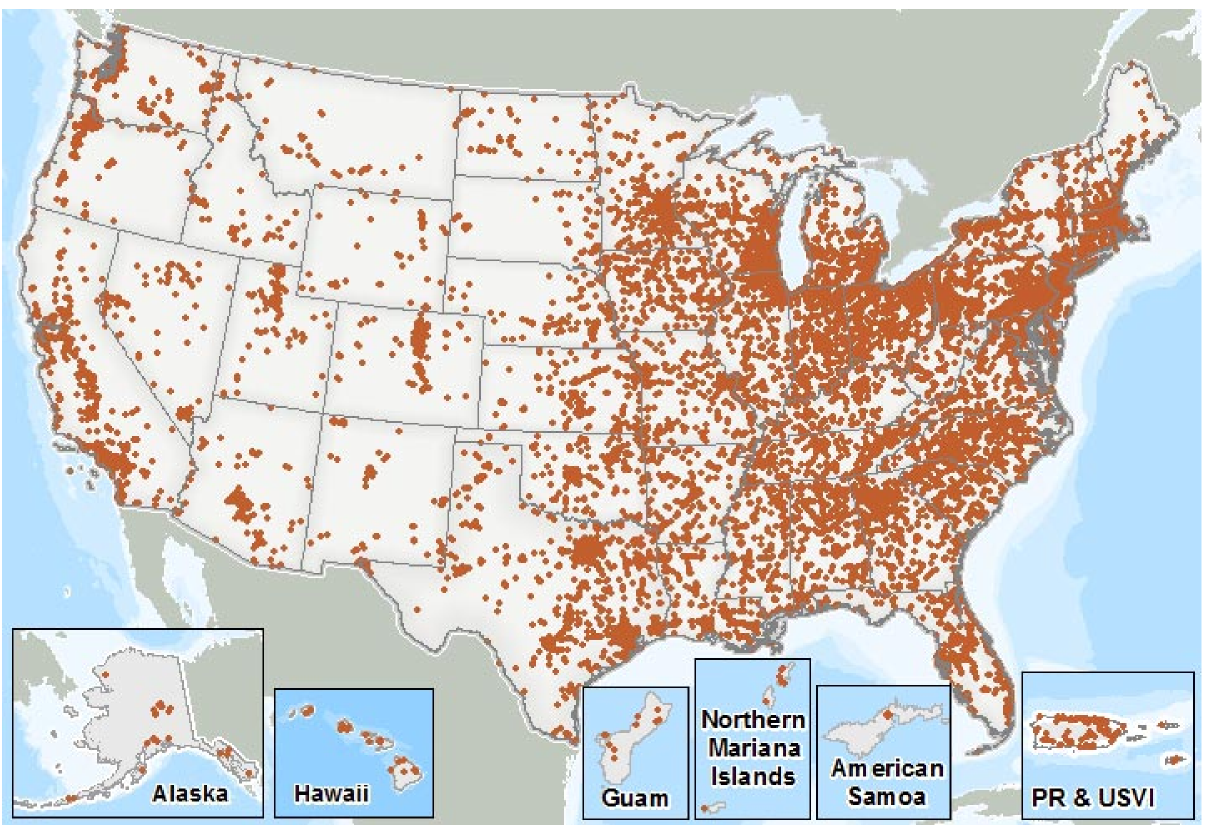
Introduction: What is the TRI National Analysis?

Tens of thousands of chemicals are used by industries and businesses in the United States to make the products on which our society depends, such as pharmaceuticals, clothing, and automobiles. Many of the chemicals needed to create these products are toxic, and while the majority of toxic chemicals are managed so that they are not released into the environment, some releases of toxic chemicals are inevitable.

It is your right to know what toxic chemicals are being used in your community, how they are being disposed of or otherwise managed, and whether their releases to the environment are increasing or decreasing over time. The Toxics Release Inventory (TRI) is an EPA 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 thousands of U.S. facilities on over 650 chemicals and chemical categories under the Emergency Planning and Community Right-to-Know Act (EPCRA) and the Pollution Prevention Act (PPA).

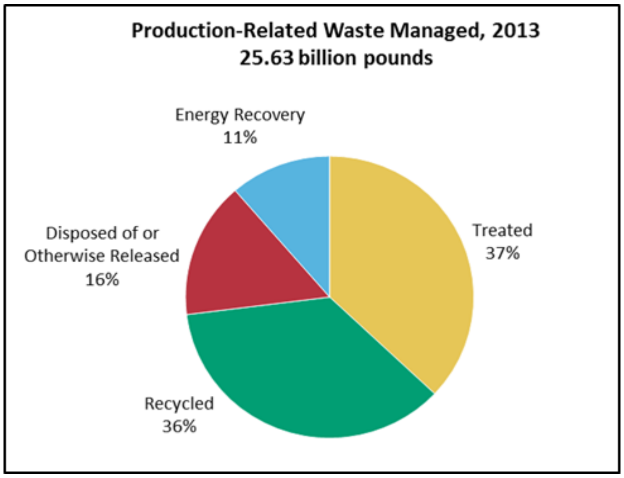
Geographic Distribution of TRI-Reporting Facilities

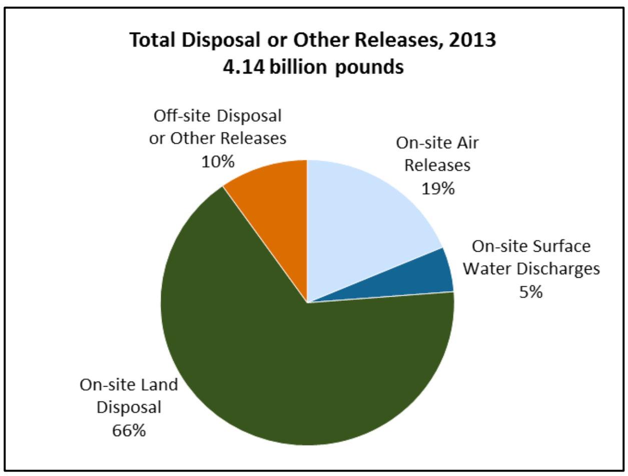


This map shows the locations of all facilities that reported to TRI for 2013. Facilities that report to TRI are typically large and are from industry sectors involved in manufacturing, metal mining, electric power generation, and hazardous waste treatment. Federal facilities are also required to report to TRI by Executive Order 12856.

Users of TRI data should be aware that TRI captures a significant portion of toxic chemicals in wastes that are managed by industrial facilities, but it does not cover all toxic chemicals or all industry sectors of the U.S. economy. Furthermore, the quantities of chemicals reported to TRI are self-reported by facilities using readily-available data. Each year, EPA conducts an extensive data quality analysis before publishing the National Analysis. During the data quality review, potential errors are identified and investigated to help provide the most accurate and useful information possible. This effort makes it possible for TRI data presented in the National Analysis to be used along with other information as a starting point in understanding how the environment and communities may be affected by toxic chemicals.

The TRI National Analysis is developed on an annual basis, and the 2013 TRI National Analysis is EPA's interpretation of TRI data reported for 2013 by July 1, 2014. It provides a snapshot of the data at one point in time. Any reports submitted to EPA after the July 1st, 2014 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.





Quick Facts for 2013

Number of TRI Facilities: 21,598

Production-Related Waste Managed: 25.63 billion lb

- Recycled: 9.23 billion lb
- Energy Recovery: 2.91 billion lb
- Treated: 9.49 billion lb
- Disposed of or Otherwise Released: 4.00 billion lb

Total Disposal or Other Releases: 4.14 billion lb

- **On-site: 3.74 billion lb**
  - Air: 0.77 billion lb
  - Water: 0.21 billion lb
  - Land: 2.75 billion lb
- **Off-site: 0.41 billion lb**

For 2013, 21,598 facilities reported to TRI. These facilities reported managing 25.63 billion pounds of toxic chemicals in production-related wastes. This is the quantity of toxic chemicals in waste that is recycled, burned for energy recovery, treated, and disposed of or otherwise released. In other words, it encompasses all toxic chemicals in waste generated from facilities' processes and operations. Of this total, 21.62 billion pounds were recycled, burned for energy recovery, or treated, and 4.00 billion pounds were disposed of or otherwise released to the environment, as shown in the Production-Related Waste Managed pie chart.

TRI facilities also reported total on- and off-site disposal or other releases of 4.14 billion pounds of toxic chemicals. As shown in the Disposal or Other Releases pie chart, most were disposed of or released on-site to land (including landfills, other land disposal and underground injection).

Note that the two metrics related to disposal or other releases shown in the Quick Facts box are similar (4.00 and 4.14 billion pounds), but total disposal or other releases is slightly higher. The reason total disposal or other releases is higher is that it includes waste from catastrophic, remedial, and non-production related events, which is not included in the production-related waste quantities. Another reason the two metrics are different is because total disposal or other releases counts only the quantity of toxic chemicals in waste at its final disposition, while production-related waste managed counts the toxic chemical waste as many times as it is managed during the year. For example, if a TRI facility transfers a waste off-site to another TRI facility that disposes of it to land, the waste would be counted twice (once for each facility that manages it) under production-related waste managed, but only once under total disposal or other releases.

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

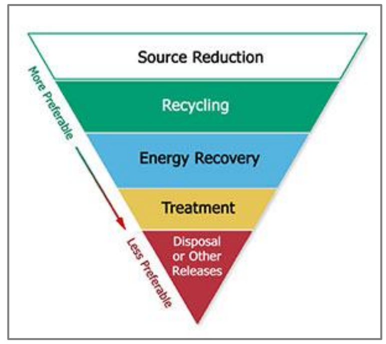
- **Waste Management and Pollution Prevention** presents trends in toxic chemicals managed and the types of pollution prevention activities that facilities have implemented.
- **Releases of Chemicals** presents trends in releases of toxic chemicals, including a focus on selected chemicals of concern.
- **Industry Sectors** highlights toxic chemical waste trends for four industry sectors.
- **Where You Live** presents analyses of TRI chemicals by 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.
- **Beyond TRI** combines TRI data with other EPA data, such as greenhouse gas emissions, to provide a more complete picture of national trends in chemical use, management and releases.

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

Pollution Prevention and Waste Management

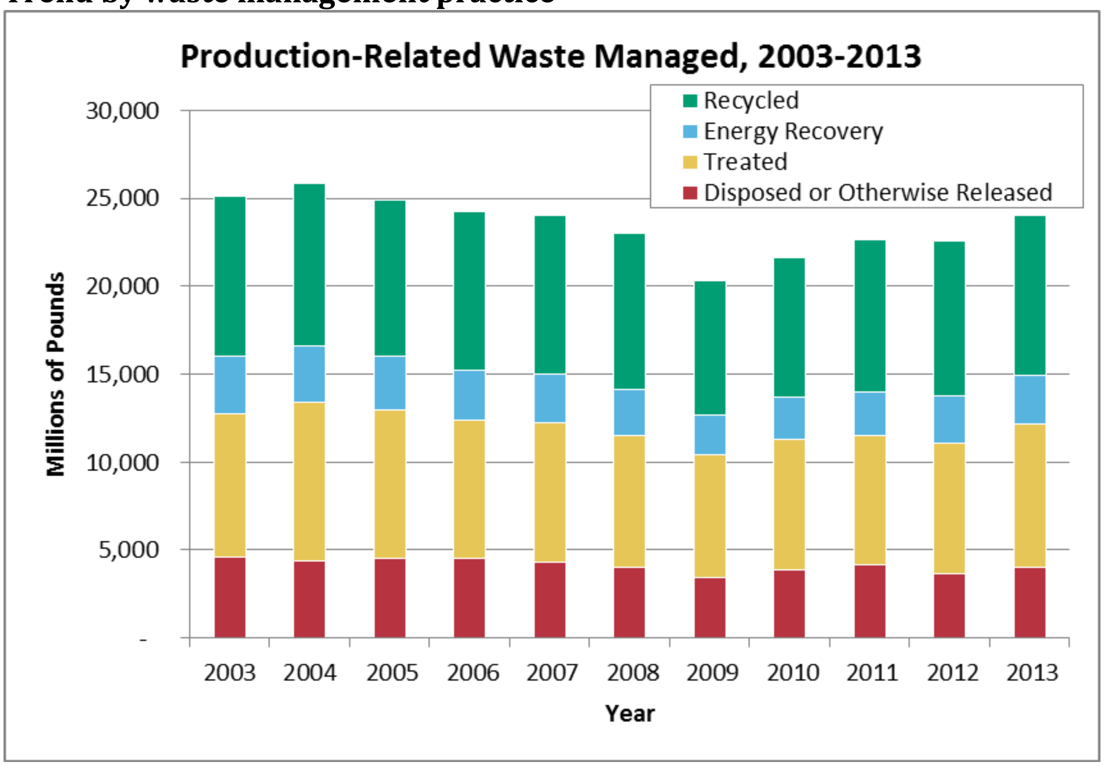
The Toxics Release Inventory (TRI) collects information from facilities on the quantities of toxic chemicals recycled, combusted for energy recovery, treated for destruction, and disposed of or otherwise released on- and off-site. This information is collectively referred to as production-related waste managed.

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



Waste Management Trends

Trend by waste management practice



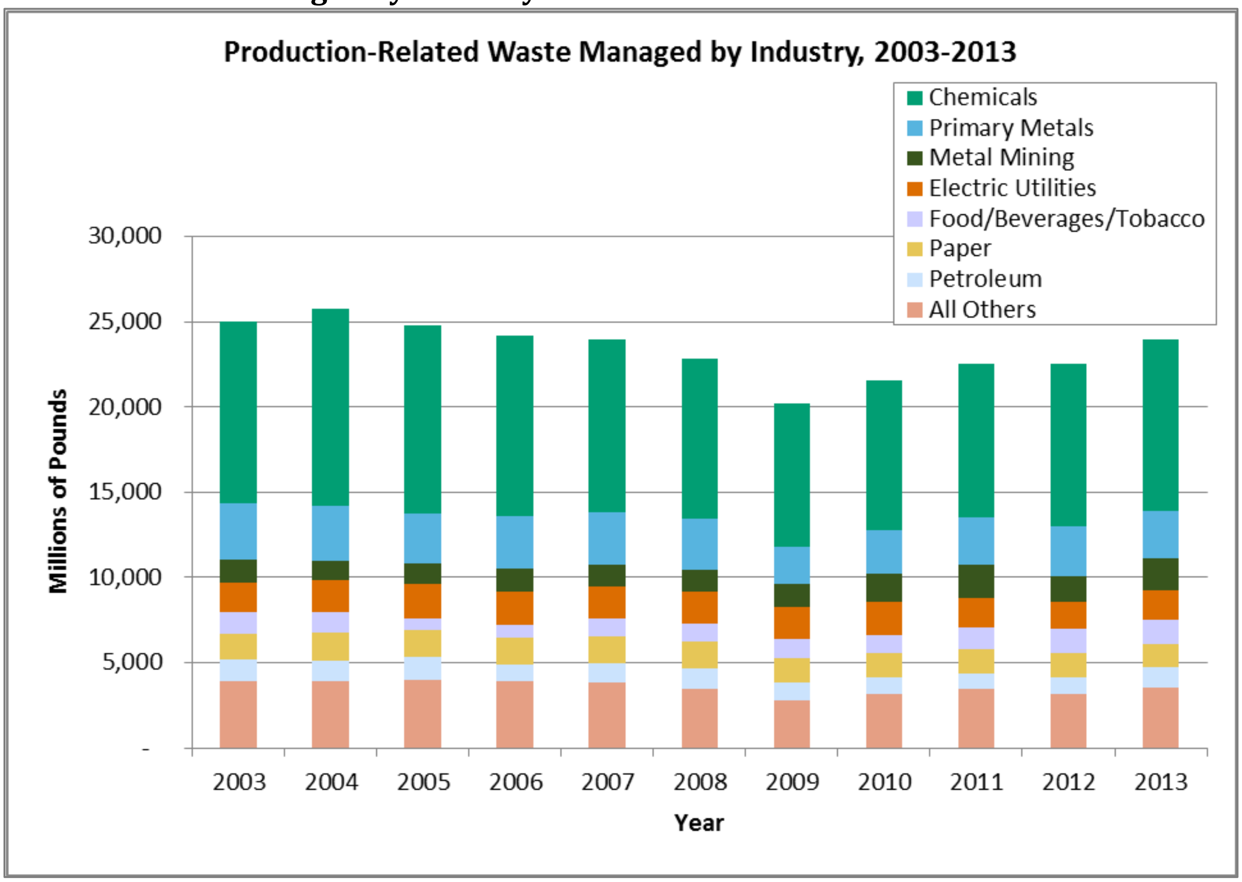
This figure shows that from 2003 to 2013, production-related waste managed by TRI facilities declined by 4% from 25.09 to 24.04 billion pounds. Changes over this time period by waste management method were:

- Disposal and other releases decreased by 606 million pounds (-13%)
- Combustion for energy recovery decreased by 551 million pounds (-17%) and
- Recycling and treatment held steady with each method changing by less than 1%.

Since 2009, production-related waste managed has generally been increasing as the U.S. economy has improved. Quantities of waste managed in 2013 are similar to what they were six years ago in 2007, with little overall change within any waste management method.

Waste Management by Industry Sector

Trend in waste managed by industry sector



This figure shows the seven industry sectors with the most reported waste managed in 2013. The contribution of each of the top sectors to production-related waste managed has not changed considerably between 2003 and 2013. For example, the top two sectors by total waste managed in 2013 (chemicals and primary metals) reported over half of waste managed in both 2003 and 2013.

Most industry sectors reported a decline in production-related waste managed from 2003 to 2013 resulting in an overall decrease of 4%. Of the seven sectors shown in the figure, only two increased their quantity of waste managed since 2003 (metal mining and food/beverages/tobacco).
In the past year, however, four of the seven sectors shown in the figure have increased their waste managed. Sectors with the greatest increases in wastes from 2012 to 2013 were:

- Chemical manufacturing, which increased by 856 million pounds (+9% from 2012)
- Metal mining, which increased by 332 million pounds (+22%)
- Electric utilities, which increased 109 million pounds (+7%) and
- Food/beverages/tobacco, which increased by 98 million pounds (+7%).

Generated waste in some industries fluctuates considerably from year to year, due to changes in production or other factors (e.g., reporting in the mining sector can change significantly based on changes in the composition of waste rock).

Economic trend in production-related waste for the manufacturing sector

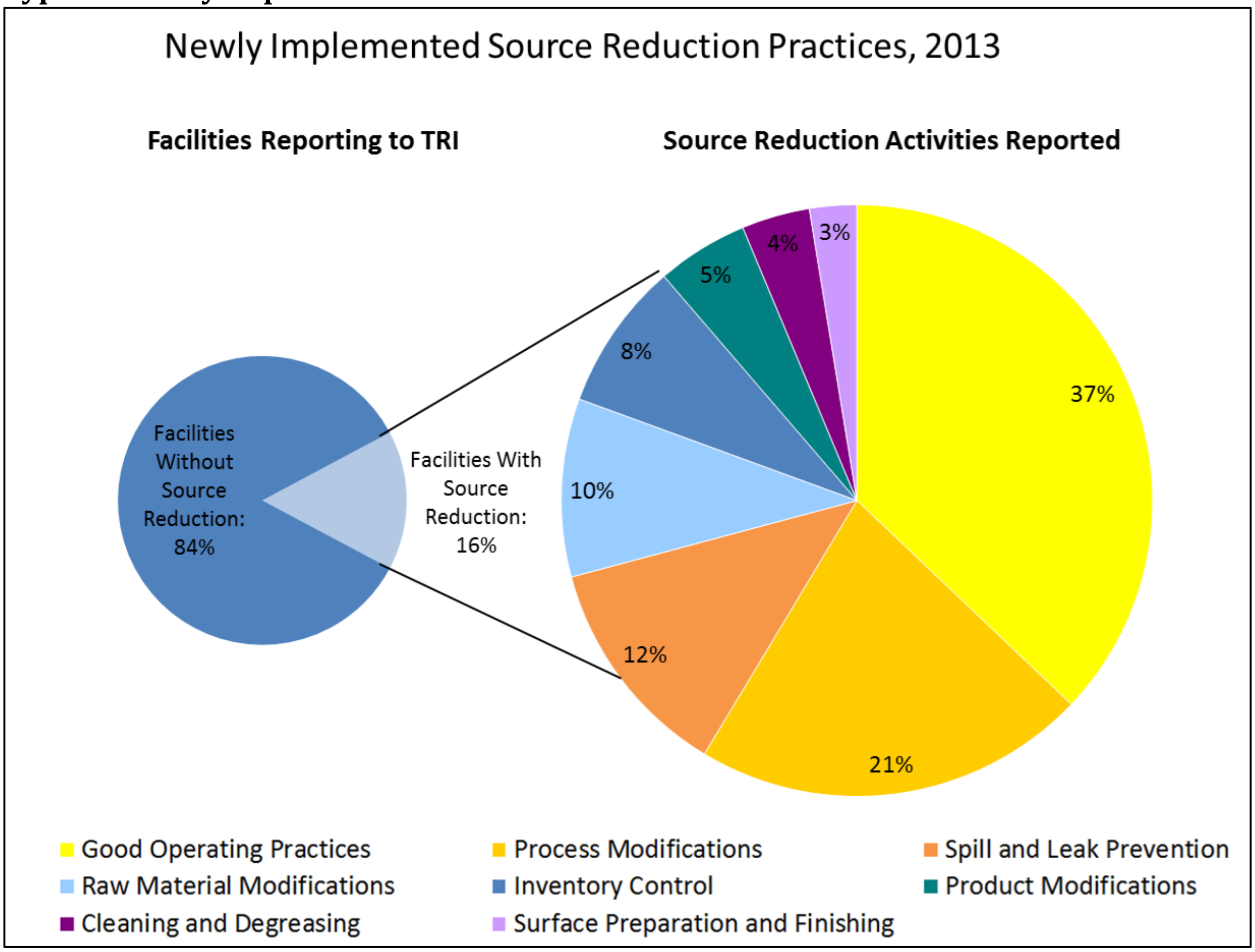
It is also important to consider the influence that production and the economy have on chemical waste generation. The figure above illustrates how changes in production levels at TRI facilities may influence production-related waste. It presents the trend in production-related waste managed by the manufacturing sector and the trend in the manufacturing sector's value added (as shown by the solid line). "Value added" from the Bureau of Economic Analysis is used as a proxy for production levels for the manufacturing sector. Value added measures the contribution of manufacturing to the nation's Gross Domestic Product (GDP), which represents the total value of goods and services produced annually in the United States. While not all of the facilities that report to TRI are in the manufacturing sector, most are (89% in 2013). The manufacturing sector includes sectors such as chemical manufacturing, metals processing, and pulp and paper manufacturing, but excludes mining, electric utilities, and waste management facilities. In 2013, TRI manufacturing facilities accounted for 80% of the production-related waste managed.

The solid line in the figure shows that value added by the manufacturing sector (adjusted for inflation) decreased by 4% from 2003 to 2013, while production-related waste managed by the manufacturing sector decreased by 8%. This graph demonstrates that, because waste is decreasing faster than production, factors other than production were also contributing to the reductions in releases. Other factors such as source reduction and pollution prevention (P2) practices are discussed in the Source Reduction/Pollution Prevention section.

More information on production trends for individual sectors, including the electric utility and metal mining sectors, which are not included in the manufacturing sector, can be found in the industry sector profiles.

Source Reduction/Pollution Prevention (P2)

Types of newly implemented source reduction

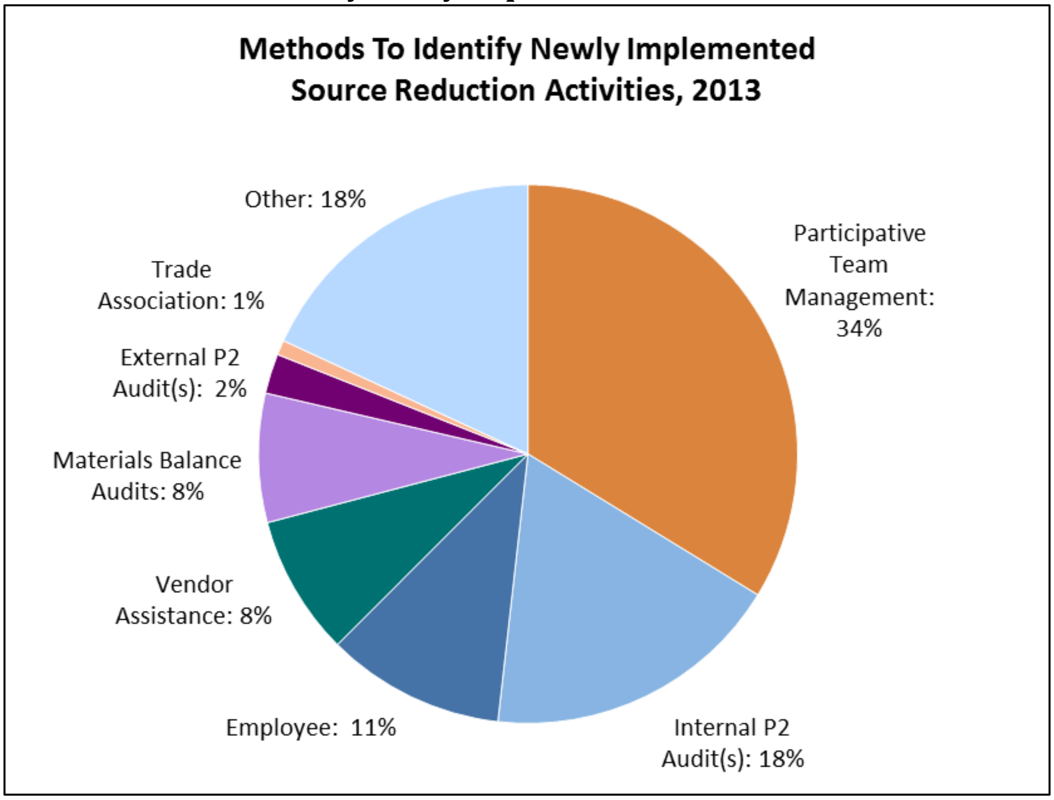


Note: Facilities report their source reduction activities by selecting from activities that fall into one of the eight categories listed in the graph legend. “Good operating practices” are defined by four codes in the Reporting Forms and Instructions, which facilities select when submitting their forms.

This figure shows the types of source reduction activities reported as implemented during 2013. In 2013, a total of 3,362 facilities (16% of all TRI facilities) reported initiating 10,623 source reduction activities. Of the source reduction activities implemented, good operating practices is reported the most at 37%. To learn more about source reduction and pollution prevention, see the TRI Pollution Prevention webpage.

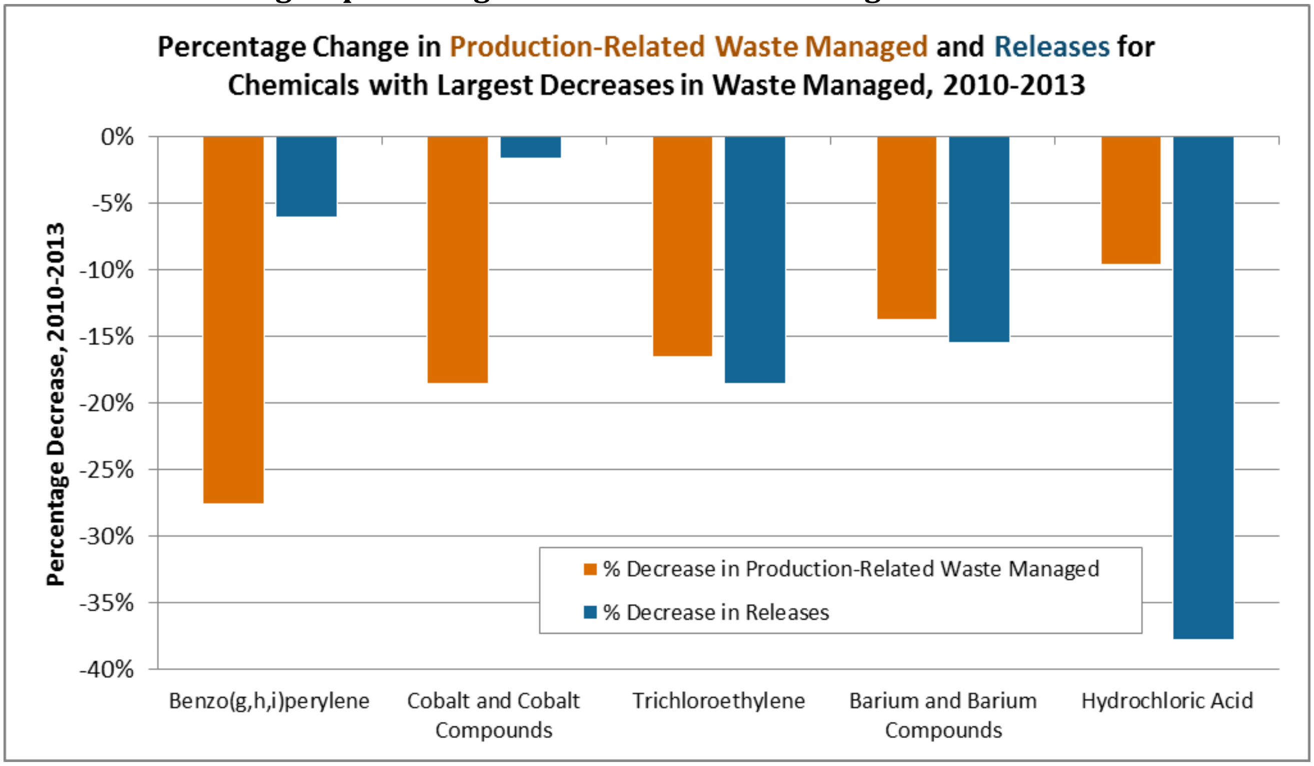
Facilities may have ongoing source reduction activities initiated in previous years that are not captured in the figure. You can find data on previously implemented source reduction activities by using the TRI P2 Search Tool.

Methods used to identify newly implemented source reduction activities



For each source reduction activity, facilities also provide information about how they identified the opportunity for source reduction. This figure shows that facilities most frequently identified source reduction opportunities through participative team management (e.g., team training to identify process improvements) and internal audits.

Chemicals with largest percentage decrease in waste managed



Note: Limited to chemicals with at least 25 forms reporting source reduction and 100 total Form Rs in 2013.

