2022 TRI National Analysis

Introduction to the 2022 TRI National Analysis

Industries and businesses in the U.S. use many chemicals to make the products we depend on, such as pharmaceuticals, computers, paints, clothing, and automobiles. While most chemicals on the Toxics Release Inventory (TRI) chemical list are managed by facilities in ways that minimize releases into the environment, releases still occur as part of normal business operations.

It is your right to know what TRI chemicals are being used in your community, how the chemical waste is managed—including through environmental releases—and whether these quantities have changed over time.

The TRI tracks how industries manage certain toxic chemicals. Information facilities report each year to EPA provides insights into how chemicals are managed by facilities conducting industrial activities such as manufacturing, metal mining, generation of electric power, and hazardous waste management. TRI data are publicly available. For calendar year 2022, more than 21,000 facilities reported to the TRI Program.

Each year, in support of its mission to protect human health and the environment, EPA analyzes the most recent TRI data, conducts comparative analyses with TRI data for previous years, and publishes its findings in the TRI National Analysis. Check out the Catalog of Applied TRI Data Uses to learn more about how EPA and others have used TRI data.

TRI Reporting

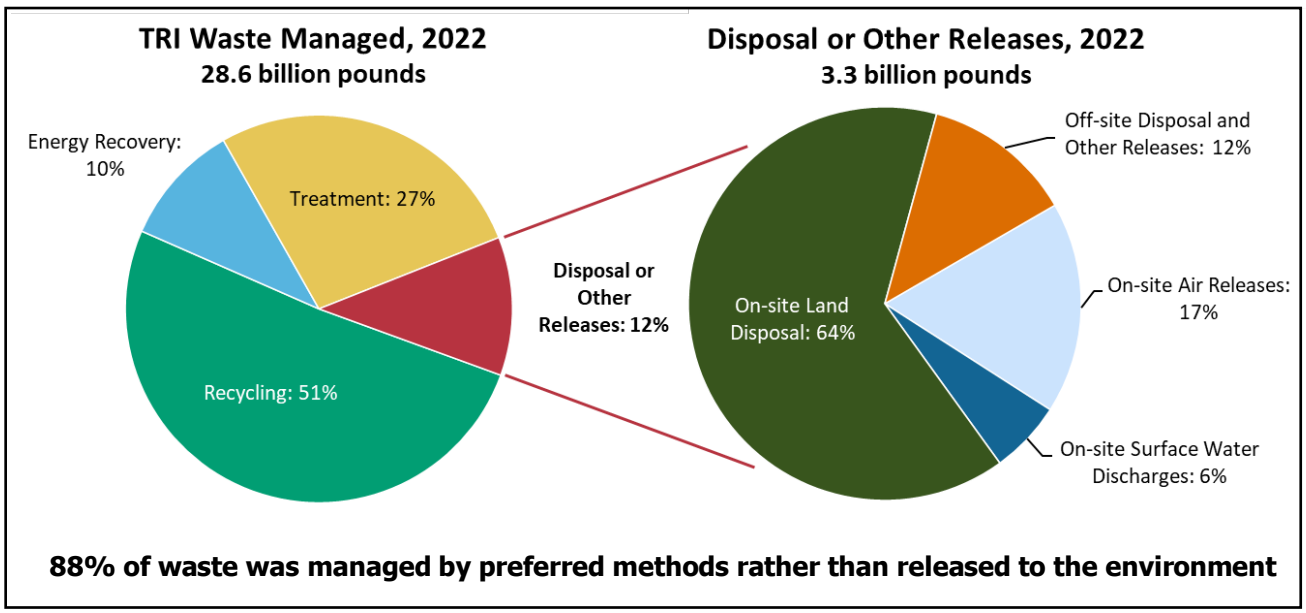
Under Section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA) and Section 6607 of the Pollution Prevention Act (PPA), facilities that meet TRI reporting requirements must report details about their pollution prevention and waste management activities—including releases—of TRI-listed chemicals that occurred during the calendar year by July 1 of the following year.

Watch a short video about the TRI Program and your right to know.

Overview of the 2022 TRI data

The two pie charts below summarize the most recent TRI data: the chart on the left shows the total amount of TRI chemical waste managed through recycling, energy recovery, treatment,

and disposal or other releases. The chart on the right shows the proportions of TRI chemical waste released to air, water, and land, and transferred off site for disposal.



