Releases of Chemicals

Releases or disposal of chemical waste into the environment occur in several ways. Facilities may release chemical waste into the air or water or dispose of it on land, per EPA regulatory requirements. Facilities may also ship (transfer) wastes that contain TRI chemicals to an off-site location for treatment or disposal. Release and disposal practices are subject to a variety of regulatory requirements designed to minimize potential exposure or harm to human health and the environment. To learn more about what EPA is doing to help limit the release of TRI chemicals into the environment, see the EPA laws and regulations webpage.

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

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

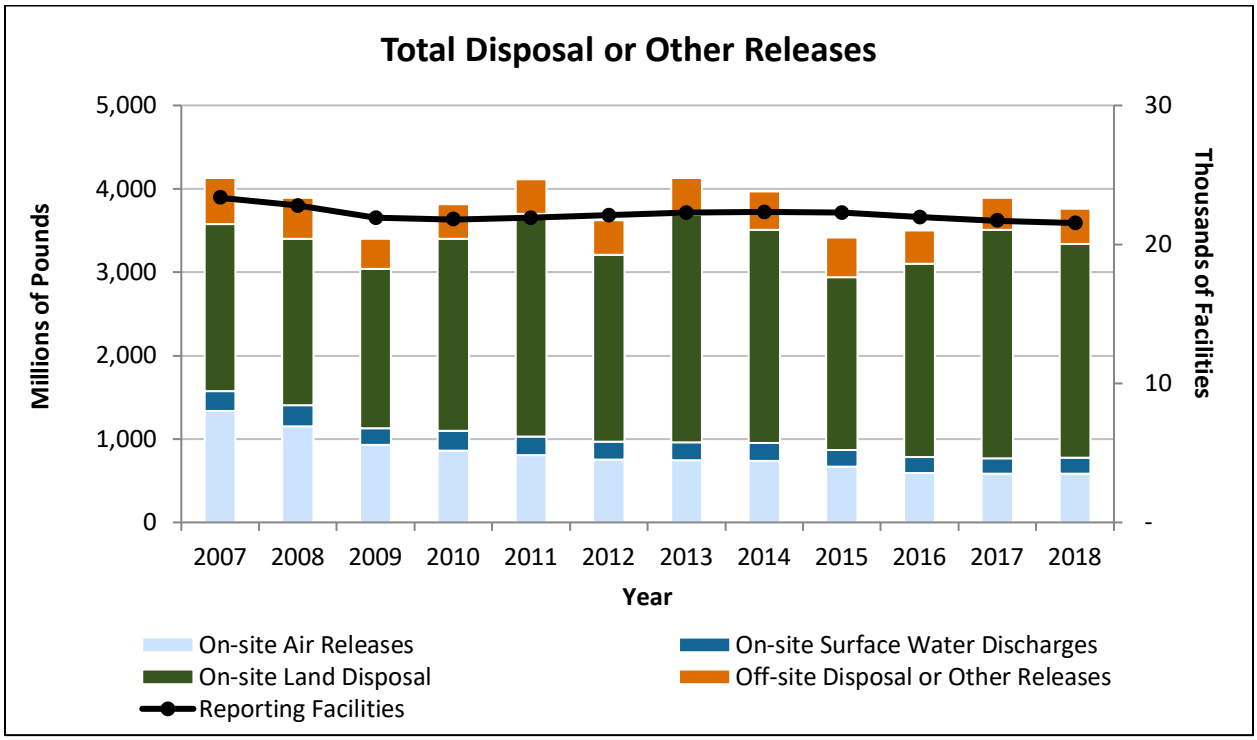
As with any dataset, there are several factors to consider when reading about or using the TRI data. Key factors associated with data presented are summarized in the Introduction. For more information see Factors to Consider When Using Toxics Release Inventory Data. Also note that the list of TRI chemicals has changed over the years. For comparability, trend graphs include only those chemicals that were reportable for all years presented. Figures and text that focus only on the year 2018 include all chemicals reportable for 2018, therefore, values for a 2018-only analysis may differ slightly from results for 2018 in a trend analysis.

Helpful Concepts

What is a release?

In the context of TRI, a "release" of a chemical generally refers to a chemical that is emitted to the air, discharged to water, or disposed of in some type of land disposal unit. The vast majority of TRI releases occur in the course of routine production operations at the facility.

The following graph shows the total disposal or other releases of TRI chemicals (also referred to as "total releases"), including on-site disposal to land, discharges to water, and releases to air, and off-site transfers for disposal or release.



Note: For comparability, trend graphs include only those chemicals that were reportable to TRI for all years presented.

From 2007 to 2018:

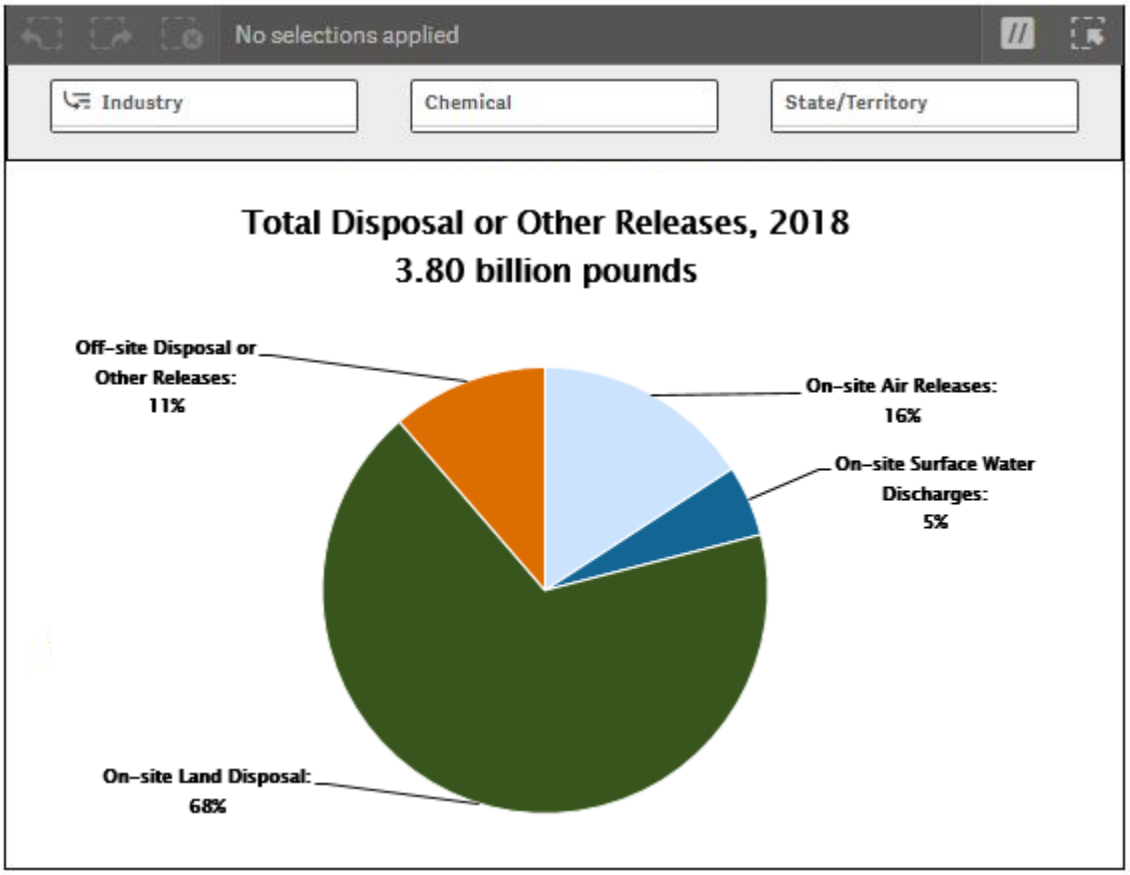
- Total disposal or other releases of TRI chemicals decreased by 9%.
  - Excluding the metal mining sector, releases decreased by 34%.
  - Reduced hazardous air pollutant (HAP) emissions, such as hydrochloric acid, from electric utilities were the most significant contributor to the decline, with additional air emission reductions from the chemical and paper manufacturing sectors.
- Air releases decreased 56%, surface water discharges decreased 18%, and off-site disposal decreased 22%.
- The number of facilities reporting to the TRI Program declined by 8% overall, although the count has remained relatively steady since 2010.

From 2017 to 2018:

- Total disposal or other releases decreased by 3%.
  - On-site land disposal decreased by 6%, which is the main driver for the decrease in total releases. There was little change in on-site air releases or on-site surface water discharges, while off-site disposal increased by 11%.

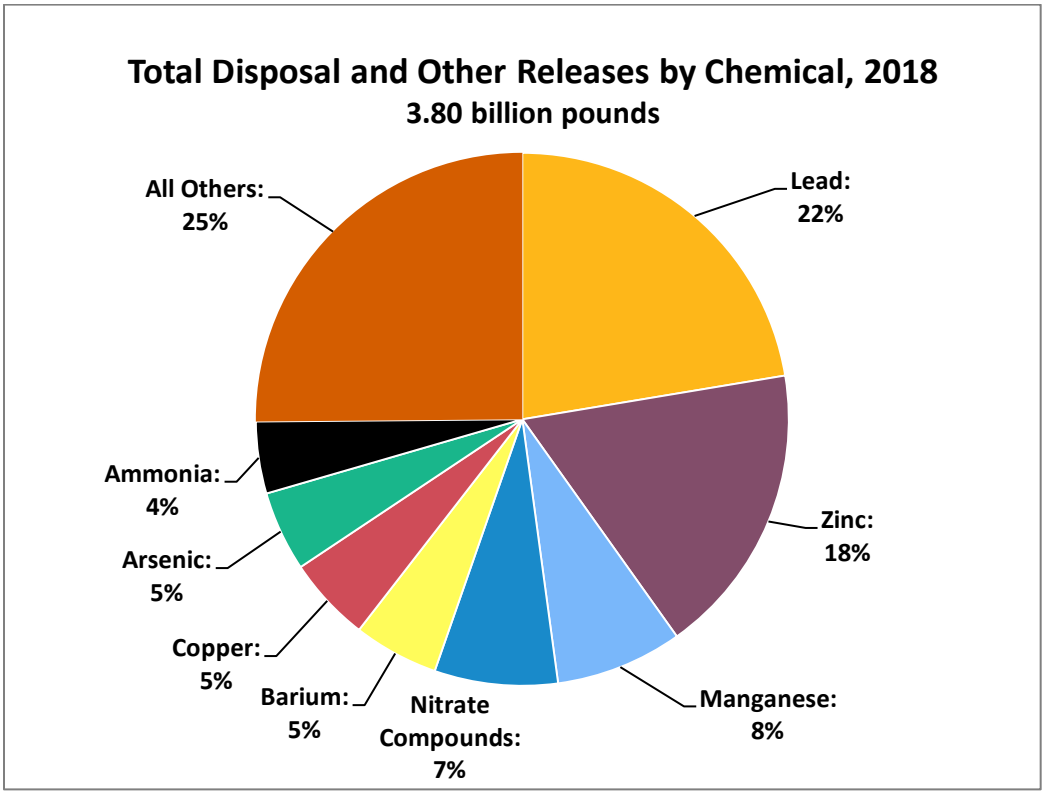
Releases in 2018

Use the interactive chart below to explore how total releases of chemicals that occurred in 2018 are associated with different industry sectors, specific chemicals, and geographies. Visit the full TRI National Analysis Qlik dashboard to explore even more information about releases of chemicals.



