of toxic chemicals managed by electric utilities.



From 2005 to 2015:

- Production-related waste managed decreased by 467 million lb (24%) since 2005.
- Net electricity generation decreased by 35% (in terms of electricity generated using coal and oil fuels as report by the [U.S. Department of Energy's Energy Information Administration](http://www.eia.doe.gov/)). The recent production decrease 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.
- Per gigawatt-hour (GWH) produced, releases decreased dramatically (38%), while quantities treated increased considerably.

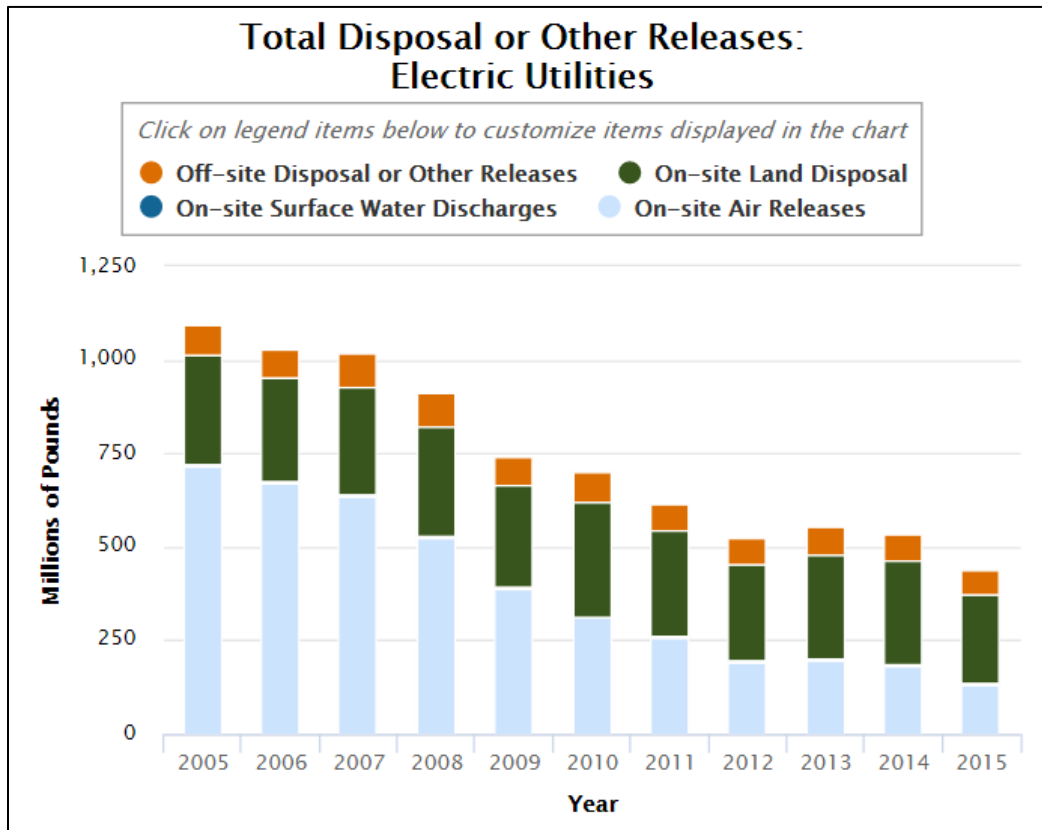


In 2015:

- Approximately two-thirds of production-related waste managed was treated, while approximately one-third was released.
 - This is in contrast to 2005, when over half of the waste was released, and about one-third was treated. This trend is in large part due to an increase in scrubbers at electric utilities that treat (or destroy) acid gases that would otherwise be released on-site to the air.

Electric Utilities Releases Trend

The following graph shows the annual quantities of toxic chemical released by electric utilities.



From 2005 to 2015:

- Releases from the electric utilities sector decreased by 60%. This decrease was driven by a 81% decrease in on-site air releases, while on-site land disposal and off-site disposal or other releases remained relatively constant.

From 2014 to 2015:

- Releases by electric utilities decreased by 18% (98 million pounds). This decrease was driven by decreases in on-site air releases and land disposal.

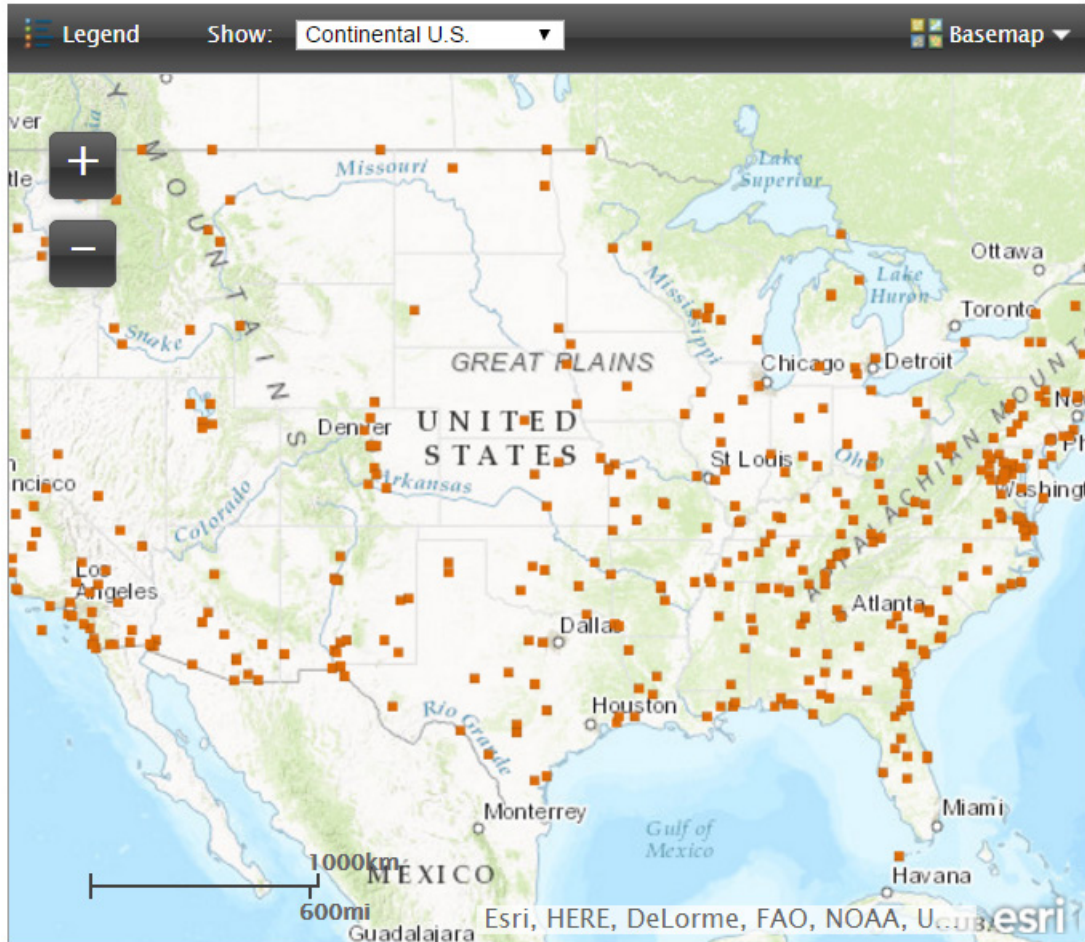


Source Reduction in the Electric Utilities Sector:

Only 20 electric utility facilities initiated source reduction activities in 2015 to reduce their toxic chemical use and waste generation. Note that adding a scrubber is considered a control technology for waste that is generated, and is not a source reduction activity that prevents waste from being generated. The most commonly reported category of source reduction activities for this sector was process modifications, which include activities such as modifying equipment, layout, or piping. [TRI's Pollution Prevention Search Tool](#) can help you learn more about pollution prevention opportunities in this sector.

Federal Facilities

This map shows the federal facilities that reported to Toxics Release Inventory (TRI) in 2015.



Federal Facilities Reporting to TRI, 2015

In 1993, President Clinton signed Executive Order 12856, "Federal Compliance with Right-to-Know Law and Pollution Prevention Requirements." This order established that TRI reporting requirements be extended to all federal facilities that meet TRI threshold reporting criteria regardless of the type of operations at the facility, as described by their NAICS code. These actions were recently affirmed in March 2015 by President Obama through Executive Order 13693, "Planning for Federal Sustainability in the Next Decade." Due to these requirements, federal facilities are subject to the TRI reporting requirements.