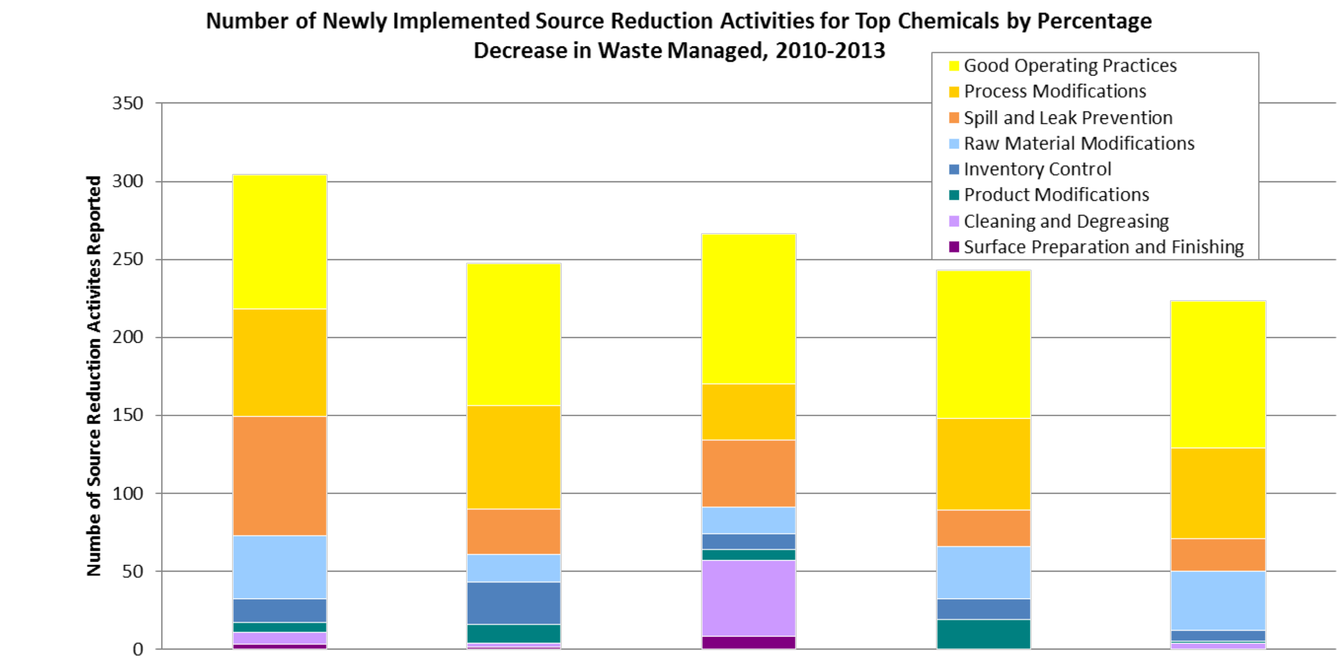
This figure shows the five chemicals with the greatest percentage decrease in waste quantities in recent years (from 2010 to 2013). Decreases in waste management quantities can be caused by many factors, including changes in production levels or estimation methods. Source reduction activities implemented by facilities have also played a significant role in reducing waste generation.

The relationship between source reduction, changes in total waste generation, and chemical releases varies from chemical to chemical.

- In many cases, reducing the generation of total waste through source reduction also decreases the amount of chemical ultimately released to the environment. For example, releases of trichloroethylene (a carcinogen that is released primarily to air) declined by 19% over the same period that total waste managed declined by 16%.
- In cases where pollution is already being effectively controlled through management methods such as treatment and recycling, source reduction may reduce the amount of total chemical waste but does not significantly decrease chemical releases. For example, cobalt (another carcinogen) is managed almost exclusively through recycling at TRI facilities. While the total quantity of cobalt waste decreased by 19%, releases declined by only 2%.
- Finally, the quantity of releases can decrease at a greater rate than the quantity of total waste generated. For example, production-related waste of hydrochloric acid decreased by about 10% while releases decreased by 38%, as facilities switched from releasing hydrochloric acid to preferred management methods, such as treatment, and also undertook source reduction activities.

Source reduction activities reported for the five chemicals in this figure are shown in the next figure.

Types of source reduction activities for chemicals with largest decreases in waste managed



Chemical	Benzo(g,h,i)perylene	Cobalt and Cobalt Compounds	Trichloroethylene	Barium and Barium Compounds	Hydrochloric Acid
% Decrease in Waste Managed 2010-2013	-28%	-19%	-16%	-14%	-10%

Notes: 1) Limited to chemicals with at least 25 forms reporting source reduction and 100 total forms in 2013. 2) Facilities report their source reduction activities by selecting from activities that fall into one of the eight categories listed in the graph legend. "Good operating practices" are defined by four codes in the Reporting Forms and Instructions, which facilities select when submitting their forms.

This figure shows the types of source reduction activities reported from 2010 to 2013 for the chemicals with the greatest percentage decrease in production-related waste managed over this time period. The type of source reduction activity implemented varies depending on the chemical's use in industrial operations and the chemical's characteristics. For example, some types of source reduction activities relate to:

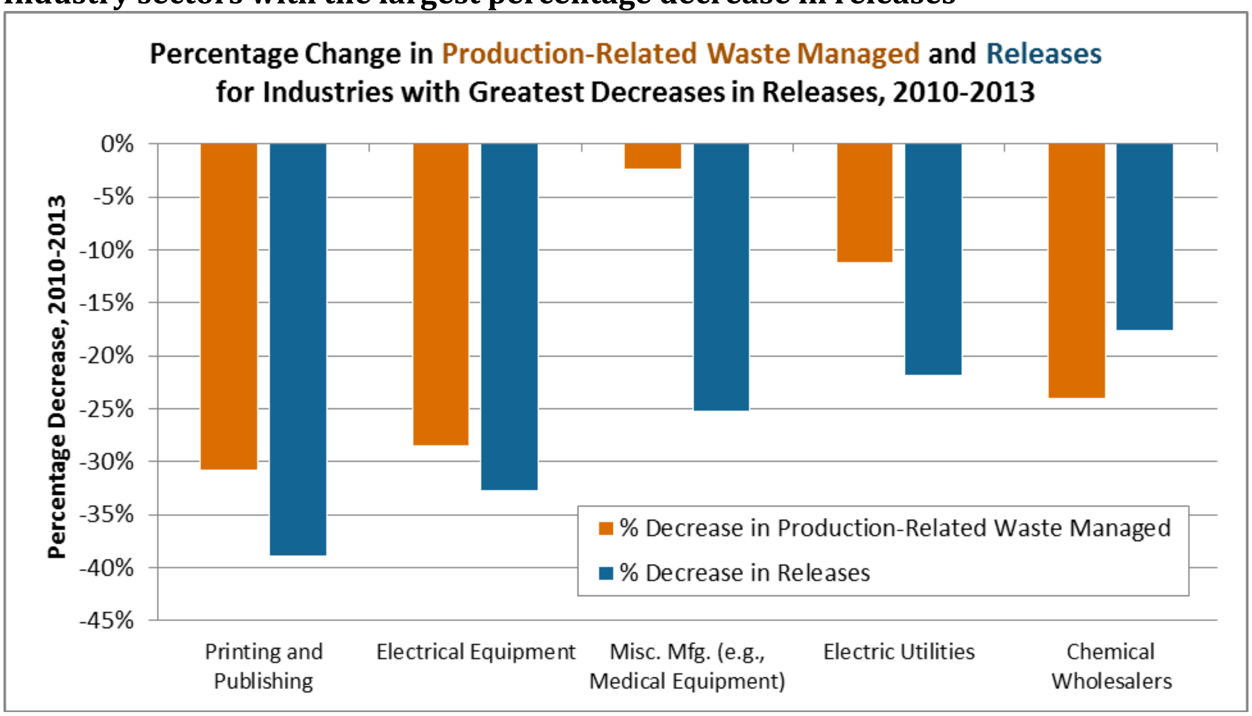
- **Cleaning and degreasing**. Changing to aqueous cleaners is more commonly implemented for trichloroethylene, a common industrial solvent, than for the other chemicals shown.
- **Spill and leak prevention.** This activity is more commonly used to reduce waste of benzo(g,h,i)perylene, a persistent, bioaccumulative and toxic (PBT) chemical constituent in petroleum products. Common spill and leak prevention activities for this chemical include improving procedures for loading, unloading, and transfer operations at petroleum bulk terminals, and installing overflow alarms or automatic shutoff valves at asphalt product manufacturing facilities.

Facilities may also report additional details to TRI about their source reduction, recycling, or pollution control activities. For the chemicals profiled in the above figure, examples of additional pollution prevention-related information reported are shown below with a link to each facility's pollution prevention report in Envirofacts.

- **Benzo(g,h,i)perylene:** A rubber product manufacturer installed three natural gas boilers and decommissioned two #6 fuel oil boilers in an effort to reduce emissions. The change was made in September 2013 and resulted in a 36% reduction in benzo(g,h,i)perylene emissions from the previous year. The facility expects they will not have any benzo(g,h,i)perylene emissions in 2014. [facility details]
- **Cobalt and Cobalt Compounds:** By installing air pollution controls on its anode furnace, a copper smelter decreased emissions of hazardous air pollutants, including cobalt compounds. The project also resulted in approximately 12% savings in natural gas consumption. [facility details]
- **Trichloroethylene:** With the help of a vendor, a pipe and tube manufacturer improved the air blanket zone on its refrigeration lines and reduced releases of trichloroethylene. [facility details]
- **Barium and Barium Compounds:** A printing plate and ink manufacturing facility significantly reduced the use of barium compounds by reformulating its products. [facility details]
- **Hydrochloric Acid:** By changing to an immersion acid process instead of using spray acid equipment, a semiconductor manufacturer is reducing emissions of aerosolized hydrochloric acid. [facility details]

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.

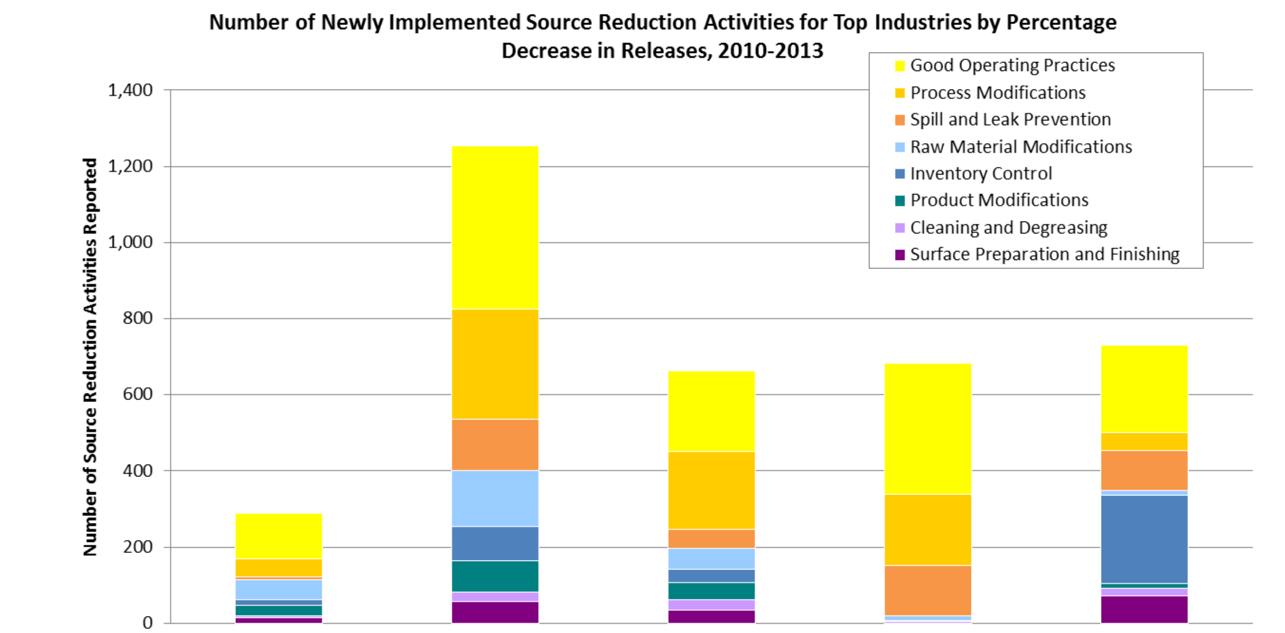
Industry sectors with the largest percentage decrease in releases



This figure shows the sectors with the greatest percentage decrease in releases from 2010 to 2013. For many sectors, source reduction activities, which reduce or eliminate waste generation at its source, have contributed to substantial decreases in both the amount of waste generated and the amount released. In other cases, pollution controls (e.g., scrubbers) have reduced releases but do not affect waste management totals, because chemicals that are treated or recycled instead of being released are still included in the total waste managed quantity. Improved pollution control techniques may thus explain why releases declined at an even faster rate than overall waste generation for four of the five industries shown above. Other factors, such as reduced production, can also contribute to decreases in both releases and overall waste generation.

Source reduction activities reported by these five industries are discussed further in the next figure.

Types of source reduction activities for sectors with largest decrease in releases



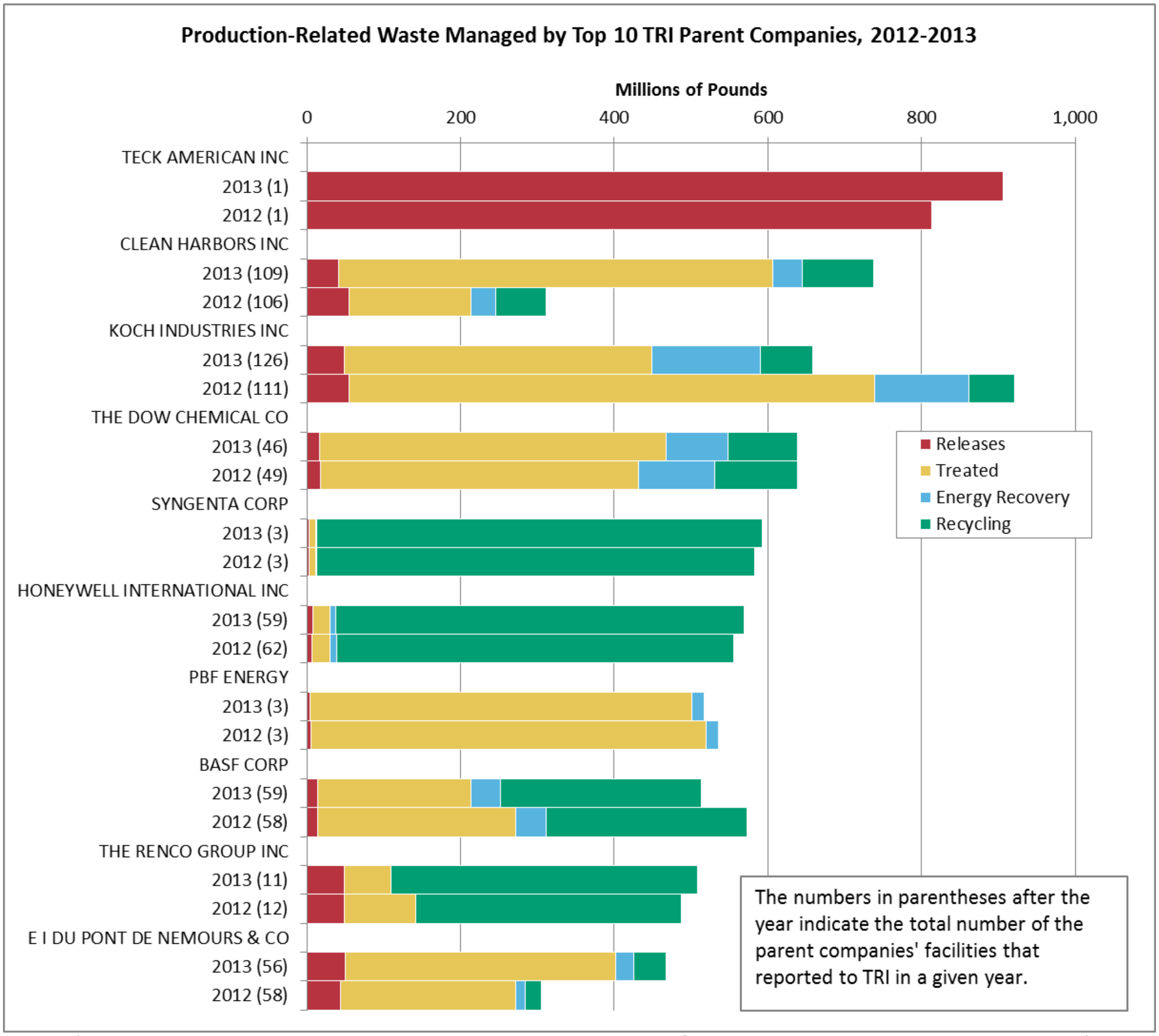
Industry	Printing and Publishing	Electrical Equipment	Misc. Mfg. (e.g., Medical Equipment)	Electric Utilities	Chemical Wholesalers
% Decrease in Releases 2010-2013	-39%	-33%	-25%	-22%	-18%

Note: Facilities report their source reduction activities by selecting from activities that fall into one of the eight categories listed in the graph legend. "Good operating practices" are defined by four codes in the Reporting Forms and Instructions, which facilities select when submitting their forms.

This figure shows the source reduction activities implemented from 2010 to 2013 for the five sectors with the greatest percentage decrease in releases over this time period. As shown in the figure, the types of source reduction activities vary significantly by industry. For example, many chemical wholesalers reported inventory control (e.g., instituting clearinghouses to exchange materials that otherwise would be discarded), while electrical equipment manufacturers frequently reported modifications to their raw materials and processes, often associated with the elimination of lead solder.

Waste Management by Parent Company

Parent companies with the most production-related waste managed



Notes: 1) For TRI Reporting, the parent company is the highest level U.S. company which directly owns at least 50 percent of the voting stock of the company. This figure uses EPA's standardized parent company names. 2) The method to display data for 2012 has been revised to reflect parent companies as of 12/31/2012.

Many of the facilities reporting to TRI are owned by parent companies that also own other facilities reporting to TRI. Facilities reporting to TRI are asked to provide information on their parent company if they have one. The parent companies reported to TRI must be located in the United States. This figure shows the parent companies that reported the most production-related waste in 2013. Eight of these parent companies were also in the top 10 in 2012, while Clean Harbors and E I Du Pont De Nemours moved into the top 10 in 2013.

These parent companies vary in size and in the sectors in which they operate. The number of TRI reporting facilities owned by these companies ranges from 1 to 126. The parent companies' TRI facilities operate in the following sectors:

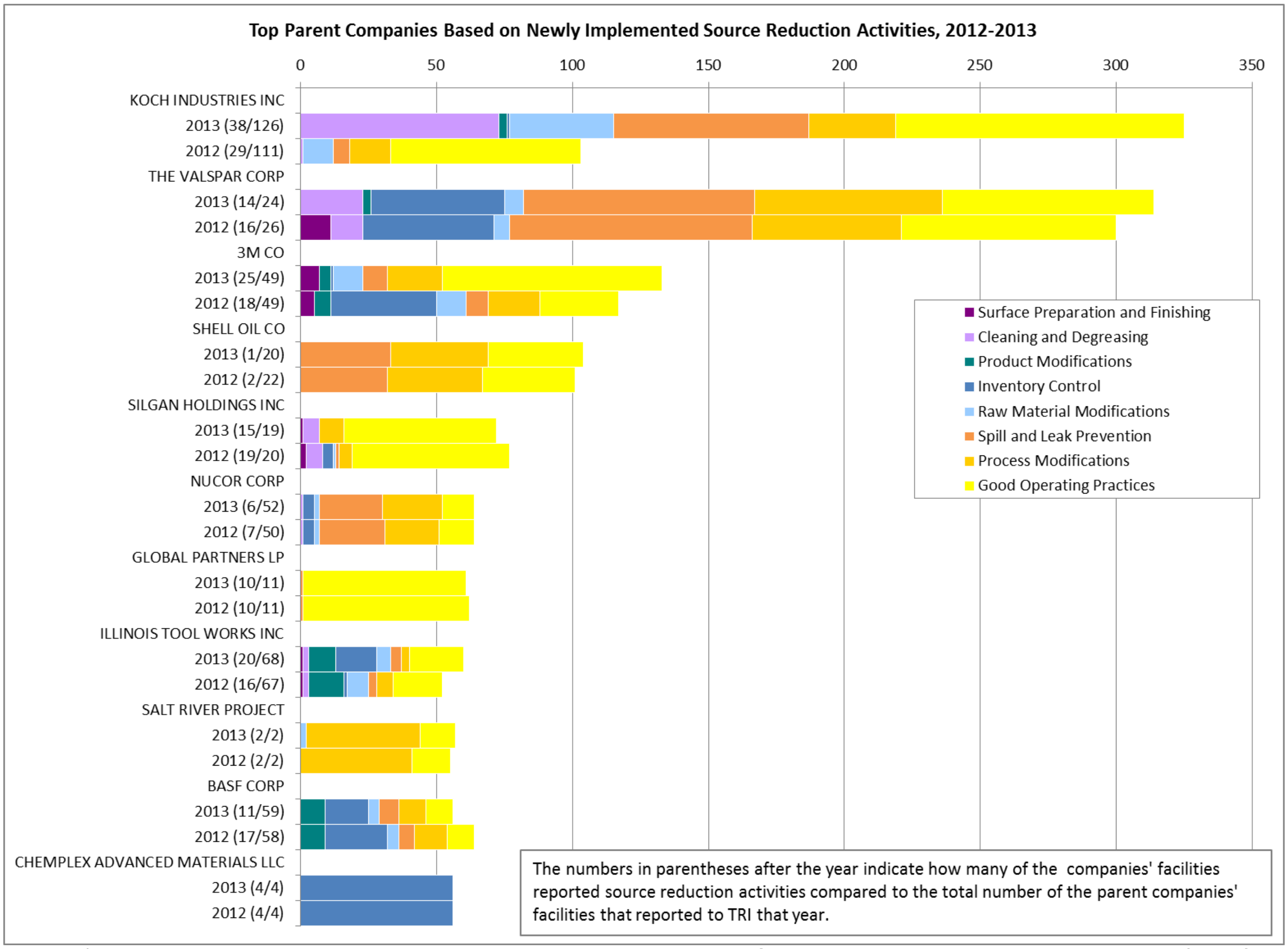
- Metal mining: Teck American
- Hazardous waste and solvent recovery: Clean Harbors
- Multiple sectors, e.g., pulp and paper, petroleum refining, and chemicals: Koch Industries
- Chemical manufacturing: Dow Chemical, Syngenta, Honeywell International, BASF, and E I Du Pont De Nemours
- Petroleum Refining: PBF Energy
- Metal smelting: The Renco Group

Nine of these top parent companies reported implementing one or more new source reduction activities in 2013. Some companies also reported additional (optional) information to TRI about their pollution prevention or waste management activities. Among the top 10 parent companies, additional information reported included:

- A Honeywell facility worked with vendor and internal department resources to develop a new formulation for its coating line. This raw material substitution resulted in a 99% reduction in the use of methanol at the facility. (Raw Material Modification) [facility details]
- Through an internal pollution prevention audit and an employee recommendation, a Syngenta facility reduced ammonia emissions by improving ammonia recovery through stripping and optimizing the conditions of reactions that involve ammonia. (Process Modification) [facility details]
- A BASF organic chemical manufacturing plant implemented a site-wide spill prevention plan, focused specifically on over-fill protections and safer chemical transfer. (Spill and Leak Prevention) [facility details]

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

Parent companies with the greatest number of new source reduction activities



Notes: 1) For TRI Reporting, the parent company is the highest level U.S. company that directly owns at least 50% of the voting stock of the company. This figure uses EPA's standardized parent company names. 2) Facilities report their source reduction activities by selecting from activities that fall into one of the eight categories listed in the graph legend. "Good operating practices" are defined by four codes in the Reporting Forms and Instructions, which facilities select when submitting their forms. 3) The method to display data for 2012 has been revised to reflect parent companies as of 12/31/2012.

This figure presents the parent companies that reported the most newly implemented source reduction activities in 2013. The parent companies' TRI facilities primarily operate in the following industries:

- Pulp and paper, petroleum refining, and chemicals: Koch Industries
- Chemical manufacturing sector: Valspar, 3M and BASF
- Petroleum refining and chemicals: Shell Oil
- Bulk petroleum industry (store and distribute crude petroleum and petroleum products): Global Partners
- Metal containers: Silgan Holdings
- Steel manufacturing: Nucor
- Chemicals, fabricated metals, and industrial equipment: Illinois Tool Works

- Electric utility: Salt River Project

Good operating practices, such as improving maintenance scheduling and installation of quality monitoring systems, are the most commonly reported source reduction activities for these top 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 activities. Examples include:

- An automotive products manufacturing facility, owned by Illinois Tool Works, reduced the need to flush pipe lines when changing product lines by adding designated pipe lines for specific chemical products. (Process Modification) [facility details]
- By switching from a batch manufacturing process to a continuous process, one 3M Co chemical facility reduced total waste of certain glycol ethers. (Process Modification) [facility details]
- A BASF organic chemical manufacturer reduced its use of nitric acid by implementing more precise delivery methods and improved metering. [facility details]

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

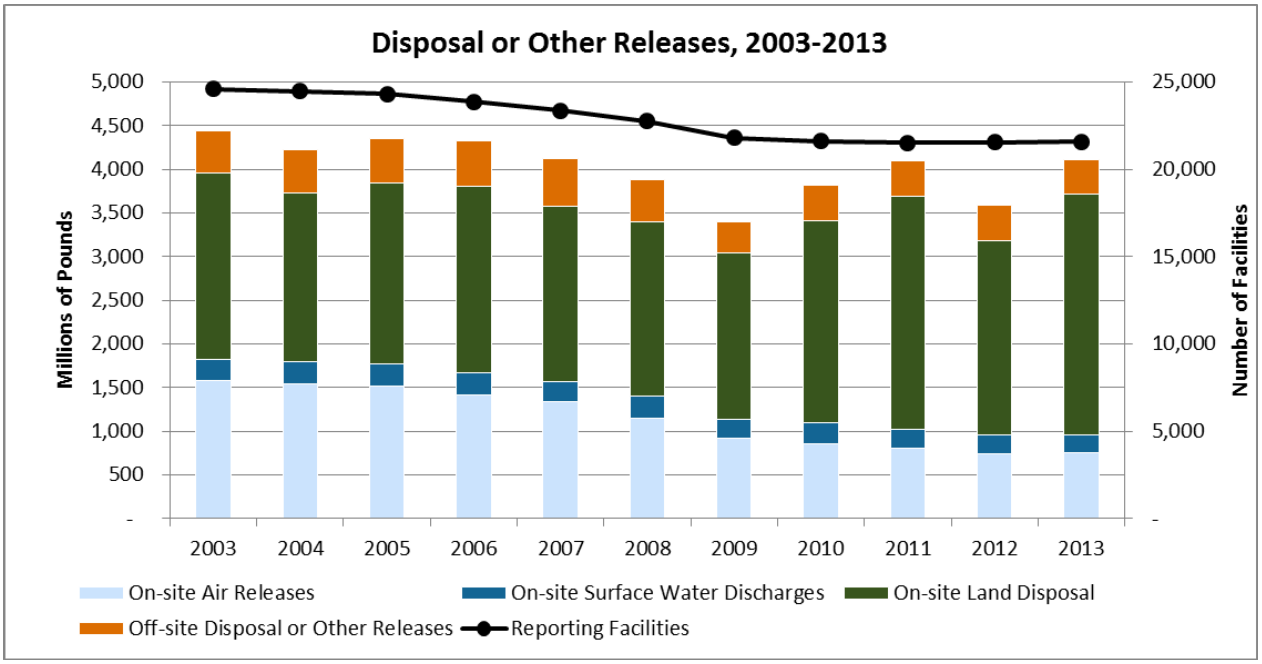
Releases of Chemicals

Disposal or other releases of chemicals into the environment occur through a range of practices. They may take place at a facility as an on-site disposal or other release to air, water, or land; or they may take place at an off-site location after a facility transfers waste that contains TRI chemicals for disposal or other release.

What Is a Release?
In 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.

Evaluating disposal and other releases can help the public identify potential concerns and gain a better understanding of possible hazards related to TRI chemicals. This evaluation can also help identify priorities and opportunities for government and communities to work with industry to reduce toxic chemical disposal or other releases and potential associated risks.

Trend in total releases



This figure shows that total disposal or other releases of TRI chemicals have decreased in the long term: they are down 7% from 2003 to 2013. From 2012 to 2013, there was a 15% increase in total releases due primarily to increases in on-site land disposal by the metal mining sector. The number of facilities reporting to TRI declined 12% from 2003 to 2013, although the count has remained steady at about 21,500 facilities since 2011.

Many factors can affect trends in total disposal or other releases, including production, management practices at facilities, the composition of raw materials used at facilities, and installation of control technologies. The long-term decreases from 2003 to 2013 in releases have been driven mainly by declining air releases, down 836 million pounds (53%) since 2003. Most of this decline is due to decreases in hazardous air pollutant (HAP) emissions, such as hydrochloric acid, at electric utilities. Reasons for the decreases include a shift from coal to other fuel sources and installation of control technologies at coal-fired power plants. As air emissions have accounted for a declining share of the total releases (down from 36% in 2003 to 18% in 2013), the portion of releases that are disposed on land has increased (up from 48% in 2003 to 67% in 2013).

Land Disposal

Trend in land disposal

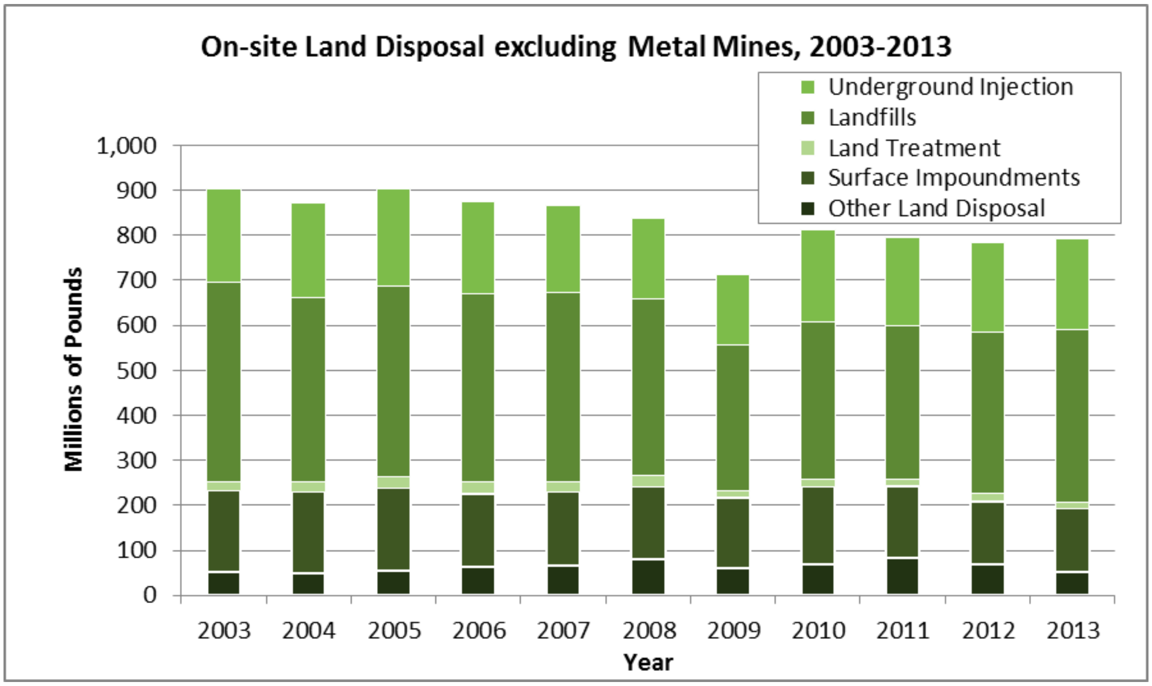
Since 2010, large fluctuations in releases have been driven by changes in on-site land disposal. This figure shows on-site land disposal over time in more detail. From 2003 to 2013, on-site land disposal has increased from 2.42 to 2.75 billion pounds, a 28% increase. Recent fluctuations are primarily due to changes in waste quantities reported to TRI as "other land disposal," which can include chemical waste disposed of in waste piles and spills or leaks. From 2003 to 2013, "other land disposal" increased by 131%, 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. Metal mines accounted for 518 million of the 525 million pound increase in land disposal from 2012 to 2013. For this reason, the next figure presents on-site land disposal excluding metal mining.