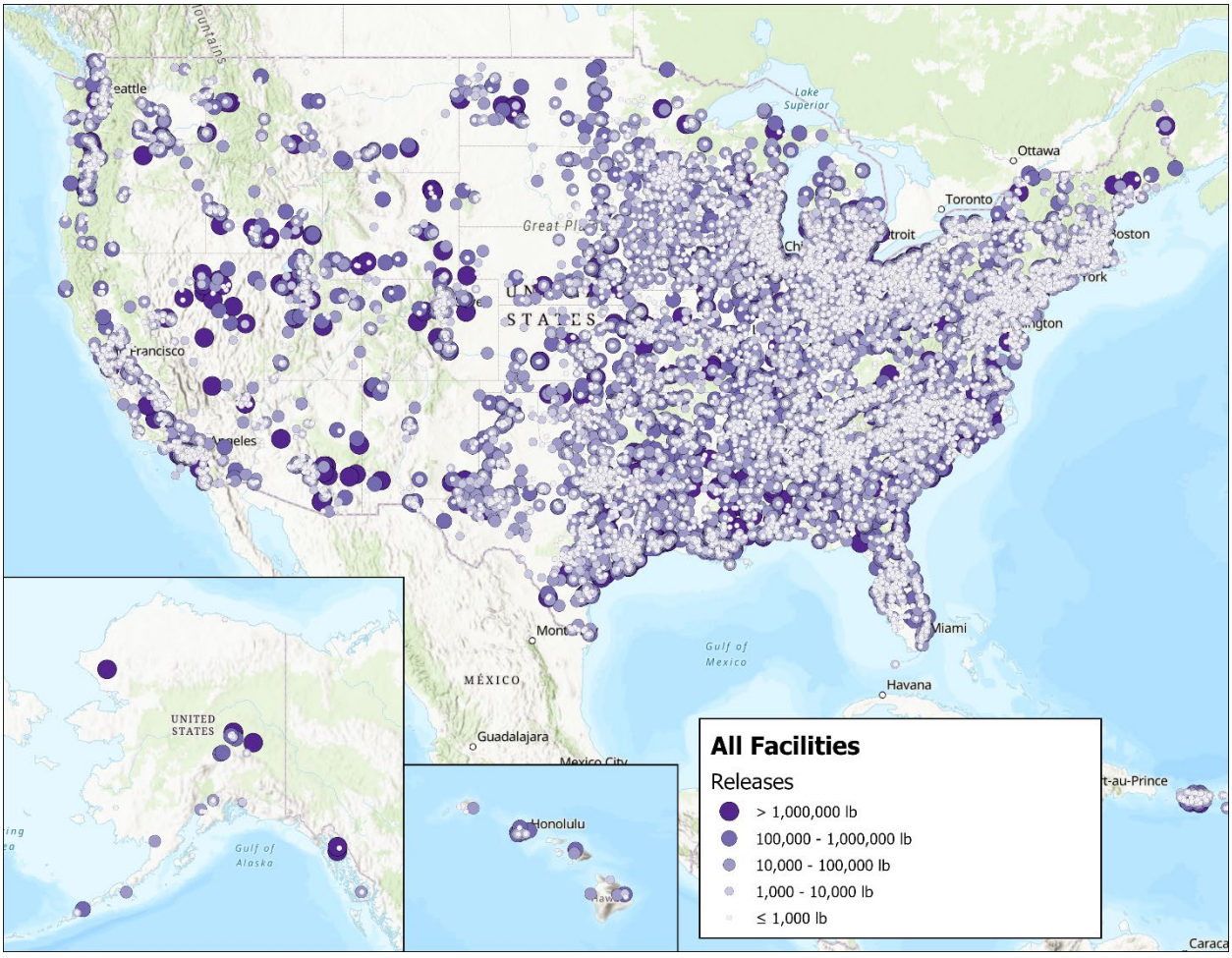
Note: 1) Percentages do not sum to 100% due to rounding. 2) To avoid double counting, the Disposal or Other Releases pie chart on the right excludes quantities of TRI chemicals that are transferred off site from a TRI-reporting facility and subsequently released on site by a receiving facility that also reports to TRI.

- Facilities reported managing 28.6 billion pounds of TRI-listed chemicals as waste during 2022. Waste managed is the quantity of TRI chemicals in waste resulting from routine operations. Facilities manage this waste through recycling, combustion for energy recovery, treatment, and disposing of or otherwise releasing the waste into the environment.
- Of this total, 88% was recycled, combusted for energy recovery, or treated, while 12% was disposed of or otherwise released into the environment.
- For TRI chemicals in waste that were disposed of or otherwise released, facilities report the quantities of these releases and whether the releases were to the air, water, or land. Most releases of TRI chemicals occur on site at facilities. However, waste containing TRI chemicals may also be shipped off site for disposal, such as to a landfill. As shown in the pie chart on the right, most TRI chemical waste was disposed of to land, which includes landfills, underground injection, and other land disposal practices.

What's new in TRI for 2022?