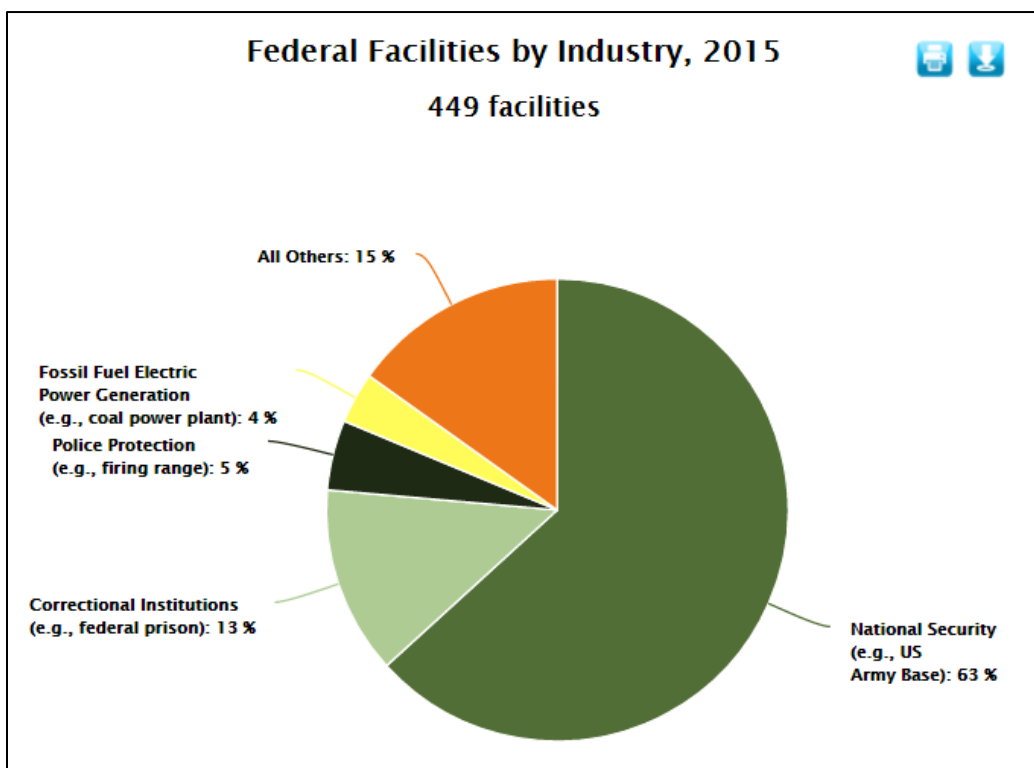


Quick Facts for 2015: Federal Facilities (All Sectors)	
Number of Facilities that Reported to TRI:	449
Number of Facilities with New Source Reduction Activities	21
Production-Related Waste Managed	181.2 million lb
Recycled	43.1 million lb
Energy Recovery	0.2 million lb
Treated	86.1 million lb
Disposed or Otherwise Released	51.8 million lb
Total Disposal or Other Releases	61.1 million lb
On-site	58.8 million lb
Air	15.4 million lb
Water	13.3 million lb
Land	30.1 million lb
Off-site	2.3 million lb

Note: Numbers may not sum exactly due to rounding.

Federal Facilities by Industry

The following pie chart shows the number of federal facilities reporting to the Toxics Release Inventory (TRI) program by industry in 2015.

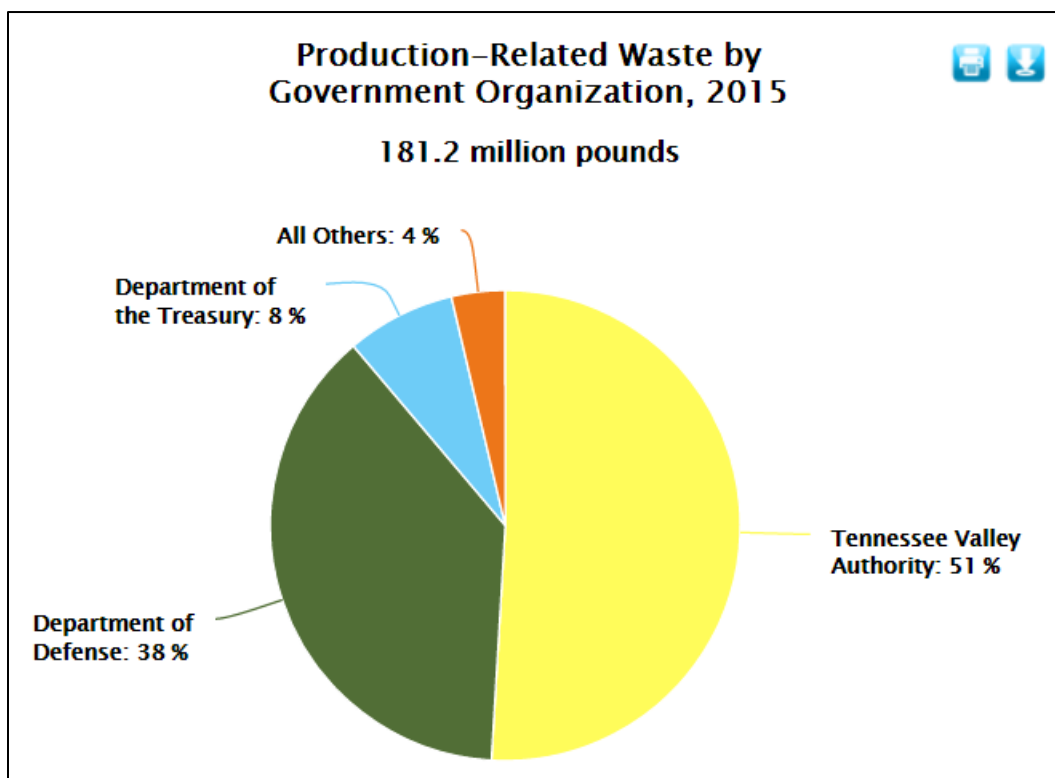


For the year 2015, 449 federal facilities in 39 different types of operations (based on their 6-digit NAICS codes) reported to the TRI Program. Almost two-thirds of these facilities were in the National Security sector, which includes Department of Defense facilities such as Army and Air Force bases. 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 National Security, such as 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 due to a more specialized activity 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 toxic chemicals managed by federal facilities by government organization in 2015.



- 96% of the TRI chemicals managed as production-related waste at federal facilities was reported by: the Tennessee Valley Authority (51%), the Department of Defense (38%), and the Department of the Treasury (8%).
- All other government organizations comprised 4% of the production-related waste managed.

The types of waste reported by federal facilities vary by the type of operation. For example, 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 2015, virtually all of the production-related waste comes from the fossil fuel plants that report in the Fossil Fuel Electric Power Generation sector. Similarly, out of 7 Department of the Treasury facilities reporting to TRI, most are mints for manufacturing currency and, accordingly, report in the Metal Stamping and Commercial Printing NAICS sector classification.



Source Reduction at Federal Facilities:

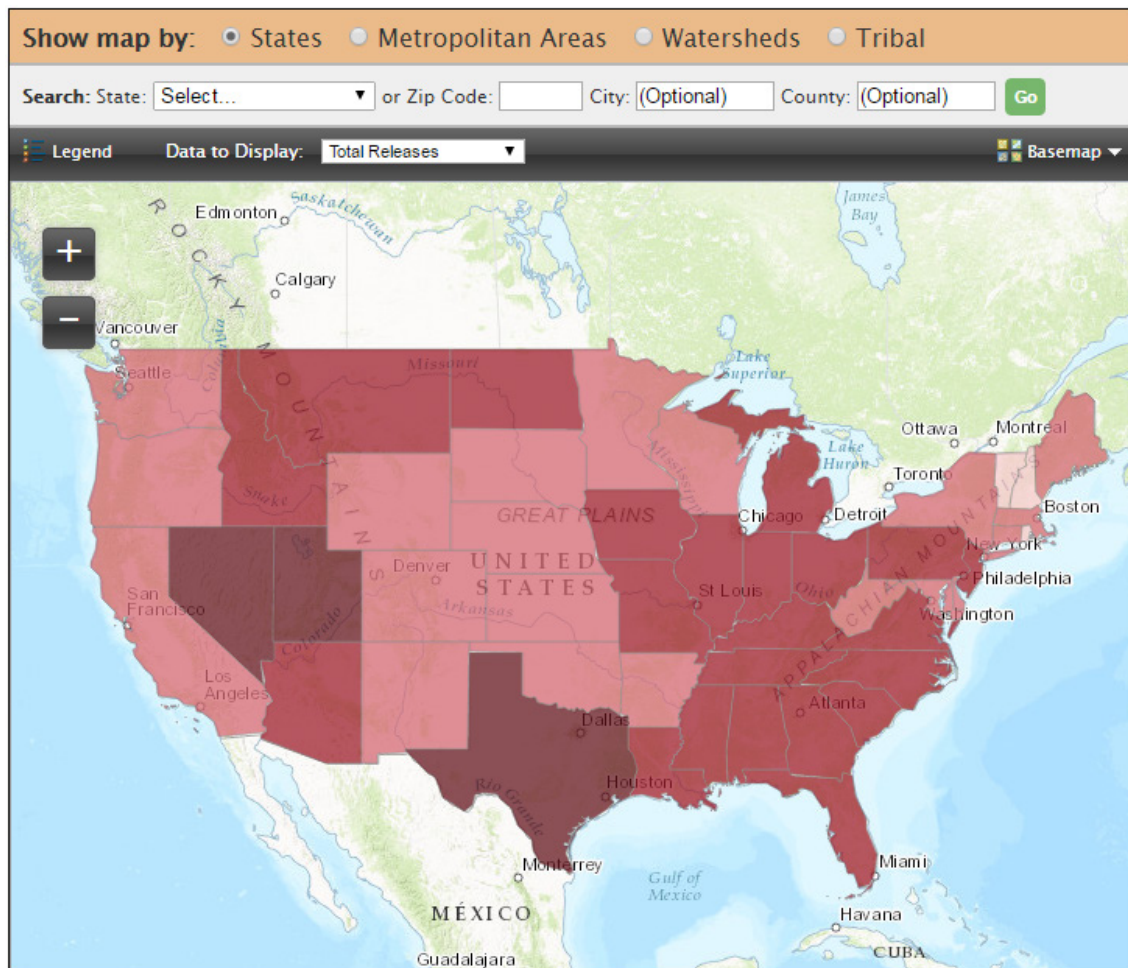
Since federal facilities are subject to TRI reporting regardless of their industry sector classification, their operations are diverse and few focus on manufacturing processes. Due to their unique functions, some federal facilities may face challenges in implementing source reduction strategies to reduce chemical waste. For the 2015 reporting year, 21 federal facilities (5%) reported implementing source reduction activities.

Facilities that do not implement source reduction activities may elect to indicate the types of barriers to source reduction they encountered. For federal facilities, most of the facilities that indicate barriers to implementing source reduction are national security or correctional institutions that report on lead or copper. For example, several facilities in the National Security sector indicated that they reported on lead because it is contained in the ammunition used on site and they have not been able to identify ammunition that does not contain lead. However, other federal facilities have been able to implement some source reduction activities. To find examples of federal facilities' source reduction activities, visit [TRI's Pollution Prevention Search Tool](#) and select industry sectors, such as National Security, Correctional Institutions, or Police Protection.

Where You Live in the 2015 TRI National Analysis

This chapter of the National Analysis looks at toxic chemical disposal or other releases that occurred at various geographic levels throughout the United States. The default map display is of total releases by state. The different shades of colors on the map indicate increasing ranges of releases based on which data are selected to display, as described in the map legend.