Releases by Chemical

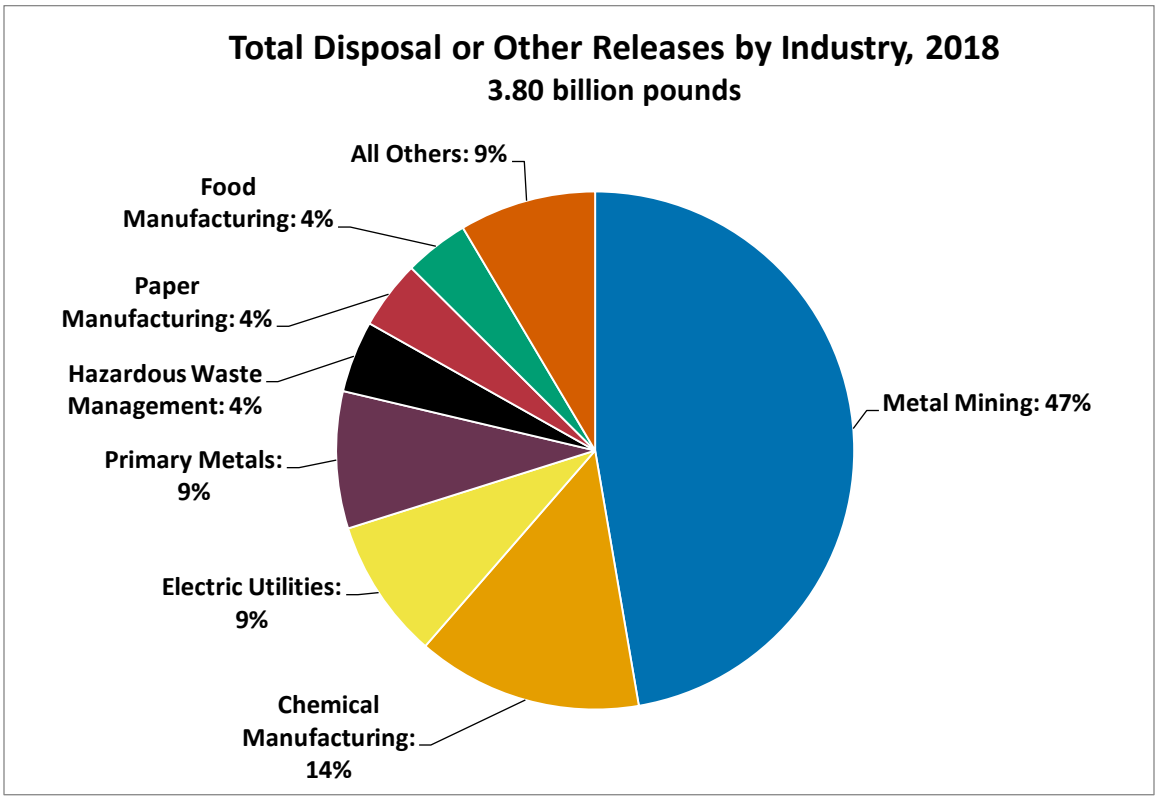
Release quantities of 8 chemicals comprised 75% of total releases.



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

Releases by Industry

The metal mining sector accounted for 47% of releases (1.80 billion pounds), which were primarily in the form of on-site land disposal. Learn more about this sector in the Metal Mining profile.

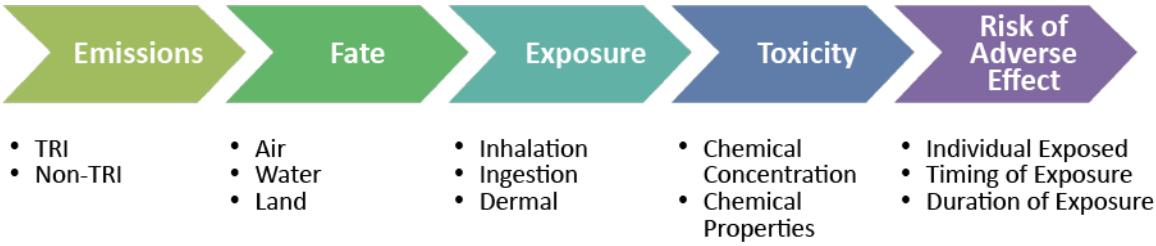


Hazard and Potential Risk of TRI Chemicals

The data collected and made publicly available in the Toxics Release Inventory (TRI) on the quantities of chemical waste released to the environment from industrial and federal facilities throughout the US is measured in pounds. Pounds of releases, however, is not necessarily an indicator of health impacts posed by the chemicals, as described in EPA's Factors to Consider When Using Toxics Release Inventory Data. Although TRI data generally cannot indicate to what extent individuals have been exposed to chemicals, TRI can be used as a starting point to evaluate exposure and potential risks TRI chemicals pose to human health and the environment.

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

Overview of Factors that Influence Risk



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

To provide context on the relative hazard and potential for risks posed by certain waste management activities of TRI chemicals (e.g., from releases to the environment), the TRI Program uses EPA's Risk-Screening Environmental Indicators (RSEI) model.

Helpful Concepts

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

The likelihood that a toxic chemical will cause an adverse health effect following its release into the environment is often referred to as ***risk***. Risk is a function of hazard and exposure.

RSEI is a screening-level, multi-media model that incorporates TRI information together with risk factor concepts to assess the potential chronic human health impacts of TRI chemicals.

RSEI includes TRI data for on-site releases to air and water, transfers to Publicly Owned Treatment Works (POTWs), and transfers for off-site incineration. RSEI does not currently model other TRI-reported waste management activities and release pathways, such as those associated with land disposal.

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

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

RSEI: Risk-Screening Environmental Indicators

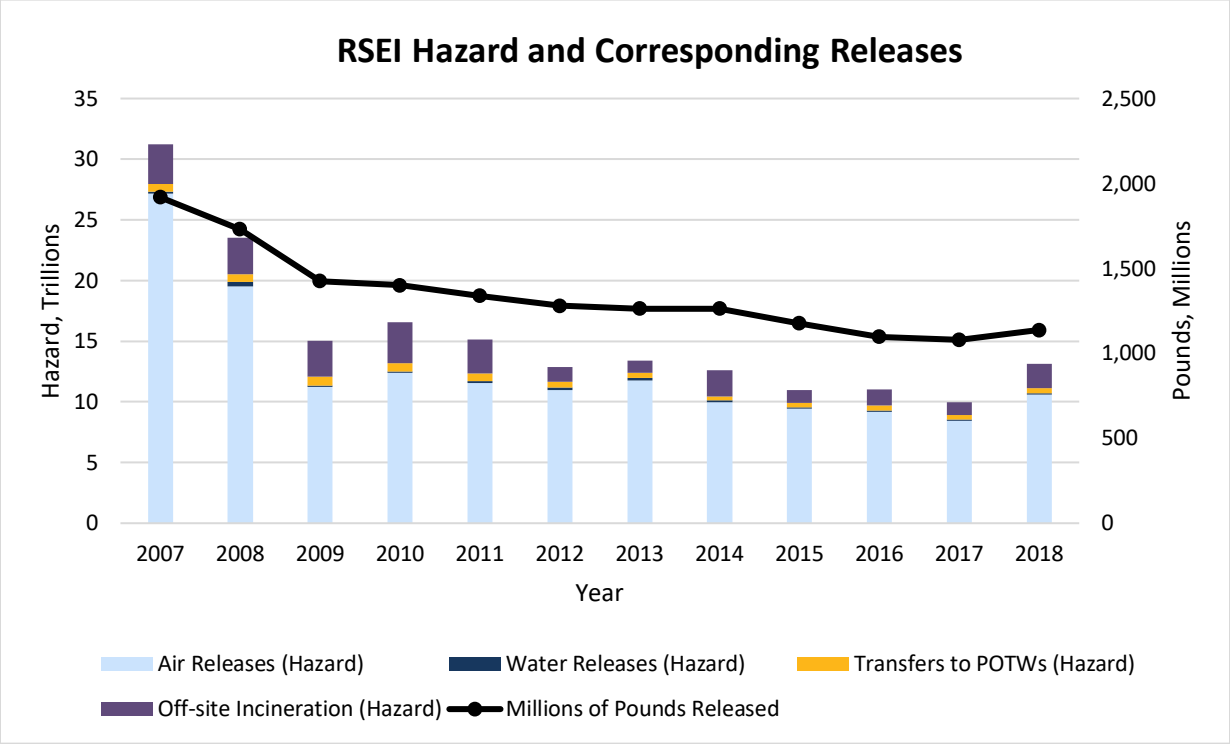
RSEI results consider more than just chemical quantities released.

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

Note that RSEI is not a stand-alone source of information for making conclusions or decisions about the risks posed by any particular facility or environmental release of a TRI chemical. RSEI does not produce a formal risk assessment, and RSEI results should not be used to determine whether a facility is in compliance with federal or state regulations. RSEI results should only be used for screening-level activities such as trend analyses that compare potential relative risks from year to year, or ranking and prioritizing chemicals, industry sectors, or geographic regions for strategic planning. RSEI can be used, however, in conjunction with other data sources and information, to help policy makers, researchers, and communities establish priorities for further investigation and to look at changes in potential human health impacts over time.

Hazard Trend

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



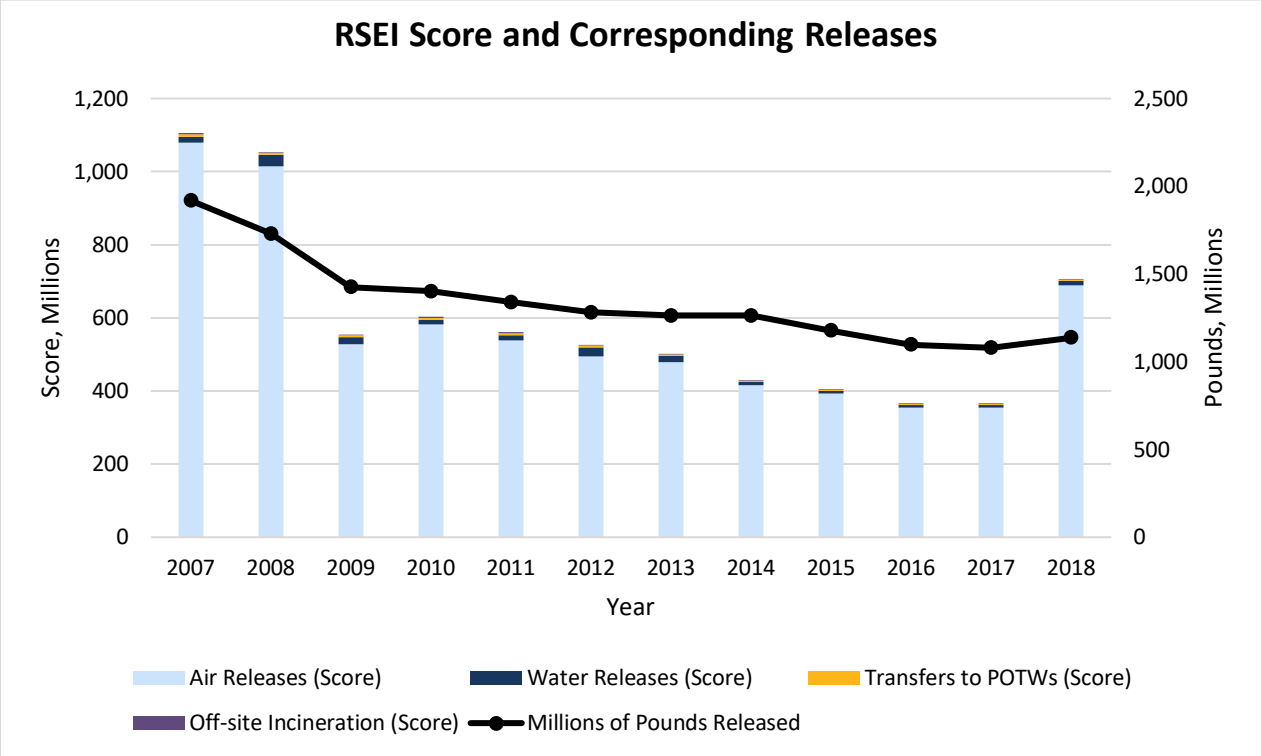
Note: For comparability, trend graphs include only those chemicals that were reportable to TRI for all years presented.

From 2007 to 2018:

- The overall RSEI hazard estimate decreased by 58%, while corresponding pounds released decreased by 41%. Thus, in recent years, TRI-reporting facilities are not only releasing fewer pounds of TRI chemicals, they may be releasing proportionally fewer pounds of the more toxic TRI chemicals relative to the less toxic TRI chemicals.
- The decrease in the hazard estimate from 2008 to 2009 was driven by a large decrease in chromium releases to air from three facilities.
- The increase in the hazard estimate from 2017 to 2018 was driven by large fugitive air releases of chromium at one facility and large off-site transfers to incineration of hydrazine and nitroglycerin by two other facilities.

Risk-Screening Trend

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



Note: For comparability, trend graphs include only those chemicals that were reportable to TRI for all years presented.