- The TRI Program expanded coverage of the natural gas processing sector to include all natural gas processing facilities that receive and refine natural gas. In prior years, only natural gas processing facilities that primarily recovered sulfur from natural gas were required to report. For 2022, 305 facilities in the sector reported managing 115 million pounds of TRI chemicals as waste, most of which (89 million pounds) were released.
- EPA extended TRI reporting requirements to cover certain contract sterilization facilities that use ethylene oxide. These facilities collectively reported releasing 9,166 pounds of ethylene oxide into the air in 2022.
- Four per- and polyfluoroalkyl substances (PFAS) were added to the TRI chemical list. To learn more, see the PFAS Chemical Profile.
- For the complete list of changes to the TRI reporting requirements for 2022, see the 2022 TRI Reporting Forms and Instructions.

Where are the Facilities that Reported to TRI for 2022 Located?



View Larger Map

TRI Data Considerations

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

- **Covered chemicals and sectors:** TRI does not include information from all facilities or industry sectors that may manage TRI chemicals in waste, nor does it cover every chemical manufactured, processed or otherwise used by facilities in the United States. The complete TRI chemical list and a list of the sectors covered by the TRI Program are available on TRI's GuideME website.
- **Reporting thresholds:** Facilities in covered sectors that manufacture, process, or otherwise use TRI-listed chemicals above listed threshold quantities within a calendar year and employ at least ten full-time equivalent employees are required to report to the TRI Program. For most TRI chemicals, the threshold quantities are 25,000 pounds of the chemical manufactured or processed, or 10,000 pounds of the chemical otherwise used during a calendar year.
- **TRI trends**: The TRI National Analysis presents trends for the last ten years (2013-2022). While the TRI chemical list has changed since 2013, the quantities of the newly added chemicals released account for less than 0.1% of national totals. To simplify the trend presentations and to enable reproducibility, all chemicals are included in the trend figures, including those that have not been on the TRI chemical list for all ten years of the trend.
- **Risk:** TRI data can be a useful starting point to help evaluate whether chemical releases may pose potential risks to human health and the environment. However, the quantity of a chemical release alone is not necessarily an indicator of exposure to the chemical, or the potential health or environmental risks posed by the chemical. Note that:
    - Chemicals on the TRI list vary in toxicity; and

TRI Reporting is Required

TRI reporting is required for facilities that meet the reporting criteria under Section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA). EPA investigates cases of EPCRA non-compliance and may issue civil penalties, including monetary fines. Since the TRI Program's creation, EPA has taken more than 3,500 TRI-related enforcement actions. For more information, see the TRI Compliance and Enforcement webpage.

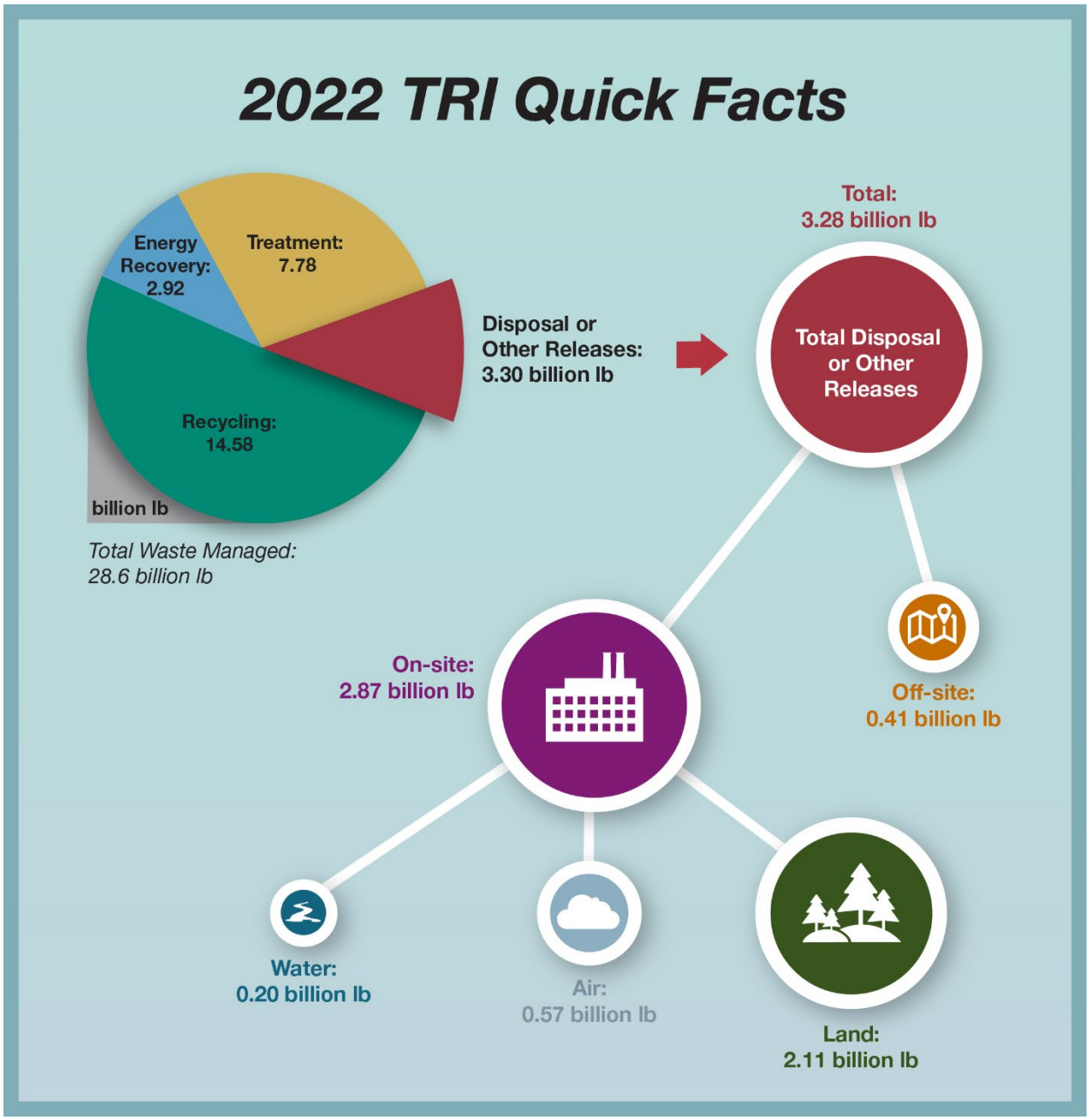
  - The extent of exposure to a chemical depends on many factors such as where the chemical is released, how it is released (i.e., into the air, water, or land), the chemical's properties, and what happens to the chemical in the environment.
  - For more information on the use of TRI data in exposure and risk evaluations, see the TRI and Estimating Potential Risk webpage and Potential Risks from TRI Chemicals in the Releases section.