Metal mining facilities typically handle large volumes of material. In this sector, 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 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.

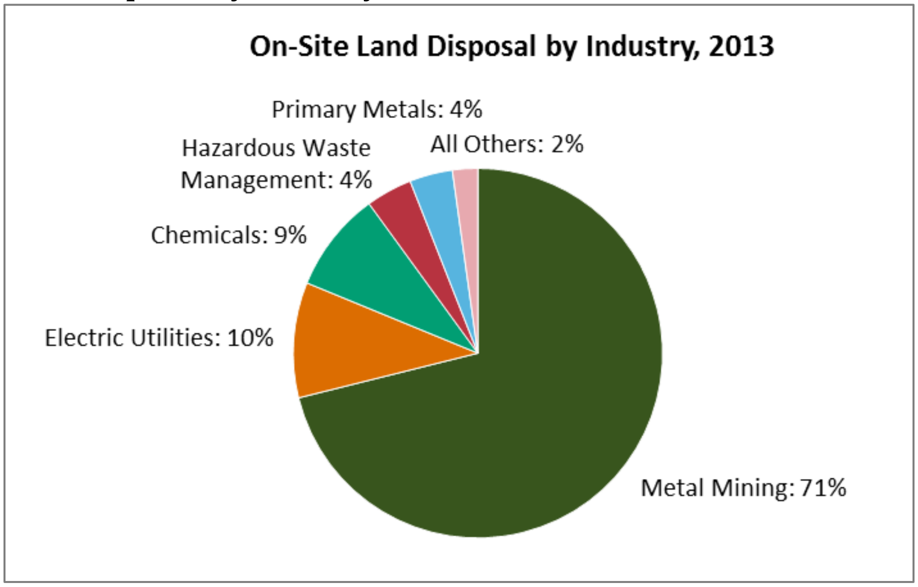
Federal and state agencies require that waste rock be placed in engineered structures that contain contaminants. Federal and state land management agencies also require that waste rock and tailings piles and heap leach pads be stabilized and re-vegetated to provide for productive post-mining land use.

For more information on waste management by the mining industry, see the Metal Mining section.



This figure shows that total on-site land disposal for all industries other than metal mining has decreased from 2003 to 2013 by 12%. Disposal to landfills, which accounts for the greatest percentage of land disposal, decreased by 14% over this time period.
While releases to land have decreased in other sectors, releases by metal mining drive overall land disposal trends. See the following section, land disposal by industry, for more information.

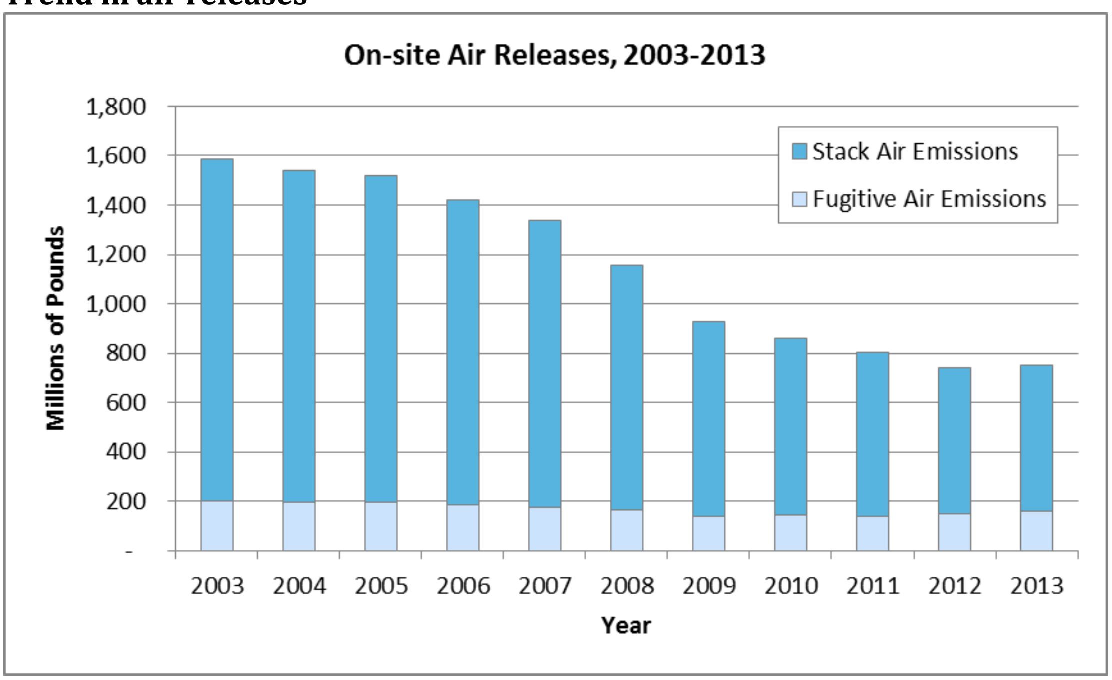
Land disposal by industry



This figure shows that the metal mining sector accounted for the majority of releases to land in 2013. Most releases from metal mines are due to chemicals contained in waste rock. The electric utilities and chemical manufacturing sectors had the next largest releases, accounting for 10% and 9% of total land disposal respectively. On-site releases to land increased from 2012 to 2013 in the metal mining and electric utilities sectors, but remained constant in the chemicals sector.

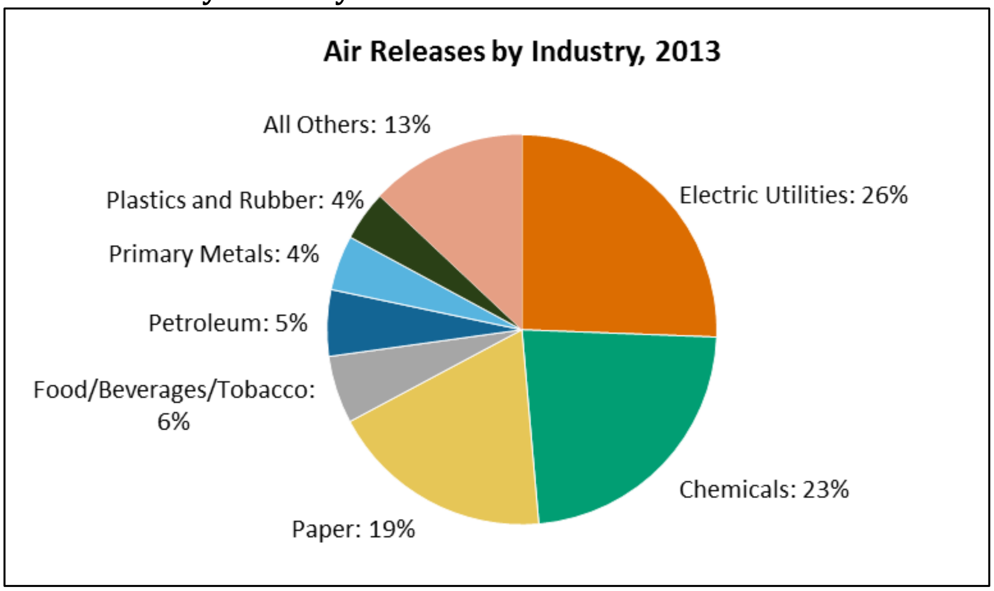
Air Releases

Trend in air releases



This figure shows a significant decline in air releases from 2003 to 2013, which has been a primary driver of the decrease in total releases since 2003. Air releases have decreased by 836 million pounds (53%) since 2003. Most of this decline is due to decreases in HAP emissions, such as hydrochloric acid, at electric utilities. HAP emissions have decreased as electric utilities have shifted away from coal to other fuel sources and installed new control technologies at coal-fired power plants. Air releases of carcinogens have also decreased; see the Air Releases of Carcinogens figure. Air releases of other chemicals of special concern, including lead and mercury, have also decreased since 2003 but have increased since 2012; see the Chemicals of Special Concern section.

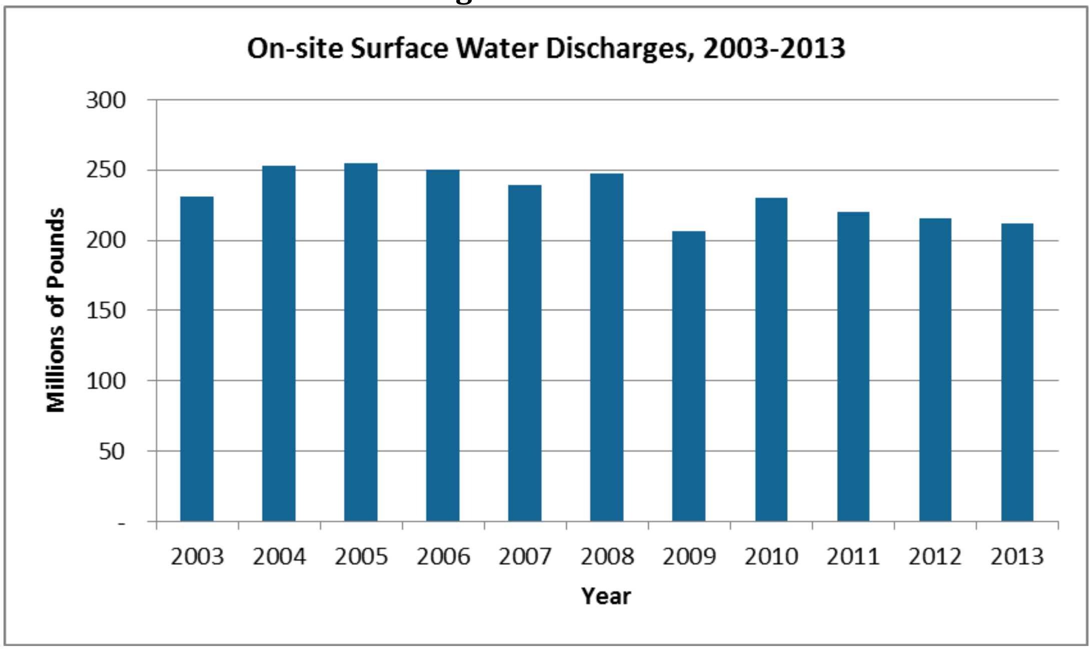
Air releases by industry



The three sectors with the greatest releases to air in 2013 are electric utilities, chemicals, and paper, as shown in this figure. Together, these three industries accounted for almost 70% of total air releases. Air releases by the electric utilities and chemicals sectors have increased slightly since 2012 (3% and 5%, respectively), while releases by the paper sector have decreased slightly (-1%). The chemical with the greatest air releases in 2013 was ammonia, followed by hydrochloric acid.

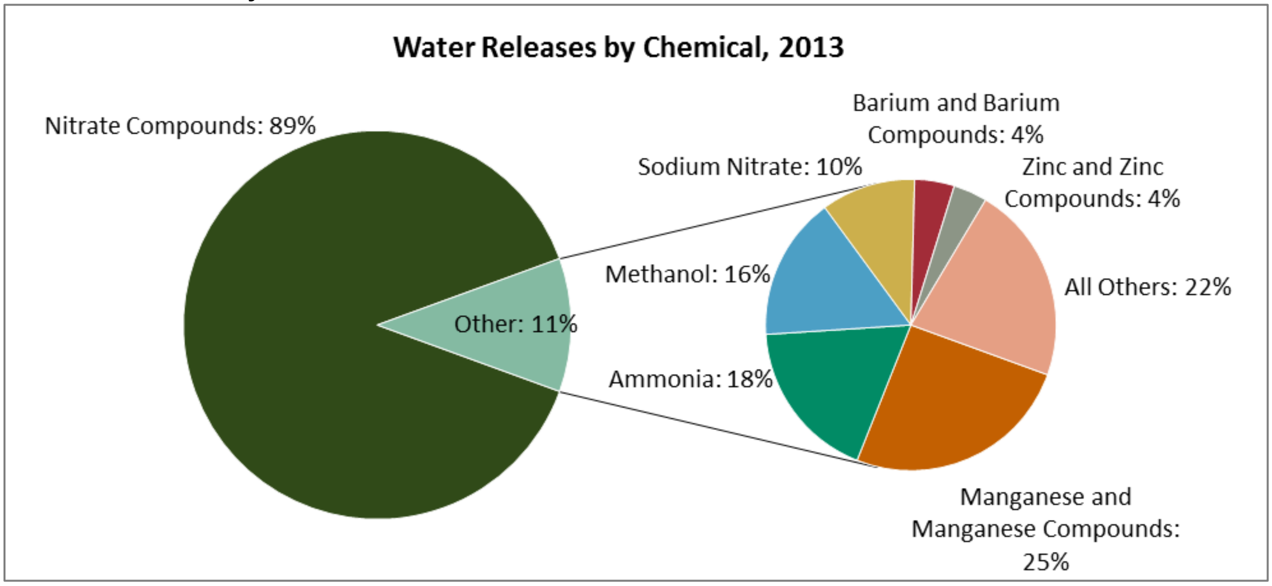
Water Releases

Trend in surface water discharges



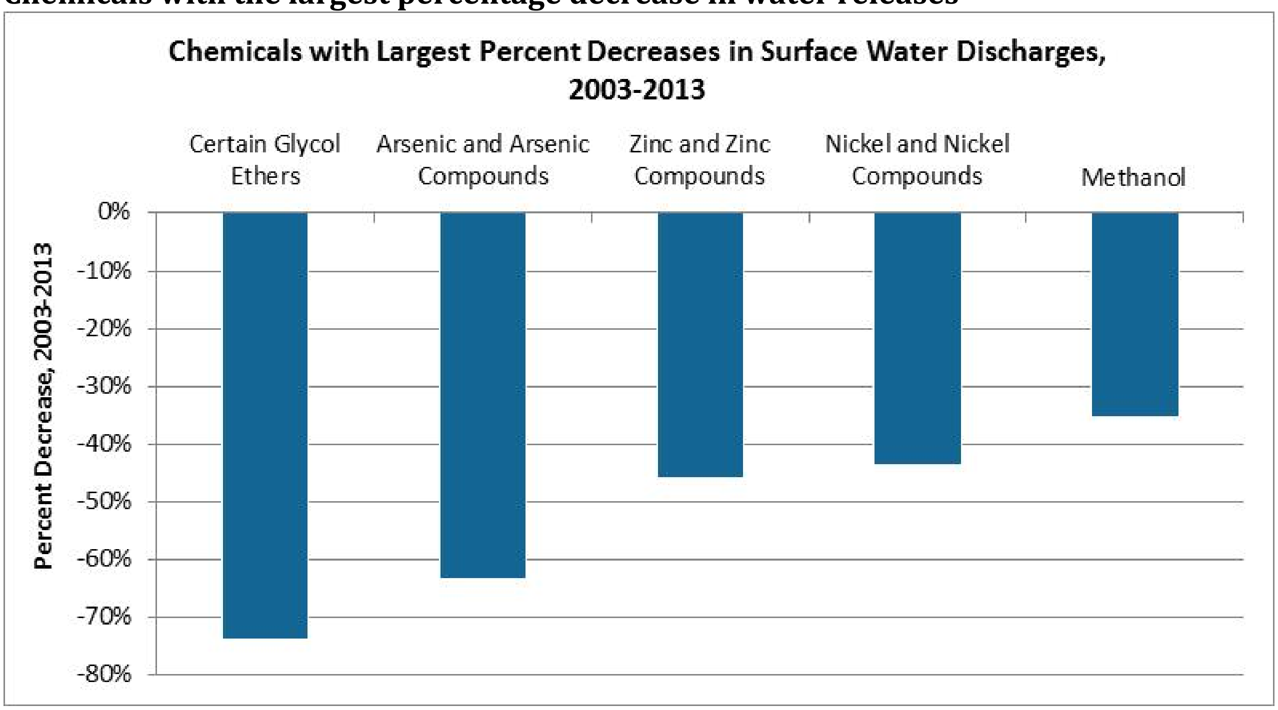
Facilities are required to report the total quantity of TRI chemicals they release to receiving streams or other water bodies. Releases to surface water have decreased by 19 million pounds (8%) since 2003. Most of this decline is due to a decrease in releases of nitrate compounds, the TRI chemical most commonly released to water. In 2013, nitrate compounds accounted for 89% of all surface water discharges. Nitrate compounds are often formed as part of the wastewater treatment process, such as when nitric acid is neutralized. Surface water discharges of nitrate compounds decreased by 7% from 2003 to 2013. Surface water discharges of other TRI chemicals, many of which are more toxic 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.

Water releases by chemical



As shown in this figure, nitrate compounds accounted for 89% of all water releases in 2013. Nitrate compounds are soluble in water and commonly formed as part of wastewater treatment processes. Manganese, ammonia and methanol are the next most commonly released chemicals, and combined account for 7% of 2013 releases to water.

Chemicals with the largest percentage decrease in water releases

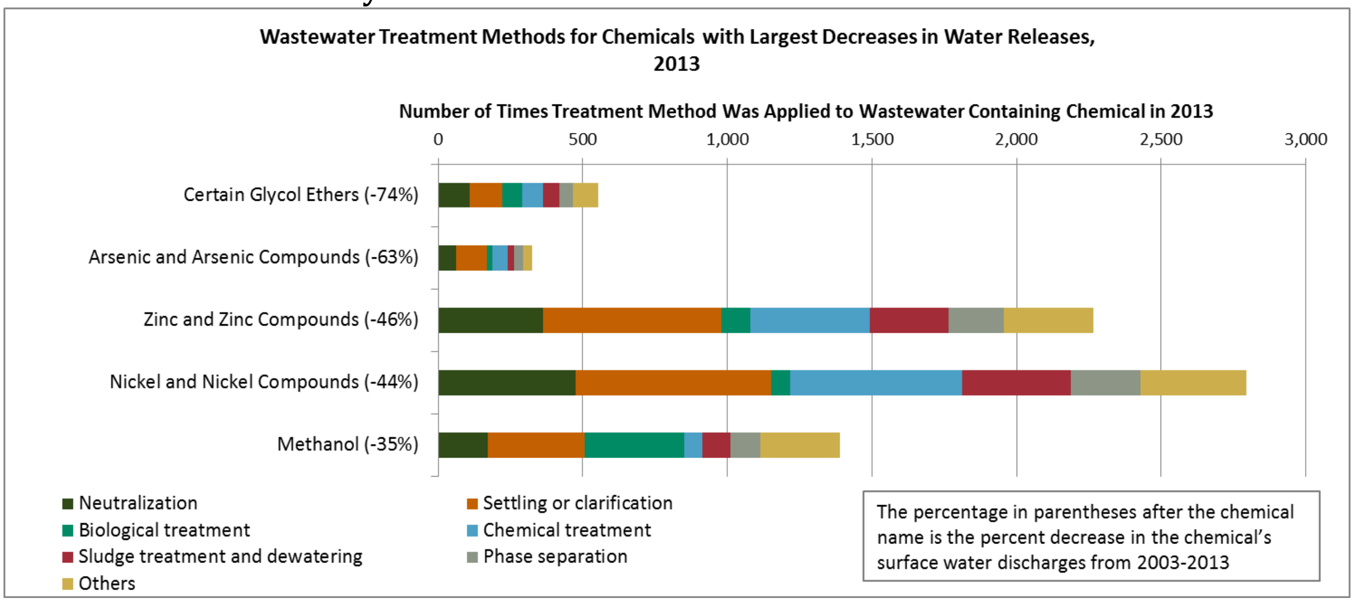


Note: Limited to chemicals with releases to water of at least 100,000 pounds in 2003 and at least 100 current forms with discharges to water.

This figure displays the chemicals with the greatest percentage decreases in surface water discharges from 2003 to 2013. Glycol ethers are commonly used as industrial solvents; methanol is used as a chemical feedstock and other applications; and arsenic, nickel, zinc, and their associated compounds are metals, primarily discharged to surface water by electric utilities and paper manufacturing facilities in 2013. Arsenic and arsenic compound discharges decreased by the greatest quantity, decreasing by 88 million pounds (-63%) from 2003 to 2013.

Facilities can decrease their releases of TRI chemicals to water through source reduction or by improving or installing treatment systems. More information on wastewater treatment methods is presented in the next figure.

Wastewater treatment by chemical



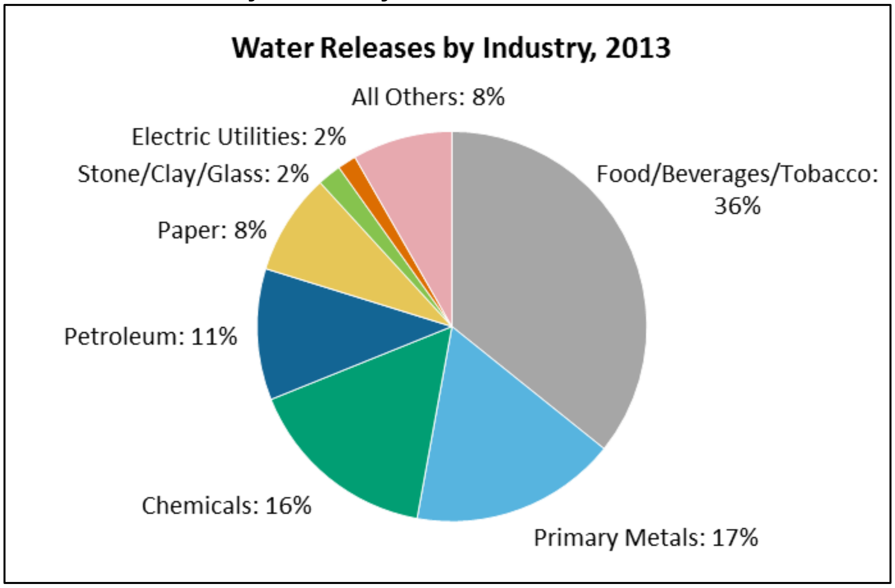
Note: Chemicals with greatest percentage decreases in surface water discharges, 2003 to 2013. Limited to chemicals with releases to water of at least 100,000 pounds in 2003 and at least 100 current forms with discharges to water.

This figure displays the types of wastewater treatment methods applied in 2013 to the chemicals for which water releases have declined at the fastest rate. Many TRI facilities treat a waste stream before release or transfer to reduce the quantities of chemicals that are ultimately released.

Different types of chemicals tend to undergo different on-site treatment methods. For example, metals (arsenic, zinc, nickel, and their compounds) in wastewater are most commonly treated by settling or clarification, whereas solids are removed using sedimentation techniques. While metals cannot be destroyed, they can be removed from the waste stream. Glycol ethers are more commonly treated using biological treatment, which is effective for some non-metals.

TRI facilities report the type and efficiency of waste treatment methods applied on-site to waste streams containing TRI chemicals. Facilities report all treatment methods that the waste stream goes through, even if the method has no impact on removing or destroying a particular chemical. For example, an aggregated waste stream containing metals and acids may go through a neutralization process, which destroys the acid but has no effect on the metals. In this case, neutralization would still be reported as a treatment method for the metal.

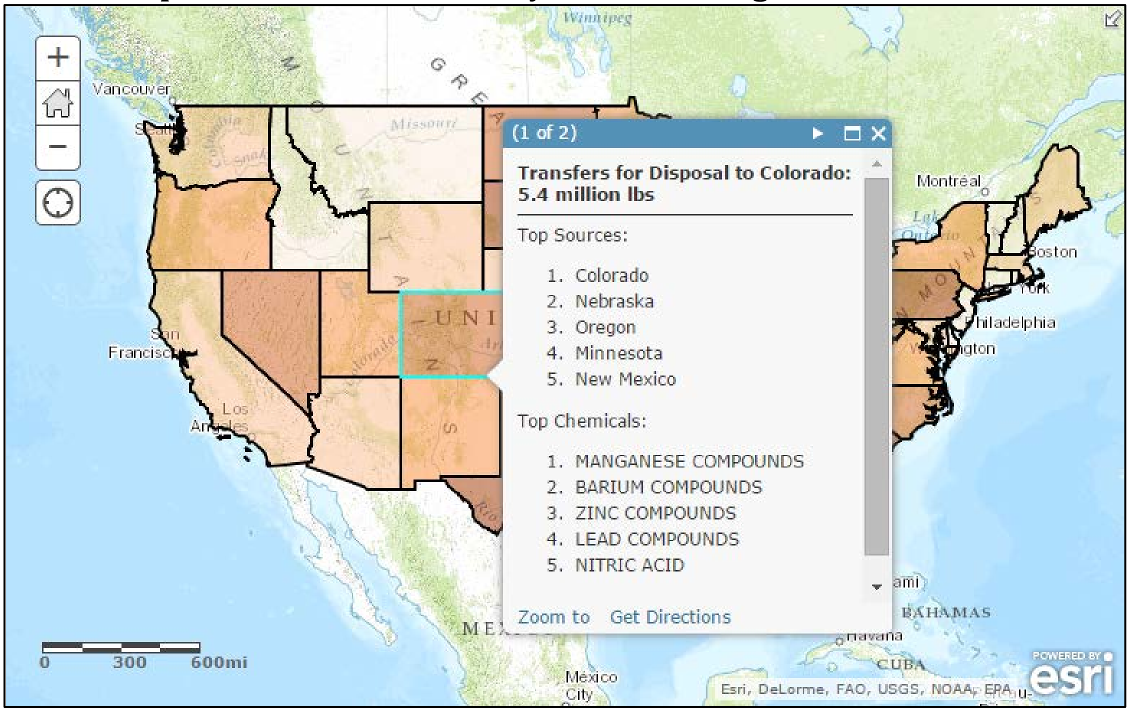
Water releases by industry



The food, beverages and tobacco sector reported the greatest pounds of releases to water in 2013, as shown in this figure. Nitrate compounds accounted for over 98% of releases by this sector. The primary metal and chemical manufacturing sectors reported the next largest releases in 2013, accounting for 17% and 16% of total releases to water respectively.

Off-site Disposal or Other Releases

Off-site disposal or other releases, by state receiving transfer, 2013



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

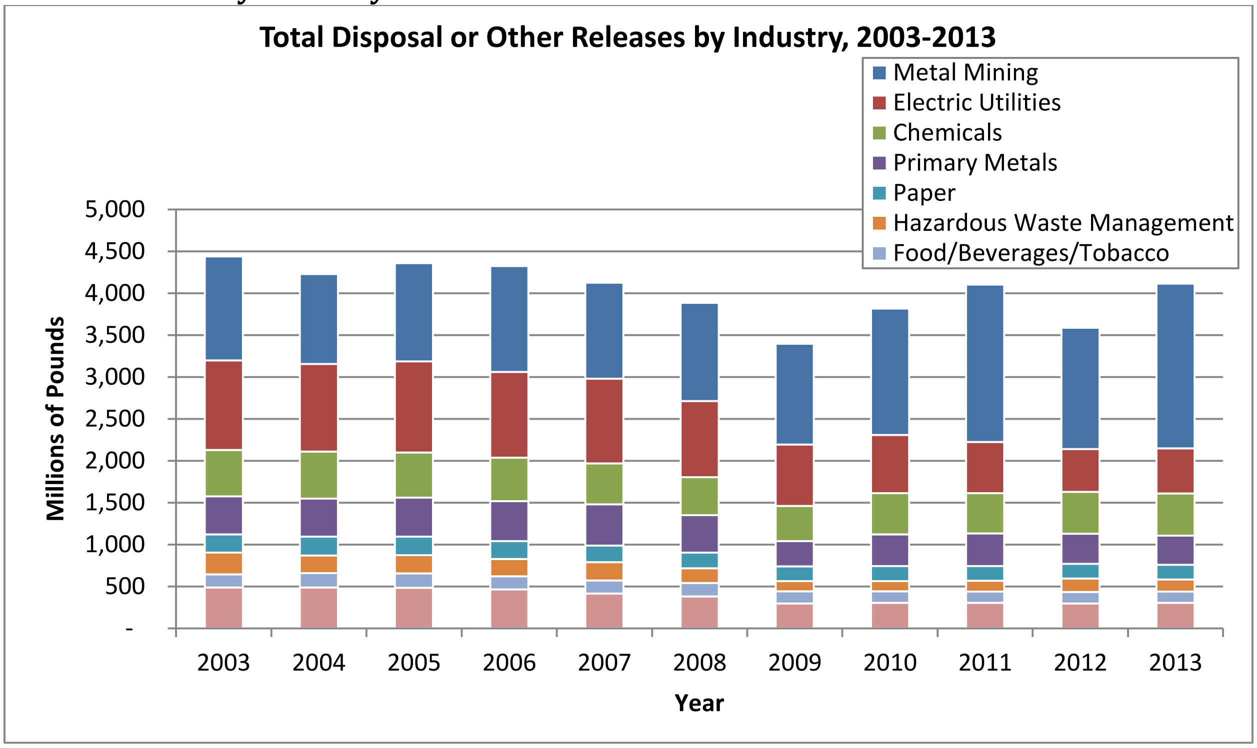
TRI facilities report the quantities of chemicals that they transfer off-site for disposal or further waste management. This map displays the amount of TRI chemicals in waste received for disposal or release by each state in 2013. The Midwest - Indiana, Pennsylvania, Illinois, Michigan, and Ohio - received the majority of TRI transfers for disposal in 2013, making up 52% of such TRI transfers.

Nationally, 83% of TRI transfers were of metals and metal compounds. Zinc, manganese, barium, copper, and lead and their compounds were the top five metals transferred during 2013. The same five states (Indiana, Pennsylvania, Illinois, Michigan, and Ohio) received the majority of metal transfers for disposal. When metals and their compounds are excluded from the analysis, Texas, Indiana, Ohio, Louisiana, and Michigan received the most non-metal transfers for disposal. The top five non-metal TRI chemicals transferred during 2013 were Nitrate compounds, ethylene glycol, methanol, nitric acid, and ammonia.

When looking at the geographic range of TRI transfers, 46 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. In addition, a large number of transfers were from neighboring states (states with directly adjoining borders). Overall, 93% of TRI transfers for disposal came from either the receiving state or from neighboring states.