To view the full interactive map, [visit the Where You Live section of the National Analysis.](#)



To view a summary of Toxics Releases Inventory (TRI) data, select search parameters within the top two rows or query the map directly. Note that searching for city- or ZIP-code-level information is possible only by specifying the search parameters.

The map displays data for states, counties, metropolitan areas, watersheds and tribes.

In addition to viewing the maps based on air, water, land, and total releases, you can also view the maps based on "RSEI Risk-Screening Scores." RSEI risk-screening scores are estimates of



potential human risk generated by EPA's publicly available [Risk-Screening Environmental Indicators \(RSEI\) model](#). These unitless scores represent relative chronic human health risk and allow you to compare RSEI scores across locations. RSEI scores consider more than just chemical quantities released; they also account for:

- Location of releases
- Toxicity of the chemical
- Fate and transport
- Human exposure pathway

For more on RSEI, see the [Hazard and Risk of TRI Chemicals](#) section.

States

States included all U.S. territories for a total of 56 states/territories. All states have facilities that reported releases to the TRI Program for the 2015 reporting year. The states with the greatest number of facilities that reported are Texas, Ohio, and California, which together accounted for 20% of total reporting facilities in 2015. Selecting a state on the map will provide a pop-up with:

- a state level summary of TRI data
- a link to the state level TRI fact sheet
- an option to zoom to the counties within the state.

When zoomed to the state's map of counties, you may click to retrieve county-level summaries of TRI data and link to a county-level TRI fact sheet.

Metropolitan Areas

More than 80% of the country's population and many of the industrial facilities that report to the TRI Program are located in urban areas. This map option shows all metropolitan and micropolitan statistical areas (metro and micro areas) in the United States as defined by the Office of Management and Budget (OMB) within which TRI-reported releases occurred in 2015. Metro and micro areas consist of one or more socially and economically integrated adjacent counties, cities, or towns. Click on any of these areas on the map for an analysis of TRI data specific to each.

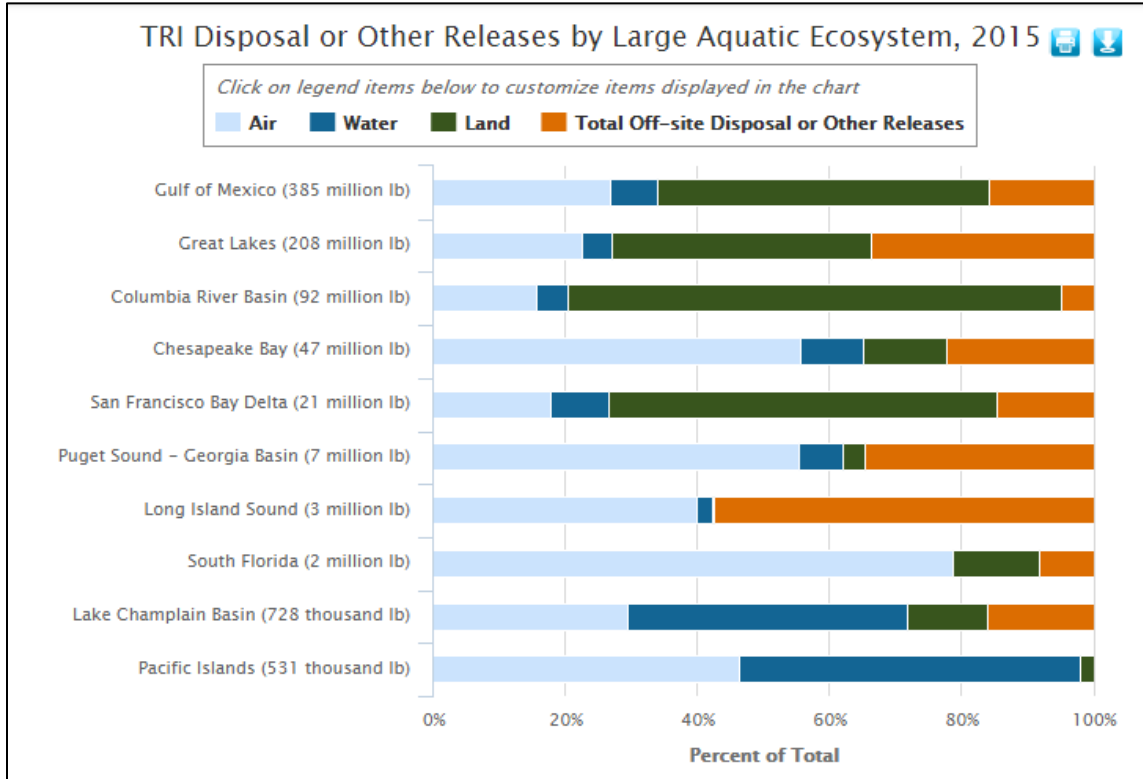
Watersheds

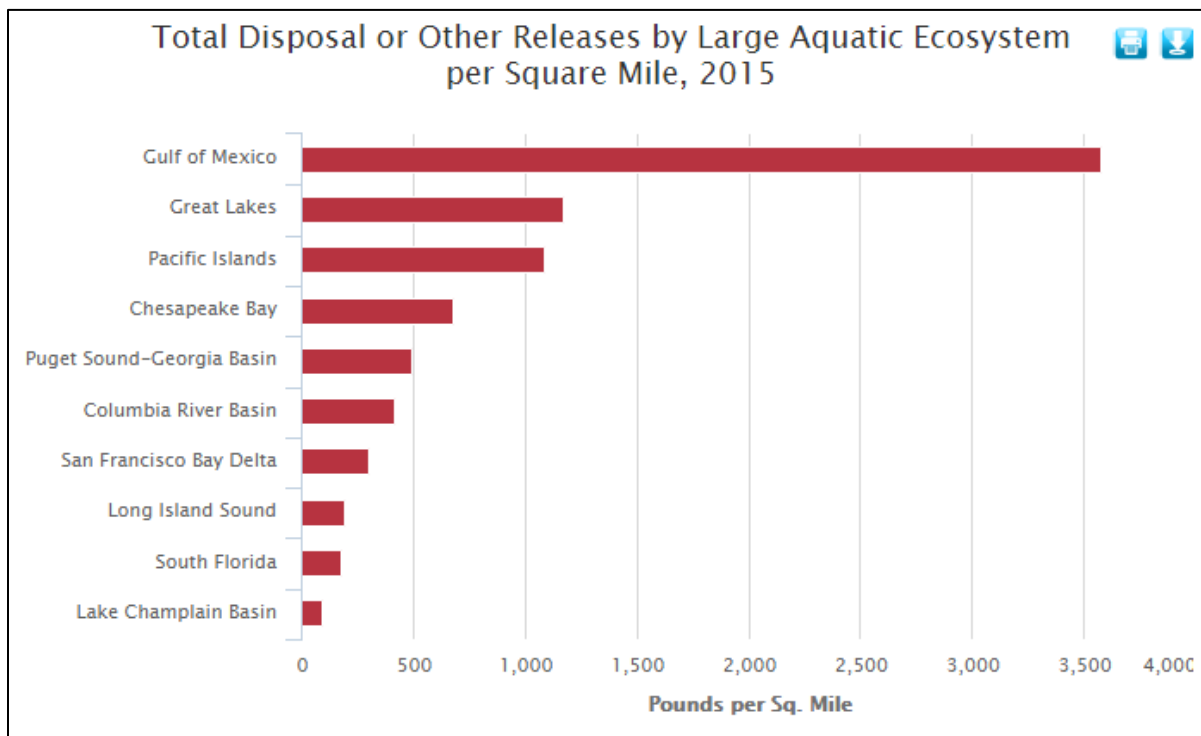


A watershed is the land area that drains to a common waterway. Rivers, lakes, estuaries, wetlands, streams, and oceans are catch basins for the land adjacent to them. Ground water aquifers are replenished based on water flowing down through the land area above them. These important water resources are sensitive to chemicals and other pollutants released within or transferred across their boundaries.

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. Click on any of the 10 LAEs featured on the map to see an analysis of toxic chemical releases in each LAE.

Water pollution, surface runoff, contaminated sediment, discharges of toxic chemicals, and air emissions can affect the environmental quality of the land, water, and living resources within an aquatic ecosystem. Persistent toxic pollutants 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, causing environmental health problems for humans and wildlife.





Congress has delegated authority to EPA to ensure that environmental programs designed to protect human health and the environment are carried out throughout the United States, including tribal lands. EPA’s policy is to work with tribes on a government-to-government basis to protect the land, air, and water in Indian country and to support tribal assumption of program authority.

The map presents 2015 Toxics Release Inventory (TRI) data relating to federally-recognized tribes and Alaska Native Villages (ANVs) as depicted by the U.S. Bureau of Land Management’s Alaska State Office. This analysis shows facilities that believe their facility is in Indian country and reported Bureau of Indian Affairs codes to EPA for 2015.

The table below lists the Indian tribes and ANVs that had at least one TRI facility reporting 2015 data, and shows which industry sector and chemicals accounted for the majority of disposal or other releases in each area. Click on the number of facilities for more information about those facilities including chemicals released, quantities released, parent company, and facility contacts.