- **Data quality:** Facilities use their best available data to determine the quantities of chemicals they report to TRI. Each year, EPA conducts an extensive data quality review that includes contacting facilities about potential errors in reported information. This data quality review process helps ensure that the TRI National Analysis is based on accurate and complete information.
- **Data presentation:** The National Analysis is intended to convey key messages from the TRI data submitted by facilities. At times, the National Analysis may simplify certain technical details when they don't have a significant impact on the information presented.
- **Late submissions, revisions, and withdrawals:** TRI reporting forms submitted to EPA or revised after the July 1 reporting deadline may not be processed in time to be included in the National Analysis. After EPA's data quality review, the TRI data are frozen in October and this dataset is used to develop the National Analysis. Any revisions, late submissions, or withdrawals made after this date are not reflected in the National Analysis but are incorporated into the TRI dataset during the spring data refresh and will be reflected in the next year's National Analysis.

Impact of Late Submissions and Revisions on the National Analysis

EPA compared the data released in October 2022 and used for the 2021 National Analysis to the updated version of these data released in October 2023. This allowed EPA to assess how late submissions and revisions to submitted data might have changed the information presented in the 2021 National Analysis, had they been included in the dataset. National waste management and release quantities were 0.1% and 1.5% different, respectively, than what was shown in the 2021 National Analysis.

Quick Facts for 2022



In this figure, the value for "Disposal or Other Releases" in the waste managed pie chart (3.30 billion lb) is greater than the value for "Total Disposal or Other Releases" (3.28 billion lb). There are several reasons why these quantities differ slightly, including:

- **Double counting:** Total disposal or other releases (the 3.28 billion pound value in the figure) removes "double counting" that occurs when a facility reports transfers of TRI chemicals in waste to another TRI-reporting facility. For example, when Facility A transfers a chemical off site for disposal to Facility B, Facility A reports the chemical as

transferred off site for disposal while Facility B reports the same chemical as disposed of on site. In processing the data, the TRI Program recognizes that this is the same quantity of the chemical and includes it only once in the total disposal or other releases metric. The waste managed metric in TRI, however, considers all instances where the TRI chemical in waste is managed (first as a quantity sent off site for disposal and next as a quantity disposed of on site), and includes both the off-site transfer and the on-site disposal. Typically, double counting accounts for most of the difference between the two release quantities shown in the TRI Quick Facts figure.

- **Non-production related waste managed**: Non-production-related waste refers to TRI chemical waste that results from one-time events, remedial actions, catastrophic events, or other events rather than standard production activities. Facilities typically report managing these waste quantities as on-site releases or transfers off site which are included in a facility's total disposal or other releases but not in the overall total for waste managed.