Releases by Industry

Total releases by industry



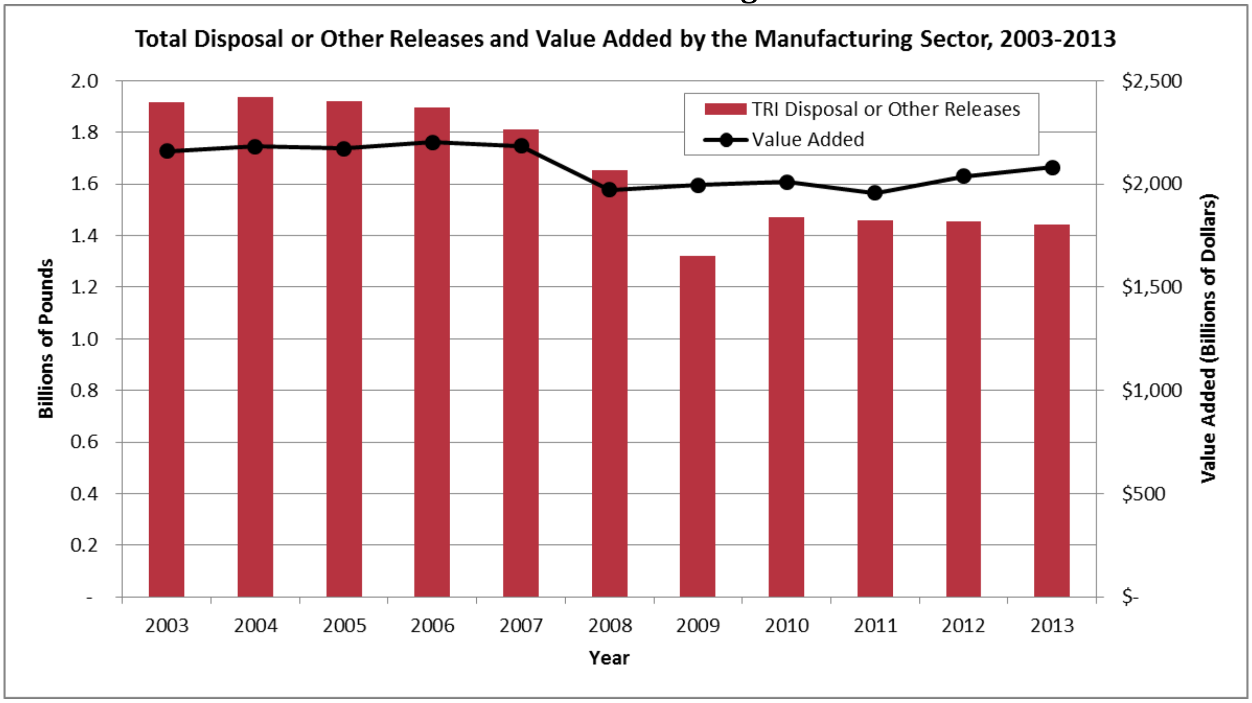
This figure shows the seven industry sectors with the largest disposal or other releases reported in 2013. Total releases from all of the top sectors besides metal mining have decreased since 2003. In the past year, however, three of the seven sectors have shown increased releases:

- Metal mining increased by 519 million pounds (+36% from 2012)
- Electric utilities increased by 29 million pounds (+6%)
- Chemicals increased by 5 million pounds (+1%)

Since 2010, on-site releases to land by metal mining facilities have fluctuated significantly. Metal mines have cited changes in production and changes in the composition of waste rock as the primary reasons for this variability.

Individual industry sectors reporting to TRI can vary substantially in size, scope, and makeup; therefore, the amounts and types of toxic chemicals generated and managed by each differ greatly. Within a sector, however, the industrial processes, products, and regulatory requirements are often similar, resulting in similar toxic chemical use and waste generation. It is useful to look at waste management trends within a sector to identify potential emerging issues. A more detailed analysis of releases and waste management by sector can be found in the industry sector profiles.

Economic trend and releases for the manufacturing sector



It is also important to consider the influence that production and the economy have on the disposal or other releases of chemicals into the environment. This figure presents the trend in total disposal or other releases by the manufacturing sector and the trend in the manufacturing sector's value added (as shown by the solid line). This figure illustrates how changes in production levels at TRI facilities may influence releases. "Value added" from the Bureau of Economic Analysis is used as a proxy for production levels for the manufacturing sector. Value added measures the contribution of manufacturing to the nation's Gross Domestic Product (GDP), which represents the total value of goods and services produced annually in the United States. The manufacturing sector includes most TRI facilities (89% in 2013), including chemical manufacturers, metals processing, and pulp and paper manufacturing. Excluded facilities include mines, electric utilities, and waste management facilities.

From 2003 to 2013, total disposal or other releases by the manufacturing sector decreased by 25%, while value added by the manufacturing sector (adjusted for inflation) decreased by only 4%. This suggests that other factors besides production may be contributing to declining releases. Possible other factors include installation of new pollution control measures and the implementation of source reduction activities.

More information on production trends for individual sectors, including additional non-manufacturing sectors, can be found in the industry sector profiles.

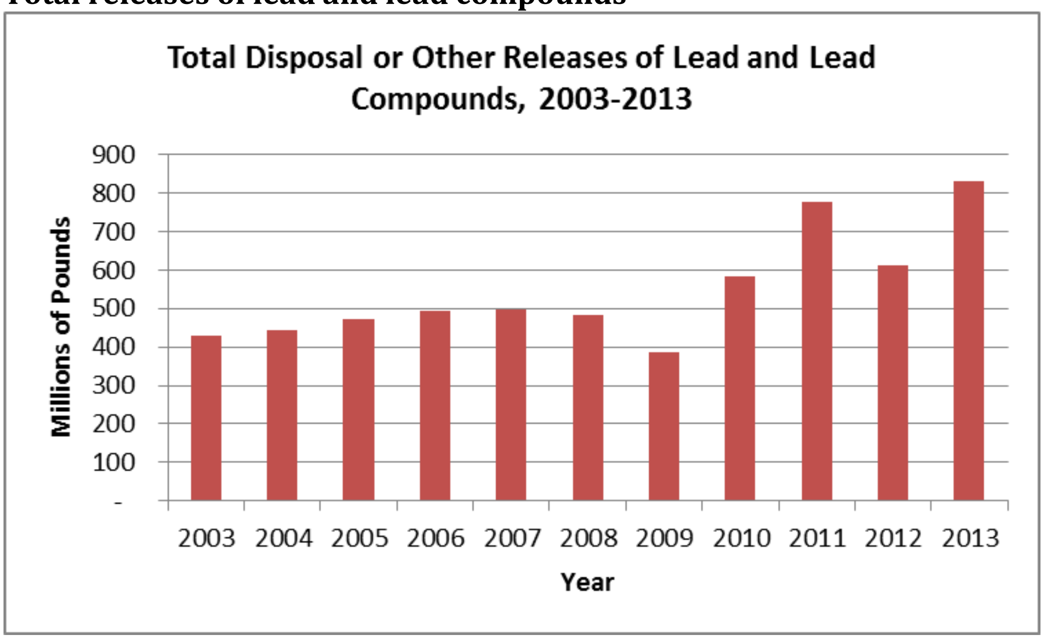
Chemicals of Special Concern

Some chemicals on the TRI list are of special concern because they are highly toxic, persistent in the environment, and accumulate in tissue, or because they may cause a health effect of special concern. Here we take a closer look at some of those chemicals.

Some TRI chemicals and chemical categories have been designated as persistent, bioaccumulative, and toxic (PBT) chemicals. PBT chemicals are of particular concern not only because they are toxic, but also because they remain in the environment for long periods of time, and they tend to build up, or bioaccumulate, in the tissue of organisms. PBT chemicals have lower reporting thresholds than other TRI chemicals. In TRI there are 16 PBT chemicals and 4 PBT chemical compound categories; see TRI's PBT webpage for the full list. In this section we look more closely at: lead and lead compounds; mercury and mercury compounds; and dioxin and dioxin-like compounds.

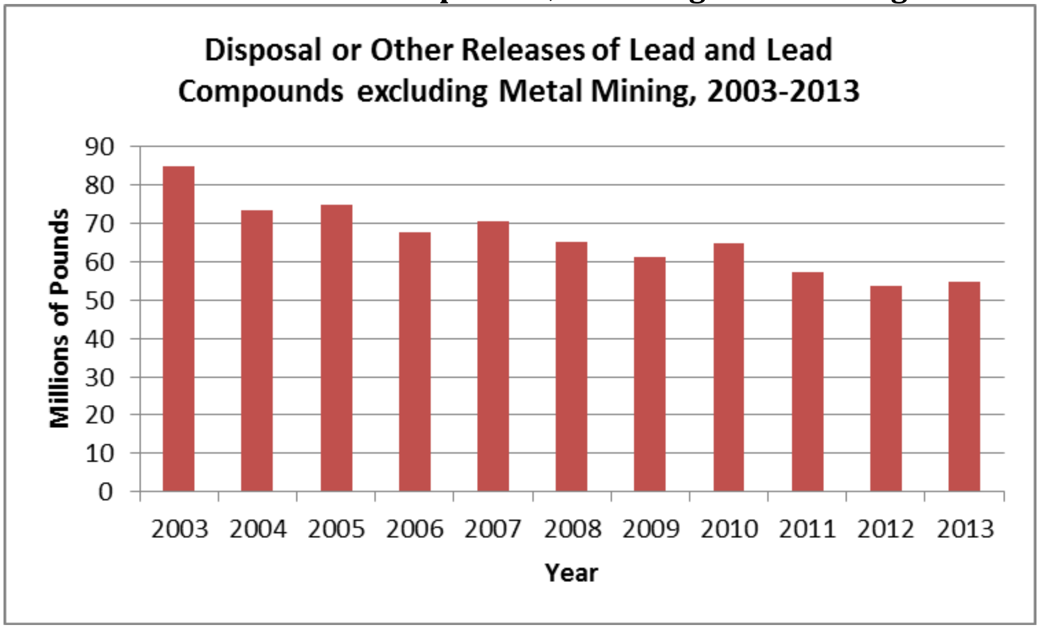
There are also about 180 chemicals in TRI that are known or suspected carcinogens, which EPA refers to as Occupational Safety & Health Administration (OSHA) carcinogens. These chemicals also have different reporting requirements. A full list of these chemicals can be found on the TRI chemicals webpage. In this section we examine how the volume of OSHA carcinogens released to air have changed over time.

Total releases of lead and lead compounds



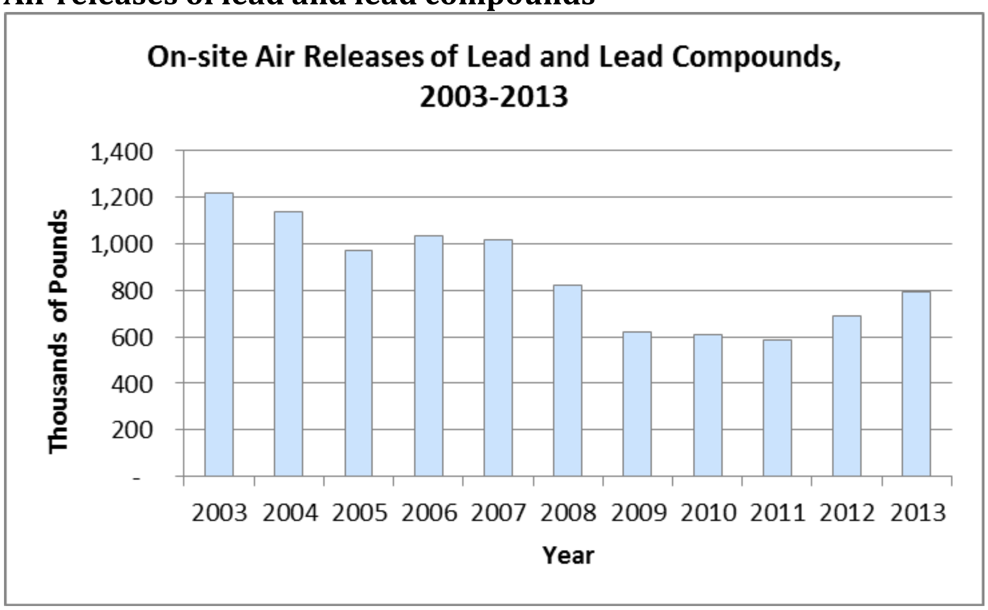
This figure shows the trend in disposal or other releases of lead and lead compounds from 2003 to 2013, with a 93% increase over the time period displayed. Lead and lead compounds accounted for 99% of the total releases of PBT chemicals in 2013 and drive total PBT chemical release trends over time. Total releases of lead and lead compounds rose and fell between 2003 and 2013, and especially fluctuated between 2010 and 2013. Trends have been driven by changes in on-site land disposal or other releases from the metal mining sector. The next figure shows disposal or other releases of lead and lead compounds excluding metal mining.

Releases of lead and lead compounds, excluding metal mining



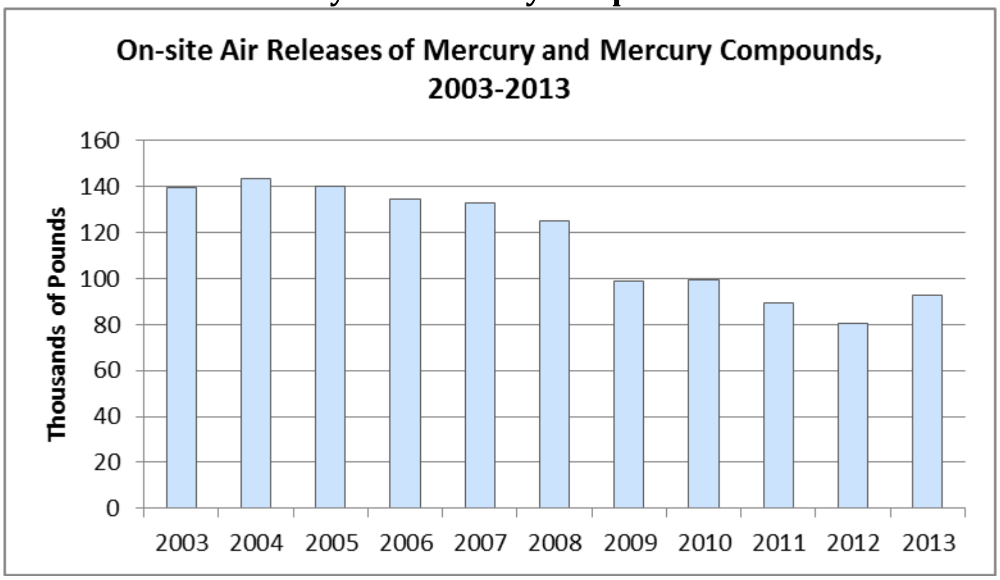
This figure shows the trend in disposal or other releases of lead and lead compounds for all sectors excluding metal mining. It is important to note that metal mining accounts for the majority of releases of lead and lead compounds; in 2013, 93% of total lead releases were reported by metal mines. Releases of lead by other sectors have decreased 35% from 2003 to 2013, as evident in the figure. Decreases have been driven by decreases in the primary metal, hazardous waste, and electric utilities sectors.

Air releases of lead and lead compounds



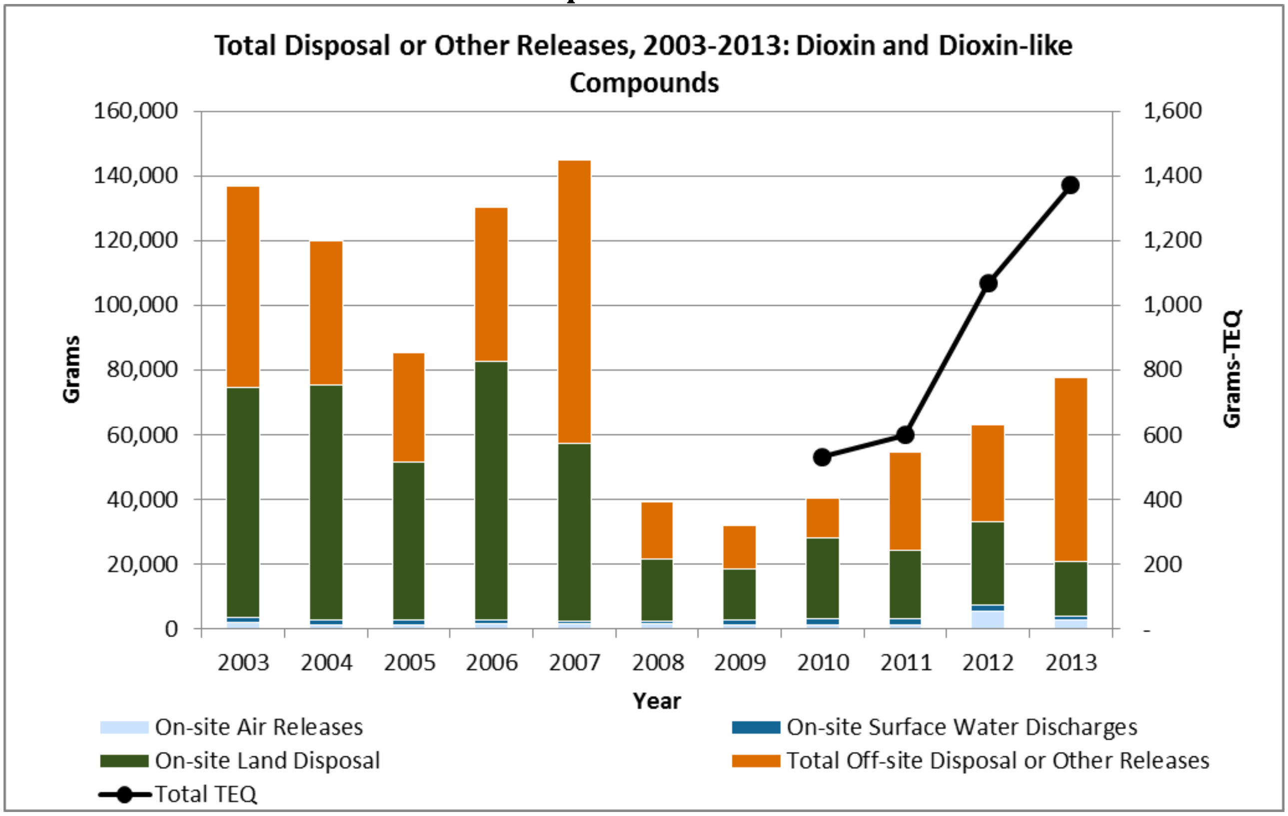
Air releases of lead and lead compounds have decreased by 35% since 2003. This decrease has been driven by electric utilities and metal mines – both sectors have decreased air releases of lead and lead compounds by more than 65%. The sector with the greatest quantity of lead and lead compound air releases is the primary metals sector, which includes iron and steel manufacturers, steel product manufacturers, metal production and processing, and foundries. In 2013, primary metals facilities accounted for almost 60% of air releases of lead and lead compounds. Air releases of lead and lead compounds have increased since 2011 due to large increases in air releases at a textile mill and a lead smelter.

Air releases of mercury and mercury compounds



This figure shows that releases of mercury to air have decreased by 15% from 2003. In the United States, coal-burning power plants are the largest source of mercury emissions to the air. Electric utilities, which include coal- and oil-fired power plants, accounted for 52% of the mercury and mercury compounds air emissions reported to TRI in 2013. This sector is also driving the decline in mercury air emissions, with a 47% reduction since 2003. Reasons for this decrease include a shift from coal to other fuel sources and installation of control technologies at coal-fired power plants. From 2012 to 2013, mercury air emissions increased by 15% (12,000 pounds), primarily driven by increased emissions from concrete manufacturing facilities, while mercury emissions at electric utilities remained constant.

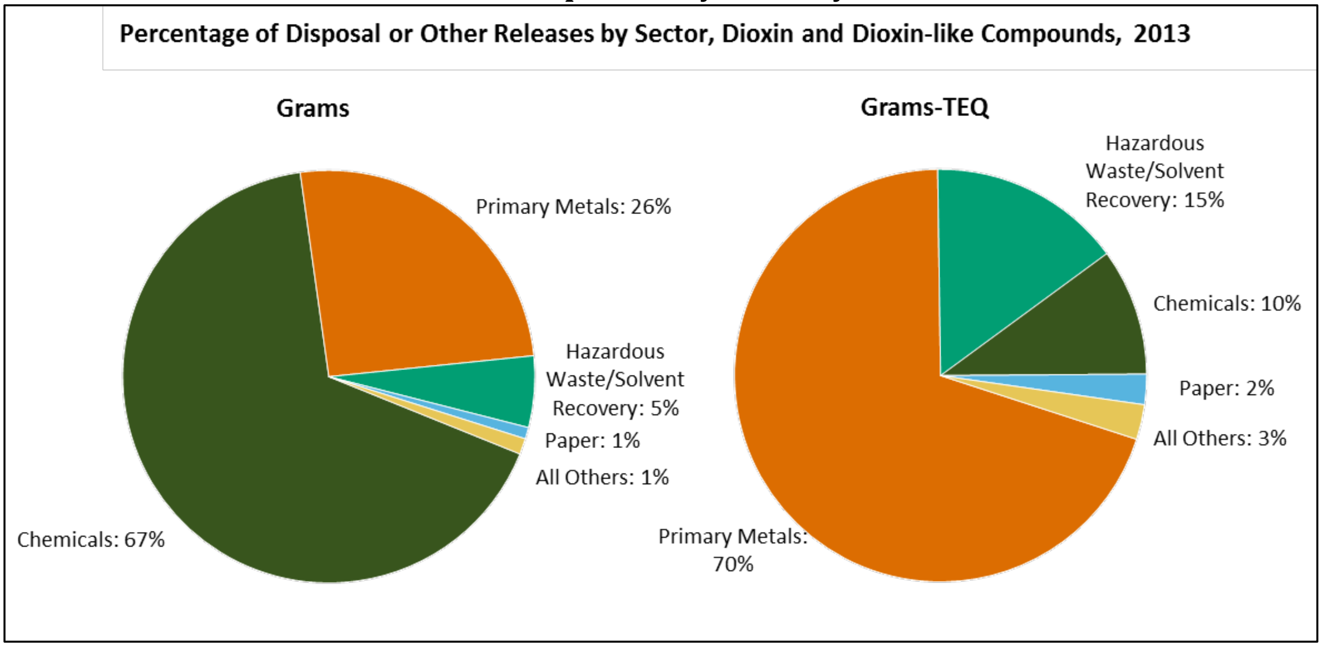
Releases of dioxin and dioxin-like compounds



Dioxin and dioxin-like compounds (dioxins) are PBTs characterized by EPA as probable human carcinogens. Dioxins are the unintentional byproducts of most forms of combustion and several industrial chemical processes. This figure shows the amount of total disposal or other releases of dioxins in grams. Releases of dioxins decreased by 43% from 2003 to 2013, but increased 23% from 2012 to 2013. This increase in 2013 was largely due to an increase in dioxins reported by one chemical manufacturer and one smelting facility. In 2013, most (73%) of the quantity released was disposed of off-site to a landfill.

TRI requires facilities to report on 17 types of dioxin (or congeners). These congeners have a wide range of toxicities. 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 toxicities can be taken into account using Toxic Equivalency Factors (TEFs), which are based on each congener's toxicity. The total grams of each congener can be multiplied by its TEF to obtain a toxicity weight. The results can then be summed 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. Since 2010 grams-TEQ have increased by 159%, while dioxin grams released have increased by 92%. 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.

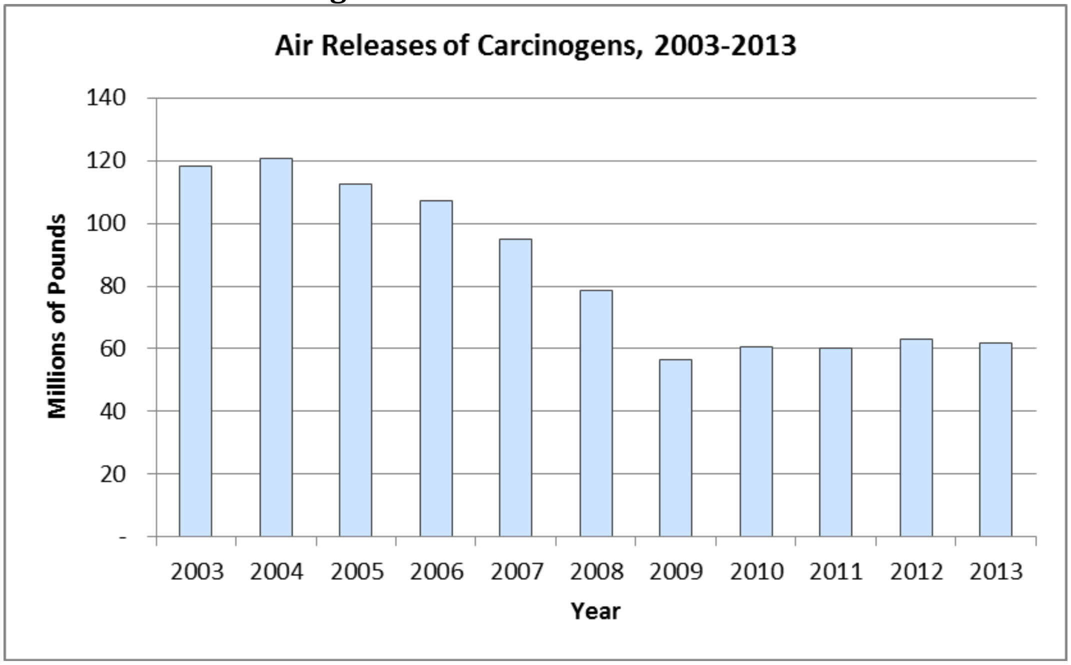
Releases of dioxin and dioxin-like compounds by industry



This figure shows the releases of dioxins in grams and grams-TEQ. Various industry sectors may dispose of or otherwise release very different mixes of dioxin congeners. Four industry sectors accounted for most of the grams and grams-TEQ of dioxins released in 2013; however, their ranking in terms of percentage of total grams and grams-TEQ is quite different.

In 2013, the chemical manufacturing industry accounted for 67% of the total grams of dioxins released, while the primary metals sector accounted for only 26% of the total grams. However, when TEFs are applied, the primary metals sector accounted for 70% of the total grams-TEQ, and the chemical manufacturing industry accounted for just 10%.

Air releases of carcinogens



Among the chemicals that are reported to TRI, there are about 180 known or suspected carcinogens, which EPA refers to as OSHA carcinogens. This figure shows that the air releases of these carcinogens decreased by 48% between 2003 and 2013. 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.

Hazard and Risk of TRI Chemicals

TRI provides information about releases of toxic chemicals from industrial facilities throughout the United States. However, trends in pounds of chemical releases do not account for potential risk of chemical releases. Although TRI cannot tell an individual whether or to what extent they might have been exposed to these chemicals, you can use it as a starting point in evaluating potential risks to human health and the environment.

First, it is helpful to introduce the concepts of hazard and risk. 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. While there are many definitions of the word risk, EPA considers risk to be the chance of adverse effects to human health or to ecological systems resulting from exposure to an environmental stressor (e.g., a toxic chemical).

Human health risk is determined by many factors, including:

- The hazard (or toxicity) of the chemical(s)
- The quantity of the chemical(s)

Helpful Concepts

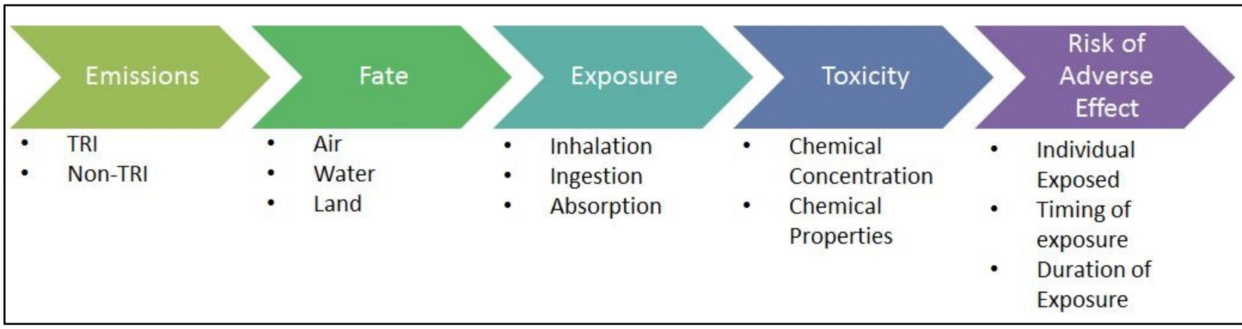
The *hazard* of a toxic chemical is its ability to cause an increased incidence of adverse health effects (e.g., cancer, birth defects). Toxicity is a way to measure the hazard of a chemical.

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.

- The fate of the chemical in the environment
- The route of exposure (inhalation, ingestion, dermal absorption)
- Frequency and length of exposure
- Individual susceptibility (e.g., genetics, life stage, health status)

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. The next figure shows some of the factors that influence an individual's risk from a toxic chemical exposure.

Overview of Factors That Influence Risk



It is important to keep in mind that while TRI captures a significant portion of toxic chemicals in wastes managed, including how chemicals are released by industrial facilities, it does not cover all facilities, all toxic chemicals, or all sources of toxic chemicals in a community. For example, potential sources of chemical exposure that would not be in 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 of disposal or other releases, the TRI Program presents its data from EPA's publicly available Risk-Screening Environmental Indicators (RSEI) model. The RSEI model includes TRI data on on-site releases to air and water, transfers to Publicly Owned Treatment Works (POTWs) and transfers for off-site incineration. Other release pathways, such as land disposal, are not currently included in the RSEI model.

The model produces a hazard estimate and a unitless risk "score," which represents relative chronic human health risk. Each type of result can be compared to results of the same type from other years.

Risk-Screening Environmental Indicators

The RSEI model considers more than just chemical quantities released, including:

- Location of releases
- Toxicity of the chemical
- Fate and transport
- Human exposure pathways
- Number of people exposed

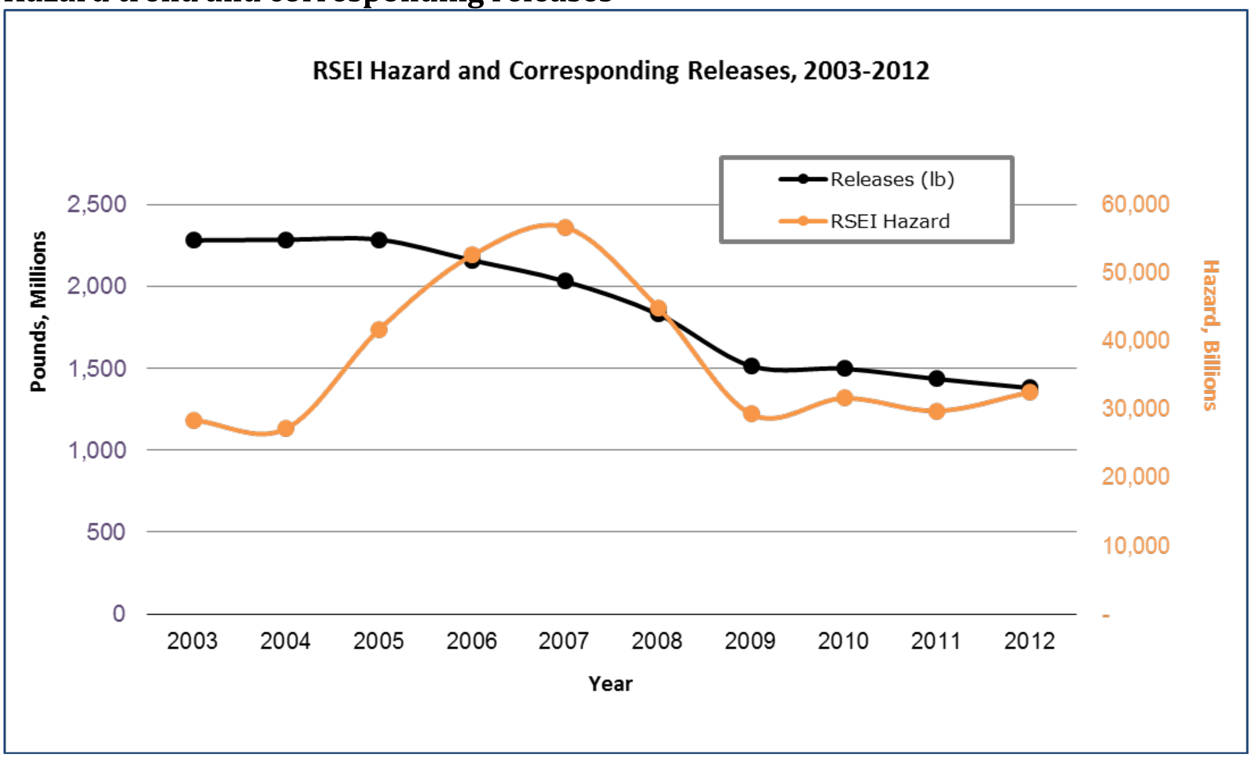
- The hazard estimates consist of the pounds released multiplied by the chemical's toxicity weight. They do not include any exposure modeling or population estimates.