From 2007 to 2018:

- The overall RSEI score estimate decreased by 36%, while corresponding pounds released decreased by 41%.
- Of the types of releases modeled by RSEI, air releases, by far, contributed the most to the RSEI scores.
- The increase in RSEI score from 2017 to 2018 was driven by increases in reported fugitive air emissions of chromium and chromium compounds from two facilities located

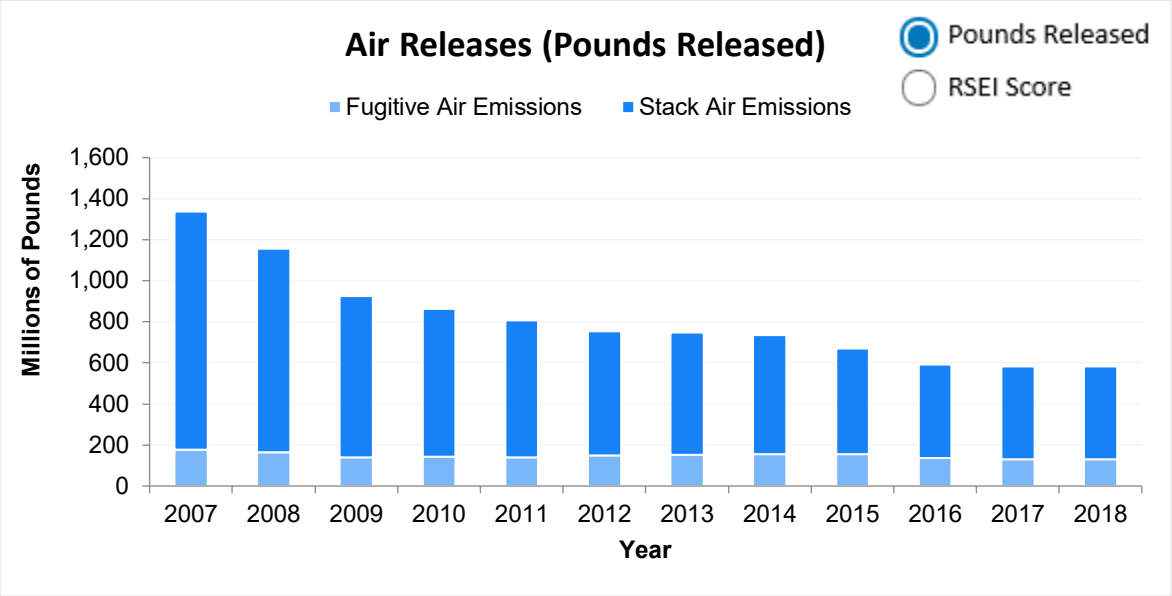
in Houston, Texas and Ocala, Florida, as well as a facility that reported a large stack air release of ethylene oxide for the first time in Jacksonville, Florida.

RSEI Dashboard

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

Air Releases

Air emissions reported to TRI continue to decline, serving as a primary driver of decreased total releases. Air releases include both fugitive air emissions and stack air emissions. This graph shows the trend in the pounds of chemicals released to air. Air emissions are regulated by EPA under the Clean Air Act.



Note: For comparability, trend graphs include only those chemicals that were reportable to TRI for all years presented.

From 2007 to 2018:

- Air releases declined significantly, serving as a primary driver of decreases in total releases.
- Air releases decreased by 56% (755 million pounds).
    - Hydrochloric acid, sulfuric acid, hydrogen fluoride, methanol, toluene, and styrene were the chemicals with the greatest reductions in air releases since 2007.
    - The decrease was driven by electric utilities due to: decreased emissions of Hazardous Air Pollutants (HAPs) such as hydrochloric acid; a shift from coal to other fuel sources (e.g., natural gas); and the installation of control technologies at coal-fired power plants.
    - Electric utilities accounted for 93% of nationwide reductions in air releases of hydrochloric acid and sulfuric acid from 2007 to 2018.

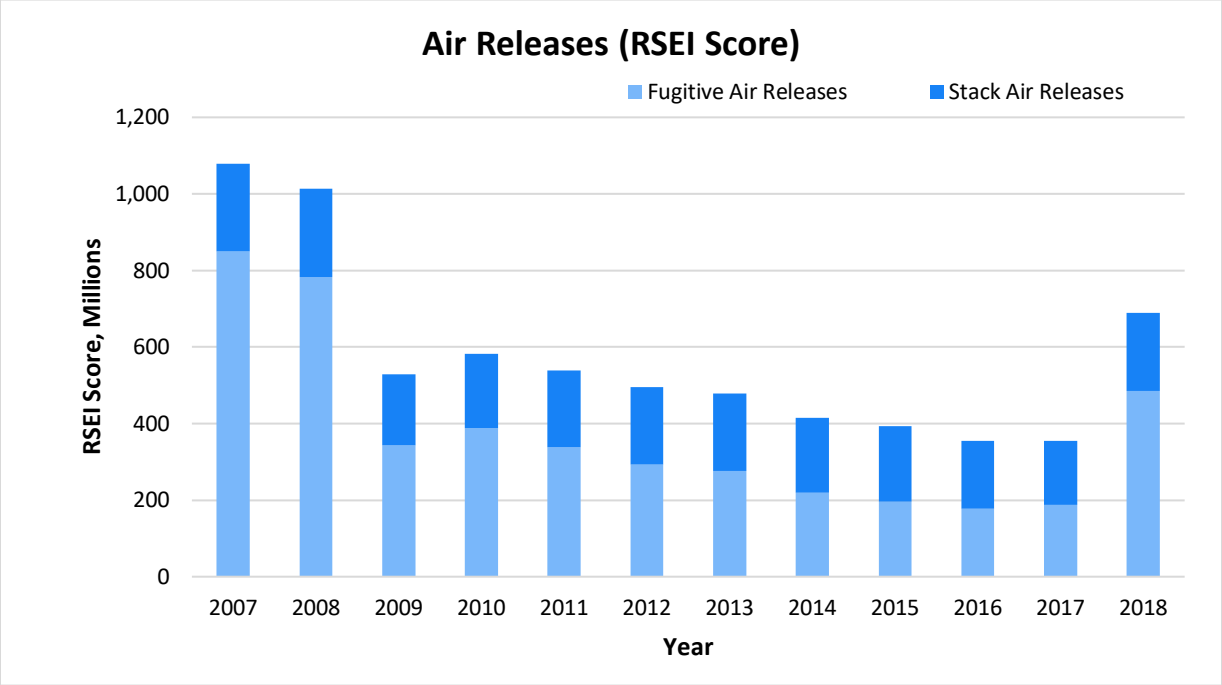
  - Note that only those electric utilities that combust coal or oil to generate power for distribution into commerce are covered under TRI reporting requirements. Therefore, electric utilities that shift from combusting coal or oil to entirely using other fuel sources (such as natural gas) no longer report to TRI.

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

In 2018:

- Ammonia, followed by methanol, accounted for the greatest air releases of TRI chemicals.
- Air releases decreased by less than one percent since 2017.

This graph shows the trend in the RSEI Scores for TRI air releases.

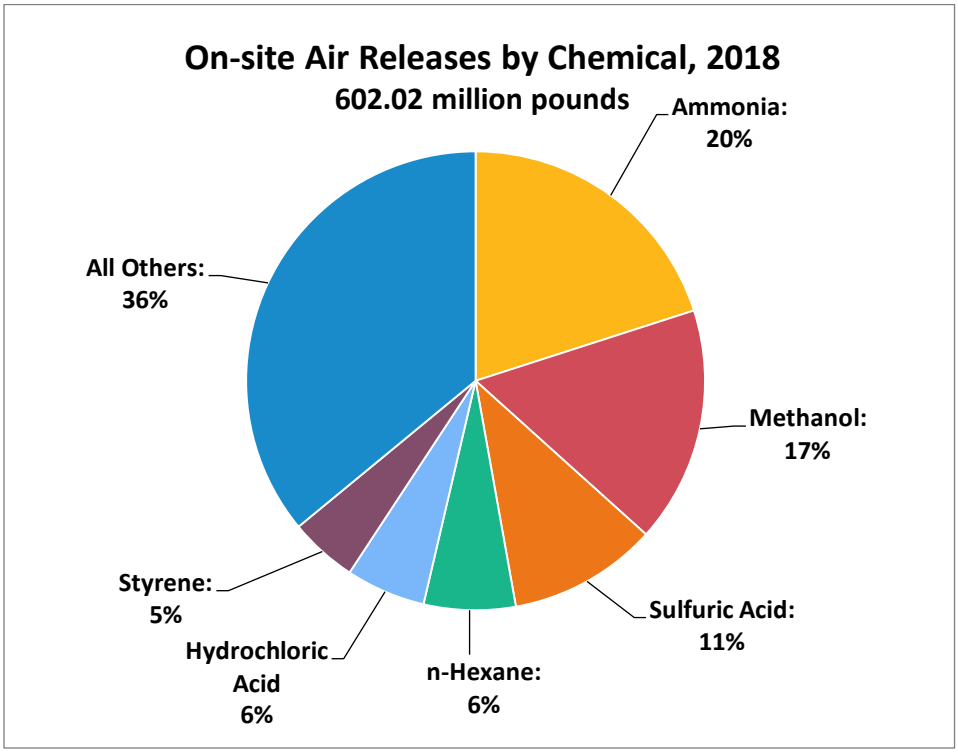


Note: For comparability, trend graphs include only those chemicals that were reportable to TRI for all years presented.

- The top chemicals by RSEI score for air releases were chromium and ethylene oxide.
- The increase in RSEI score from 2017 to 2018 was driven by increases in reported fugitive air emissions of chromium and chromium compounds from two facilities located in Houston, Texas and Ocala, Florida, as well as a facility that reported a large stack air release of ethylene oxide for the first time in Jacksonville, Florida.
- Stack air releases tend to contribute relatively less to the RSEI score than fugitive air releases. This is because chemicals released through stacks tend to get dispersed over a wider area than fugitive air releases, resulting in lower average concentrations, and therewith, lower potential for population exposure.
- For a complete, step-by-step description of how RSEI models air releases and derives RSEI Scores from stack air emissions and fugitive air emissions, see "Section 5.3 Modeling Air Releases" in Chapter 5 ("Exposure and Population Modeling") of EPA's Risk-Screening Environmental Indicators (RSEI) Methodology, RSEI Version 2.3.6.
- For general information on how RSEI Scores are estimated, see Hazard and Potential Risk of TRI Chemicals.

Air Releases by Chemical

This pie chart shows which TRI chemicals were released to air in the greatest quantities during 2018.



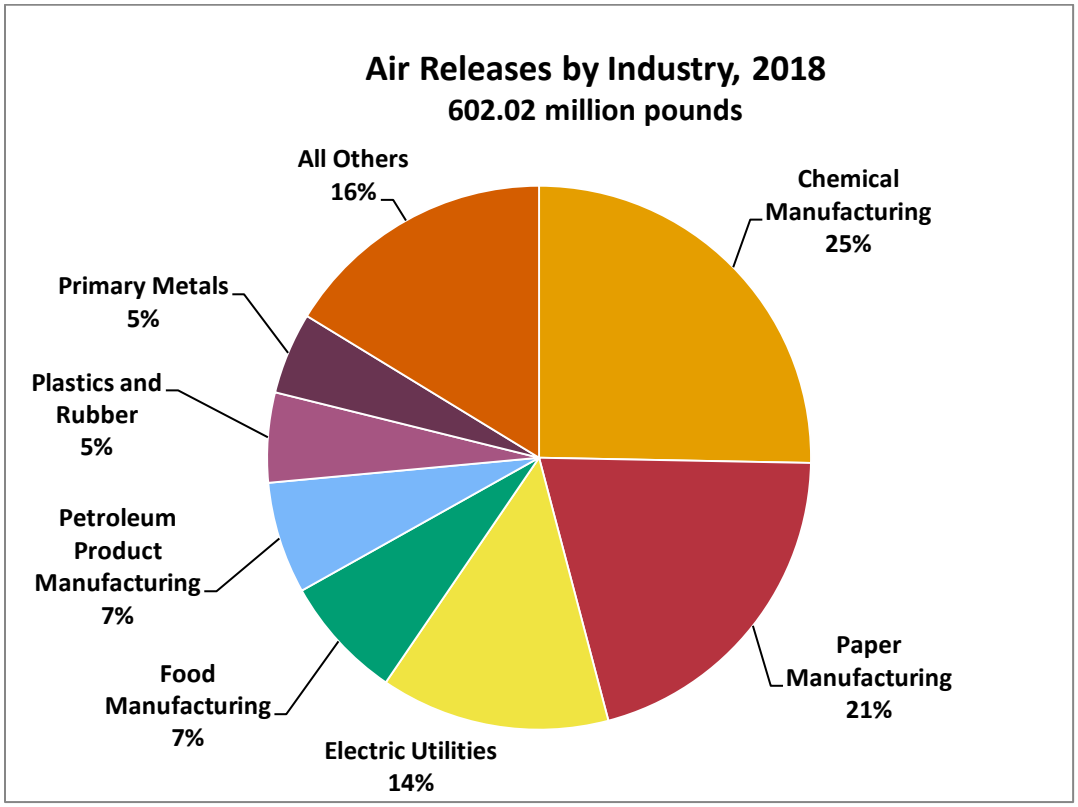
Note: Percentages may not sum to 100% due to rounding.

- Facilities manufacturing nitrogen fertilizers accounted for about one third of the air releases of ammonia reported to TRI for the past five years.
- Air releases of methanol were primarily from pulp, paper, and paperboard mills and have decreased by 24% since 2007.
- Air releases of n-hexane were primarily from food manufacturing facilities. Air releases of n-hexane have increased by 10% since 2007.
- Thirty-three percent of hydrochloric acid and 78% of sulfuric acid emissions to air were reported by facilities in the electric utilities sector. Air releases of these two chemicals reported to TRI have decreased considerably since 2007. One reason for the decrease in air releases of these chemicals reported to TRI is the increase in the use of natural gas

as a fuel for electricity generation. Natural gas power plants are not required to report to TRI.