Indian Tribes and Alaska Native Villages	State(s)	Number of Facilities	Total On-site and Off-site Disposal or Other Releases (lb)	Primary Industry Sector(s) (% of disposal or other releases)	Primary Chemical(s) (% of disposal or other releases)
Tohono O'odham Nation of Arizona	AZ	<u>1</u>	4,357,668	Metal Mining (100%)	Lead Compounds (91%)
Navajo Nation, Arizona, New Mexico and Utah	AZ, NM	<u>2</u>	3,673,158	Electric Utilities (100%)	Barium Compounds (67%)
Ute Indian Tribe of the Uintah and Ouray Reservation, Utah	UT	<u>1</u>	2,255,711	Electric Utilities (100%)	Barium Compounds (77%)
Puyallup Tribe of the Puyallup Reservation	WA	<u>11</u>	460,549	Hazardous Waste/Solvent Recovery (68%); Petroleum (25%)	Chromium (61%); Ammonia 17%
Confederated Tribes and Bands of the Yakama Nation	WA	<u>3</u>	142,024	Plastics and Rubber (100%)	Styrene (84%); Methyl Methacrylate (14%)
Cherokee Nation	OK	<u>1</u>	118,891	Paper (100%)	Sulfuric Acid (57%); Methanol (35%)
Coeur D'Alene Tribe	ID	<u>2</u>	111,065	Wood Products (100%)	Methanol (74%); Acetaldehyde (25%)
Shoalwater Bay Indian Tribe of the Shoalwater Bay Indian Reservation	WA	<u>2</u>	34,814	Food (93%)	Chlorodifluoromethane (100%)
Saginaw Chippewa Indian Tribe of Michigan	MI	<u>1</u>	2,787	Machinery (100%)	Chromium (62%); Nickel (31%)
Arapaho Tribe of the Wind River Reservation	WY	<u>1</u>	2,650	Chemicals (100%)	Sulfuric Acid (100%)
Eastern Band of Cherokee Indians	MI	<u>1</u>	478	Fabricated Metals (100%)	Nickel Compounds (38%); Ethylene Glycol (37%); Chromium Compounds (25%)
Gila River Indian Community of the Gila River Indian Reservation, Arizona	AZ	<u>8</u>	362	Primary Metals (100%)	Copper (70%); Lead (30%)
Oneida Tribe of Indians of Wisconsin	WI	<u>4</u>	334	Chemicals (98%)	Methanol (96%)
Salt River Pima-Maricopa Indian Community of the Salt River Reservation, Arizona	AZ	<u>1</u>	261	Nonmetallic Mineral Products (100%)	Aluminum (99%)

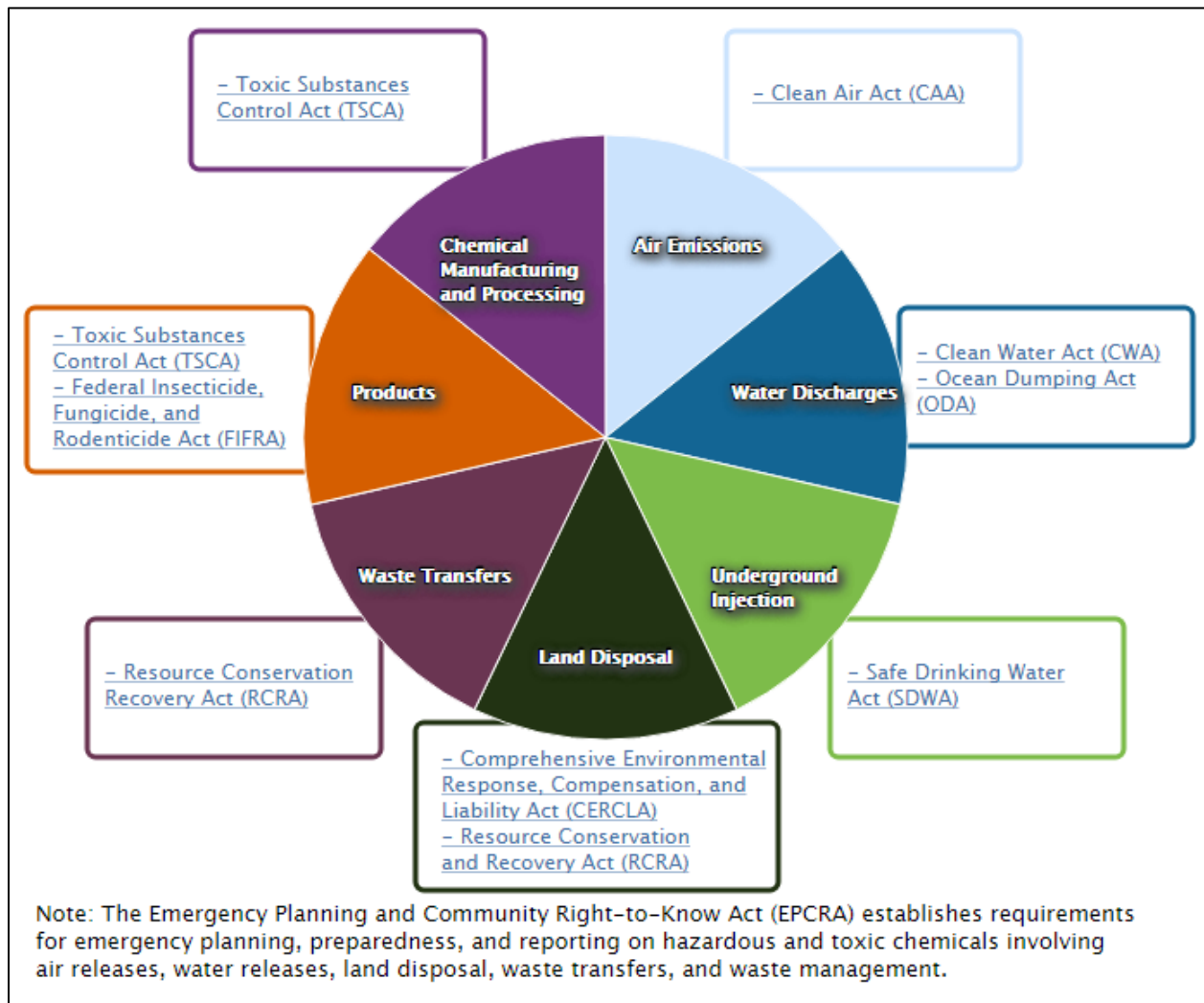


Indian Tribes and Alaska Native Villages	State(s)	Number of Facilities	Total On-site and Off-site Disposal or Other Releases (lb)	Primary Industry Sector(s) (% of disposal or other releases)	Primary Chemical(s) (% of disposal or other releases)
Colorado River Indian Tribes of the Colorado River Indian Reservation, Arizona and California	AZ	<u>1</u>	23	Hazardous Waste/Solvent Recovery (100%)	Toluene (43%); n-Hexane (26%); Benzene (25%)
Tulalip Tribes of Washington	WA	<u>1</u>	23	Primary Metals (100%)	Chromium Compounds (57%); Nickel Compounds (43%)
Nez Perce Tribe	ID	<u>1</u>	10	Wood Products (100%)	Lead (100%)
Suquamish Indian Tribe of the Port Madison Reservation	WA	<u>1</u>	0	Nonmetallic Mineral Products (100%)	Lead Compounds (100%)

TRI and Beyond

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





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 others applications as shown in the table below.

Current Uses of TRI Data by EPA Offices and Regions

EPA Office	Promote Pollution Prevention	Make Decisions	Add Context	Identify Potential Violators	Inform Stakeholders
Air and Radiation		X	X		
Land and Emergency Management	X	X	X	X	X
Enforcement and Compliance Assurance		X	X	X	
International and Tribal Affairs		X			X
Chemical Safety and Pollution Prevention	X	X	X	X	X
Water	X	X	X	X	
Inspector General			X		
Environmental Information				X	X
Regions	1, 2, 3, 5, 6, 7, 8, 9	2, 3, 4, 5, 6, 7, 8, 9	2, 3, 4, 5, 6, 9	1, 2, 3, 4, 6, 7, 9, 10	1, 3, 4, 5, 6, 8, 9



This chapter highlights three thematic areas that use TRI data with other data sources:

- Climate Change:
 - A comparison of TRI data and EPA's Greenhouse Gas Reporting Program (GHGRP) data collected under the Clean Air Act (CAA)
- TSCA Work Plan (Priority) Chemicals:
 - An example of how TRI data complements data collected under the Toxic Substances Control Act (TSCA)
- Ozone Depleting Substances:
 - An analysis of TRI air releases for a subset of chemicals further regulated under the Clean Air Act (CAA) to reduce the amount of ozone depleting substances used in the U.S.

Sections in this chapter

Comparing TRI and Greenhouse Gas Emissions

TSCA and TRI

Ozone Depleting Substances



Comparing TRI and Greenhouse Gas Emissions

Under the authority of the Clean Air Act, EPA's [Greenhouse Gas Reporting Program](#) (GHGRP) requires large emitters of greenhouse gases and suppliers of certain products to submit annual greenhouse gas reports to EPA. Emissions of greenhouse gases lead to elevated concentrations of these gases in the atmosphere, which alter the Earth's radiative balance and contribute to climate change. These elevated concentrations are reasonably anticipated to endanger the public health and welfare of current and future generations. The purpose of the GHGRP is to collect timely, industry-specific data to help us better understand the sources of greenhouse gas emissions. Comparing and integrating GHGRP data with Toxics Release Inventory (TRI) data about chemical releases from industrial facilities can provide a more complete picture of a facility's environmental performance.

In 2015:

- Over 8,000 facilities reported direct emissions of greenhouse gases (GHGs) to the atmosphere, totaling over 3.05 billion metric tons of carbon dioxide equivalent (mtCO₂e).
- This represents about half of the 6.87 billion mtCO₂e that EPA estimated were released in the United States from all human-related sources per the 2014 annual [U.S. Greenhouse Gas Inventory](#). The GHGRP does not require direct emissions reporting from all U.S. sources. For example, the transportation sector and agricultural sources of GHG emissions are not included in the GHGRP.
- The primary greenhouse gas reported to the GHGRP was carbon dioxide (CO₂), which is released during fossil fuel combustion and various industrial processes.

TRI reporting focuses on toxic chemicals and as a result covers different chemicals than does the GHGRP. Some TRI chemicals are a result of combustion of fuels for energy (as most GHG emissions are), but others are used in and released from additional processes ranging from

What do GWP and CO₂e mean?

Each GHG has an associated global warming potential (GWP). The GWP is a relative measure of how much heat a GHG traps in the atmosphere relative to CO₂ over a given time period. The GWP of CO₂ is one. GHG emissions values are typically expressed in metric tons of carbon dioxide equivalent (CO₂e) so that the impacts of different gases can be directly compared.

What chemicals were reported to GHGRP for 2015?