- RSEI risk scores are calculated using on-site releases to air and water, transfers to POTWs, and transfers for off-site incineration as reported to TRI. Note that other release pathways, such as land disposal, are not currently modeled in RSEI. The scores are based on many factors including the amount of the chemical released, the location of the release, the chemical's toxicity, its fate and transport through the environment, and the route and extent of potential human exposure.

RSEI is 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 and produce a simple score. The model should be used for screening-level activities such as trend analyses at the national level that compare relative risk from year to year, or ranking and prioritization of chemicals or industry sectors for strategic planning. RSEI is not a formal risk assessment, which typically requires site-specific information and detailed population distributions to predict exposures for estimating potential health effects. Instead, RSEI is commonly used to quickly screen and highlight situations that may potentially lead to chronic human health risks. Because modeling the exposure of TRI chemicals is time and resource intensive, only RSEI data through 2012 are currently available. More information about the model can be accessed at the RSEI webpage.

Most disposal or other release practices are subject to a variety of regulatory requirements designed to limit environmental harm. To learn more about what EPA is doing to help limit the release of harmful chemicals to the environment see EPA's laws and regulations page.

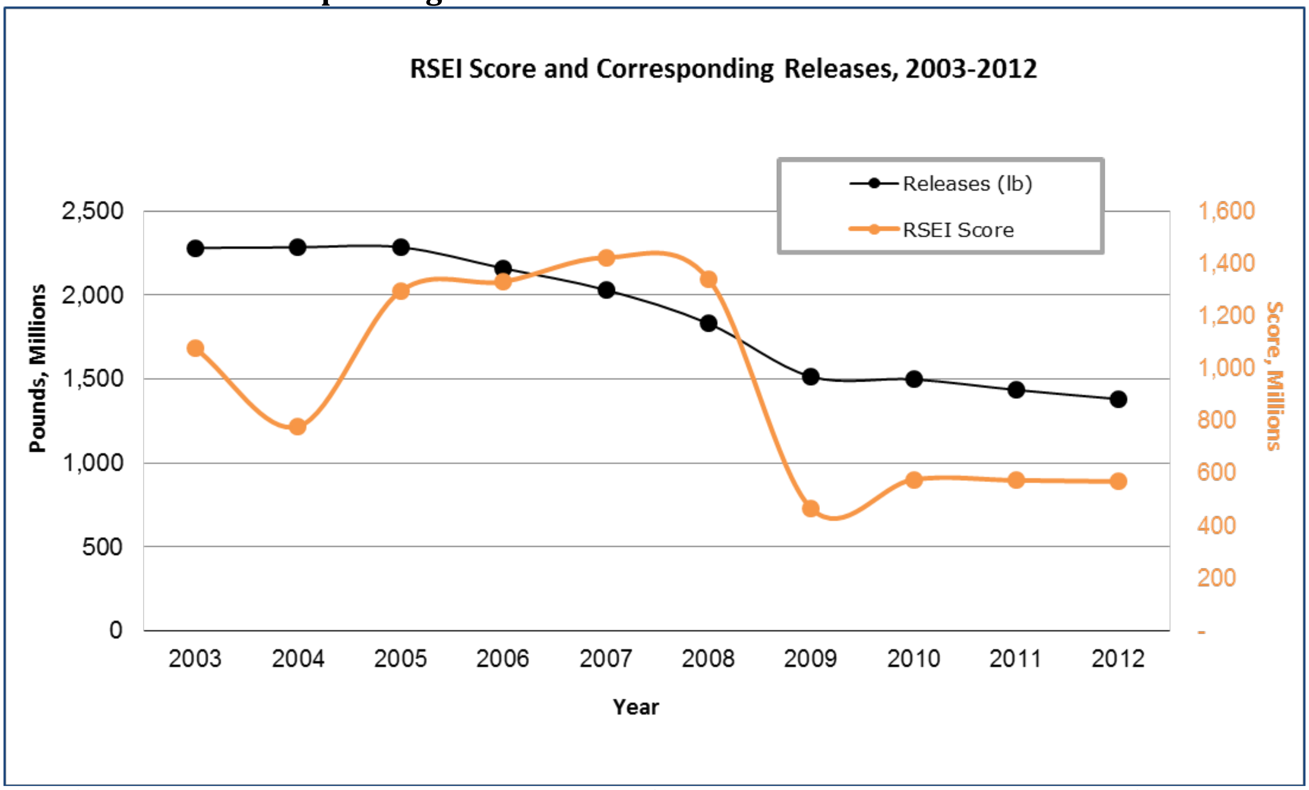
Hazard trend and corresponding releases



Note: Only includes releases currently modeled through RSEI (on-site releases to air and water, transfers to POTWs, and off-site transfers for incineration). RSEI hazard = reported pounds x chemical-specific toxicity weight.

RSEI hazard estimates consider the amounts of chemicals released to air and water from reporting facilities, POTWs or off-site incinerators, and the toxicity of the chemicals. This figure shows RSEI hazard estimates for 2003 through 2012. The increase in the hazard estimate from 2004 to 2007 is driven mainly by an increase in off-site transfers to incineration of diaminotoluene and increased chromium releases to air. Overall, the figure shows that hazard has increased by 14% from 2003 to 2013, while corresponding pounds released have decreased by 40%. This suggests that TRI reporters may be releasing chemicals with relatively higher toxicities in recent years.

Risk trend and corresponding releases



Note: Only includes releases currently modeled through RSEI (on-site releases to air and water, transfers to POTWs, and off-site transfers for incineration).

RSEI also produces unitless risk “scores,” which 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.

This figure shows the trend in the RSEI score from 2003 through 2012. Over this time period, the RSEI score decreased by 47%, while the corresponding pounds released over the same time period decreased by 40%. These results, when considered along with the RSEI hazard trend, suggest that the RSEI score is going down not because of reduced toxicity, but rather because of reduced exposure modeled in RSEI, which may be a result of where the chemical waste is released or how it is being released, such as a shift in the release media.

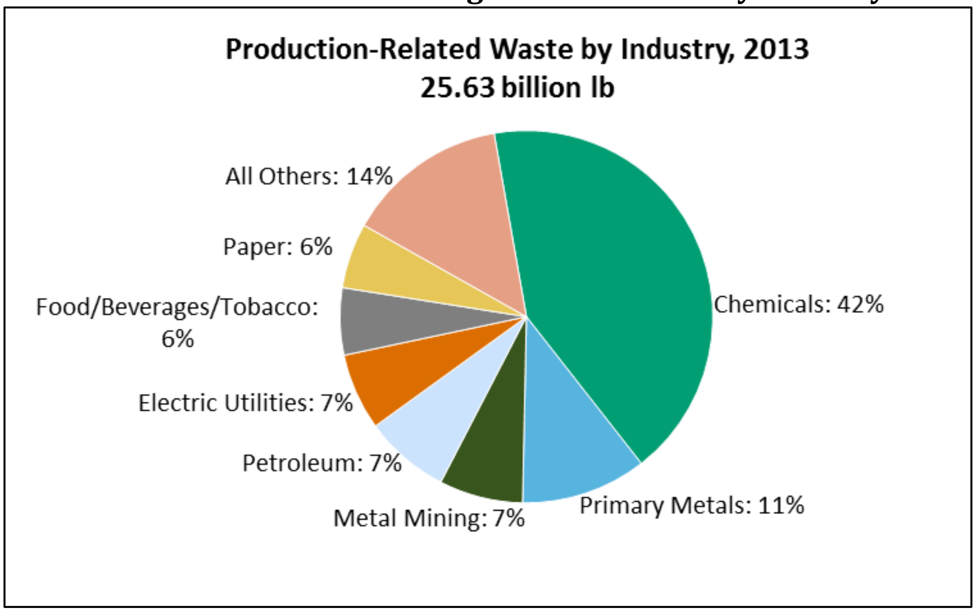
Industry Sectors

Comparing Industry Sectors

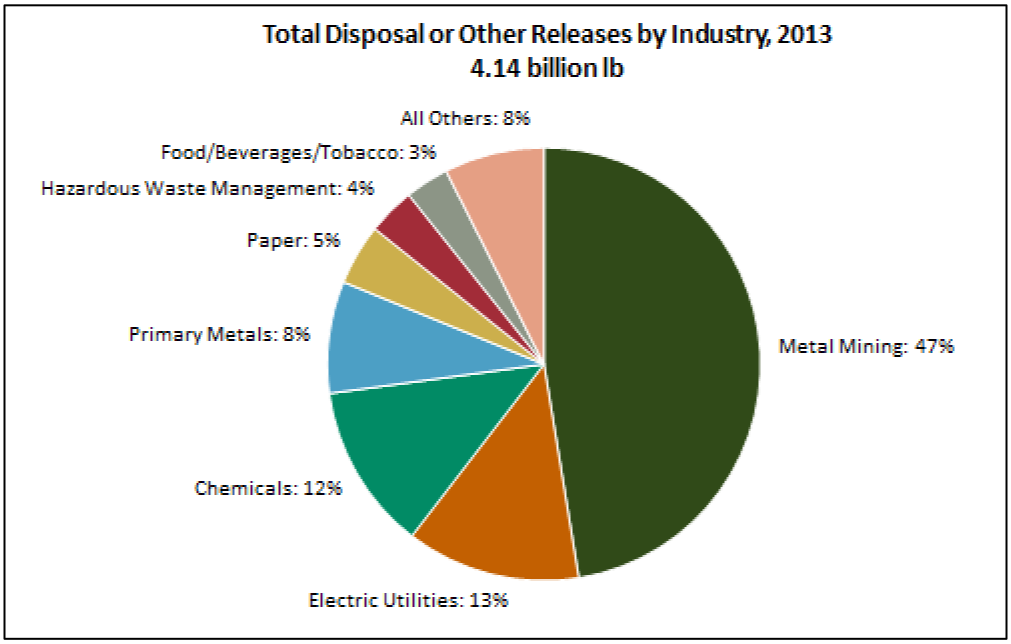
Individual industry sectors reporting to TRI can vary substantially in size, scope, and makeup, therefore, the amounts and types of toxic chemicals generated and managed by each differ greatly. Within a sector, however, the industrial processes, products, and regulatory requirements are often similar, resulting in similar toxic chemical use and waste generation. Therefore, it is useful to look at waste management trends within a sector to identify potential emerging issues and opportunities for better waste management practices.

This chapter examines which sectors contribute the most to production-related waste managed and total disposal or other releases in 2013, and highlights several industry sectors to show trends occurring over time within each. For analysis purposes, the TRI program has combined 3- and 4-digit North American Industry Classification System (NAICS) codes to create 26 distinct industry sector categories.

Production-related waste managed and releases by industry



This pie chart shows that 86% of production-related waste managed was reported from seven industry sectors. More than 60% originated from three sectors: chemicals (42%), primary metals (11%), and metal mining (7%).



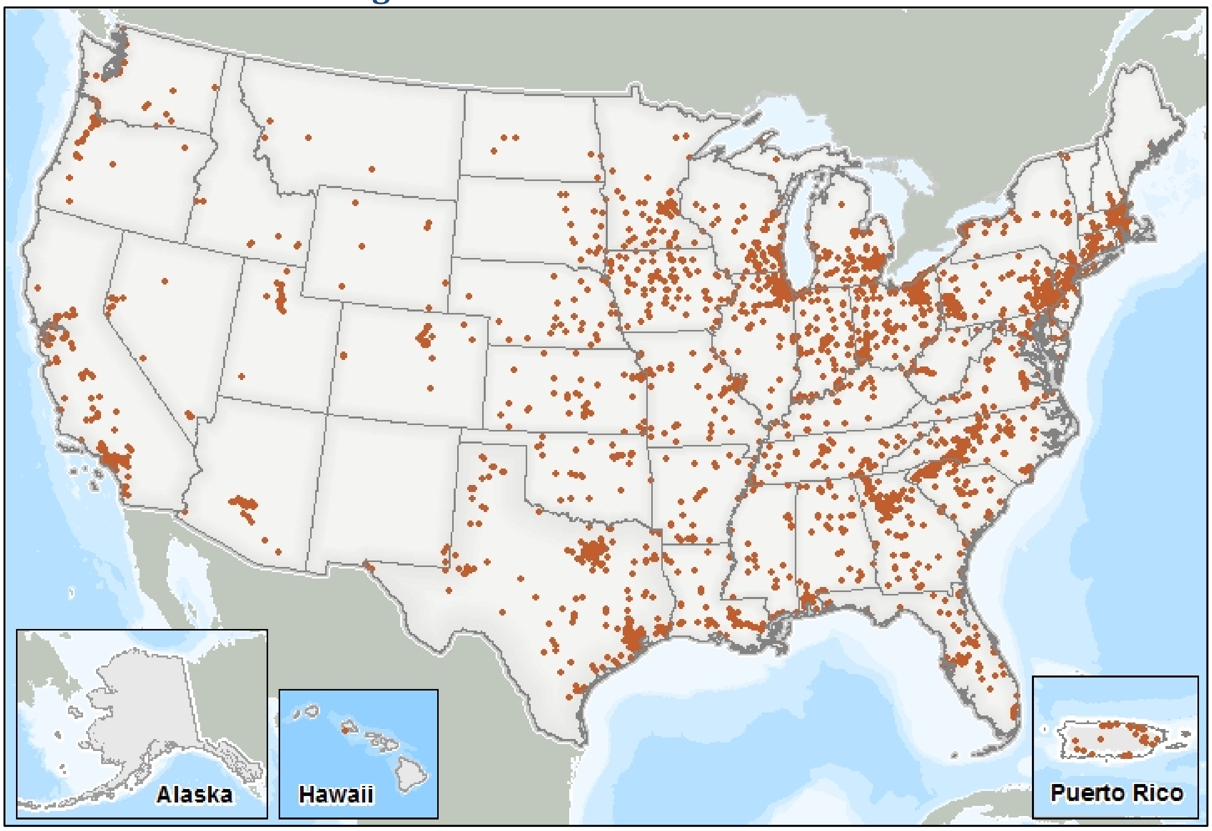
This pie chart shows that 92% of total disposal or other releases of TRI chemicals originated from seven of the 26 TRI industry sectors. Recall that disposal or other releases make up a portion of production-related waste managed, so this chart shows a more in-depth look at the 4.14 billion pounds of releases that are also one part of the 25.63 billion pounds of production-related waste managed. More than two-thirds originated from just three industry sectors: metal mining (47%), electric utilities (13%), and chemicals (12%). Both metal mining and chemical sectors are in the top three for waste management and total releases.

Over time, the amounts and proportions of TRI chemicals managed including how released have varied. For more details, see the production-related waste managed by industry trend graph and the releases by industry trend graph.

Some sectors have reported a significant percentage decrease in production-related waste managed and releases in recent years. For more information on these sectors and their reported source reduction activities, see the industry sectors with largest percentage decrease in releases graph and the types of source reduction activities graph.

It is also important to consider the influence that production and the economy have on waste managed and releases. For more information, see the production-related waste managed and value added by the manufacturing sector graph and the total releases and value added by the manufacturing sector graph.

Chemical Manufacturing



Chemical Manufacturing Facilities Reporting to TRI, 2013

Chemical manufacturers produce a variety of products, including basic chemicals, products used by other manufacturers (such as synthetic fibers, plastics, and pigments), and consumer products (such as paints, fertilizers, drugs, and cosmetics). In 2013, 3,454 chemical manufacturing facilities reported to TRI; more than any other sector. This sector reported 42% of the TRI production-related waste managed; also more than any other sector.

Quick Facts for 2013 Chemical Manufacturing

Number of TRI Facilities: 3,454

Facilities Reporting Newly Implemented Source Reduction Activities: 737

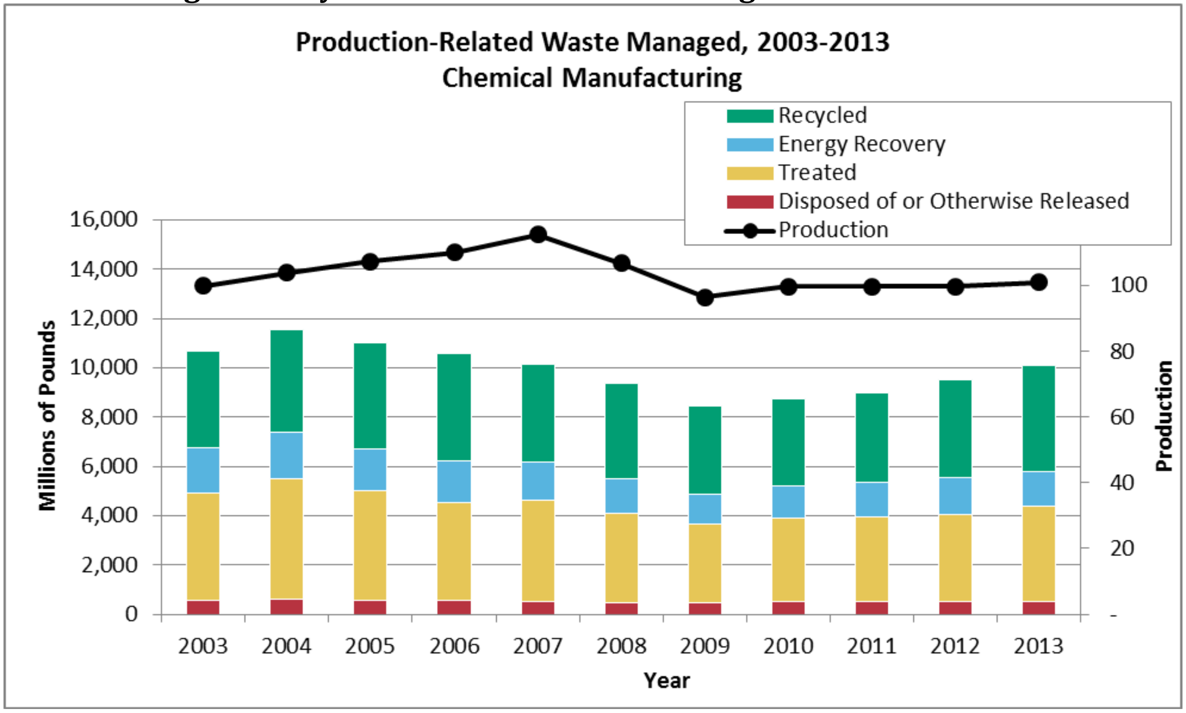
Production-Related Waste Managed: 10,819.1 million lb

- Recycled: 4,375.0 million lb
- Energy Recovery: 1,557.4 million lb
- Treated: 4,364.6 million lb
- Disposed of or Otherwise Released: 522.2 million lb

Total Disposal or Other Releases: 523.3 million lb

- **On-site: 453.8 million lb**
  - Air: 177.9 million lb
  - Water: 34.0 million lb
  - Land: 241.9 million lb
- **Off-site: 69.5 million lb**

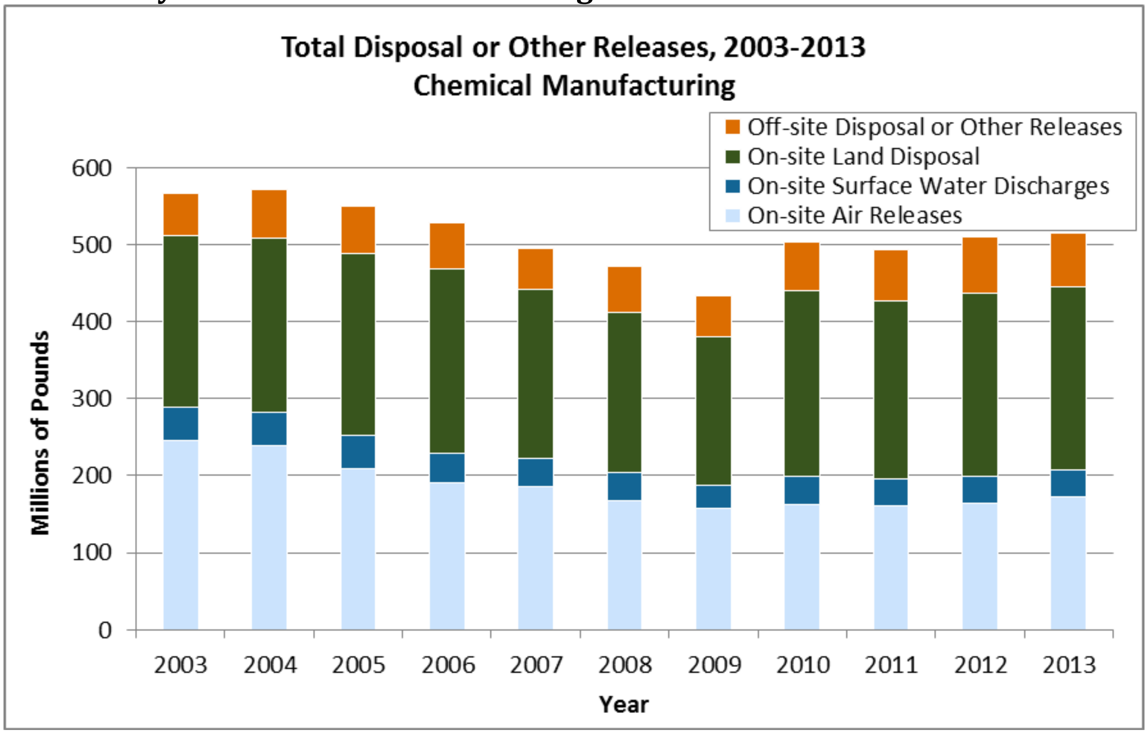
Waste management by the chemical manufacturing sector



This figure shows that production-related waste managed by the chemical manufacturing sector decreased by 5% from 2003 to 2013, while production (represented by the black line as reported by the Federal Reserve Board Industrial Production Index) fluctuated but changed little overall. In 2013, 5% of the sector's waste was released, while the rest was managed through treatment, energy recovery, and recycling. Quantities of waste released, treated, or used in energy recovery have decreased since 2003, while the quantity of waste recycled has increased. From 2012 to 2013, production-related waste managed increased by 9%, primarily due to an increase in treatment and recycling.

Although the chemical manufacturing sector has consistently been the sector with the most production-related waste managed, 21% of facilities in the sector initiated source reduction activities in 2013 to reduce their toxic chemical use and waste generation. The most commonly reported category of source reduction activities for the sector was good operating practices, which includes improving maintenance scheduling, record keeping, and procedures and changing production schedules to minimize equipment and feedstock changes. For example, one facility reported adjusting its production schedule to increase the batch size of zinc products, which reduced the frequency of vessel cleanouts. Other common source reduction activities in the chemical manufacturing sector include process modifications and spill and leak prevention. TRI's Pollution Prevention Search Tool can help you learn more about pollution prevention opportunities in this sector.

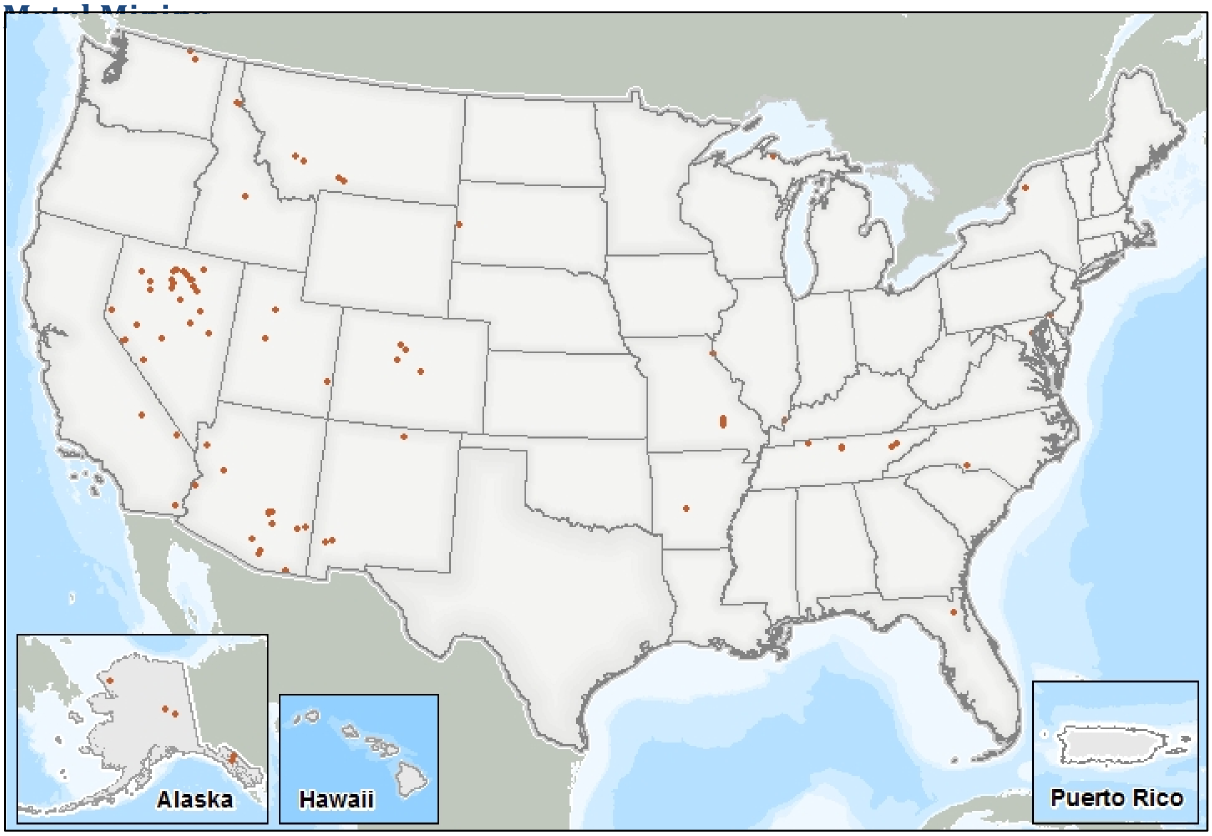
Releases by the chemical manufacturing sector



As shown in this figure, total releases by the chemical manufacturing sector decreased by 9% from 2003 to 2013. This is primarily due to a reduction in air emissions. Water releases have also declined since 2003, while on-site releases to land and off-site disposal have increased slightly. Over the past four years, total releases remained fairly constant with only an increase of 5 million pounds (+1%) from 2012 to 2013. The chemical manufacturing sector had the third-largest quantity of total disposal or other releases in 2013.

For more information on how this sector and others can choose safer chemicals, visit EPA's Design for the Environment Program pages for Alternatives Assessments and the Safer Chemical Ingredients List.

Metal Mining



Metal Mines Reporting to TRI, 2013

The portion of the metal mining sector covered by TRI includes facilities mining for copper, lead, zinc, silver, gold, and several other metals. In 2013, 88 metal mining facilities reported to TRI and 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 electrical and industrial equipment. The extraction and beneficiation of these minerals generate large amounts of waste.

Quick Facts for 2013
Metal Mining

Number of TRI Facilities: 88

Facilities Reporting Newly Implemented Source Reduction Activities: 9

Production-Related Waste Managed: 1,863.4 million lb

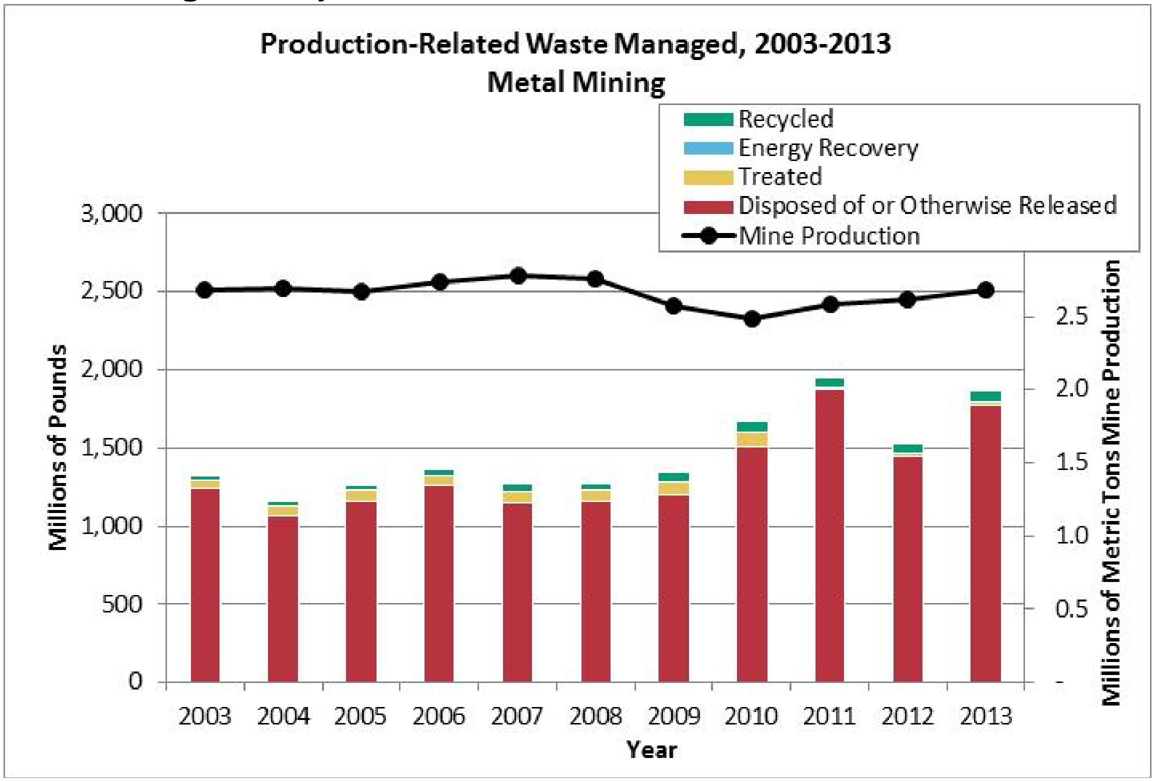
- Recycled: 66.1 million lb
- Energy Recovery: 5 lb
- Treated: 25.2 million lb
- Disposed of or Otherwise Released: 1,772.1 million lb

Total Disposal or Other Releases: 1,966.0 million lb

- **On-site: 1,962.9 million lb**
  - Air: 2.9 million lb
  - Water: 1.3 million lb
  - Land: 1,958.7 million lb
- **Off-site: 3.1 million lb**

Note: The amounts disposed of or otherwise released under Production-Related Waste Managed exclude releases due to catastrophic or other one-time events not related to normal production processes.