Air Releases by Industry

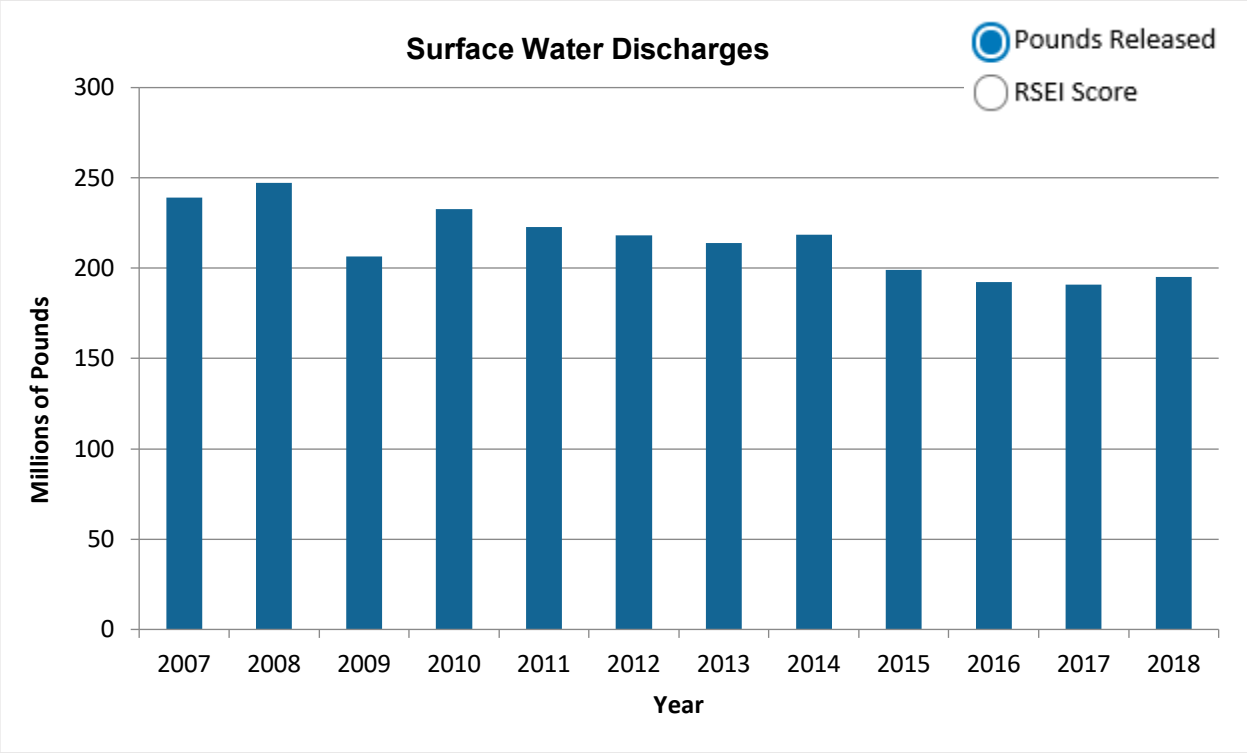
This pie chart shows the TRI-covered industry sectors that reported the greatest releases of TRI chemicals to air during 2018.



- Chemical manufacturing, paper manufacturing, and the electric utility sectors accounted for the greatest releases to air in 2018. Air releases in these three industries each changed by less than 1% since 2017:
    - Chemical manufacturing: 652,000 pound decrease
    - Paper manufacturing: 423,000 pound increase
    - Electric utilities: 336,000 pound decrease

Water Releases

Facilities are required to report the quantity of Toxics Release Inventory (TRI) chemicals they release to receiving streams or other water bodies. Surface water discharges are often regulated by other programs and require permits such as the Clean Water Act National Pollutant Discharge Elimination System (NPDES) permits. The following graph shows the trend in the pounds of TRI chemical waste discharged to water bodies.



Note: For comparability, trend graphs include only those chemicals that were reportable to TRI for all years presented.

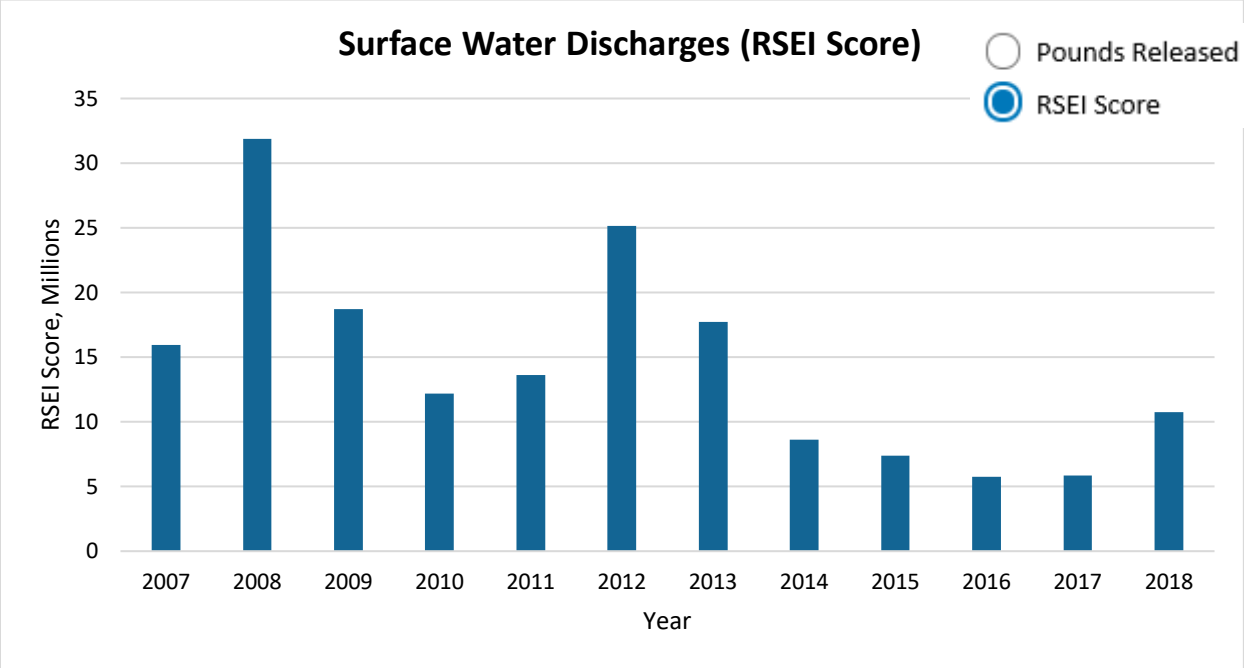
From 2007 to 2018:

- Surface water discharges decreased by 18% (44 million pounds). Most of this decline was due to reduced releases of nitrate compounds to water.
    - Nitrate compounds are often formed as byproducts during wastewater treatment processes such as when nitric acid is neutralized, or when nitrification takes place to meet standards under EPA's effluent guidelines. Nitrate compounds are released to water in quantities that are larger than any other TRI chemical released to water.

In 2018:

- Nitrate compounds alone accounted for 89% of the total quantity of all TRI chemicals discharged to surface waters.

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

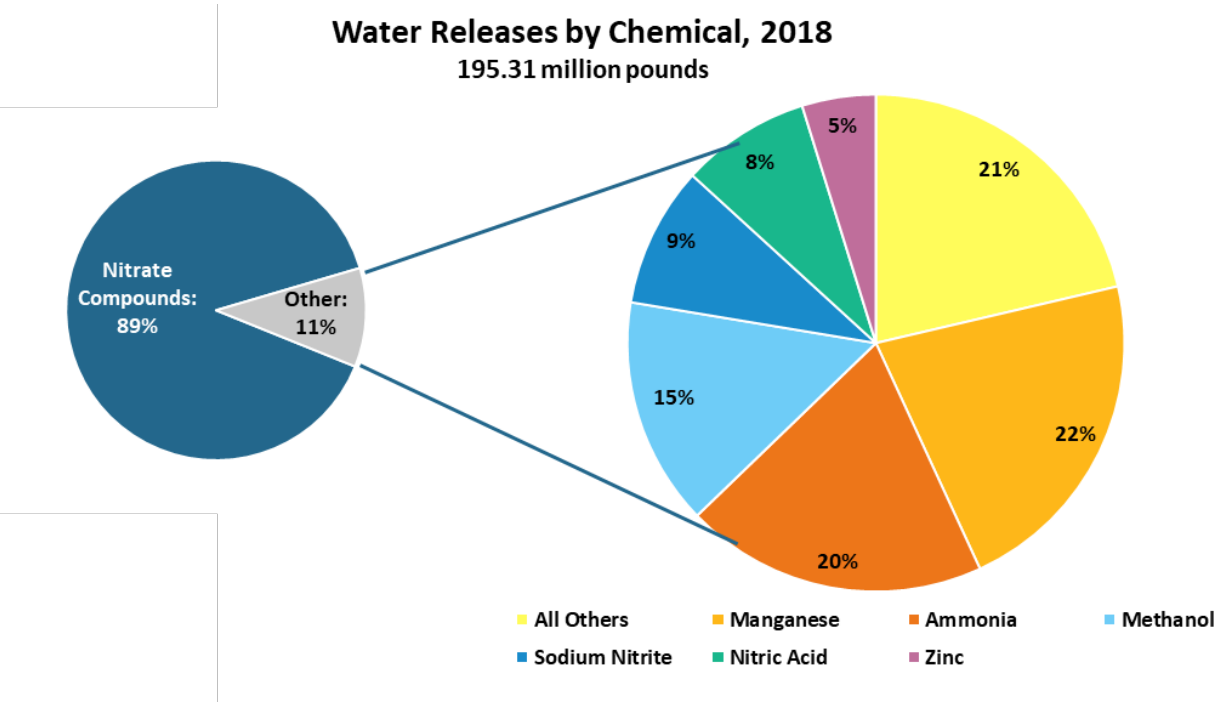


- The biggest contributor to RSEI water scores from 2007 to 2018 was arsenic compounds. For 2018, the largest contributor to RSEI water scores was mercury compounds.
- The increase in the RSEI score from 2017 to 2018 was due to an overall increase in surface water discharges of TRI chemicals, and also large releases to water of mercury from the Chemours Starke facility in Starke, Florida. [Click to view facility details in the P2 tool]
- The high RSEI score for water discharges in 2008 includes a large one-time release of arsenic compounds due to a coal fly ash slurry spill, and a release of benzidine, which has a relatively high toxicity.
- For a complete, step-by-step description of how RSEI derives RSEI Scores from surface water discharges of TRI chemicals see "Section 5.4 Modeling Surface Water Releases" in Chapter 5 ("Exposure and Population Modeling") of EPA's Risk-Screening Environmental Indicators (RSEI) Methodology, RSEI Version 2.3.6.

- For general information on how RSEI Scores are estimated, see Hazard and Potential Risk of TRI Chemicals.

Water Releases by Chemical

This pie chart shows which TRI-listed chemicals were released to water bodies in the greatest quantities during 2018.



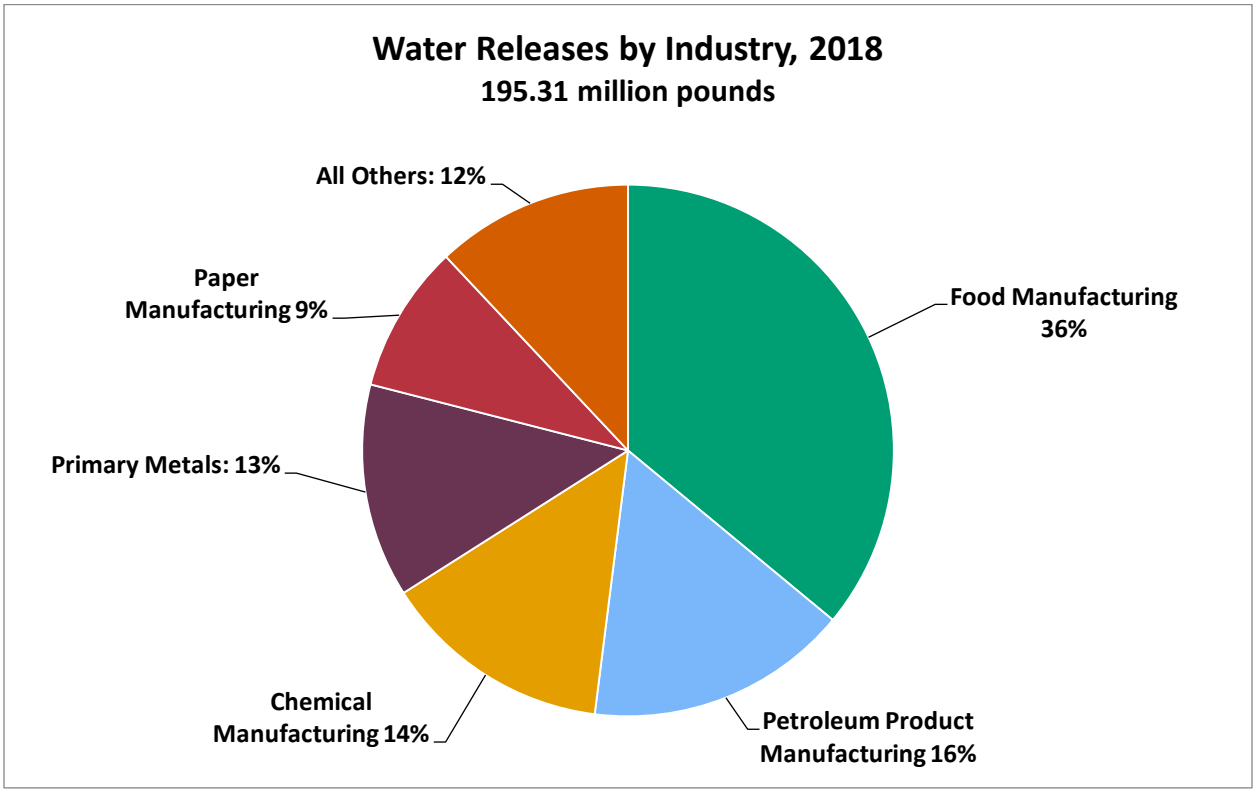
Note: In this chart, metals are combined with their metal compounds, although metals and compounds of the same metal are listed separately on the TRI list (e.g. lead is listed separately from lead compounds).