For more information on TRI, the chemicals and industry sectors it covers, the reporting requirements, and to access TRI data, visit the TRI website.

Pollution Prevention

Pollution prevention, also known as "P2" or "source reduction," is any practice that reduces or eliminates pollution at its source prior to waste management. With less waste being created, the likelihood of impacts to human health and the environment is reduced. Additionally, it is often less expensive for facilities to prevent pollution from being created than to pay for control, treatment, or disposal of wastes.

Under the Pollution Prevention Act of 1990 (PPA), facilities that report to the Toxics Release Inventory (TRI) Program are required to include information on any newly implemented P2 activities. Many facilities also choose to include additional details that further describe their P2 actions. As a result, TRI serves as a robust tool for identifying effective P2 practices and highlighting pollution prevention successes.

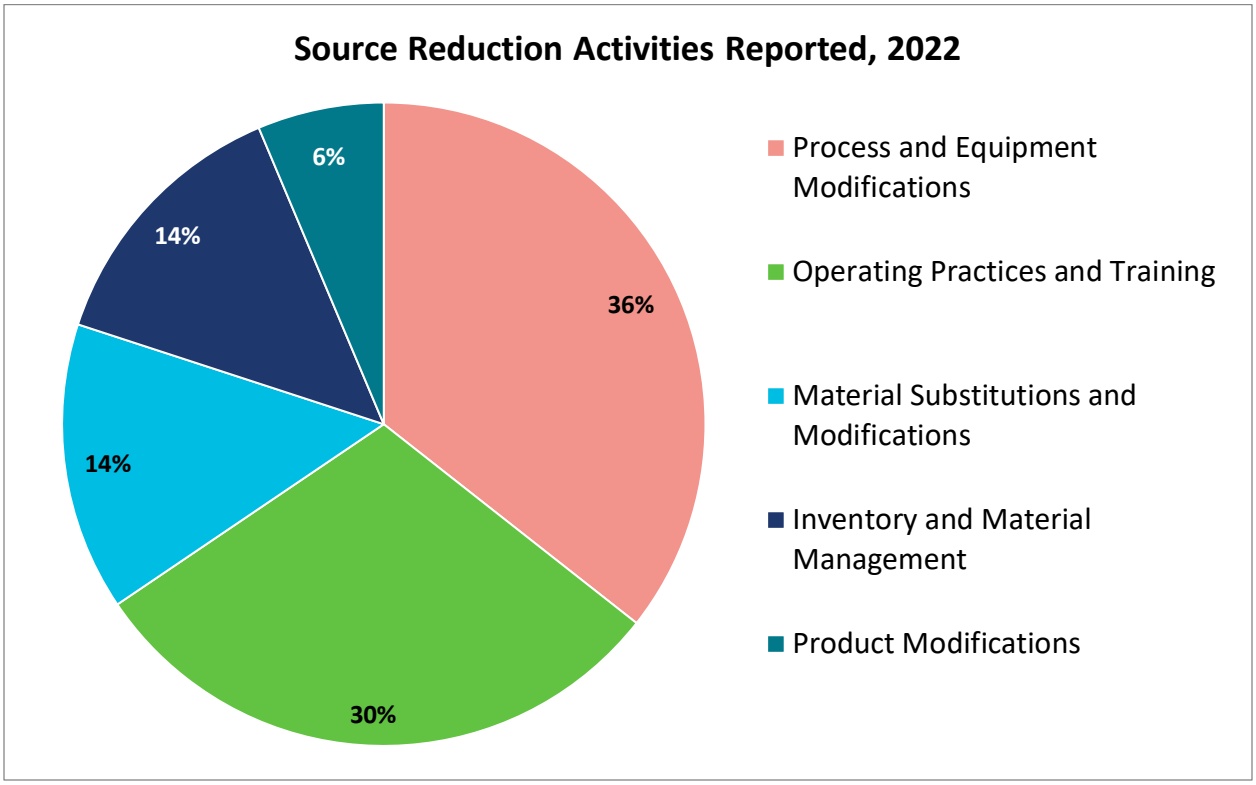
2022 Highlights

- TRI facilities implemented 3,589 new source reduction activities.
- Facilities implemented source reduction activities for almost 200 different chemicals.

As with any dataset, there are many factors to consider when using TRI data. Find a summary of key factors associated with the data used in the National Analysis in the Introduction. For more information see *Factors to Consider When Using Toxics Release Inventory Data*.

Source Reduction Activities

Facilities are required to report any source reduction activities that they initiated or completed during the reporting year to TRI. Source reduction information can help facilities learn from each other's best practices and potentially lead to better environmental stewardship and implementation of more P2 actions. When reporting source reduction activities to TRI, facilities choose from 24 codes that describe the activities they implemented. These codes are grouped into the five categories shown in the graph below. EPA's recent analysis Measuring the Impact of Source Reduction shows the efficacy of different types of source reduction activities.