Waste management by metal mines

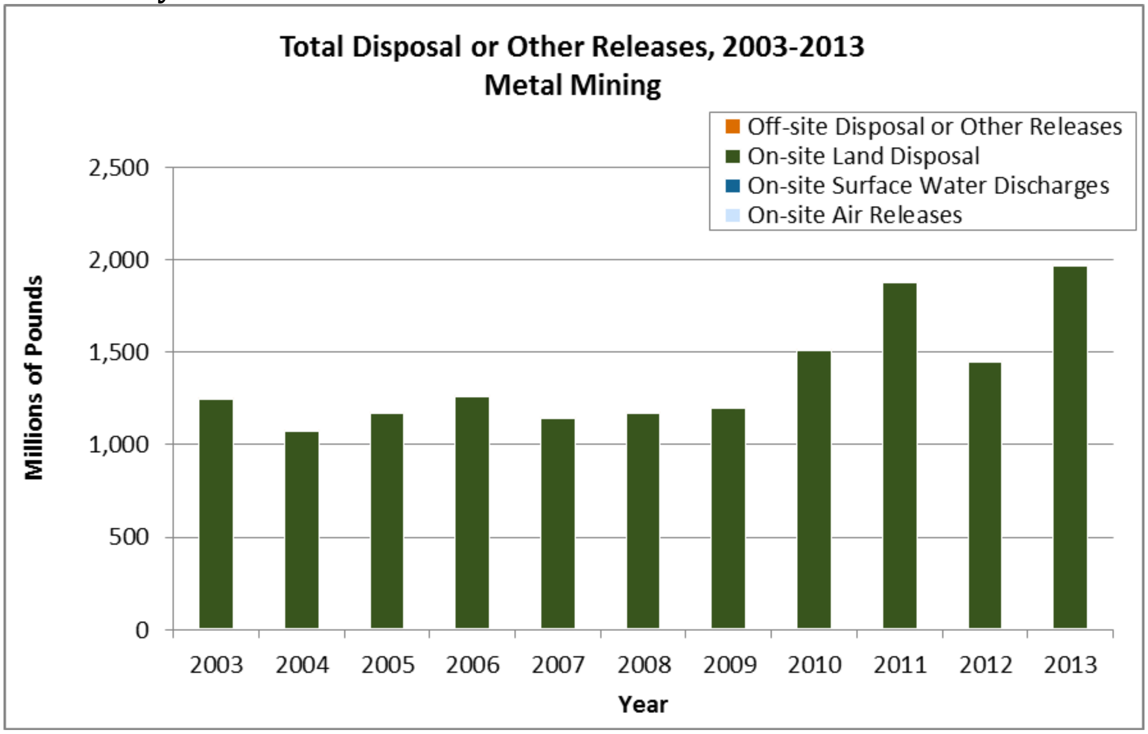


As shown in this figure, 95% of the metal mining sector's production-related waste managed is disposed of or otherwise released. While metal mining production (as reported in the U.S. Geological Survey Mineral Commodities Surveys) has remained relatively steady from 2003 to 2013, as shown by the black line in the graph, the quantity of waste managed has fluctuated. This indicates that factors other than production have contributed to the recent changes in quantities of waste managed. One factor frequently cited by facilities 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. Large quantities of toxic chemicals in waste rock may qualify for the exemption and not need to be reported in one year, but not qualify for the exemption the next year or vice versa.

In the metal mining sector, 9 of the 88 facilities initiated source reduction activities in 2013 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 improving maintenance scheduling, record keeping, or procedures.

To learn more about this sector, visit EPA's website on reducing pollution from mineral processing operations.

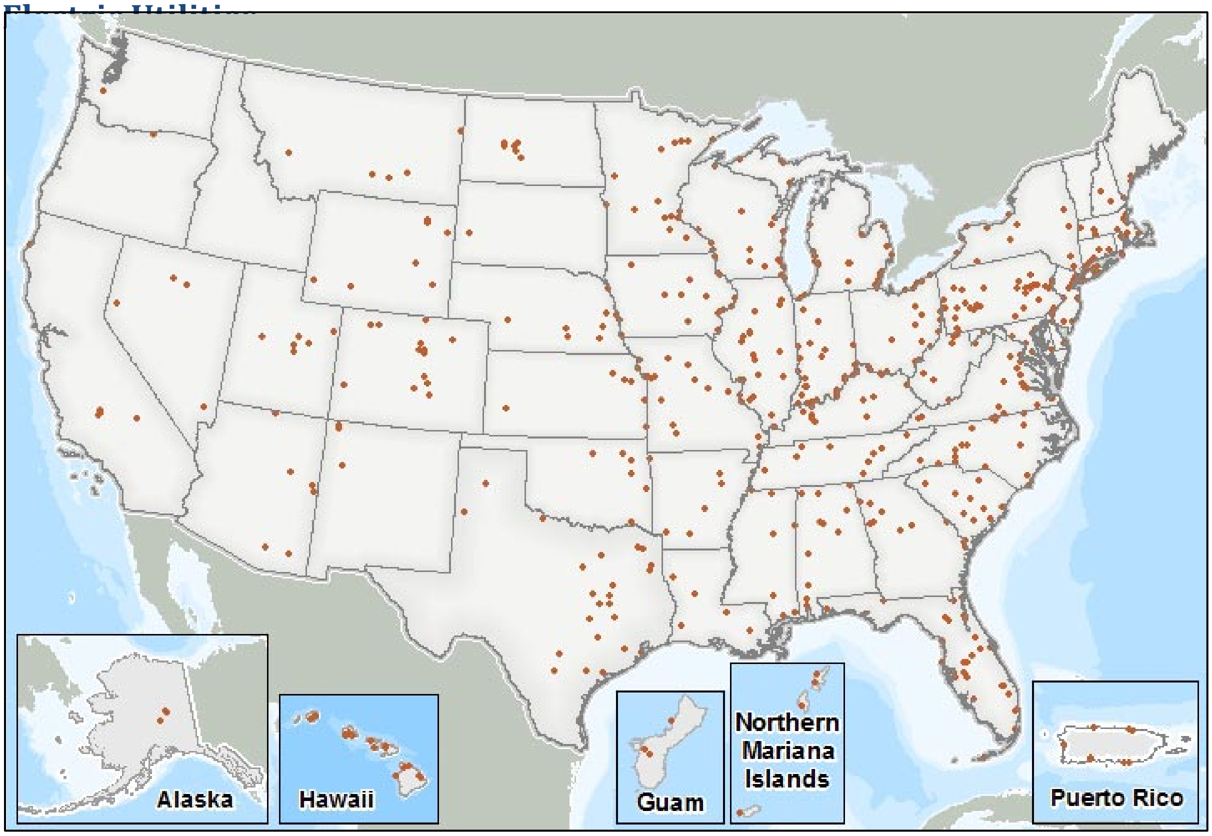
Releases by metal mines



The metal mining sector's total disposal or other releases reflect the high volume of materials managed on-site at metal mines. As shown in this figure, more than 99% of the sector's releases are on-site land disposal. On-site land disposal by metal mines has fluctuated in recent years, decreasing significantly in 2012 and then increasing again in 2013. Several mines have reported that changes in production and changes in the chemical composition of the deposit being mined are the primary cause of these 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 2013, the metal mining sector reported the largest quantity of total disposal or other releases, accounting for 47% of the releases for all industries. It also represents almost three quarters (71%) of the on-site land disposal for all sectors in 2013.

Electric Utilities



Electric Utilities Reporting to TRI, 2013

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 those that combust coal or oil to generate power for distribution in commerce must report to TRI. There are 567 electric generating facilities.

Quick Facts for 2013
Electric Utilities

Number of TRI Facilities: 567

Facilities Reporting Newly Implemented Source Reduction Activities: 17

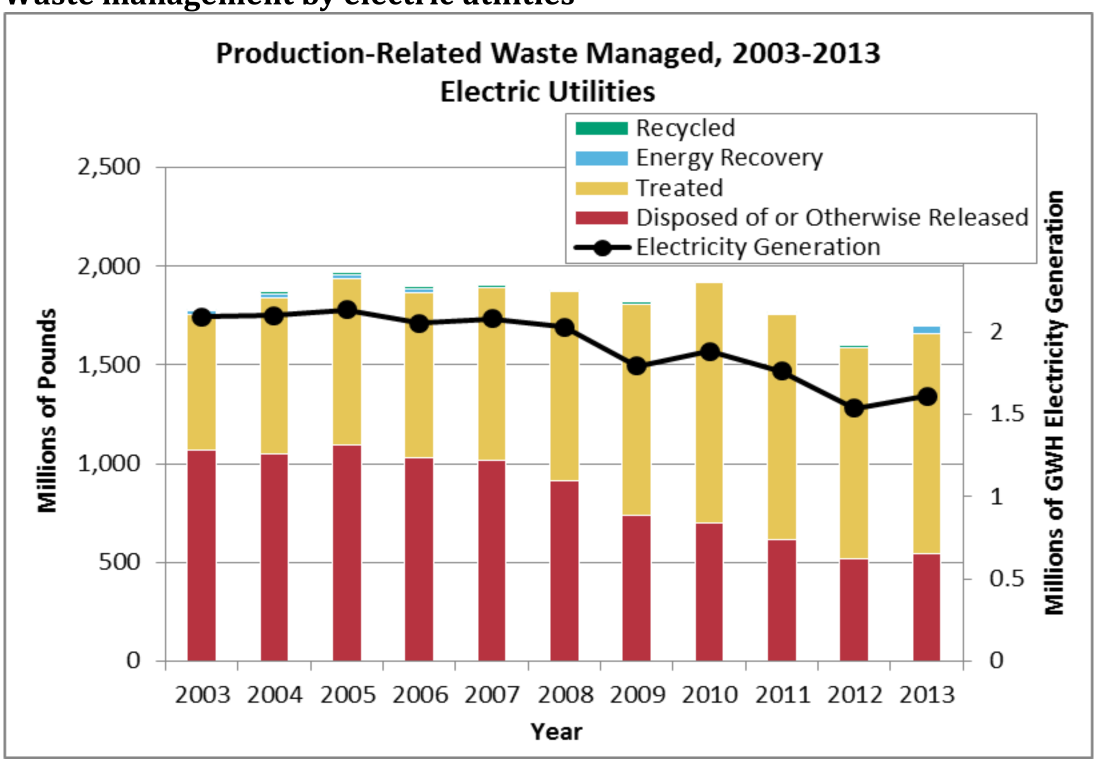
Production-Related Waste Managed: 1,705.6 million lb

- Recycled: 7.3 million lb
- Energy Recovery: 38.9 million lb
- Treated: 1,112.4 million lb
- Disposed of or Otherwise Released: 547.0 million lb

Total Disposal or Other Releases: 547.9 million lb

- **On-site: 479.1 million lb**
  - Air: 197.9 million lb
  - Water: 3.3 million lb
  - Land: 277.8 million lb
- **Off-site: 68.8 million lb**

Waste management by electric utilities

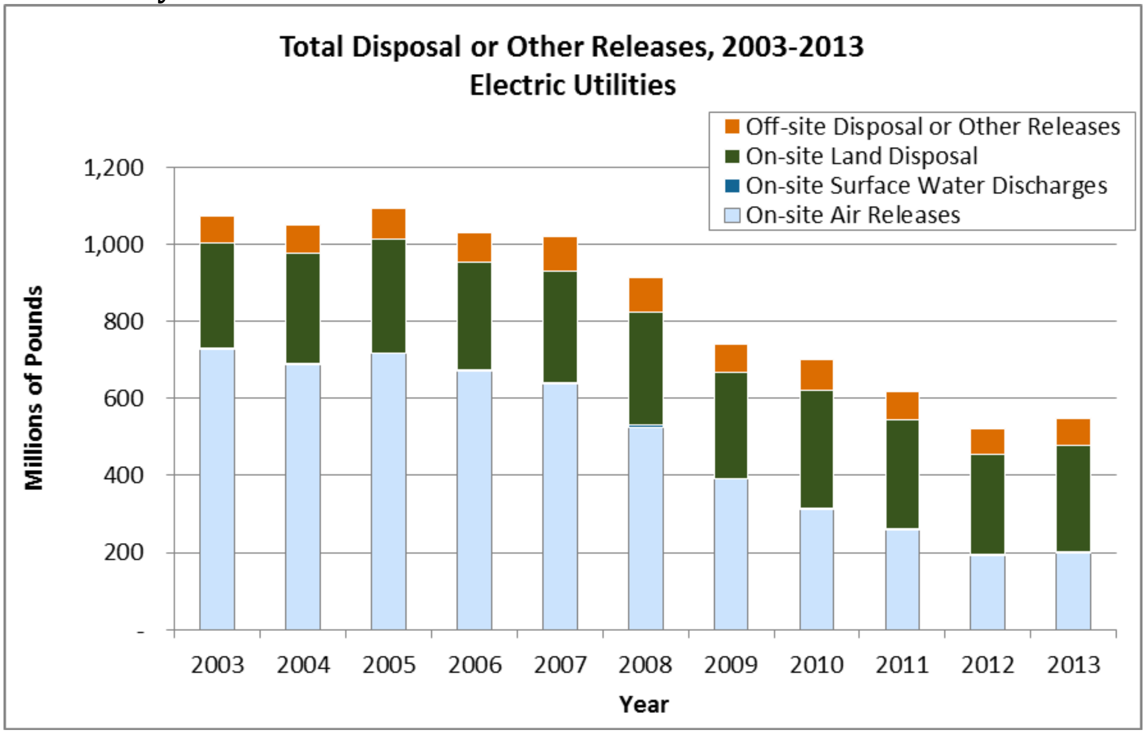


Production-related waste managed has decreased by 4% since 2003, while net electricity generation (in terms of electricity generated using coal and oil fuels as reported by the U.S. Department of Energy's Energy Information Administration), has decreased by 23%. The recent production decrease is driven by the industry's transition to natural gas, which exempts many electric utilities from TRI reporting. While the overall quantity of production-related waste managed has not significantly changed, the ways in which the sector manages this waste have changed considerably.

In 2013, approximately two-thirds of production-related waste managed was treated, while approximately one-third was released. This is in contrast to 2003, when the opposite was the case – almost two-thirds of the waste was released, and over one-third was treated. This trend is in large part due to an increase in the number of scrubbers at electric utilities that treat (or destroy) acid gases that would otherwise be on-site air releases. The releases per gigawatt-hour (GWH) produced have dramatically decreased, offset by an increase in quantities treated per gigawatt-hour produced.

In the electric utilities sector, only 3% of facilities initiated source reduction activities in 2013 to reduce their toxic chemical use and waste generation. (Note: Adding a scrubber would not be considered a source reduction activity because it controls waste rather than preventing waste generation.) The most commonly reported type 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.

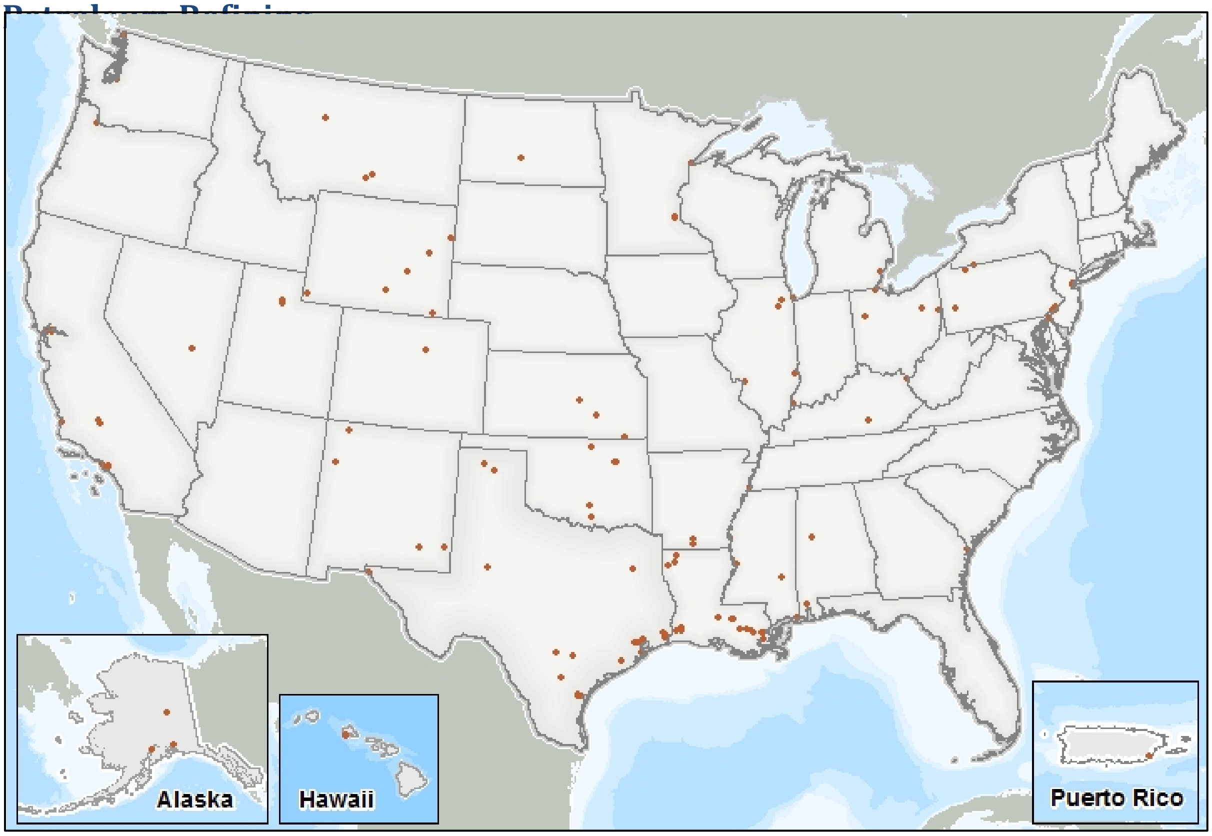
Releases by electric utilities



The electric utilities sector's releases decreased by 49% from 2003 to 2013. This decrease is driven by a 73% decrease in on-site air releases from 2003 to 2013. Over this time period, on-site land disposal and off-site disposal or other releases remained relatively constant, while on-site surface water discharges increased by 13%. From 2012 to 2013, releases by electric utilities increased by 5% (28 million pounds). This increase was primarily driven by an increase in on-site land disposal.

This sector reported the second-largest total disposal or other releases of any industry sector in TRI for 2013, including the largest on-site air emissions, which represented over 25% of air emissions from all industries.

Petroleum Refining



Petroleum Refineries Reporting to TRI, 2013

Petroleum refineries process crude oil and natural gas liquids to produce finished petroleum products. The primary products of the industry fall into three major categories: fuels (e.g., gasoline, kerosene); finished non-fuel products (e.g., solvents, asphalt); and petrochemical feedstocks (e.g., benzene, xylene). While there are only 151 facilities in this sector (0.7% of all facilities), they report almost 7% of production-related waste managed. Refineries are primarily concentrated near oil fields and ports, with the majority being along the Gulf Coast and in the Midwestern states.

Quick Facts for 2013 Petroleum Refining

Number of TRI Facilities: 151

Facilities Reporting Newly Implemented Source Reduction Activities: 17

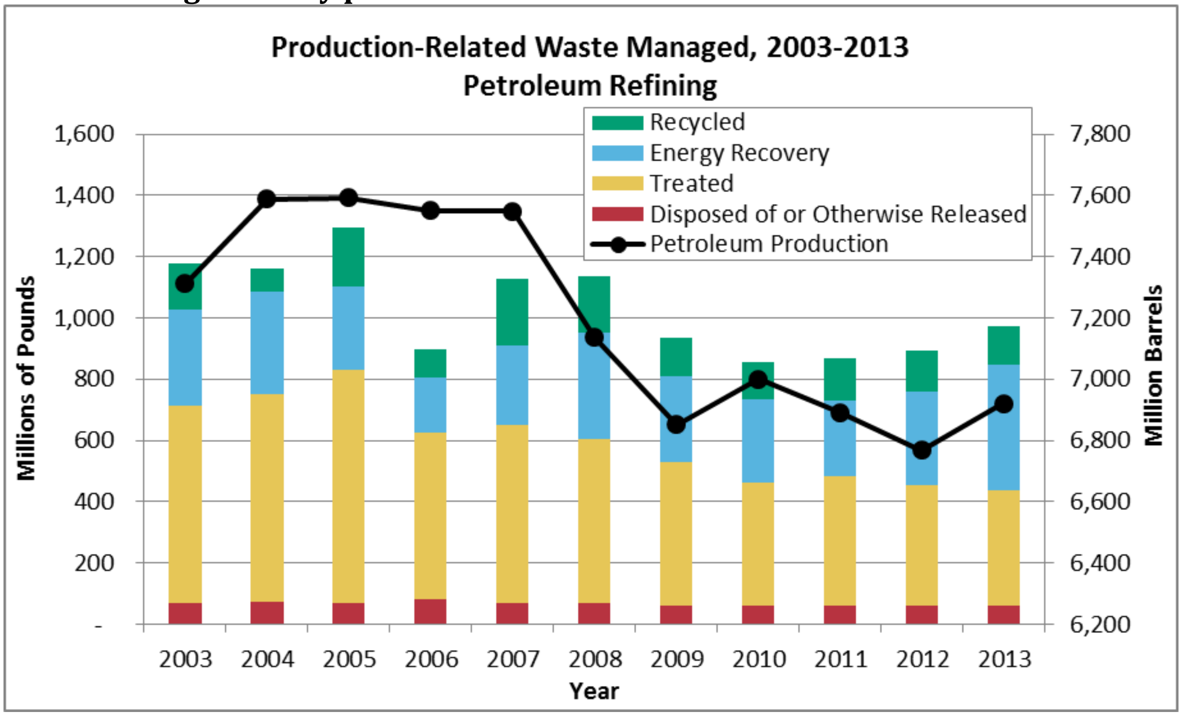
Production-Related Waste Managed: 1,661.3 million lb

- Recycled: 147.8 million lb
- Energy Recovery: 411.4 million lb
- Treated: 1,038.7 million lb
- Disposed of or Otherwise Released: 63.4 million lb

Total Disposal or Other Releases: 63.6 million lb

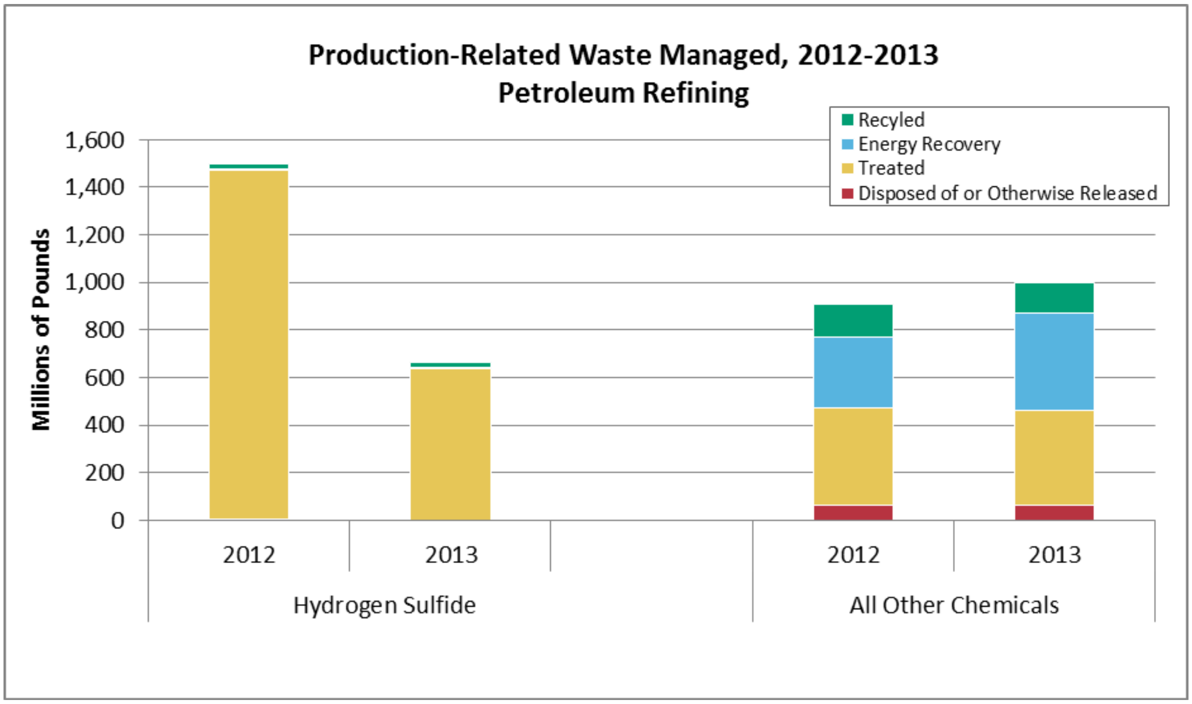
- **On-site: 60.3 million lb**
  - Air: 35.5 million lb
  - Water: 22.3 million lb
  - Land: 2.4 million lb
- **Off-site: 3.3 million lb**

Waste management by petroleum refineries



Note: Hydrogen sulfide is excluded from the production-related waste trend figure because it was not a TRI-reportable chemical until 2012.

This figure shows that production-related waste managed by the petroleum refining sector has decreased by 17% from 2003 to 2012, while production (represented by the black line as reported by the Federal Reserve Board Industrial Production Index) has also decreased, but only by 5%. In 2013, 4% of the sector's waste was released, while the rest was managed through treatment, energy recovery, and recycling. The quantity treated decreased by 45% from 2003 to 2013 while the quantity used for energy recovery increased by 34%. In 2013, three chemicals accounted for two-thirds of the sector's waste — hydrogen sulfide (40%), ammonia (18%), and ethylene (9%). Hydrogen sulfide is excluded from the production-related waste trend figure because it was not a TRI-reportable chemical until 2012. The following figure shows quantities of hydrogen sulfide managed by the petroleum refining sector in 2012 and 2013.

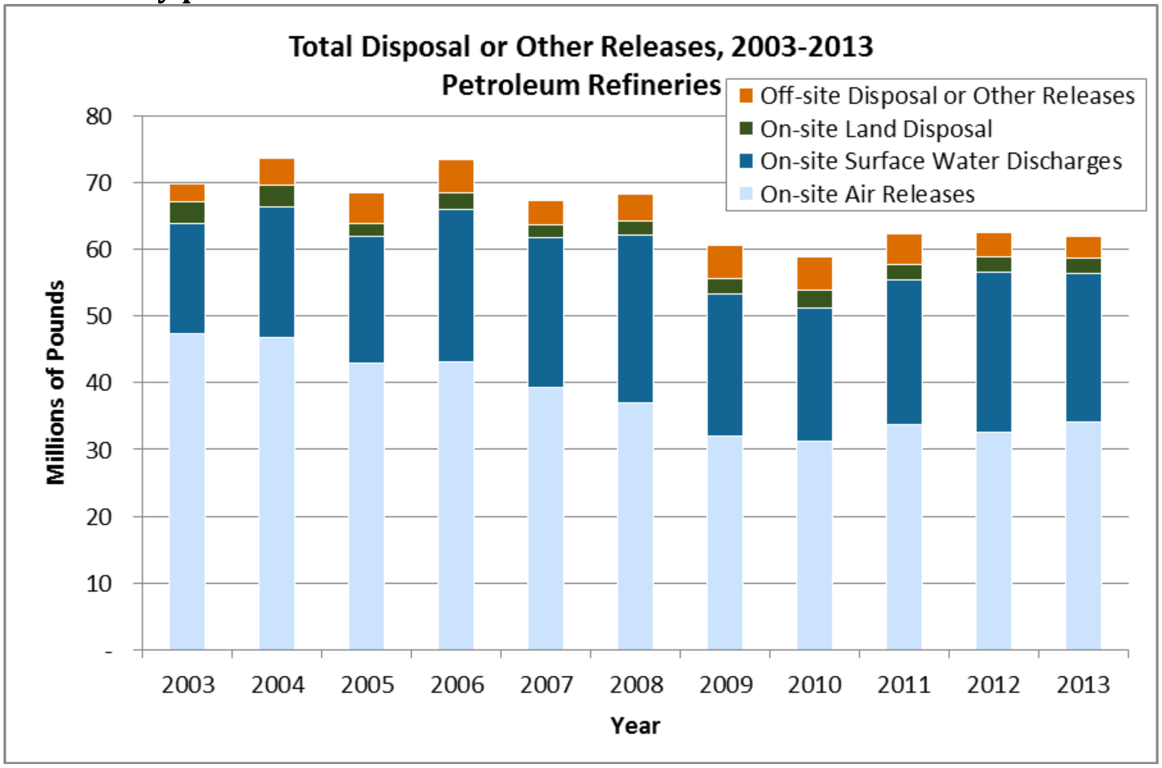


This figure shows the quantity of hydrogen sulfide that the petroleum refining industry reported to TRI in 2012 and 2013 compared to all other TRI chemicals reported by refineries. Hydrogen sulfide is generated from the hydrotreating process that reacts the sulfur compounds found in crude oil with hydrogen gas. The resulting hydrogen sulfide is then typically converted into elemental sulfur using the Claus process. Thus, almost all hydrogen sulfide is reported as treated.

From 2012 to 2013, when hydrogen sulfide is included, the industry's production-related waste decreased by 31%, driven by a reduction in hydrogen sulfide waste reported, which dropped from 1,483 million lb to 665 million lb. This reduction was primarily due to decreased hydrogen sulfide reporting by a few facilities, although most facilities in the sector reported much less hydrogen sulfide waste in 2013 than they did in 2012.

In 2013, 11% of petroleum refineries initiated source reduction activities in 2013 to reduce their toxic chemical use and waste generation. The most commonly reported source reduction activities were good operating practices, process modifications, and spill and leak prevention. For example, a petroleum refinery reported that it replaced two charge heaters with one charge heater that uses an ultra-low nitrogen oxides burner and reduced the benzene waste generated while increasing production. TRI's Pollution Prevention Search Tool can help you learn more about pollution prevention opportunities in this sector.