- Nitrate compounds accounted for 89% of the total quantity of TRI chemicals released to water in 2018. Nitrate compounds are soluble in water and commonly formed as part of facilities' on-site wastewater treatment processes. The food manufacturing sector contributed 40% of total nitrate compound releases to water, due to the treatment required for large quantities of biological materials in wastewaters from meat processing facilities.
    - While nitrate compounds are less toxic to humans than many other TRI chemicals, in nitrogen-limited waters, nitrates have the potential to cause increased algal growth leading to eutrophication in the aquatic environment. See EPA's Nutrient Pollution webpage for more information about the issue of eutrophication.

- Manganese and manganese compounds, ammonia, and methanol were the next most commonly released chemicals, and, in terms of combined mass quantities, accounted for 6% of the chemicals released to water.

Water Releases by Industry

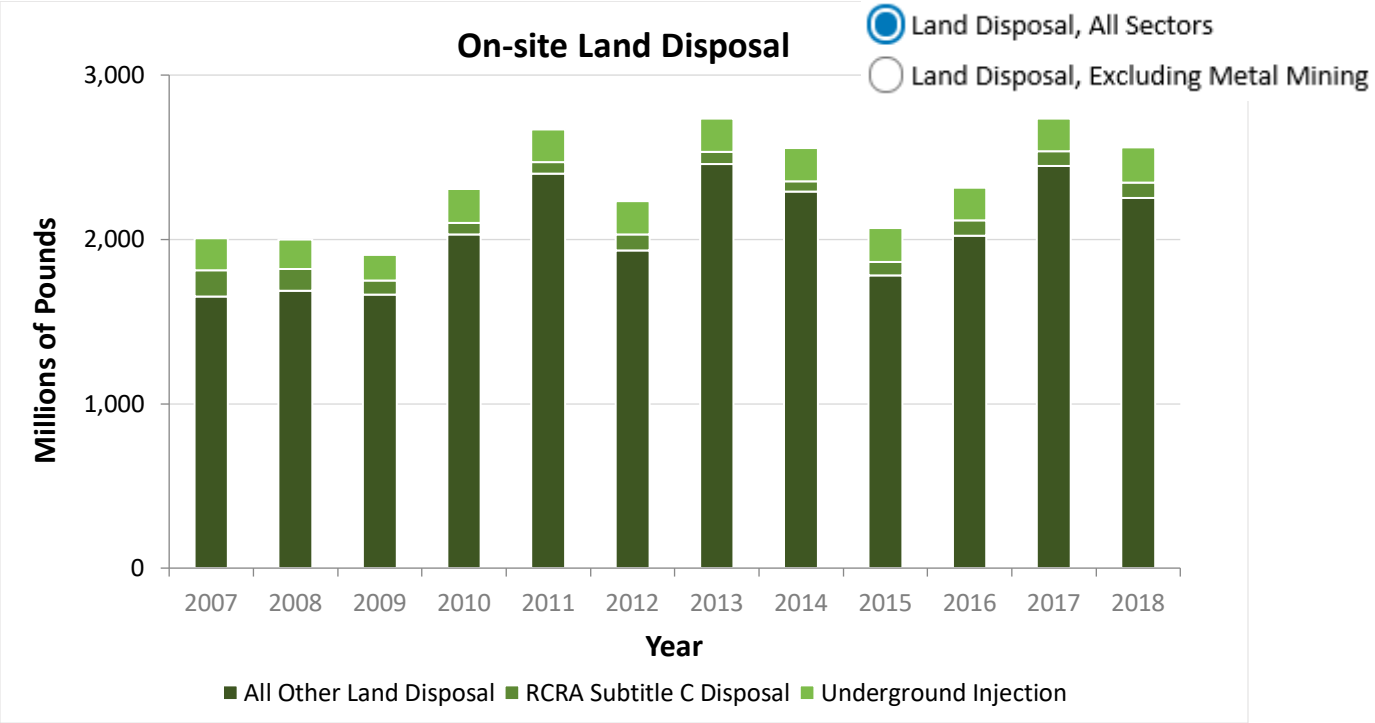
This pie chart shows the TRI-covered industry sectors that reported the greatest releases of TRI chemicals to water bodies during 2018.



- The food manufacturing sector accounted for 36% of the total quantities of TRI chemicals released to water during 2018, which was similar to its contribution over the past 10 years.
    - Nitrate compounds accounted for 99% of the total quantities of TRI chemicals released to water from the food manufacturing sector. Nitrate compounds are relatively less toxic to humans than many other TRI chemicals discharged to surface waters but are formed in large quantities by this sector during wastewater treatment processes due to the high biological content of wastewater.

Land Disposal

This graph shows the trend in chemicals reported to TRI as disposed of to land. The metal mining sector accounts for most of the TRI chemical quantities disposed of to land. Disposal of chemicals to land is often regulated by EPA under the Resource Conservation and Recovery Act (RCRA).



Note: For comparability, trend graphs include only those chemicals that were reportable to TRI for all years presented.

From 2007 to 2018:

- On-site land disposal increased by 28% (from 2.0 to 2.6 billion pounds).
- Recent fluctuations were primarily due to changes in TRI chemical quantities disposed of to land on site by metal mines.

- "All Other Land Disposal" in the figure includes disposal: in landfills and surface impoundments that are not regulated under RCRA Subtitle C; to soil (land treatment/application farming); and any other land disposal. Most of the TRI chemical quantities reported as "other land disposal" were from the disposal of waste rock at metal mines.

In 2018:

- Land disposal trends are largely driven by the metal mining sector, which accounted for 70% of land disposal quantities. Select the "Land Disposal, Excluding Metal Mining" button to view the land disposal trend with metal mines excluded from the analysis.
    - Most of the land disposal quantities from the metal mining sector were made up of either lead compounds (44%) or zinc compounds (26%).

Helpful Concepts

What is underground injection?

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

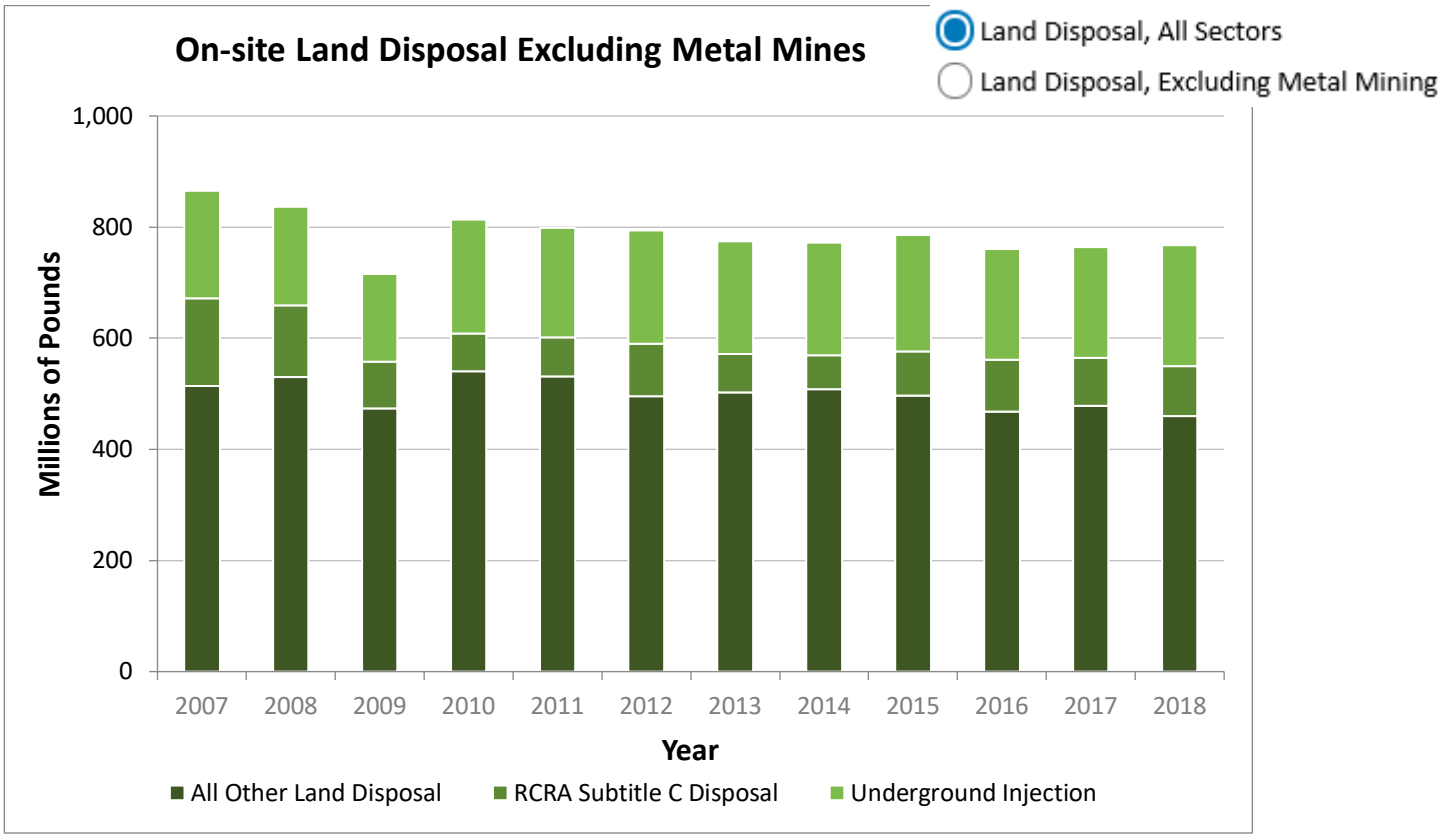
What is RCRA Subtitle C disposal?

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

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

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

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



Note: For comparability, trend graphs include only those chemicals that were reportable to TRI for all years presented.

From 2007 to 2018:

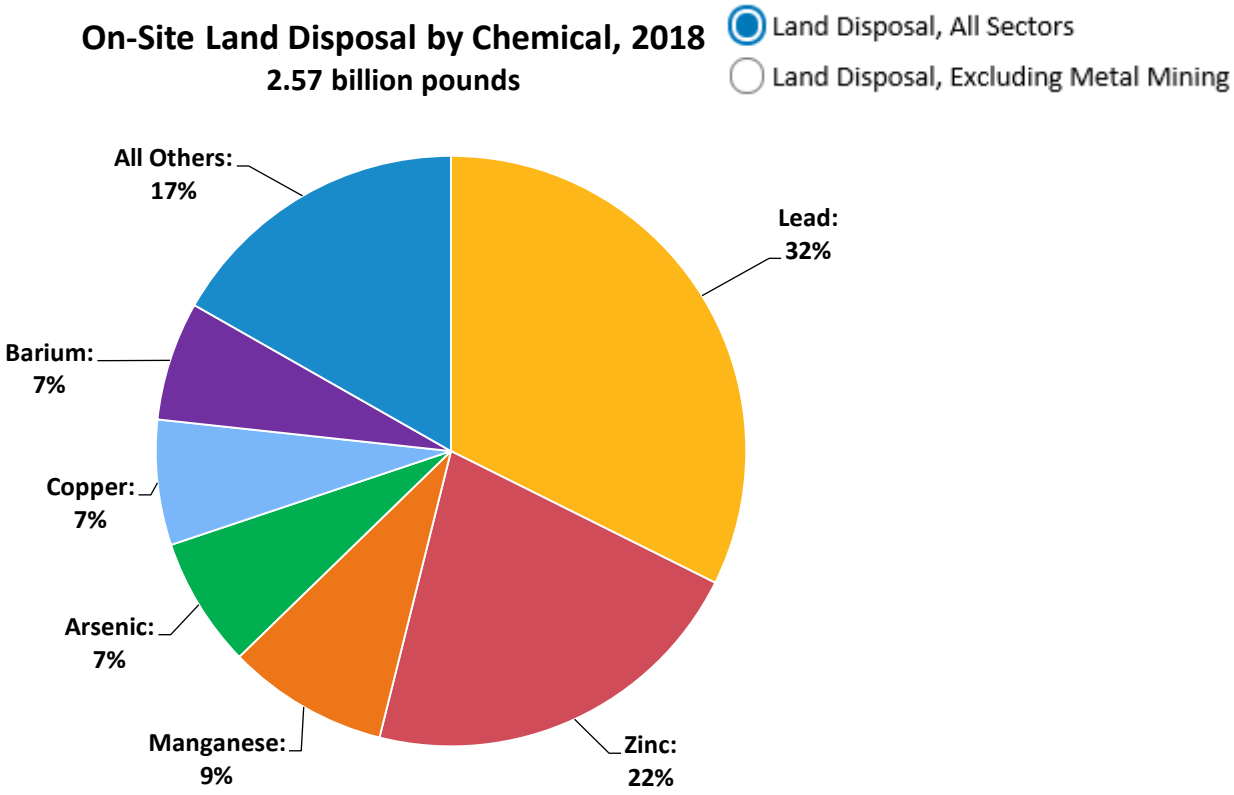
- Total on-site land disposal for all industries other than metal mining decreased by 11%.
- The decrease in land disposal for industries other than metal mining was driven by reduced releases to land from electric utilities and hazardous waste management facilities.