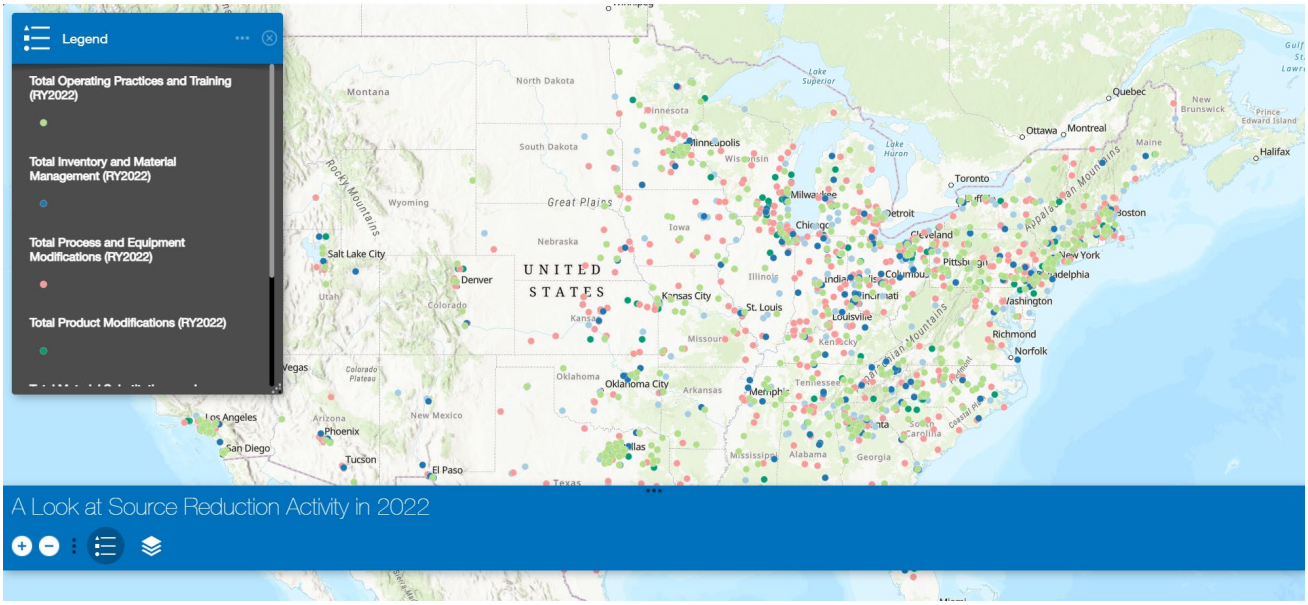


Note: Facilities report their source reduction activities by selecting from a list of 24 codes that describe their activities. These codes fall into one of five categories listed in the graph legend and are defined in the *TRI Reporting Forms and Instructions*.

- In 2022, 1,759 facilities (8% of all facilities that reported to TRI) implemented a combined 3,589 new source reduction activities.
- The most reported source reduction category was **Process and Equipment Modifications**.
    - For example, an adhesive manufacturing facility used historical data to optimize batch sizes which reduced the quantity of methyl methacrylate waste managed.

- Facilities also report how they identified the opportunity to implement each pollution prevention activity. The most reported methods for finding these opportunities were **Participative Team Management** and **Internal Pollution Prevention Audits**.

The map below shows facilities that reported implementing one or more source reduction activity during 2022.