- Carbon dioxide = 91.3% of the mtCO₂e total
- Methane = 7.2%
- Nitrogen Oxide (N₂O) = 0.9%
- Fluorinated Gases (HFCs, PFCs, SF₆) = 0.7%

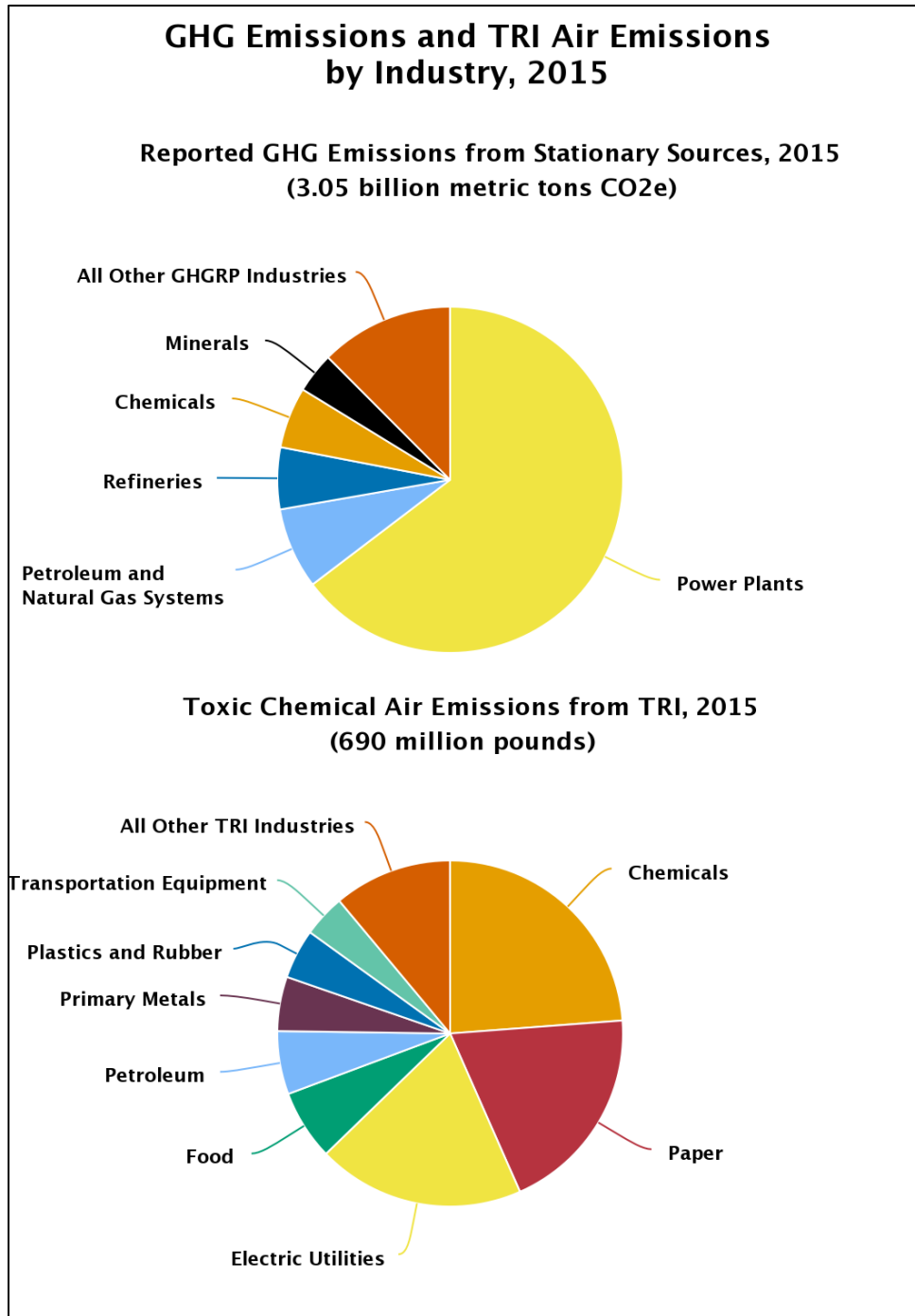


metal mining to surface cleaning. Analyzing toxic chemical releases reported to TRI and greenhouse gas emissions reported to the GHGRP together creates a more complete picture of emissions at the facility and industrial sector levels.

Note that in addition to differences in the chemicals reported to TRI and GHGRP, there are numerous other program differences including reporting thresholds. For TRI, the reporting threshold for most chemicals is 25,000 pounds manufactured or processed, or 10,000 pounds otherwise used per year, whereas for the GHGRP, the reporting threshold is based on emissions and is generally 25,000 metric tons of carbon dioxide equivalent per year.

Top Sectors Reporting TRI Air Emissions and GHG CO₂e

This figure shows the top sectors reporting air emissions to the Greenhouse Gas Reporting Program (GHGRP) and the Toxics Release Inventory (TRI) in 2015.



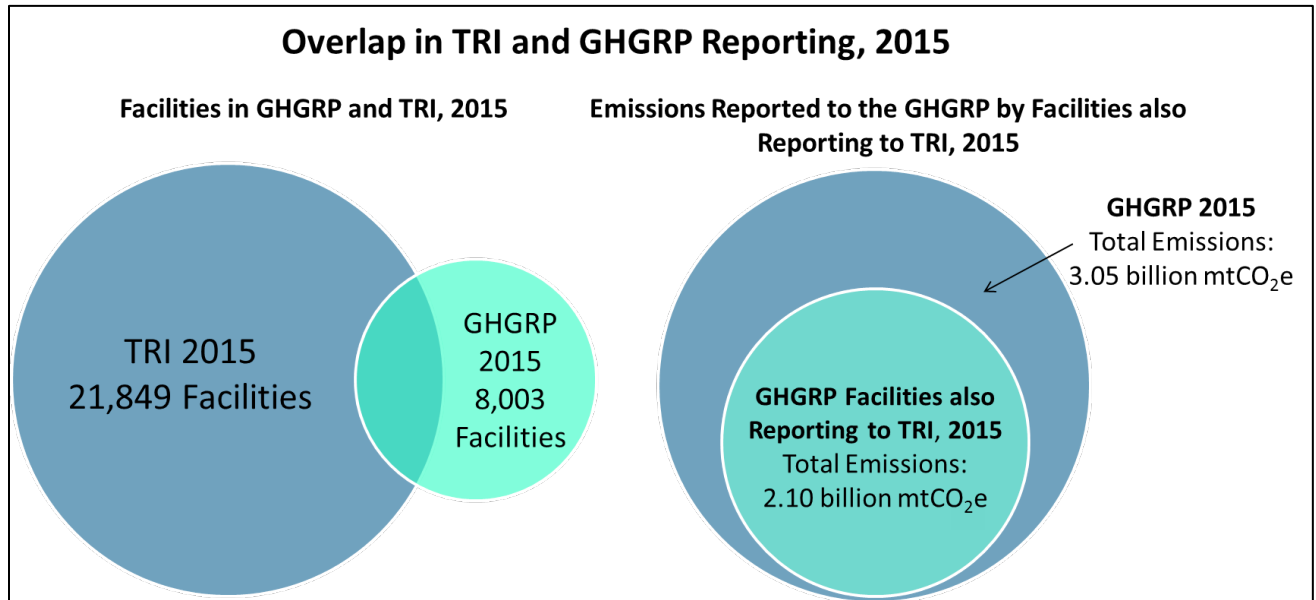


In 2015:

- The top air emitting sectors in TRI are similar, but not identical to, the top emitting sectors covered by the GHGRP.
- While electric utilities are a primary source of air emissions reported to both programs, both the chemical manufacturing and paper sectors report more toxic chemical air emissions than are reported by electric utilities. In prior years, electric utilities were the largest contributor to TRI air emissions, but with shifts in the sector toward natural gas and renewable energy sources, as well as improved emission controls, the sector is no longer the largest contributor to TRI air emissions.

Overlap in TRI and GHGRP Reporting

The figure below shows the overlap between facilities that report to the Toxics Release Inventory (TRI) and the Greenhouse Gas Reporting Program (GHGRP).

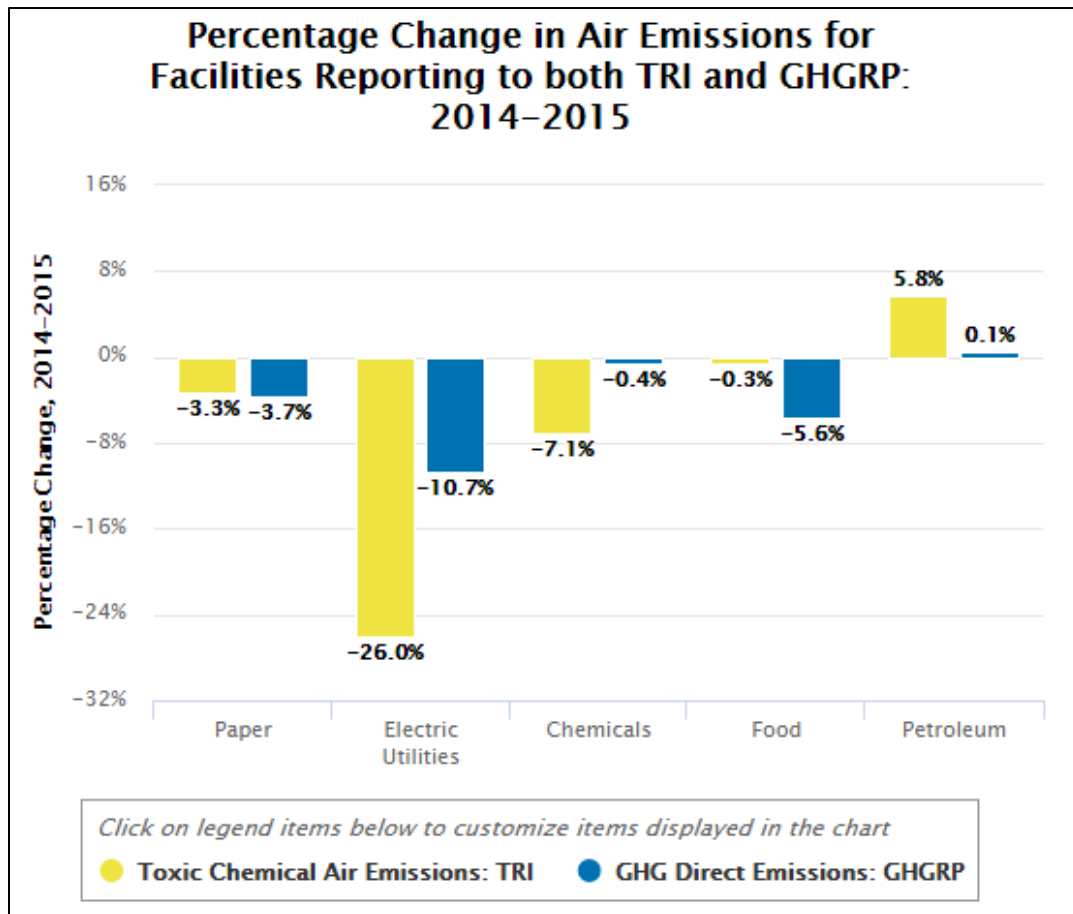


In 2015:

- Almost one-third of the facilities reporting to the GHGRP also reported to the TRI Program.
- However, this subset of GHGRP reporters accounted for 69% of GHGRP emissions, indicating that the facilities reporting the greatest greenhouse gas (GHG) emissions also trigger TRI requirements for reporting on toxic chemicals.

Percentage Change in TRI and GHG Air Emissions

The graph below shows the percentage change in air emissions and greenhouse gas emissions from 2014-2015 for facilities that reported to both the Toxics Release Inventory (TRI) and the Greenhouse Gas Reporting Program (GHGRP).



From 2014 to 2015:

- For the five industry sectors with the greatest TRI-reported air emissions, this figure shows the percentage change in total air emissions for the subset of facilities reporting to both the TRI Program and the GHGRP.
- While based on a consistent subset of facilities, the percentage change in emissions by industry sector varies between the two programs.



- The variations are driven by differences in the types of pollutants reported to the TRI Program and the GHGRP and by the impacts of certain source reduction and pollution control activities. Actions taken by facilities may include:
 - Reduction of fuel consumption, which decreases emissions of both greenhouse gases and toxic chemicals that are byproducts of fuel combustion.
 - Installation of new treatment technology, which may reduce emissions of a specific TRI chemical but does not affect greenhouse gas emissions.

TRI and TSCA

On June 22, 2016, President Obama signed into law the Frank R. Lautenberg Chemical Safety for the 21st Century Act, which amends the [Toxic Substances Control Act \(TSCA\)](#), the Nation's primary chemicals management law. Under the new law, which received bipartisan support in both the U.S. House of Representatives and the Senate, all existing chemicals in commerce and new chemicals entering the market will be reviewed for safety through a risk-based process with increased public transparency.



Prior to the enactment of the revised TSCA, [EPA identified 90 chemicals for further assessment under TSCA](#), referred to as “work plan chemicals”. EPA selected these chemicals based on their hazard (e.g., neurotoxic effects), exposure (e.g., detected in biomonitoring programs), or persistence and bioaccumulation characteristics, and their assessment will likely continue under the new TSCA law. Assessments

may take the form of conceptual models, analysis plans or risk evaluations and are intended to inform next steps in risk management activities. Of the 90 work plan chemicals, 53 are also TRI-listed, as either a specific chemical or as a member of a chemical category.

The new law requires EPA to establish a process for prioritizing additional chemicals for risk evaluation. TRI provides valuable information to the TSCA prioritization and evaluation processes and also serves as a tool for tracking the nation's progress toward reduced environmental releases of chemicals with identified risks.

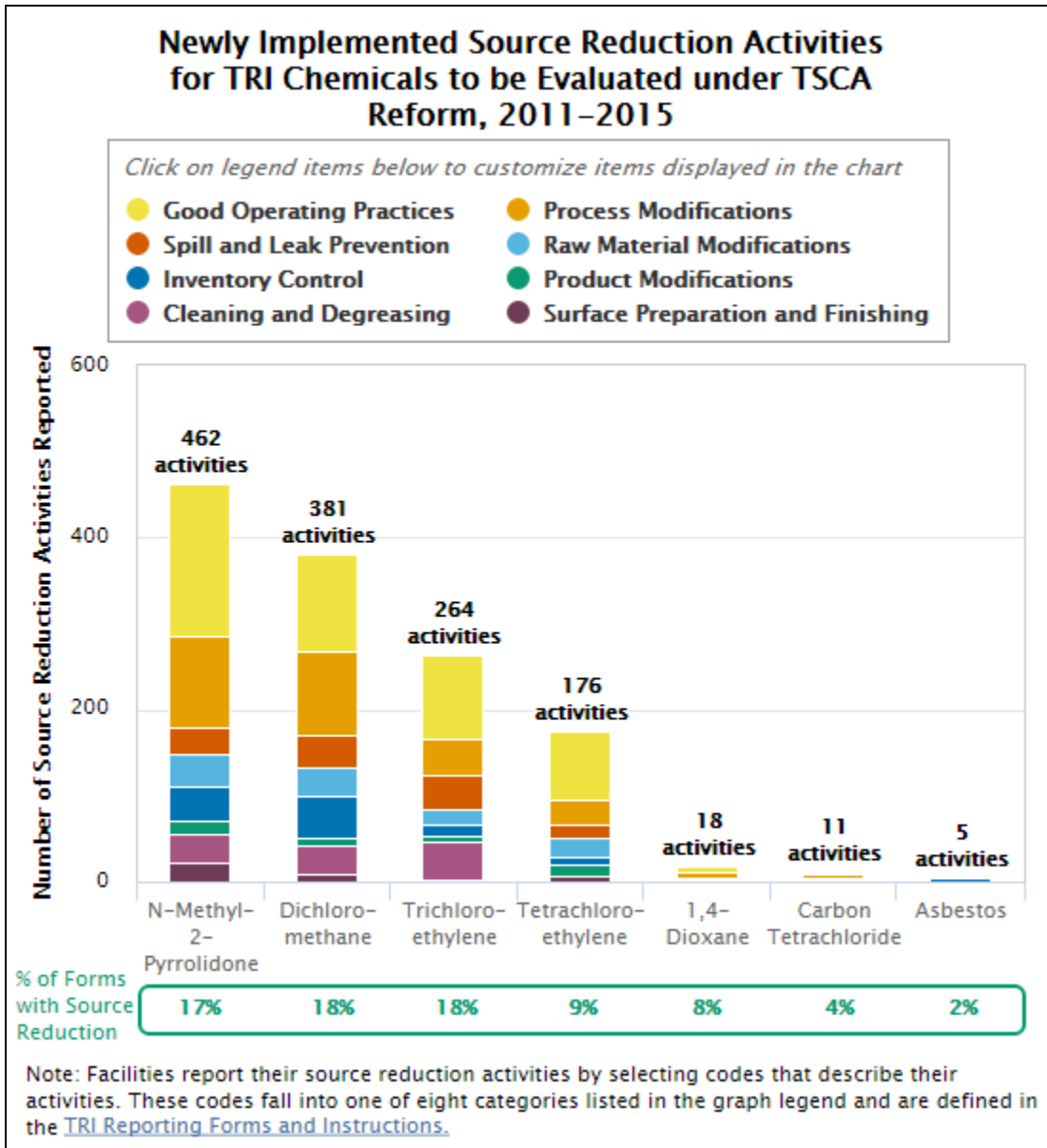


Source Reduction Activities for Chemicals to be Evaluated under TSCA

In November 2016, EPA announced the first ten chemicals it will evaluate for potential risks to human health and the environment under Toxic Substances Control Act (TSCA) reform. Most of these ten chemicals are Toxics Release Inventory (TRI)-listed chemicals where TRI data are currently available, as shown in the table below. Two of these chemicals – 1-bromopropane and hexabromocyclododecane (HBCD) – have been recently added to the TRI chemical list and reporting will begin in 2017 and 2018, respectively.