In 2018:

- Excluding on-site land disposal by metal mines, the chemicals disposed of to land in the largest quantities were: barium and barium compounds (18%), manganese and manganese compounds (12%), and zinc and zinc compounds (10%).
- Excluding on-site land disposal by metal mines, most land disposal was reported by the chemical manufacturing, electric utilities, hazardous waste management, and primary metals sectors.

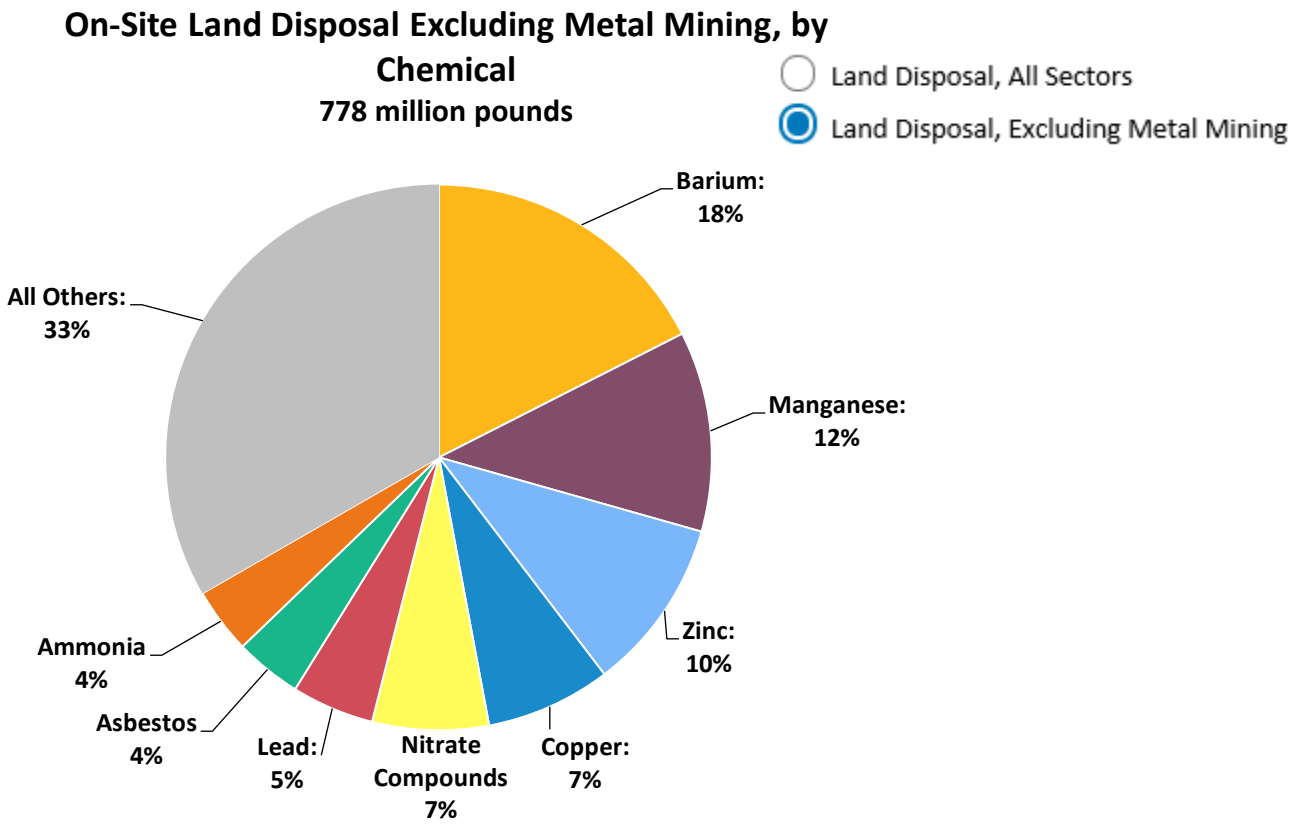
Land Disposal by Chemical

This pie chart shows the chemicals disposed of to land on site in the greatest quantities during 2018.



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

The metal mining sector alone was responsible for 95% of the lead and lead compounds and 86% of the zinc and zinc compounds disposed of to land in 2018. Annual fluctuations occur in land disposal quantities reported by metal mines because even a small change in the chemical composition of the mineral deposit being mined can lead to big changes in the amount of TRI-listed chemicals reported nationally.



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

From 2007 to 2018:

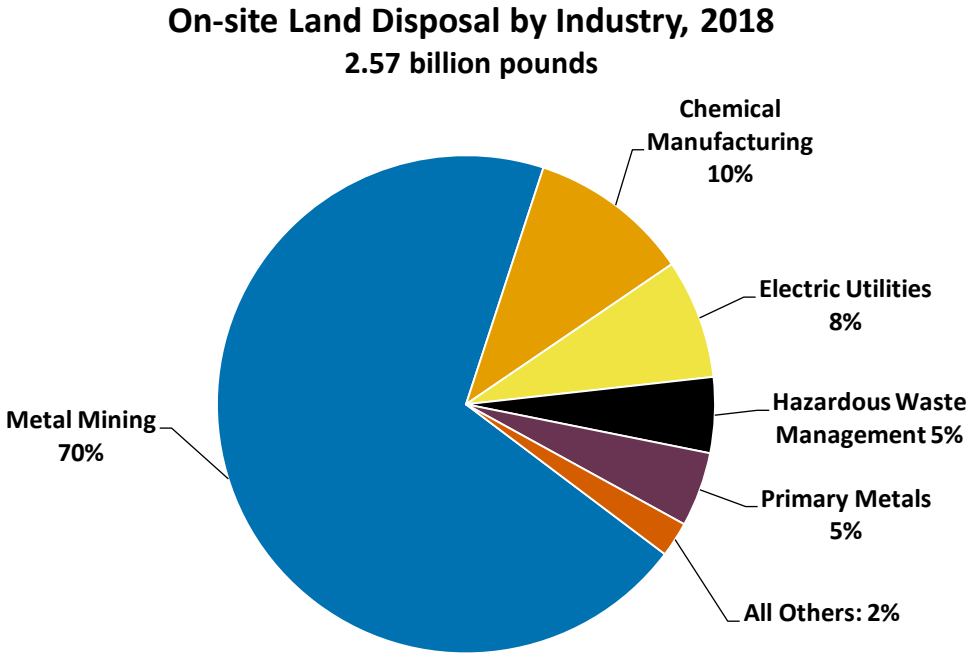
- Barium: Releases decreased 27%.
- Manganese: Releases decreased 17%.
- Zinc: Releases decreased 47%.

In 2018:

- When the metal mining sector is excluded, a wider variety of chemicals contribute to most of the land releases. Eight different chemicals, for example, comprised 67% of land releases, as opposed to three chemicals comprising a comparable 63% of releases when metal mining is included.

Land Disposal by Industry

This pie chart shows the TRI-covered industry sectors that reported the greatest quantities of TRI chemicals disposed of to land on site during 2018.



- The metal mining sector accounted for most of the TRI chemicals disposed of to land in 2018, mostly due to chemicals contained in waste rock.
- The relative contribution by each industry sector to on-site land disposal has not changed considerably in recent years.

Chemicals of Special Concern

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

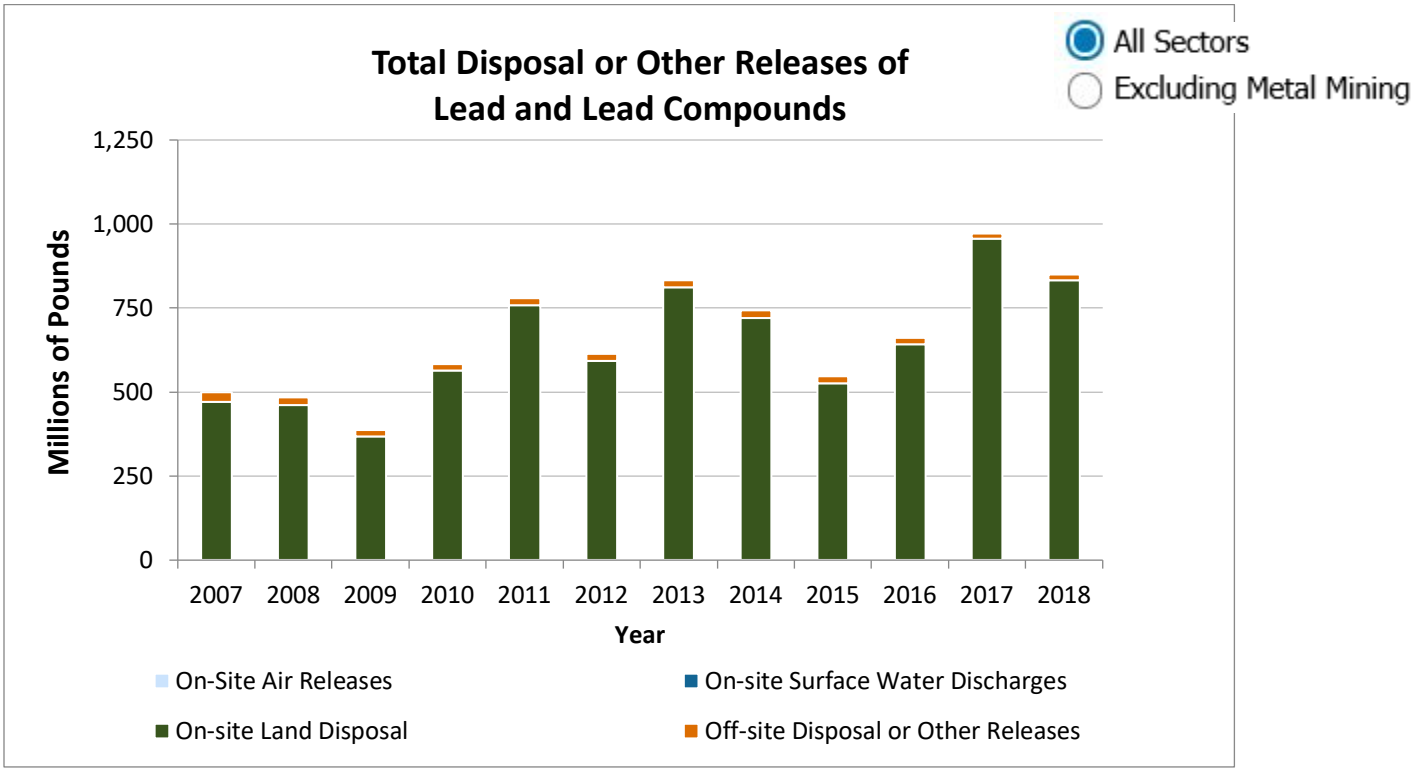
Chemicals designated as PBTs are toxic and remain in the environment for a long time where they tend to build up in the tissue of organisms throughout the food web. These organisms serve as food sources for other organisms, including humans, that are sensitive to the toxic effects of PBT chemicals.

Reporting requirements for the 16 chemicals and 5 chemical categories designated as PBTs on the TRI chemical list for Reporting Year 2018 are more stringent than for other TRI chemicals. This section focuses on the following PBT chemicals: lead and lead compounds; mercury and mercury compounds; and dioxin and dioxin-like compounds.