Additional Resources

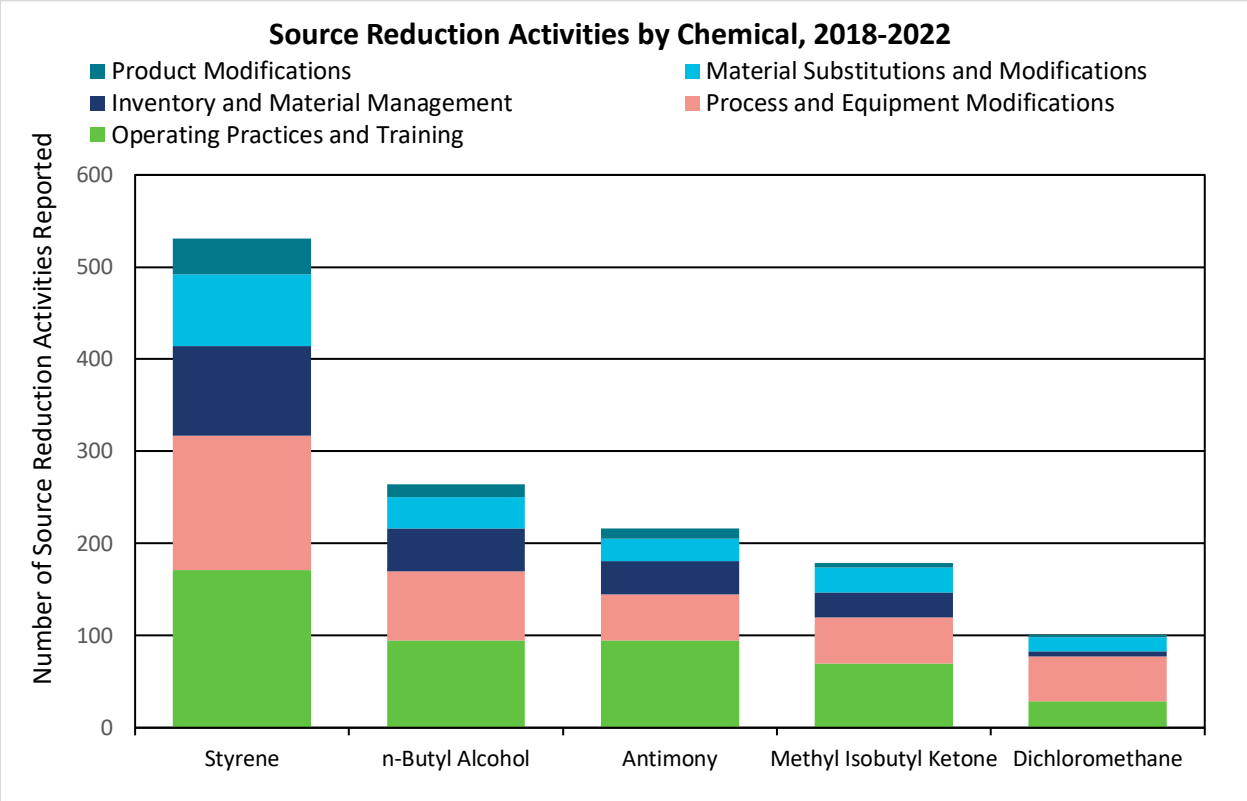
- For more information on how facilities report source reduction to TRI, see the TRI Source Reduction Reporting webpage.
- See the TRI P2 Data Overview Factsheet for more information on source reduction reporting in recent years.
- Facilities may have implemented source reduction activities in earlier years that are ongoing or have been completed. To see details about these activities, use the TRI P2 Search Tool.
- Facilities interested in exploring source reduction opportunities can reach out to their EPA Regional P2 Coordinator to arrange a free, confidential P2 assessment with a third-party P2 expert.
- The TRI Pollution Prevention Reporting Guide provides examples of source reduction activities at facilities and guidance to improve reporting.
- The TRI Green Chemistry and Green Engineering webpage has information about green chemistry and engineering principles and examples of activities that facilities have reported to TRI.

- EPA partners with the American Chemical Society's Green Chemistry Institute® to present Green Chemistry Challenge Awards to organizations that have advanced green chemistry.
- The Solvent Substitutions Reported to TRI webpage is an interactive resource that allows users to find information about specific substitutions for TRI-listed solvents to other solvent chemicals, mixtures, or solvent-free processes.

Source Reduction Activities by Chemical and Industry

Source Reduction Activities by Chemical

This figure shows the number of source reduction activities for the chemicals with the highest source reduction reporting rates over the last five years by the type of activity.



Note: 1) Limited to chemicals with at least 100 reports of source reduction activities from 2018 to 2022. 2) In this figure, antimony is combined with antimony compounds, although metals and compounds of the same metal are listed separately on the TRI list. 3) Facilities report their source reduction activities by selecting from a list of 24 codes that describe their activities. These codes fall into one of five categories listed in the graph legend and are defined in the *TRI Reporting Forms and Instructions*.

From 2018 to 2022:

- Facilities reported 16,462 source reduction activities for more than 240 chemicals and chemical categories.
- Chemicals with the highest source reduction reporting rates included styrene, *n*-butyl alcohol, antimony, methyl isobutyl ketone, and dichloromethane.
- The types of source reduction activities implemented for these chemicals vary depending on the chemicals' characteristics and how they are used. For example:

- **Process and Equipment Modifications,** including optimizing reaction conditions and modifying equipment, layout, or piping, can help reduce the amount of solvents such as *n*-butyl alcohol, needed for a process.
- **Material Substitutions and Modifications** include the use of alternative materials in the manufacturing process, such as replacing styrene, a chemical used to make plastics, and replacing antimony compounds, which are used as a component of flame retardants, batteries, and electronics.