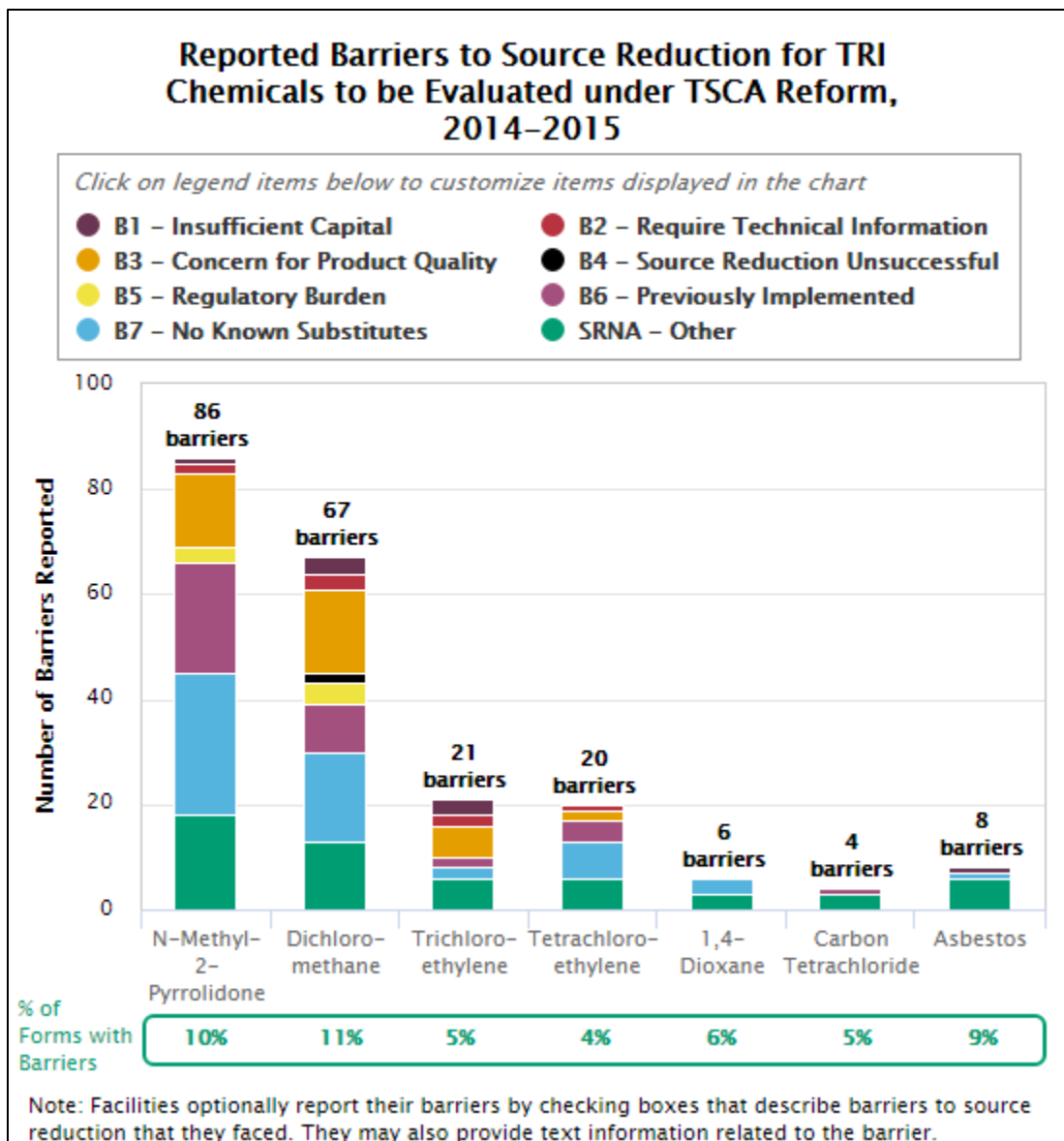
Chemicals to be Evaluated	TRI-listed Chemical?
1,4-Dioxane	Yes
1-Bromopropane	Yes; reporting starts in 2017
Asbestos	Partially; reportable only if in the friable form
Carbon Tetrachloride	Yes
Cyclic Aliphatic Bromide Cluster	Partially; HBCD reporting starts in 2018
Dichloromethane (also called Methylene Chloride)	Yes
N-Methylpyrrolidone (NMP)	Yes
Pigment Violet 29	No
Trichloroethylene (TCE)	Yes
Tetrachloroethylene	Yes

TRI can provide valuable information to the TSCA evaluations such as the types of source reduction activities that TRI filers have implemented to reduce the quantity of the chemical generated as waste, as shown in the figure below.



Barriers to Source Reduction for Chemicals to be Evaluated under TSCA

Since 2014, facilities that report to the Toxics Release Inventory (TRI) have the option to report the barriers they encountered to source reduction. The barriers reported to TRI are shown in the figure below for the seven chemicals that are TRI-listed included in the first chemicals that EPA will evaluate for potential risks to human health and the environment under Toxic Substances Control Act (TSCA) reform.





Example: TSCA and TRI Information for Trichloroethylene

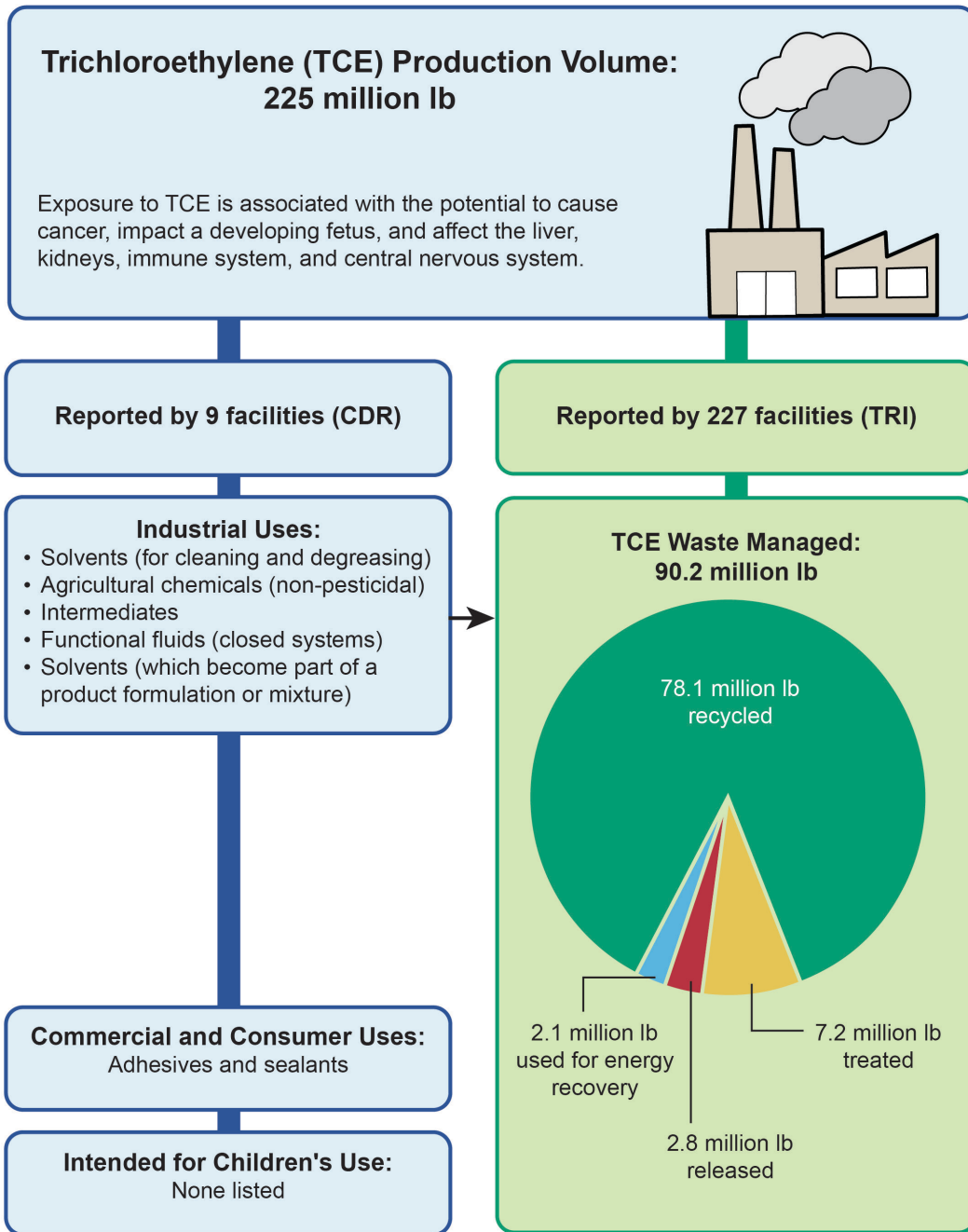
Under the Toxic Substances Control Act (TSCA), EPA collects information about the manufacture, including import, and use of chemicals in U.S. commerce through the Chemical Data Reporting (CDR) rule. This information on the production of chemicals complements the Toxics Release Inventory (TRI) data on the management of chemical waste (including releases, recycling, and source reduction). To illustrate how TRI information complements the TSCA chemical assessments, one chemical, trichloroethylene (TCE), is presented as an example.

[EPA has undertaken efforts to reduce the risks TCE poses to public health and the environment.](#)

For example, EPA has conducted a risk assessment; initiated a rulemaking to eliminate the risk of TCE in aerosol degreasers, as a spotting agent at dry cleaning facilities, and in vapor degreasing operations; and coordinated a voluntary phase out of TCE in arts and crafts spray fixative product marketed to consumers.

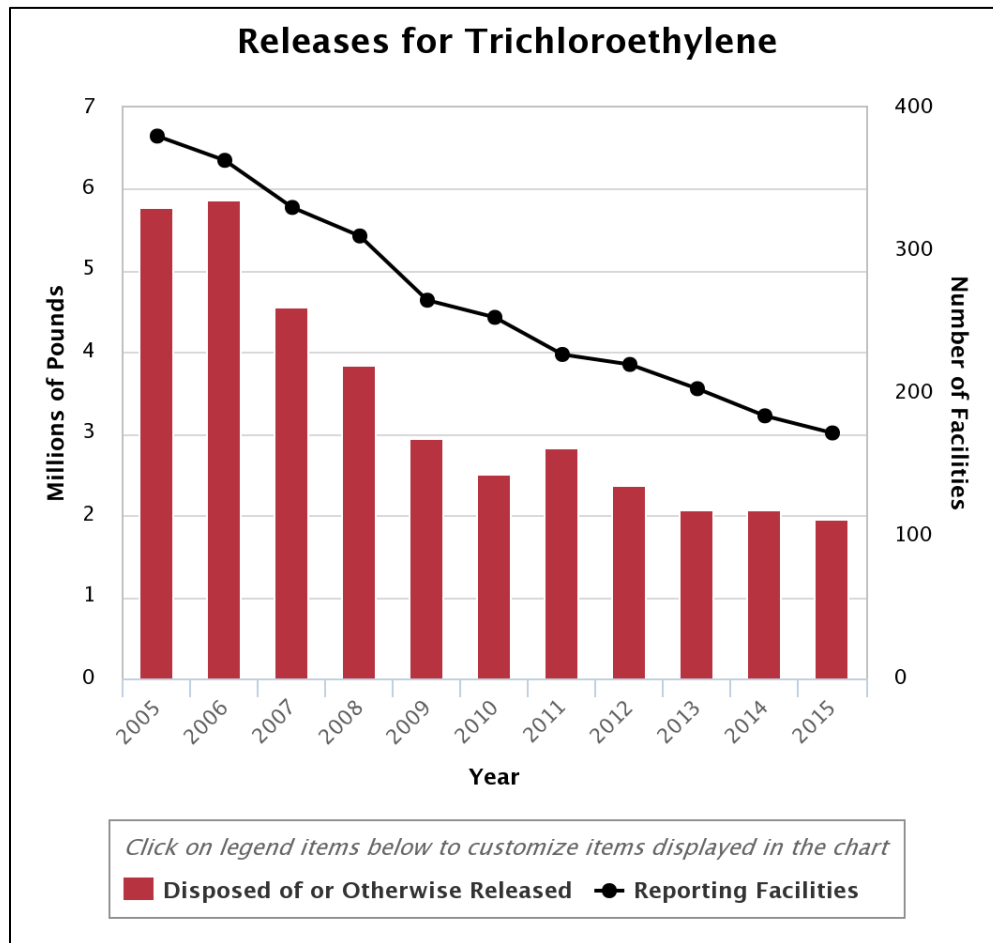
Utilizing the chemical information reported to TRI and collected under the CDR rule together provides a more complete picture of a chemical's lifecycle from sources of import and domestic manufacture to means of final disposition in the environment or products, as shown in this figure.