Releases by petroleum refineries

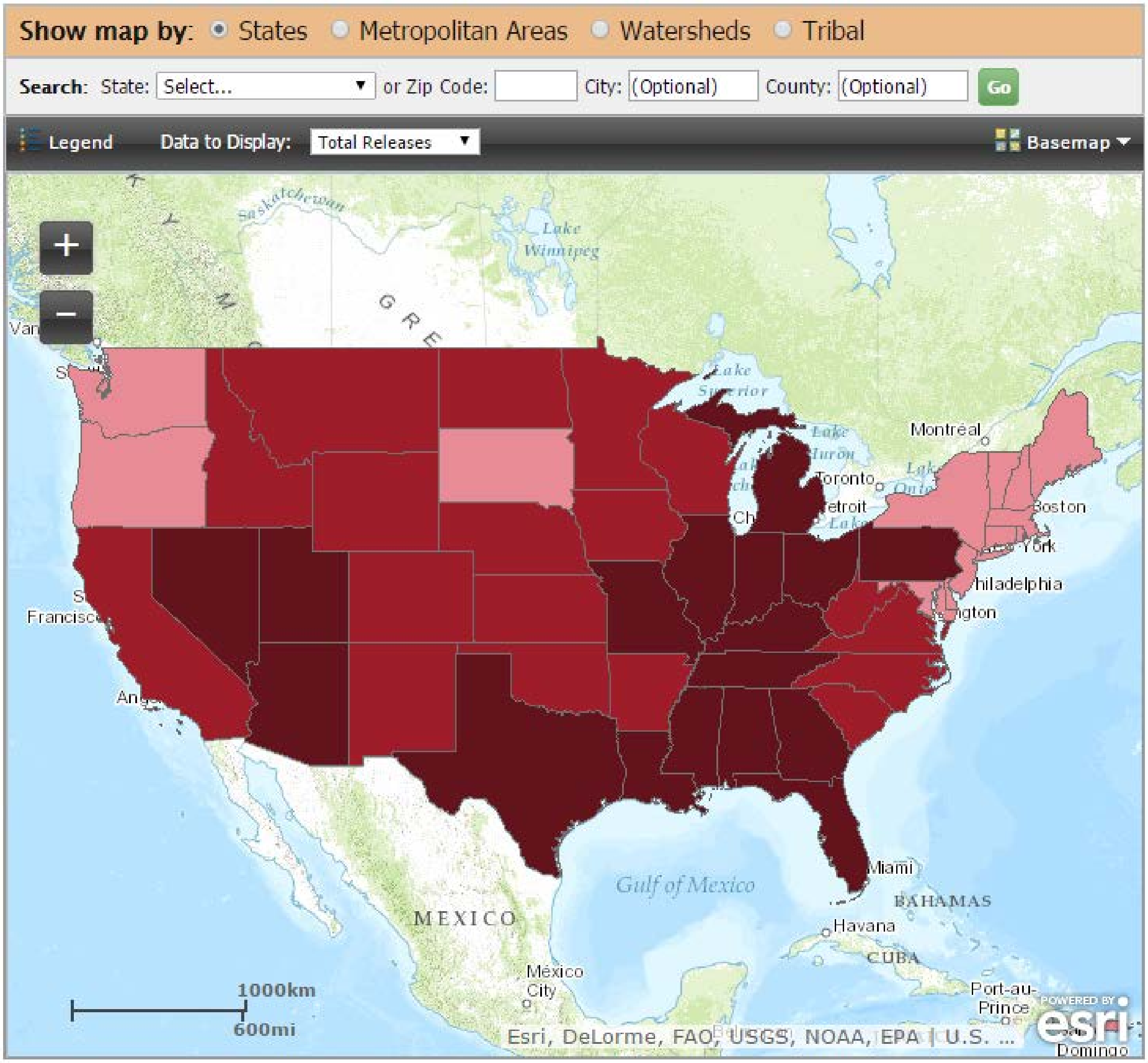


The petroleum refining sector's releases decreased by 11% from 2003 to 2013. This decrease was driven by a decrease in on-site air releases from 2003 to 2013, although the reduction is offset in part by increased water releases. From 2012 to 2013, both releases by petroleum refineries and production levels remained relatively steady. The top chemicals released were nitrate compounds (to water), and ammonia and sulfuric acid aerosols (to air). Ammonia is generated from nitrogen compounds in crude oil from hydrotreatment or catalytic cracking. Ammonia is destroyed in wastewater treatment operations, generating nitrate compounds that are subsequently released in wastewater streams. Sulfuric acid is generated by the reaction of water with sulfur compounds present in processed crude oil or from fuel combustion.

2013 TRI National Analysis: Where You Live

Introduction & Summary | Pollution Prevention & Waste Management | Releases of Chemicals | Industry Sectors | **Where You Live** | Beyond TRI

Note: It may take a moment for the map to load.



View Larger Map, **Click on any one of the states or counties in the map to see detailed information.**

This chapter of the National Analysis looks at toxic chemical disposal or other releases at various geographical levels throughout the United States. The map default display is of total releases by state.

To view summary 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 tribal.

States

States include all U.S. territories for a total of 56 states/territories. All 56 states and territories have facilities that report releases to the TRI program. The three states with the greatest number of TRI facilities are Texas, Ohio and Pennsylvania, which together accounted for 22% of total reporting facilities in 2013. 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

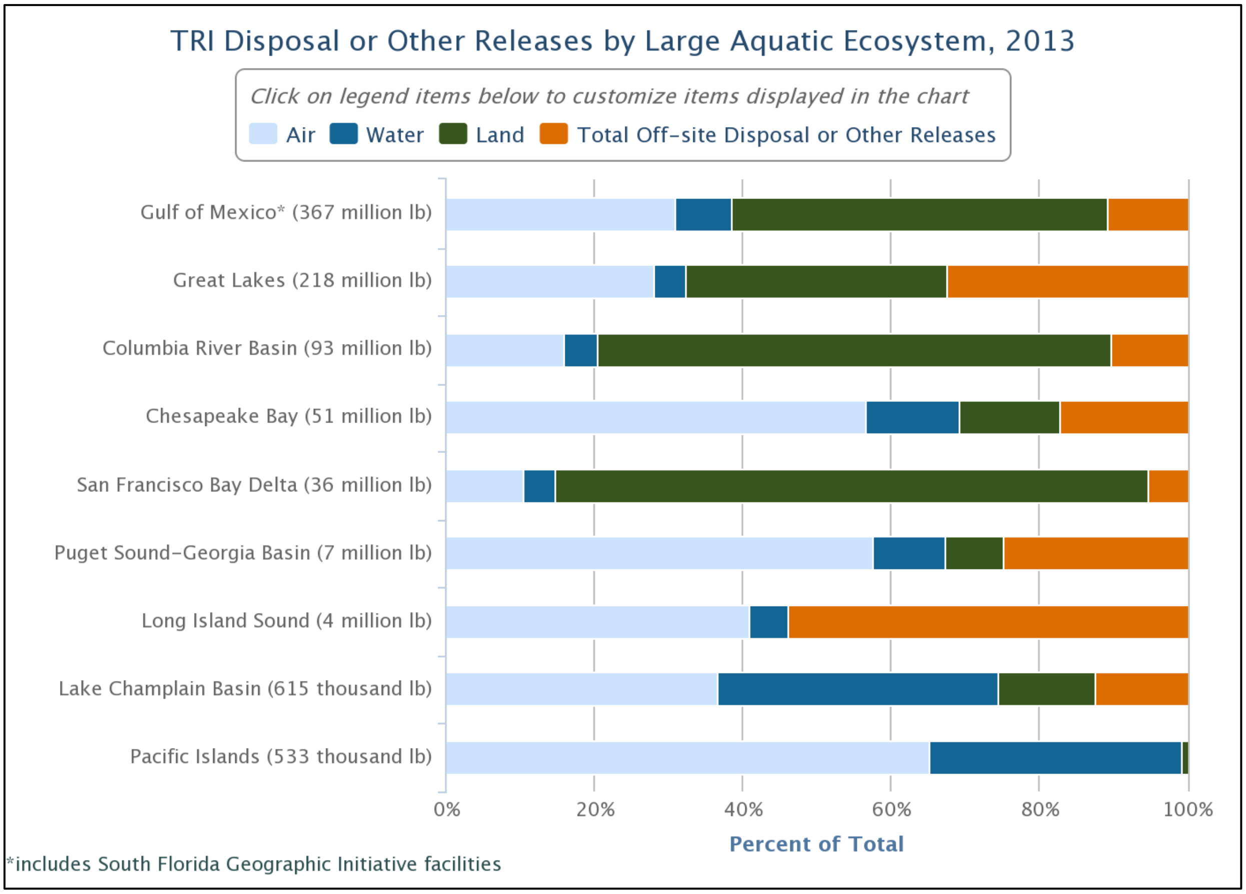
More than 80% of the country's population and many of the industrial facilities that report to the TRI Program are located in urban areas. This map option shows all metropolitan and micropolitan statistical areas (metro and micro areas) in the United States as defined by the Office of Management and Budget (OMB), that had releases in 2013. 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.

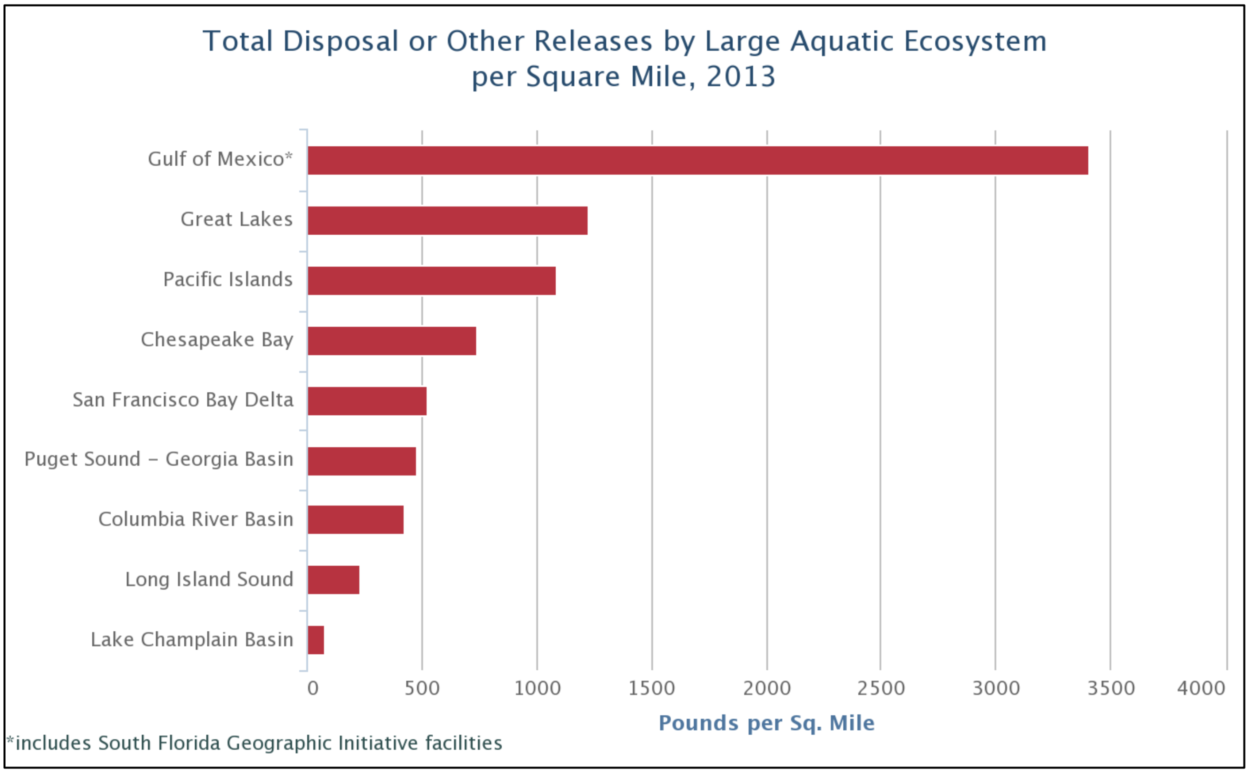
Watersheds

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, toxic discharges, 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 the tissues of fish and other wildlife at the top of the food chain to concentrations many times higher than in the water or air, causing environmental health problems for humans and wildlife.





Tribal

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 on 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 2013 Toxics Release Inventory (TRI) data relating to federally-recognized tribes in the lower 48 states 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 2013.

The table below lists the Indian tribes and ANVs that had at least one TRI facility reporting 2013 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 (lbs)	Primary Industry Sector(s) (% of disposal or other releases)	Primary Chemical(s) (% of disposal or other releases)
Navajo Nation, Arizona, New Mexico and Utah	AZ, NM	2	5,322,217	Electric Utilities (100%)	Barium and Barium Compounds (68%)
Tohono O'odham Nation of Arizona	AZ	1	2,413,448	Metal Mining (100%)	Lead and Lead Compounds (74%)
Ute Indian Tribe of the Uintah and Ouray Reservation, Utah	UT	1	1,857,696	Electric Utilities (100%)	Barium and Barium Compounds (83%)
Puyallup Tribe of the Puyallup Reservation	WA	12	347,729	Petroleum (39%); Hazardous Waste/Solvent Recovery (32%)	Ammonia (23%); Methanol (23%); Lead and Lead Compounds (15%)
Confederated Tribes and Bands of the Yakama Nation	WA	3	204,267	Plastics and Rubber (100%)	Styrene (74%)
Coeur D'Alene Tribe	ID	2	41,264	Wood Products (100%)	Methanol (98%)
Rincon Band of Luiseno Mission Indians of the Rincon Reservation, California	CA	1	6,575	Transportation Equipment (100%)	Styrene (100%)
Arapaho Tribe of the Wind River Reservation, Wyoming	WY	1	3,023	Chemicals (100%)	Sulfuric Acid (100%)
Saginaw Chippewa Indian Tribe of Michigan	MI	1	2,049	Machinery (100%)	Chromium and Chromium Compounds (62%)
Tulalip Tribes of Washington (previously listed as the Tulalip Tribes of the Tulalip Reservation, Washington)	WA	1	775	Primary Metals (100%)	Chromium and Chromium Compounds (66%)
Oneida Tribe of Indians of Wisconsin	WI	4	455	Chemicals (99%)	Methanol (97%)
Suquamish Indian Tribe of the Port Madison Reservation	WA	1	43	Stone/Clay/Glass (100%)	Lead and Lead Compounds (100%)
Colorado River Indian Tribes of the Colorado River Indian Reservation, Arizona and California	AZ	1	30	Hazardous Waste/Solvent Recovery (30%)	Beneze (33%); Toluene (33%); Dichloromethane (33%)
Nez Perce Tribe	ID	1	23	Wood Products (100%)	Lead and Lead Compounds (100%)
Gila River Indian Community of the Gila River Indian Reservation, Arizona	AZ	6	9	Primary Metals (100%)	Copper and Copper Compounds (99%)

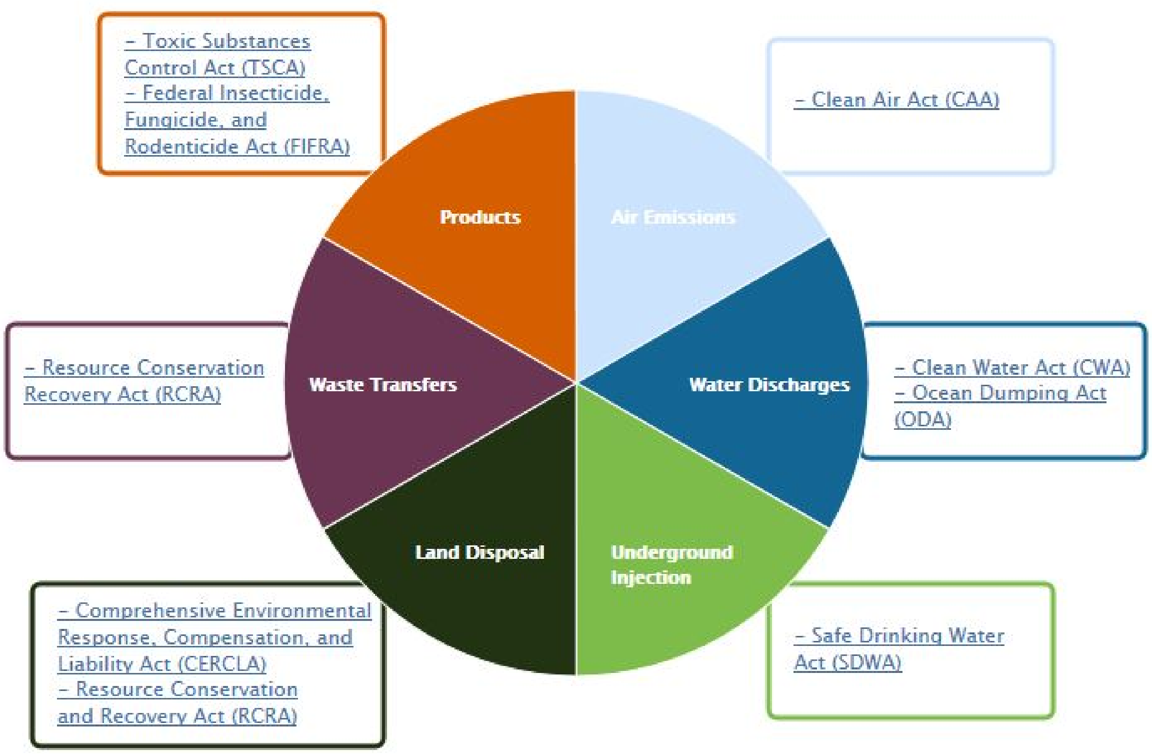
Salt River Pima-Maricopa Indian Community of the Salt River Reservation, Arizona	AZ	1	1	Stone/Clay/Glass (100%)	Lead and Lead Compounds (100%)

TRI & Beyond

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

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 laws that EPA carries out and the industrial processes they regulate. While many programs at EPA focus on one area, TRI covers releases to air, water, and land; waste transfers; and waste management activities. Therefore, TRI data are especially valuable, as they can be combined with many other datasets to provide a more complete picture of national trends in chemical use, management, and releases.



This chapter highlights three thematic areas that combine TRI 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);
  - A comparison of TRI and GHG waste rates for different fuels using data from the Department of Energy's Energy Information Administration; and

  - A look at projected sea level rise in the United States relative to TRI facility locations using National Oceanic and Atmospheric Administration (NOAA) data.
- Surface Water
  - An analysis of TRI and EPA's Discharge Monitoring Report (DMR) data collected under the Clean Water Act (CWA).
- Chemical Safety:
  - An analysis of TRI and emergency planning data collected under the Clean Air Act (CAA), including Risk Management Plans (RMPs), and other sections of the Emergency Planning and Community Right-to-Know Act (EPCRA).

Comparing TRI and Greenhouse Gas Emissions

Under the authority of the Clean Air Act, EPA's Greenhouse Gas Reporting Program requires large emitters of greenhouse gases (GHGs) and suppliers of certain products to submit annual greenhouse gas reports to EPA. Emissions of GHGs lead to elevated concentrations of these gases in the atmosphere that alter the Earth's radiative balance and contribute to climate change. These elevated concentrations are reasonably anticipated to endanger both 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 source of GHG emissions and to inform climate policy.

What is CO_2e?

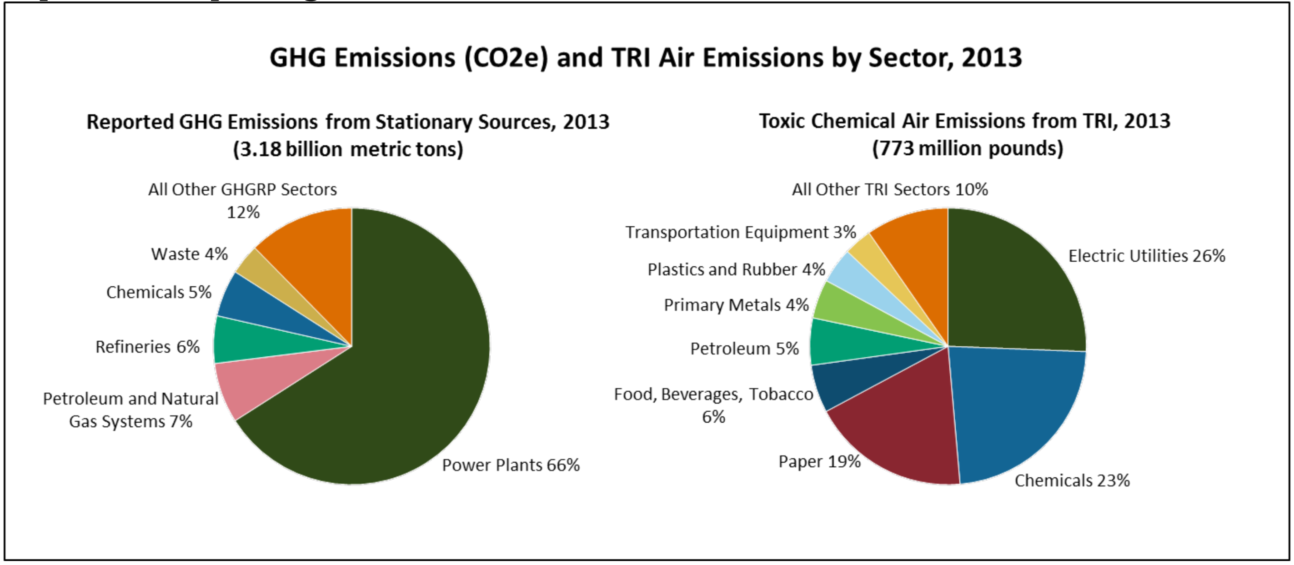
GHG emissions are typically expressed in a common metric, so that their impacts can be directly compared as some gases are more potent than others. The international standard practice is to express GHGs in CO_2e.

What chemicals were reported to GHGRP for 2013?

- Carbon dioxide = 91.4% of the mtCO_2e total
- Methane = 7%
- Nitrous Oxide (N_2O) = 0.8%
- Fluorinated gases (HFCs, PFCs, SF_6) = 0.7%

In 2013, over 7,800 facilities reported direct emissions of GHGs to the atmosphere, totaling over 3.18 billion metric tons of carbon dioxide equivalent (mtCO_2e). This represents about half of the 6.5 billion mtCO_2e that EPA estimated to be released in the United States from all human-related sources per the 2012 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.

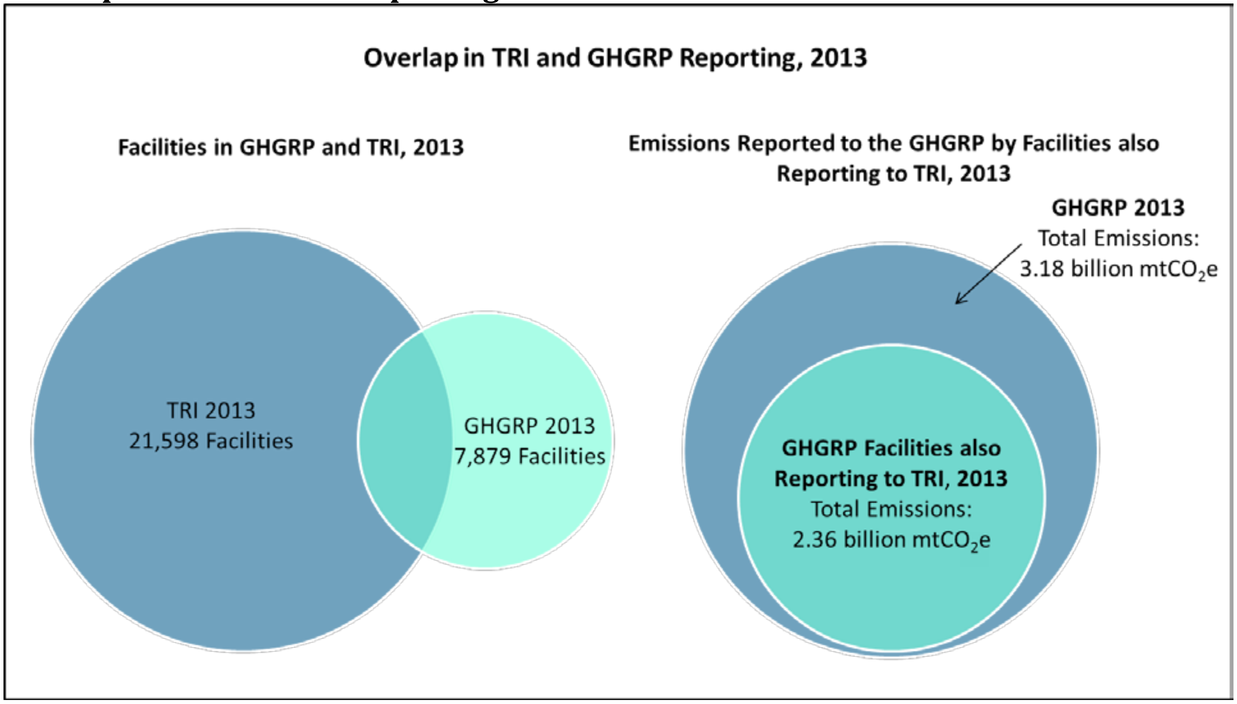
Top sectors reporting TRI air emissions and GHG CO2e



This figure shows the top sectors reporting air emissions to the GHGRP and TRI in 2013. The primary greenhouse gas reported to the GHGRP is carbon dioxide (CO_2), which is released during fossil fuel combustion and various industrial processes. TRI reporting focuses on toxic chemicals and therefore covers different chemicals from 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 metal mining to surface cleaning. Therefore, 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 the primary reporters of air emissions to both programs, the chemical manufacturing industry reports more chemical air emissions to TRI than to the GHGRP. 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 sector levels.

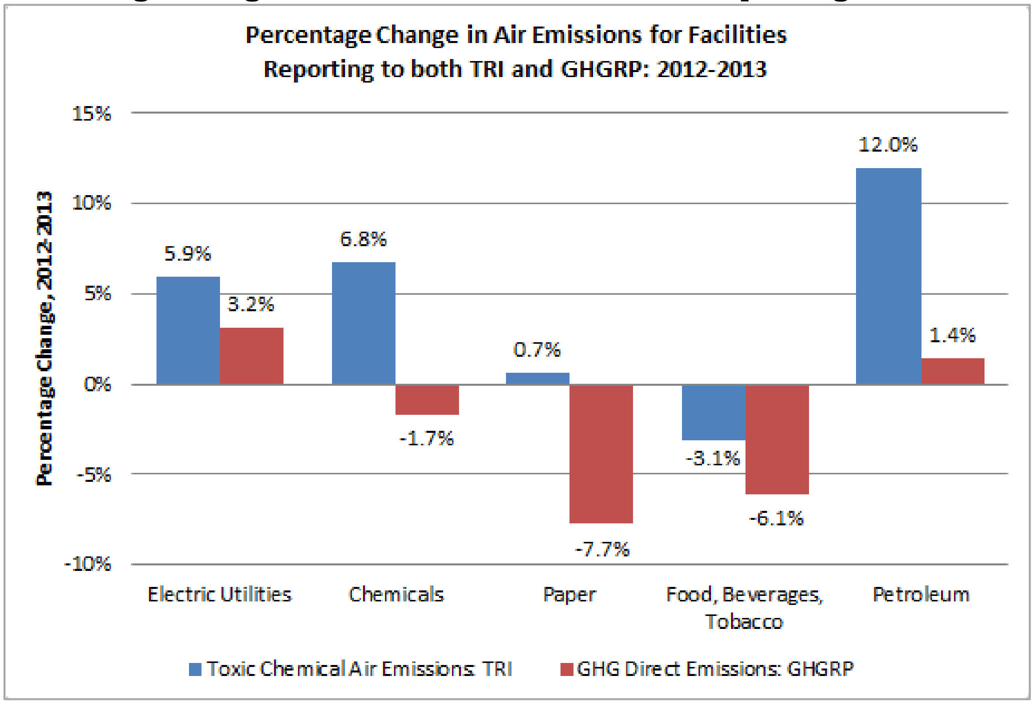
Note that in addition to differences in the chemicals reported to TRI and the GHGRP, there are numerous other program differences including reporting thresholds. For TRI, the reporting threshold for most chemicals is 25,000 pounds manufactured or processed, or 10,000 pounds otherwise used per year, whereas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

Overlap in TRI and GHG reporting



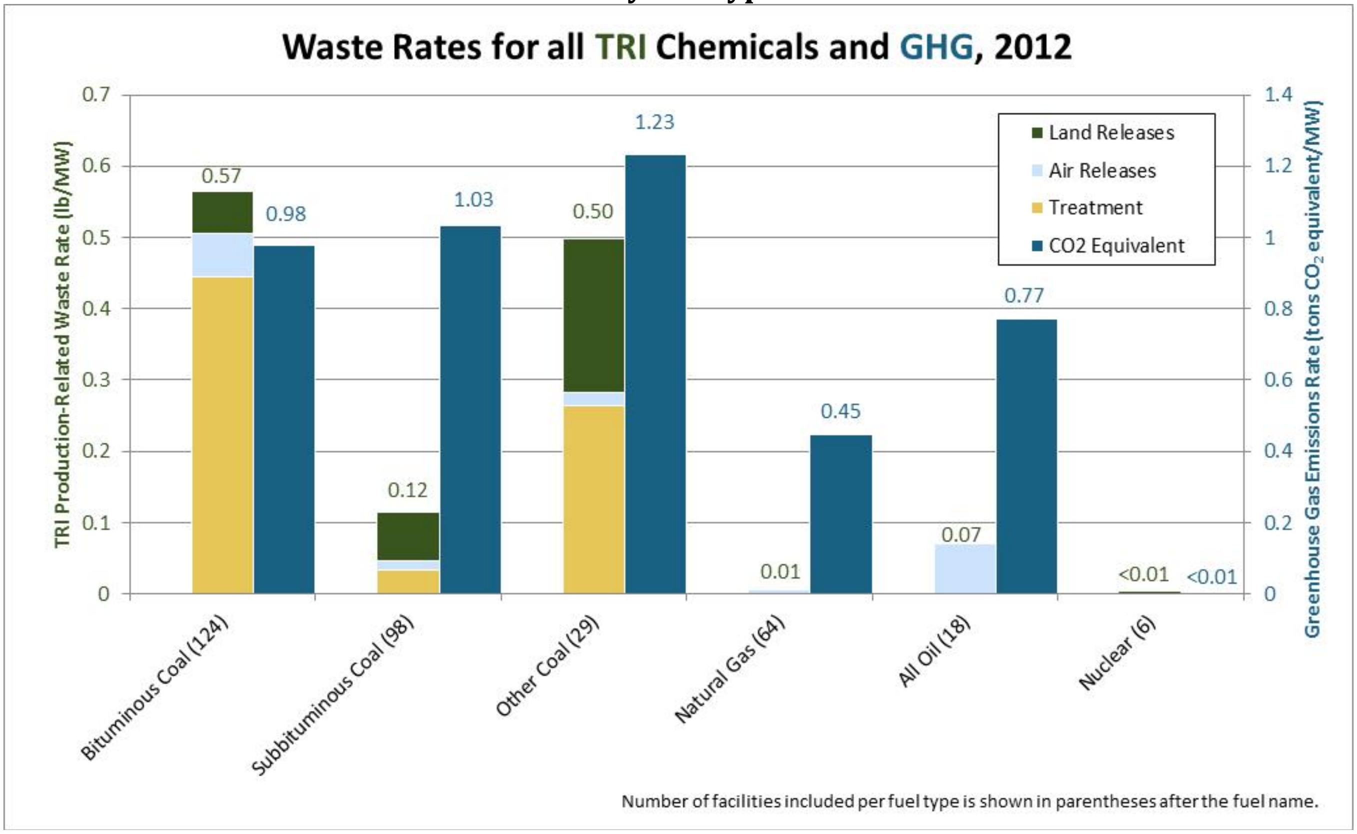
In 2013, more than one-third of the facilities reporting to GHGRP also reported to TRI. However, this subset of GHGRP reporters accounted for almost three-quarters of GHGRP emissions, indicating that the facilities reporting the greatest GHG emissions also trigger TRI requirements for reporting on toxic chemicals.