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

Lead Releases Trend

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



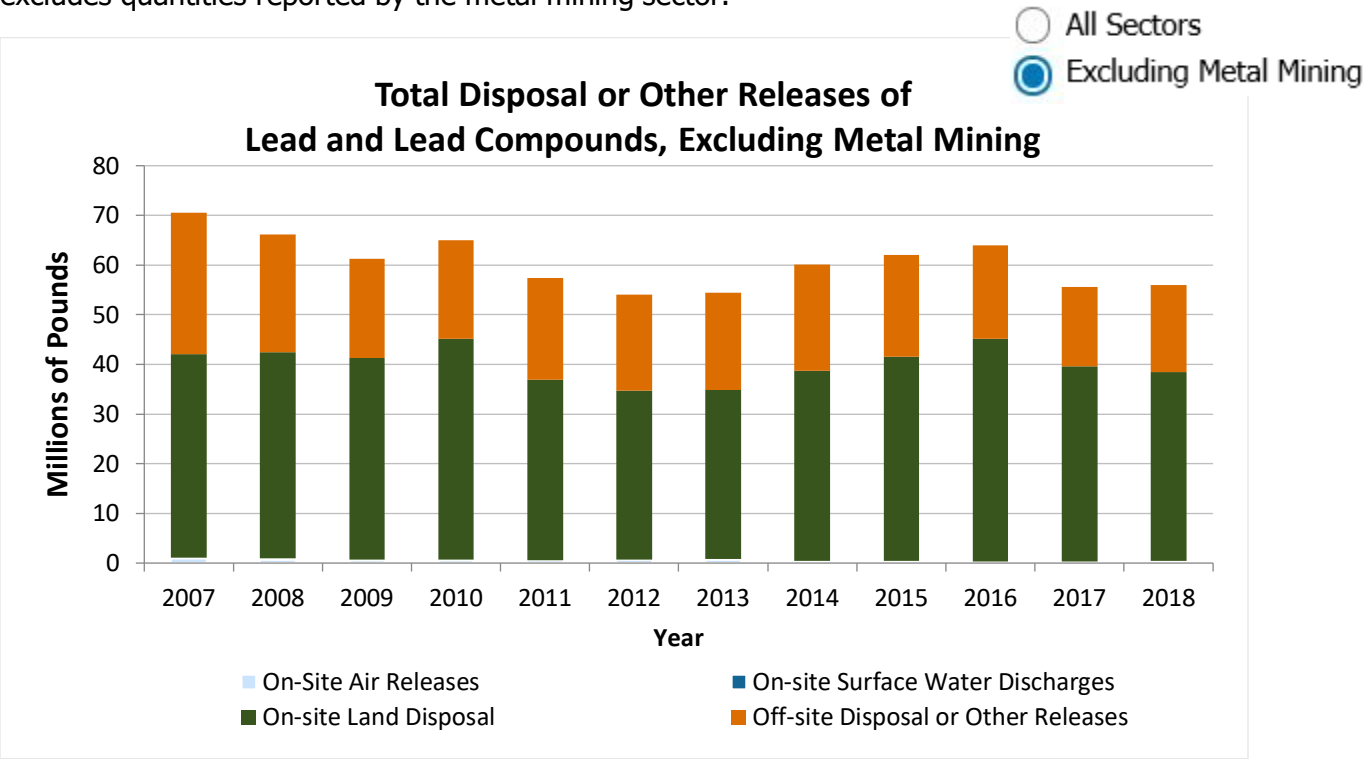
From 2007 to 2018:

- Releases of lead and lead compounds rose and fell between 2007 and 2018, with an overall increase of 71%.
- The metal mining sector accounts for most of the lead and lead compounds disposed of on site to land, driving the overall trend. For 2018, for example, metal mines reported 95% of total lead and lead compounds disposed of to land on site.

From 2017 to 2018:

- Total releases of lead and lead compounds decreased by 12% (121 million pounds).

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

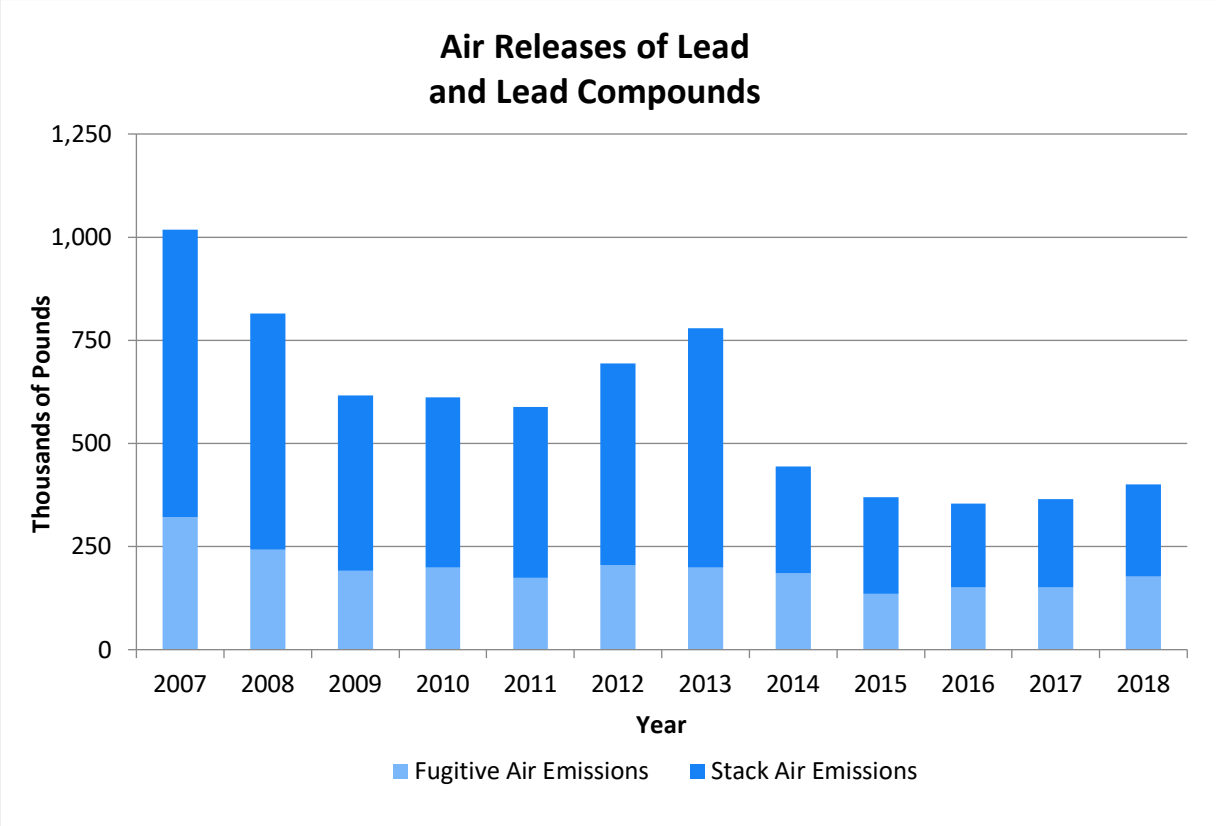


From 2007 to 2018:

- Among sectors other than metal mining, releases of lead and lead compounds have decreased by 21% (14.5 million pounds).
- Among sectors other than metal mining, most releases of lead and lead compounds were from the primary metals and hazardous waste management sectors.

Lead Air Releases Trend

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



From 2007 to 2018:

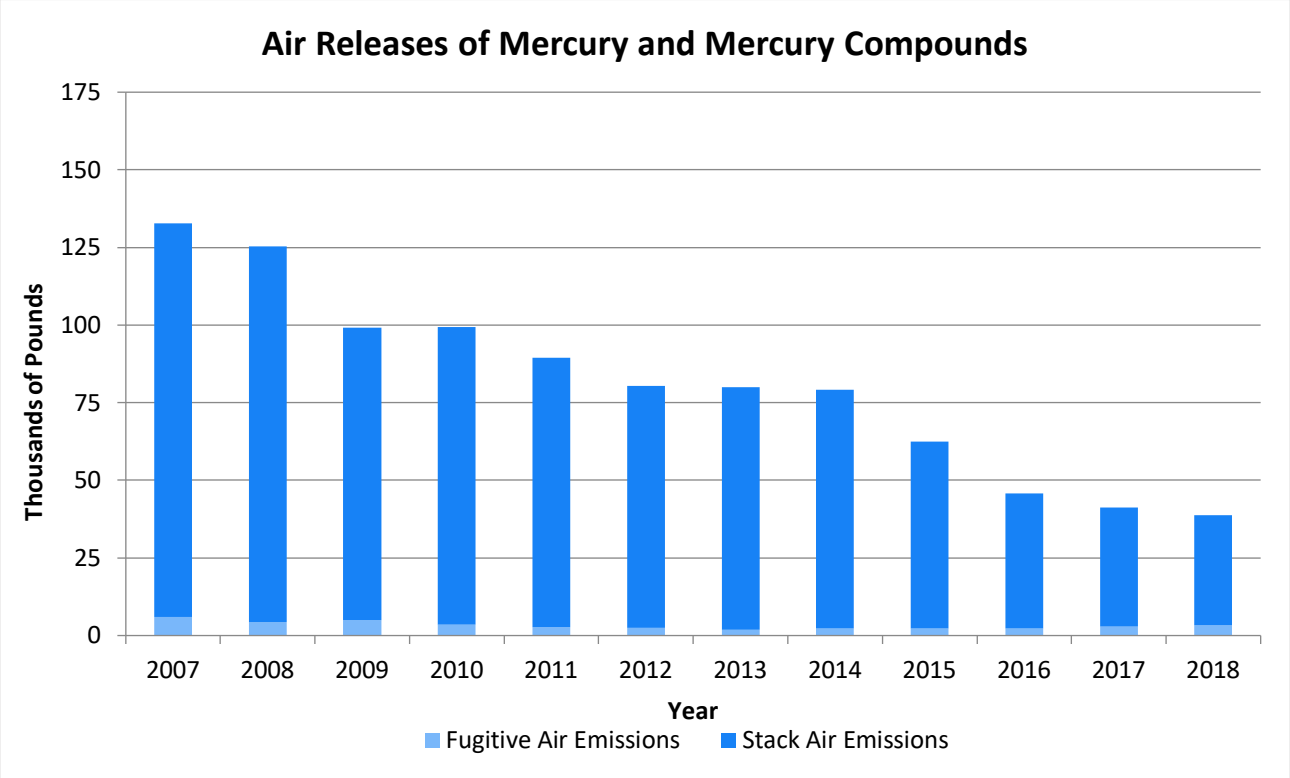
- Air releases of lead and lead compounds decreased by 61%. The primary metals and electric utilities industry sectors have driven this decrease.
- The primary metals sector, which includes iron and steel manufacturers and smelting operations, reported the greatest quantities of releases of lead and lead compounds to air.

From 2017 to 2018:

- Air releases of lead and lead compounds increased by 10%. This is largely due to a single facility in the primary metals sector. The facility attributed its increase in reported air releases of lead for 2018 to higher throughput and updated emission factors.
- In 2018, 44% of air releases of lead were from the primary metals industry sector.

Mercury Air Releases Trend

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



From 2007 to 2018:

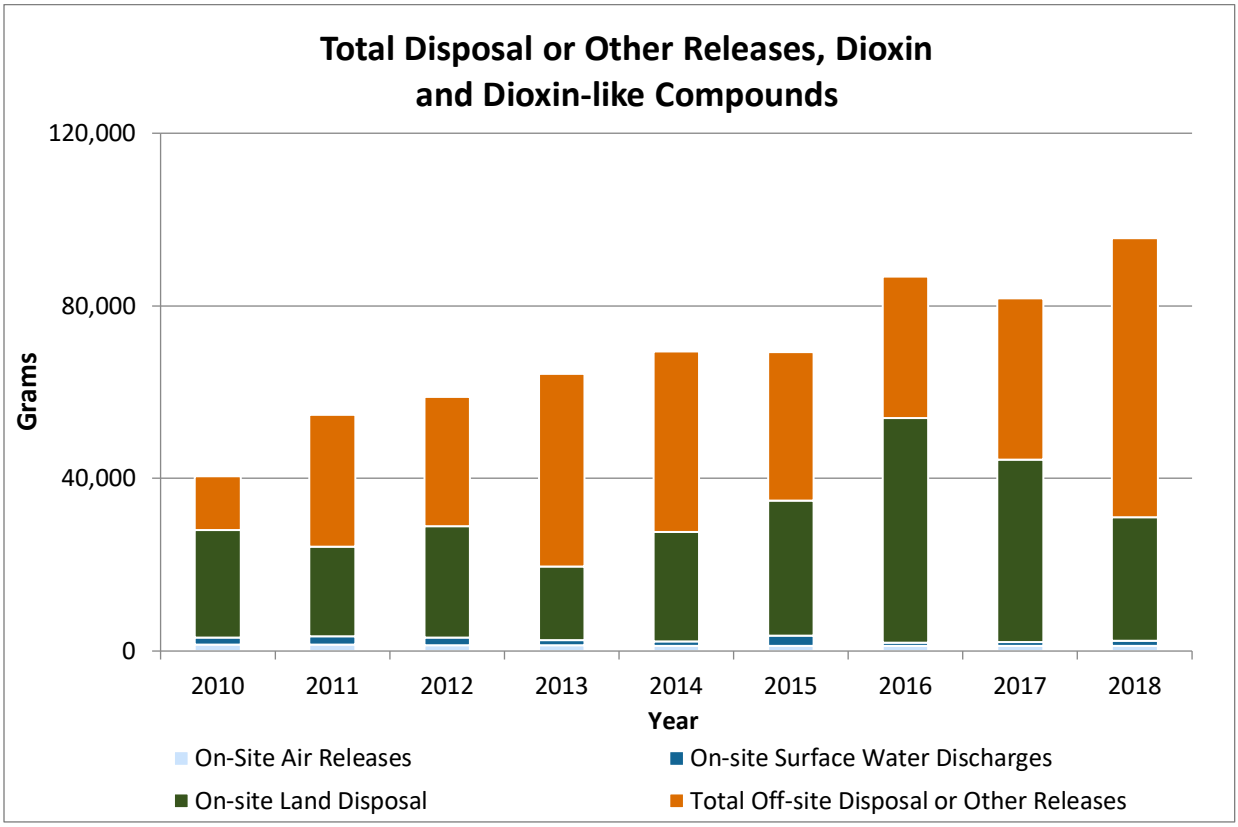
- Releases of mercury and mercury compounds to air decreased by 71%.
- Electric utilities drove the decline in mercury air emissions, with a 90% reduction (84,000 pounds).