In 2011 (the most recent year of CDR data which was published in 2012), nine manufacturers, including importers, reported a total production volume of 225 million pounds of TCE manufactured. Industrial uses reported include as a solvent or intermediate in chemical manufacturing. During the same year, 227 facilities filed a TRI form for TCE, reporting a total of 90 million pounds of waste, most of which (87%) was managed through recycling.



TRI Releases for Trichloroethylene

The figure below shows the trend in releases of trichloroethylene (TCE) reported to the Toxics Release Inventory (TRI) over the last ten years.



As shown in the figure, since 2005, releases of TCE reported to TRI have decreased by 66%. Much of the reduction is from decreased releases by the Fabricated Metals sector which uses TCE in degreasing. EPA's [TRI Pollution Prevention \(P2\) Spotlight](#) provides additional information on how this sector is reducing their TCE releases. The number of facilities reporting TCE has also declined considerably over this time period.

TRI reporting facilities also provide information on the source reduction activities they implement to generate less waste. From 2011 through 2015, 28% of the facilities reporting TCE reported a source reduction activity; among the most common are:

For More on TCE

[To learn more about TCE, where it's found, and EPA's actions to date, see the TSCA webpage on TCE resources.](#)



- cleaning and degreasing modifications, such as changing to aqueous cleaners, and
- process modifications, such as upgrading valves or adding insulation to a degreaser to reduce TCE use and losses.

Use the [TRI P2 Search Tool](#) to view descriptions of facilities' activities to reduce TCE wastes. For example, an [aircraft component manufacturer](#) replaced the existing steam control valve on their TCE vapor degreaser with an electronically controlled steam valve. This change enabled them to run more parts through the degreaser while reducing TCE consumption.



Ozone Depleting Substances

In the 1970s, scientists concluded that chlorofluorocarbons (CFCs) were depleting the stratospheric ozone layer. The ozone layer in the stratosphere protects life on Earth from the harmful effects from the sun's radiation. This concern about the damage to the ozone layer led to a ban on using CFCs as aerosol propellants. However, in the 1980s, consumption of CFCs continued to increase. Through an [international agreement on the Protection of the Ozone Layer](#) and the adoption of the Montreal Protocol on Substances that Deplete the Ozone Layer (Montreal Protocol) countries agreed to phase out production and consumption of ozone-depleting substances (ODS). All countries recognized by the United Nations have ratified the Montreal Protocol. Visit [EPA's Ozone Protection website](#) for more information.

ODS have lifetimes in the atmosphere long enough to allow them to be transported by global winds into the stratosphere. There, they release chlorine or bromine when they break down, and these chlorine and bromine atoms damage the protective ozone layer.

Congress added two categories of ODS, designated as class I and class II, to the Clean Air Act Amendments in 1990. Many class I and class II ozone-depleting substances are included on the Toxics Release Inventory (TRI) chemical list and, hence, the quantities released to the environment or otherwise managed as waste are reportable to EPA's TRI Program. As shown in the tables below, many ODS also have high global warming potential (GWP).

Ozone-depletion potential (ODP)

represents the ratio of calculated ozone column change for each mass unit of a gas emitted into the atmosphere relative to the calculated depletion for the gas.

Global warming potential (GWP)

represents how much a given mass of a chemical contributes to global warming over a certain time period compared to the same mass of carbon dioxide.

Class I ODS

Releases of **CFCs and other class I ODS**, such as methyl chloroform, carbon tetrachloride, and halons come from use as refrigerants, solvents, foam blowing agents, fire suppression agents and in other applications. The production and import of class I ODS have been phased out¹, though they may still be recovered from existing appliances, reclaimed to industry standards and reused. Class I substances have a higher ozone depletion potential and have been completely phased out in the U.S.; with a few exceptions, this means no one can produce or import class I substances.



EPA regulations issued under [the Clean Air Act](#) phaseout the production and import of ozone-depleting substances (ODS), which meet all the reduction targets agreed to under the Montreal Protocol. The U.S. phaseout has operated by reducing in stages the amount of ODS that may be legally produced and imported into the U.S. The ban on production and import of halons took effect January 1, 1994. The ban on production and import of other class I ODS-excluding methyl bromide-took effect on January 1, 1996. Methyl bromide was phased out on January 1, 2005 with exemptions for critical uses and quarantine and preshipment.

Class I Ozone-depleting Substances	TRI Chemical Name	CAS RN	ODP ²	GWP ³
CFC-11	Trichlorofluoromethane	75-69-4	1	4,750
CFC-12	Dichlorodifluoromethane	75-71-8	1	10,900
CFC-13	Chlorotrifluoromethane	75-72-9	1	14,420
CFC-113	Freon 113	76-13-1	0.8	6,130
CFC-114	Dichlorotetrafluoroethane	76-14-2	1	10,000
CFC-115	Monochloropentafluoroethane	76-15-3	0.6	7,370
Halon 1211	Bromochlorodifluoromethane	353-59-3	3	1,890
Halon 1301	Bromotrifluoromethane	75-63-8	10	7,140
Halon 2404	Dibromotetrafluoroethane	124-73-2	6	1,640
CCL ₄	Carbon tetrachloride	56-23-5	1.1	1,400
Methyl Chloroform	1,1,1-trichloroethane	71-55-6	0.1	146
Methyl bromide	Bromomethane	74-83-9	0.7	5

Class II ODS

Hydrochlorofluorocarbons (HCFCs) are class II ODS that are less damaging to the ozone layer than class I substances, and are currently being phased-out consistent with the Clean Air Act and Montreal Protocol. HCFCs were developed as transitional substitutes from class I substances and are subject to a later phaseout schedule than class I substances. Historically, the most widely used HCFCs were HCFC-22, used as a refrigerant, HCFC-141b, used as a solvent and foam-blowing agent, and HCFC-142b, used as a foam-blowing agent and component in refrigerant blends. The table below shows the phaseout schedule for HCFCs.



U.S. Action to Meet the Montreal Protocol Phaseout Schedule for Class II		
Years to Be Implemented	Implementation of HCFC Phaseout through Clean Air Act Regulations	Percent Reduction in HCFC Consumption and Production from Baseline
2003	No production or import of HCFC-141b	35.0% (2004)
2010	No production or import of HCFC-142b and HCFC-22, except for use in equipment manufactured before January 1, 2010	75.0%
2015	No production or import of any other HCFCs, except as refrigerants in equipment manufactured before January 1, 2020	90.0%
2020	No production or import of HCFC-142b and HCFC-22	99.5%
2030	No production or import of any HCFCs	100.0%

Class II Ozone-depleting Substances	TRI Chemical Name	CAS RN	ODP ²	GWP ³
HCFC-21	Dichlorofluoromethane	75-43-4	0.04	151
HCFC-22	Chlorodifluoromethane	75-45-6	0.055	1,810
HCFC-121	1,1,2,2-tetrachloro-1-fluoroethane	354-14-3	0.01-0.04	100
HCFC-123	2,2-dichloro-1,1,1-trifluoroethane	306-83-2	0.02	77
HCFC-123a	1,2-dichloro-1,1,2-trifluoroethane	354-23-4		77
HCFC-123b	1,1-dichloro-1,2,2-trifluoroethane	812-04-4		77
HCFC-124	2-chloro-1,1,1,2-tetrafluoroethane	2837-89-0	0.022	609
HCFC-124a	1-chloro-1,1,2,2-tetrafluoroethane	354-25-6		609
HCFC-132b	1,2-dichloro-1,1-difluoroethane	1649-08-7	0.008-0.05	100
HCFC-133a	2-chloro-1,1,1-trifluoroethane	75-88-7	0.02-0.06	100
HCFC-141b	1,1-dichloro-1-fluoroethane	1717-00-6	0.11	725
HCFC-142b	1-chloro-1,1-difluoroethane	75-68-3	0.065	2,310
HCFC-225ca	3,3-dichloro-1,1,1,2,2-pentafluoropropane	422-56-0	0.025	122



Class II Ozone-depleting Substances	TRI Chemical Name	CAS RN	ODP²	GWP³
HCFC-225cb	1,3-dichloro-1,1,2,2,3-pentafluoropropane	507-55-1	0.033	595
HCFC-253	3-chloro-1,1,1-trifluoropropane	460-35-5	0.003-0.03	

¹ Under the phaseout there is a limited exception for production and import of controlled substances that are transformed or destroyed. Importers can also petition EPA to import used ODS.

² The numbers in this column represent ODP values from Annex A-E of the *Montreal Protocol on Substances that Deplete the Ozone Layer*. Some numbers have been updated through amendments to the Protocol.

³ The numbers in this column represent GWP values from the Intergovernmental Panel on Climate Change (IPCC) *Fourth Assessment Report: Climate Change 2007 (AR4)*. The values listed are for direct radiative forcing and can be found in Table 2.14 of the "Physical Science Basis" contribution to the report.

TRI Air Releases of Ozone Depleting Substances, in Pounds

As shown in the figures below, the Toxics Release Inventory (TRI) data demonstrate a decrease in Class I and II ozone depleting substance (ODS) emissions over the past ten years as a result of the adoption of the Montreal Protocol and amendments to the Clean Air Act.