Percentage change in air emissions for facilities reporting to both TRI and GHGRP



This figure shows the percentage change in total air emissions from 2012 to 2013 for the subset of facilities reporting to both TRI and GHGRP, in the five industry sectors with the greatest TRI air emissions. While the graph is 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 TRI and GHGRP and by the impacts of certain source reduction and pollution control activities. Some actions taken by facilities, such as reducing fuel consumption, decrease emissions of both greenhouse gases and toxic chemicals that are byproducts of fuel combustion. Other actions, like the installation of new treatment technology, may reduce emissions of a specific TRI chemical but not affect greenhouse gas emissions.

TRI waste rates and GHG emissions rates by fuel type



This figure shows TRI waste management rates and GHG emission rates for facilities in the electric utilities industry that reported to both TRI and the GHGRP for 2012, the most recent year for which the facility-level fuel use data are available. By fuel type, the figure shows:

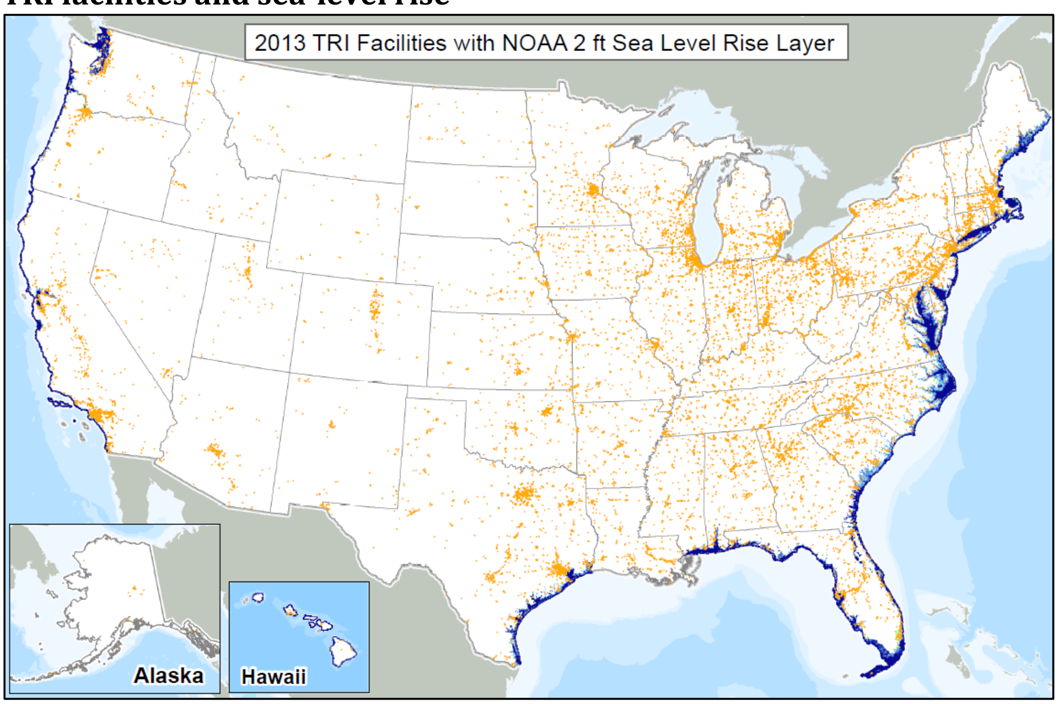
- **Bituminous coal** has the highest total TRI waste generation per megawatt hour (MWh) of electricity produced, most of which is treated for destruction. Of the coal types, however, bituminous coal has the lowest moisture content, making it the most efficient coal in terms of power generation. Bituminous coal therefore has the lowest GHG emission rate. West Virginia leads production of bituminous coal, followed by Kentucky and Pennsylvania.
- Among coal types, combustion of **subbituminous coal** generates significantly less acid aerosol than bituminous coal or other coal, resulting in a lower TRI waste generation rate. Wyoming produces the vast majority of subbituminous coal in the U.S.
- All **coal** combustion (bituminous, subbituminous, and other which includes lignite and waste coal) generates ash, which may be disposed of to land.
- Of the fossil fuels, **natural gas** has the lowest TRI air release rate and the lowest TRI waste management rate, as it contains lower levels of toxic chemicals in the fuel. Natural gas also has the lowest carbon content per energy quantity and as such, has a GHG emission rate considerably lower than that of coal and oil fuels.
- **Oil fuels**, consisting of distillate and residual fuel oil, have the highest air release rate of the fossil fuels. This reflects an absence of reported treatment methods at TRI

facilities burning oil. As oil fuels have a lower carbon content than coal, they have a lower GHG emission rate than coal, but greater than that of natural gas.
- Few **nuclear** power plants are required to report to TRI and the rates calculated in the graph are based on only six facilities. Based on these facilities' reporting, nuclear plants' generation rates for both toxics and GHGs are very low.

You can learn more about TRI reporting by electric utilities in the Electric Utilities Industry section.

Notes:
- This figure only includes electric utilities that combust some (even small amounts) of coal or oil; most natural gas electric utilities do not combust these fuels and therefore are not subject to TRI reporting.
- The figure includes waste rates for the primary TRI waste management methods for the sector: air emissions, land disposal, and treatment. Other TRI waste management methods, such as recycling and discharges to water, account for less than 1% of waste managed and therefore are not included in the figure.
- To ensure that the emissions were representative of the specific fuel types, 481 facilities were excluded from this graph because their fuel mix exceeded 1% of other fuel types.
- These rates are based on waste generated at the electric utility only and do not reflect the entire lifecycle of the fuel (e.g., they do not include extraction of the fuel).
- Data on the quantity of fuel used by facility are from the Department of Energy's Energy Information Administration.

TRI facilities and sea-level rise



Global sea-level rise has been a persistent trend for decades. It is expected to continue beyond the end of this century, which will cause significant impacts in the United States. Scientists have very high confidence (greater than 90% chance) that the global mean sea-level will rise at least 8 inches (0.2 meters) and no more than 6.6 feet (2.0 meters) by 2100.[1] This map displays facility locations that reported to TRI in 2013 with a preliminary look at the potential of a 2 foot sea-level rise as projected by NOAA. The blue areas on the coast show the potential sea-level rise inundation of 2 feet above the current Mean Higher High Water mark. Therefore, TRI facilities in or near this area may be inundated in a 2-foot sea-level rise scenario. Prior to any actual sea-level rise, many of these facilities face a higher potential to experience flooding or other weather-related damage due to periodic storm events.

Notes:

- These sea-level rise data are provided by NOAA's Coastal Services Center and illustrate the scale of potential flooding, not the exact location. They should only be used for screening-level visualization and should not be used for navigation, permitting, or other legal purposes.
- The NOAA sea-level rise map includes all states except for Louisiana and Alaska. There are no plans to map Alaska because of inadequate statewide coastal elevation data. Similarly, Louisiana is not included because of a lack of recent, accurate coastal elevation data and the difficulty in accurately flood mapping this coastal geography that includes a complex levee system. NOAA is discussing the issue with Louisiana officials.

For information about how the federal government is taking action to help Americans adapt to current and potential risks of climate change, see EPA's website on federal and EPA adaptation programs.

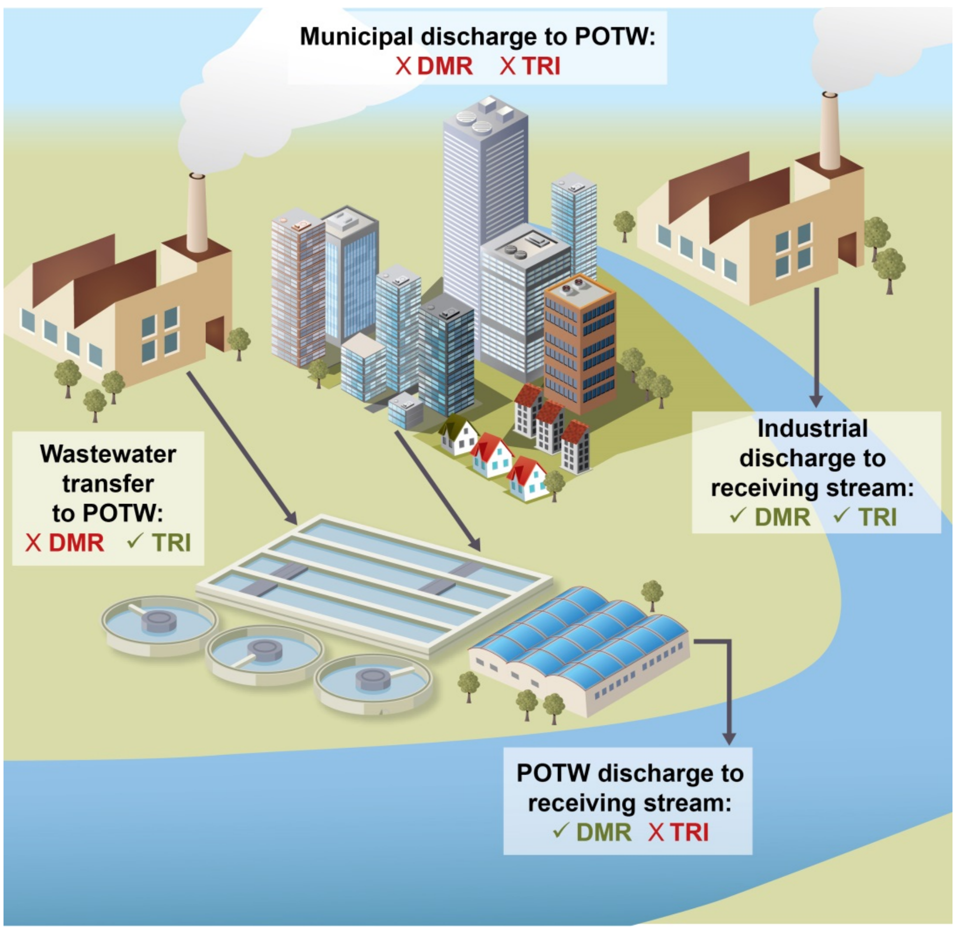
[1] http://cpo.noaa.gov/Home/AllNews/TabId/315/ArtMID/668/ArticleID/80/Global-Sea-Level-Rise-Scenarios-for-the-United-States-National-Climate-Assessment.aspx

Regulating chemical releases to water

EPA collects data on pollutant releases to water under the authority of the National Pollutant Discharge Elimination System (NPDES). The NPDES program aims to protect and restore the quality of U.S. rivers, lakes, and coastal waters through permits that control and require monitoring of pollutant discharges from point sources. Under the Clean Water Act (CWA), facilities are required to obtain a NPDES permit for all point sources that discharge pollutants into waters of the United States and report compliance with permit limits via monthly Discharge Monitoring Reports (DMRs).

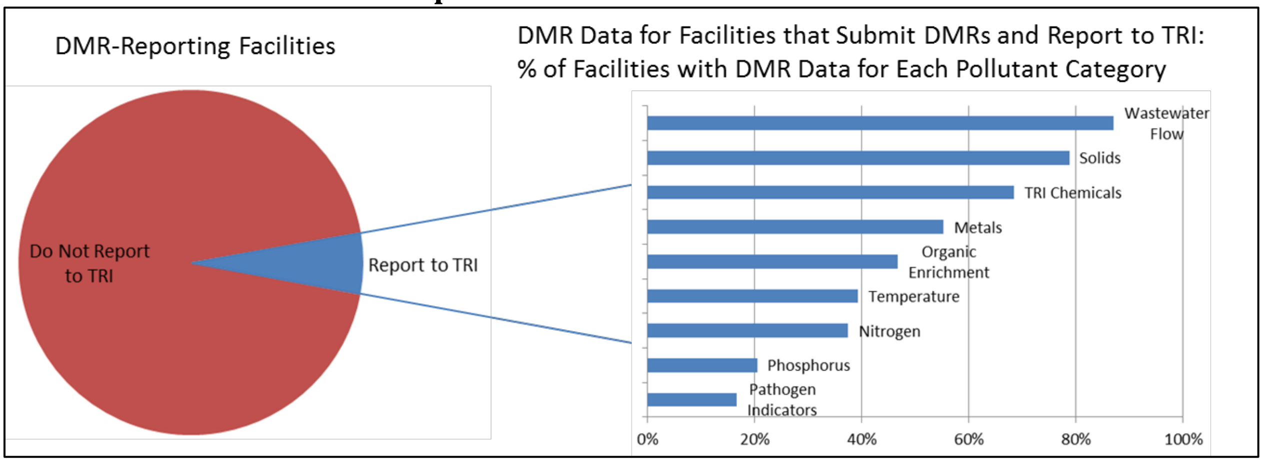
Through the DMRs submitted, the NPDES program collects data for the facility-specific parameters identified in the facility's NPDES permit. The DMR data may include release quantities of specific chemicals as well as other water quality measures, such as pH and temperature, flow rates, and conventional parameters such as biochemical oxygen demand and total suspended solids. Along with TRI data about toxic chemical releases to water, DMRs serve as a primary source of data on pollutant discharges to surface water.

This figure illustrates the types of wastewater streams that the TRI Program and DMR data describe.



TRI data capture discharges to receiving streams and chemical transfers to Publically Owned Treatment Works (POTWs) from industrial facilities. DMR data capture discharges to receiving streams by both industrial facilities and POTWs, but do not capture transfers from an industrial facility to a POTW. Neither data set captures municipal discharges to POTWs.

DMR data for facilities that report to TRI

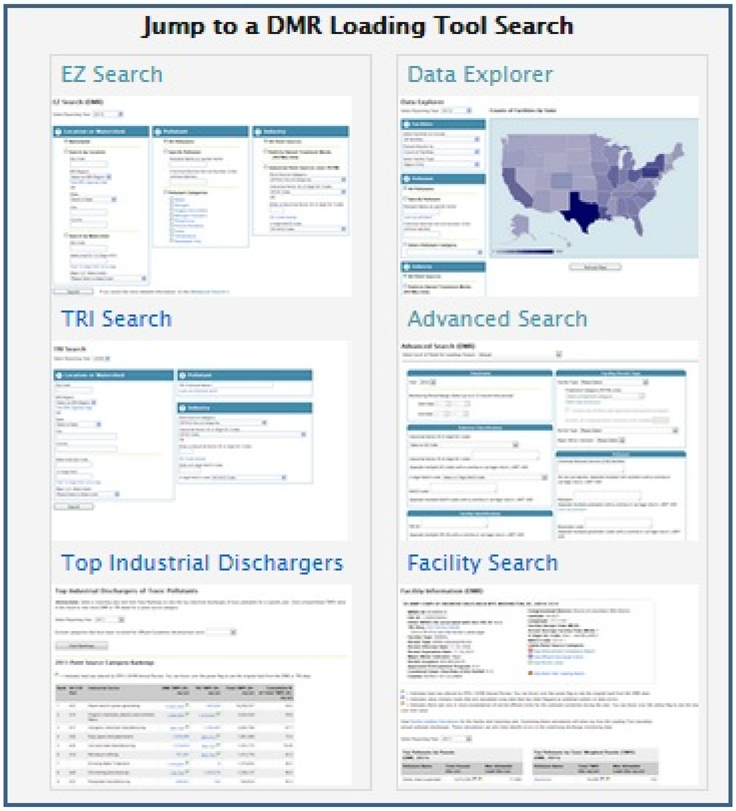


While the data collected by TRI and DMRs differ in important ways, using both TRI and DMR data provides a more complete understanding of pollutants being discharged into surface waters. As shown in the pie chart, 6% of the facilities that submit DMRs also report to TRI. The bar graph focuses on this subset of facilities that report to TRI and submit DMRs. Through their DMRs, these facilities provide information on many other parameters that may impact water quality, such as the temperature, or biochemical or chemical oxygen demand (i.e., organic enrichment) of their water discharges.

There are several considerations to keep in mind when comparing TRI and DMR data:

- **Reporting Facilities:** Permitting authorities, such as the states, are not required to report DMR measurements for smaller, non-major, facilities. In addition, facilities may be exempt from reporting to TRI if they are not in a covered industry sector or does not meet the threshold number of employees.
- **Regulated Chemicals:** In the DMR data, facilities only report discharges of pollutants that the NPDES permit requires them to monitor. The pollutants with monitoring requirements in a facility's NPDES permit are at the discretion of the permitting authority. Other pollutants may be discharged but are not reported on DMRs. TRI facilities only report chemicals on the TRI list, and may be exempt from reporting releases of chemicals if they do not meet activity thresholds.

DMR and TRI data can be explored together using the DMR Pollutant Loading Tool. This tool provides information on which facilities are discharging pollutants to surface water, what pollutants and how much of each they are discharging, and where these discharges occur. Explore the tool to learn more about discharges of pollutants to surface waters in your community.

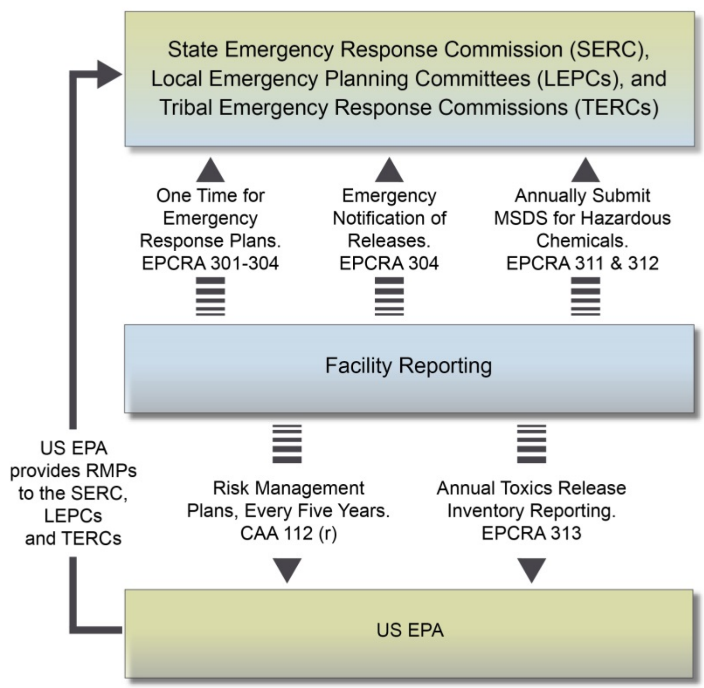

Jump to a DMR Loading Tool Search
EZ Search
Data Explorer
TRI Search
Advanced Search
Top Industrial Dischargers
Facility Search

Chemical safety and emergency planning

In the wake of recent chemical spills and accidents at facilities in Texas, West Virginia and North Carolina, the government has renewed focus on chemical safety and accident preparedness. On August 1, 2013, the President signed Executive Order 13650 to improve the safety and security of chemical facilities and reduce the risks of hazardous chemicals to workers and communities. The order directs the federal government to improve operational coordination with state and local partners, and enhance Federal agency coordination and information.

Both the Emergency Planning and Community Right-to-Know Act (EPCRA) and (which includes the Toxics Release Inventory) the Clean Air Act (CAA) section 112(r) Risk Management Program encourage communication between facilities and the surrounding communities about chemical safety and chemical risks. The programs implemented under these regulations are intended to encourage state, local, and tribal planning for, and response to, releases of hazardous substances; to provide the public, local governments, fire departments, and other emergency officials with information concerning potential chemical hazards present in their communities; and to prevent and minimize the impact of chemical releases.

TRI data, along with other EPCRA and risk management data on chemical storage and use, provide a greater understanding of potential hazards in communities.



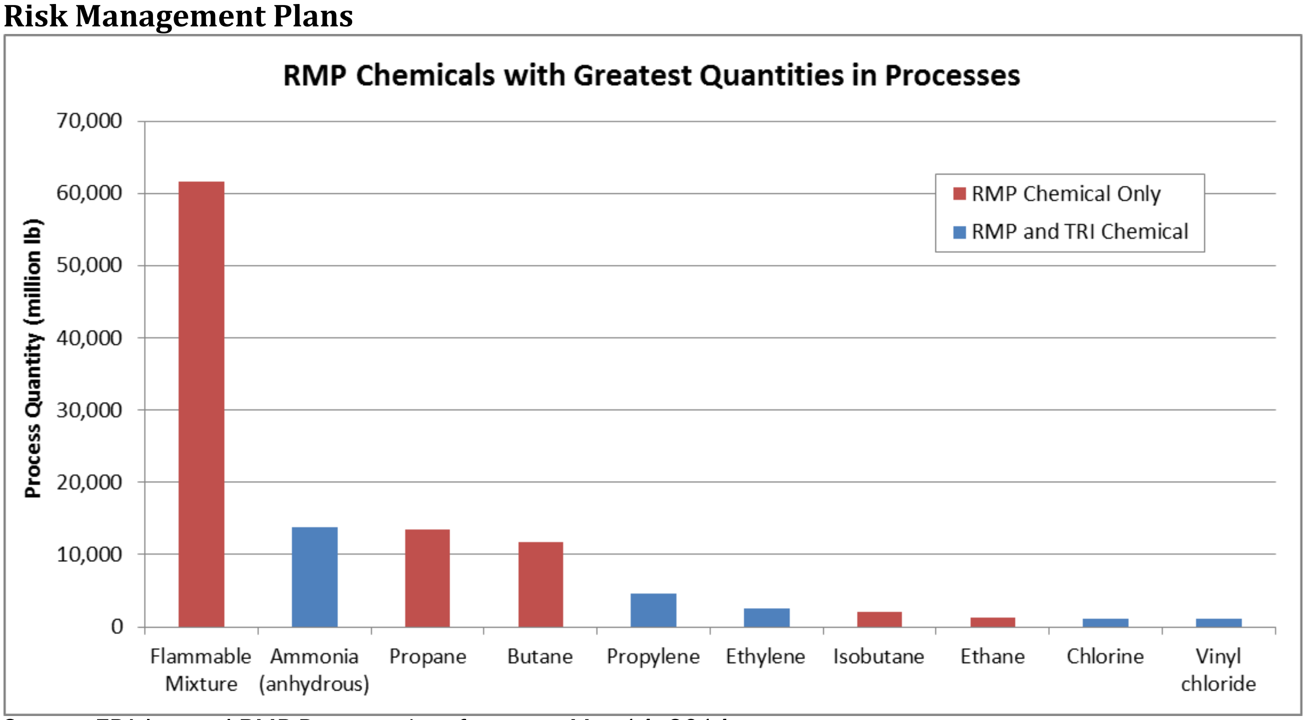
EPCRA, enacted in 1986, has four major provisions. The Community Right-to-Know provisions cover TRI (section 313) and the hazardous chemical storage reporting requirements (sections 311-312). Other EPCRA sections focus on emergency planning (sections 301-303) and emergency release information (section 304). Separately from EPCRA, CAA section 112(r) establishes the Risk Management Plan rule and helps to reduce harm from extremely hazardous substances (EHS). Facilities covered report information to the respective authorities as noted in the diagram.

The types of hazardous and toxic chemicals covered by the RMP and each of the EPCRA provisions differ as shown in the table below. A broad array of chemicals is also covered, more extensive than the 650 chemicals and chemical categories covered by TRI.

Chemicals Covered by EPCRA and CAA 112(r)	
EPCRA 301-303	355 extremely hazardous substances (EHS)
EPCRA 304	355 EHS and approximately 800 specific substances and 1,500 radionuclides under CERCLA
EPCRA 311/312	More than 500,000 hazardous substances with material safety data sheets (MSDSs)
EPCRA 313	More than 650 toxic chemicals and chemical categories
CAA 112(r)	77 EHS and 63 flammable gases and liquids

Regulatory requirements by themselves will not guarantee safety from chemical accidents. Those who are handling hazardous substances must take the responsibility and act to prevent, prepare for, and respond to chemical emergencies. For extremely hazardous substances (EHS), a facility must notify the appropriate officials and participate in local emergency planning activities. This includes preparation of an emergency response plan that contains information community officials can use at the time of a chemical accident. A facility covered under the RMP Rule is required to submit a Risk Management Plan (RMP) to EPA. Currently, approximately 13,000 facilities have an active RMP.

Risk Management Plans



Source: EPA Internal RMP Dataset, data frozen on May 14, 2014.

The Risk Management Plan (RMP) complements TRI in that it provides details on chemical hazards and emergency planning. RMP and TRI cover some, but not all, of the same chemicals, as shown in this figure. RMP reporting includes 77 acutely toxic chemicals and 63 flammable gases or highly volatile flammable liquids – 53 of which are also individually listed TRI chemicals. The RMP chemical with the greatest quantity processed at facilities is "flammable mixture," which can consist of mixtures of different flammable gasses and liquids such as propane, butane and isobutane.[2] Chemical reporting thresholds also differ between TRI and RMP – RMP thresholds vary from 1,000 to 20,000 pounds of chemicals in a process, while TRI thresholds reflect total annual use. Approximately 2,700 facilities report to both TRI and RMP. RMP also provides information on many sectors not covered by TRI, such as Sewage Treatment Facilities.

RMP and TRI data complement each other when a facility reports under both programs. RMP submissions provide details on where the chemical is used and how the facility prevents and prepares for accidental releases. TRI data provide details on the process-related, non-accidental releases of the chemical. In the following graphics, chlorine is used as an example of how TRI and RMP data may be combined for a more complete picture of the facility's handling of the chemical.

Example chemical: Chlorine reported in RMP & TRI

Chlorine is reported to both TRI and RMP. It is one of the most commonly manufactured chemicals in the United States, with a domestic production volume of 22 billion pounds in 2011.[3] It is used in industrial operations primarily as a chemical reactant, but is also widely used as a bleach or disinfectant. While chlorine can be pressurized and cooled to a liquid for storage and shipment, when liquid chlorine is released, it quickly turns into a gas that stays close to the ground and spreads rapidly. Chlorine gas irritates the respiratory system, and as a strong oxidizer, it may react strongly (e.g., explosively) with other materials. Data over the past five years show that there have been 588 accidents, resulting in 749 injuries, one death, and an estimated $128 million in property damage.[4,5] Proper management of chlorine at industrial facilities is vital to workers and the surrounding community.

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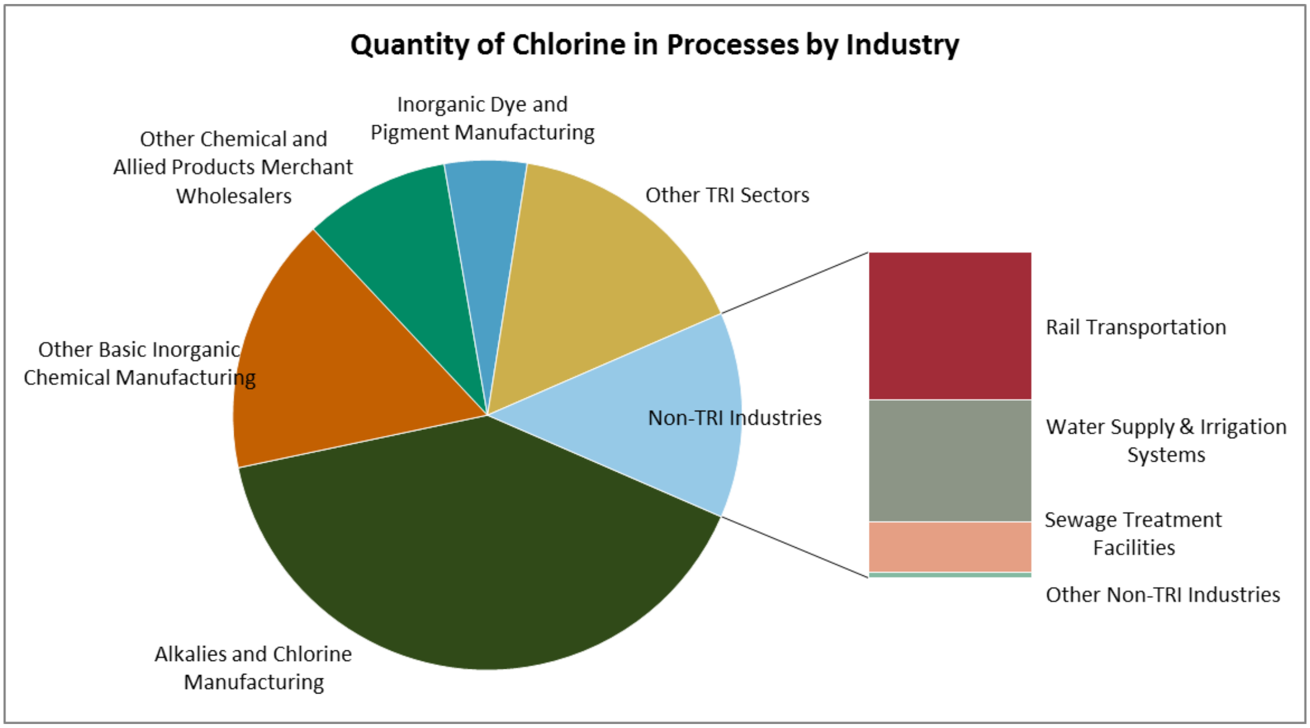
[2] Flammable mixtures are covered under RMP if a regulated substance is in the mixture above 1 percent and the entire mixture meets the National Fire Protection Association flammability hazard rating of 4 (NFPA-4).
[3] http://www.epa.gov/cdr/
[4] EPA Internal RMP Dataset, data frozen on May 14, 2014.
[5] Injuries and damages include all accidents at the facilities, not just those involving chlorine.



Chlorine is covered by RMPs in over 3,300 facilities from May of 2009 to May of 2014, with approximately 808 million pounds in processes. The top industries by pounds of chlorine are Chemical Manufacturing and Chemical Wholesalers, as shown in the figure. These industry sectors also report to TRI. When viewed by counts of facilities, the two industries with the most facilities reporting chlorine in processes in an RMP are water supply and irrigation systems (1,401 facilities) and sewage treatment facilities (703 facilities). Neither of these industries is required to report to TRI.

Facilities report different types of information in an RMP than to TRI. For example, a facility in Charleston, TN, reported in its 2013 RMP:

- Quantity in processes: 33.8 million pounds of chlorine in its chlor-alkali process in 100% concentration as gas liquefied by pressure
- Accident history: In 2005, over-pressurization of a line, caused by human error, resulted in an accidental release of less than 1 pound of chlorine

For 2013, the same facility reported to TRI 272.7 pounds of chlorine air releases. Taken together the data provide a more complete picture of the facility's handling of the chemical.

For more information, please visit the EPCRA webpage. To learn more about Risk Management Plans, see the RMP Rule webpage. The public may access RMP data at Federal Reading Rooms. For more information on TRI, see EPA's TRI webpage.