From 2017 to 2018:

- Air releases of mercury and mercury compounds decreased by 6%.
- The primary metals sector, which includes iron and steel manufacturers and smelting operations, accounted for 35% of the air emissions of mercury and mercury compounds reported to TRI for 2017 and 2018.

Dioxins Releases Trend

This graph shows the trend in the grams of dioxin and dioxin-like compounds disposed of or otherwise released by TRI-reporting facilities from 2010 to 2018. Note that the dioxins chemical category is reported to TRI in grams while all other TRI chemicals are reported in pounds. The TRI reporting requirements for dioxin and dioxin-like compounds changed in reporting year 2010, so for a consistent presentation this graph starts with 2010.



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

From 2010 to 2018:

- Dioxin releases increased by 136%. This increase was largely driven by three facilities which together released over 400,000 grams of dioxins between 2010 and 2018, accounting for 66% of all dioxin releases reported during that time.
    - Increases in off-site releases of dioxins were largely driven by two facilities, both basic organic chemical manufacturing facilities.

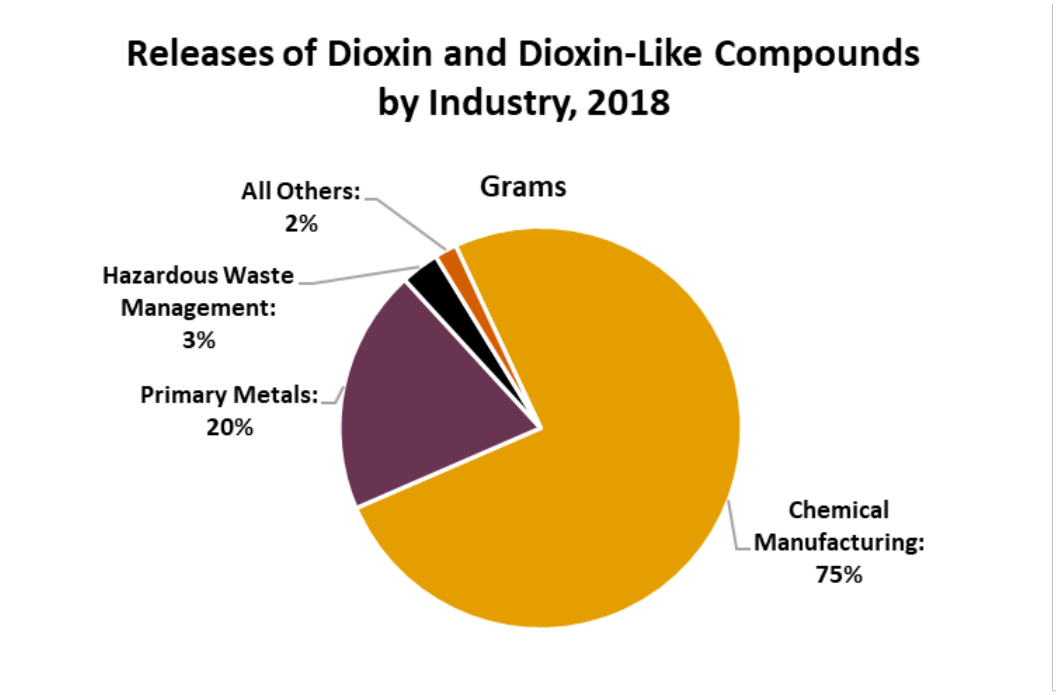
From 2017 to 2018:

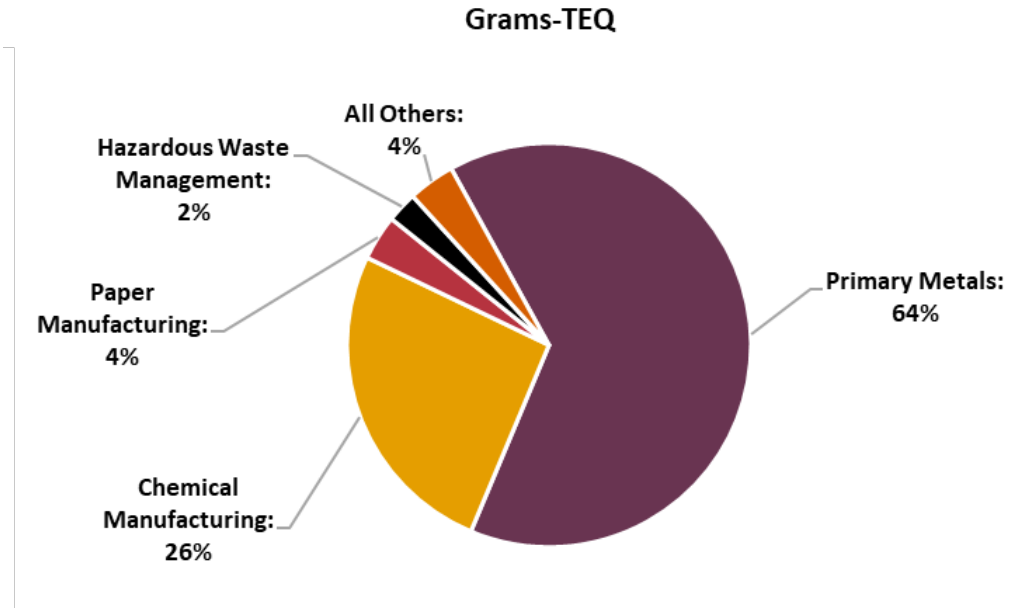
- Releases of dioxins increased by 17%.
    - Off-site disposal or other releases increased by 73% and were largely driven by one basic organic chemical manufacturing facility which reported 35,000 grams released in 2018. In comparison, this facility reported releasing fewer than 6,000 grams annually between 2010 and 2018.
- In 2018, most (68%) of the quantity released was disposed or otherwise released off site.

Dioxins Releases by Industry

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

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



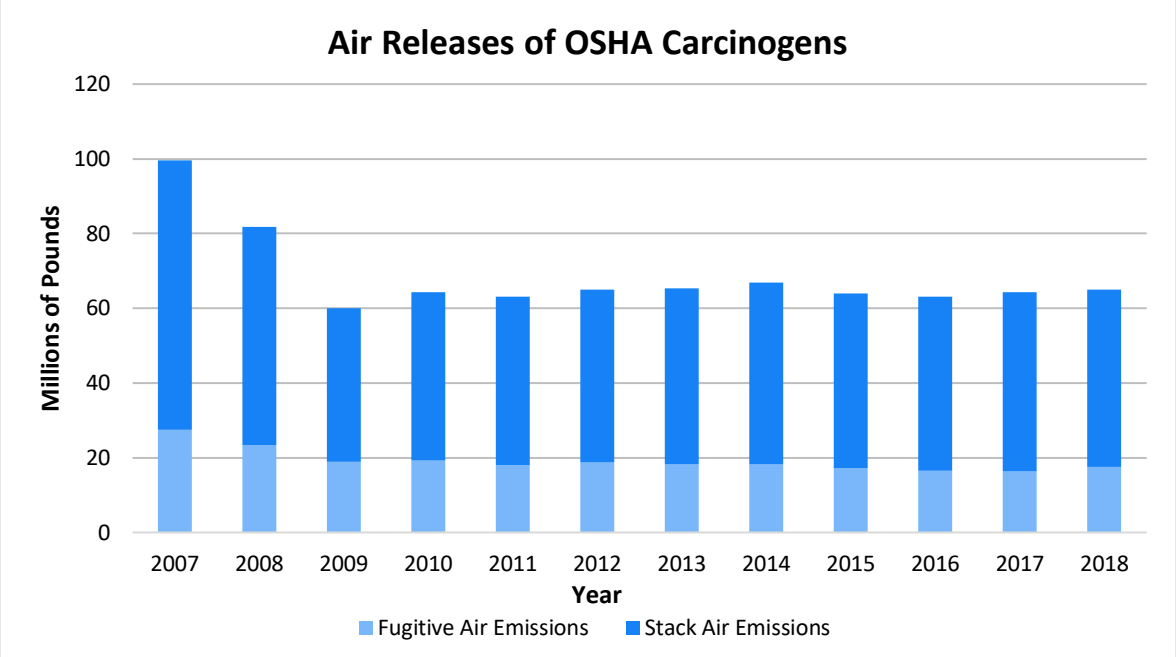


- Various industry sectors may dispose of or otherwise release very different mixes of dioxin congeners.
- The chemical manufacturing industry accounted for 75% and the primary metals sector for 20% of total grams of dioxins released.

- However, when TEFs are applied, the primary metals sector accounted for 64% and the chemical manufacturing sector for 26% of the total grams-TEQ released.

Occupational Safety and Health Administration (OSHA) Carcinogens Air Releases

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



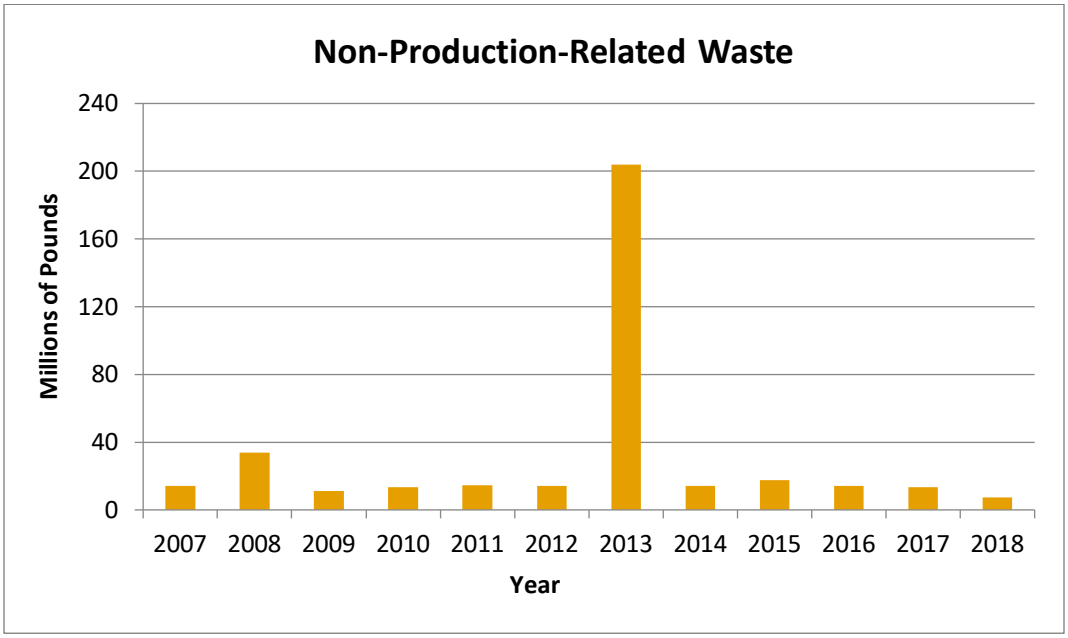
Note: For comparability, trend graphs include only those chemicals that were reportable to TRI for all years presented.

From 2007 to 2018:

- Air releases of these carcinogens decreased by 35%.
- The long-term decreases in air releases of OSHA carcinogens were driven mainly by decreases in releases of styrene to air from the plastics and rubber and transportation equipment industries.
- In 2018, air releases of OSHA carcinogens consisted primarily of styrene (44% of the air releases of all OSHA carcinogens), acetaldehyde (12%) and formaldehyde (7%).

Non-Production-Related Waste

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



- For 2018, 553 facilities reported 7.4 million pounds of one-time, non-production-related releases of TRI chemicals.
- Non-production-related waste from all facilities was below 35 million pounds in all years except for 2013 when a mining facility reported a one-time release of 193 million pounds. The facility reported zero releases in 2014 and has not reported to TRI since.