Facilities may also report additional details about their source reduction activities in an optional text field of the TRI reporting form.

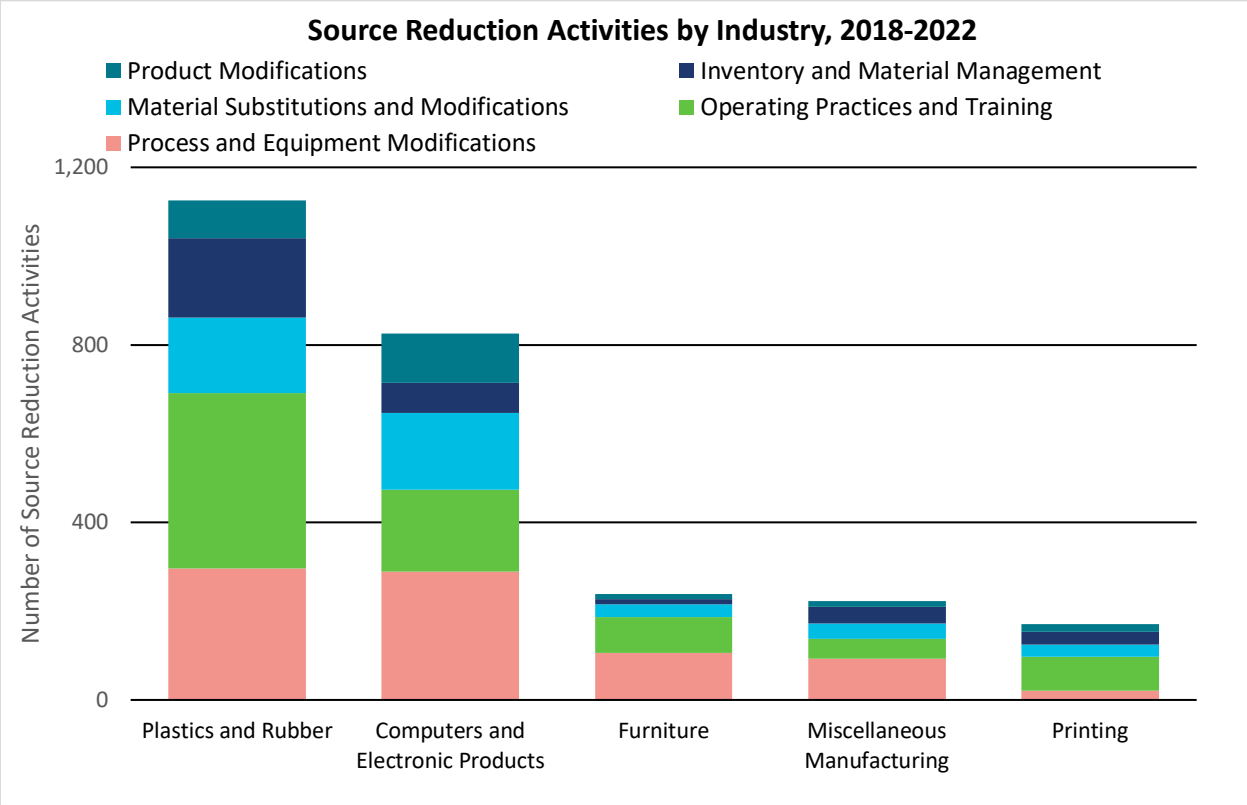
Examples of optional source reduction information for 2022:

- **Styrene**: A plastics plumbing fixture manufacturer improved operating temperatures by shifting employees' casting schedules, which reduced the amount of styrene managed as waste.
- **Antimony**: An electronic connector manufacturing facility reduced the amount of antimony compounds managed as waste by replacing old equipment with newer and more efficient equipment.
- **Methyl isobutyl ketone**: An automobile manufacturer changed to a purge solvent with lower volatile organic compound (VOC) content, reducing the amount of methyl isobutyl ketone managed as waste.

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

Source Reduction Activities by Industry

This figure shows the number of source reduction activities reported by the industries with the highest source reduction reporting rates over the last five years.



Note: 1) Limited to industries with at least 100 source reduction activities reported from 2018 to 2022. 2) Facilities report their source reduction activities by selecting from a list of 24 codes that describe their activities. These codes fall into one of five categories listed in the graph legend and are defined in the *TRI Reporting Forms and Instructions*.

From 2018 to 2022:

- The five industry sectors with the highest source reduction reporting rates were plastics and rubber products manufacturing, computers and electronic products manufacturing, furniture manufacturing, miscellaneous manufacturing, and printing.
- For most sectors, **Process and Equipment Modifications** were the most frequently reported types of source reduction activity. Other commonly reported source reduction activities varied by sector. For example, computers and electronic products manufacturers frequently reported **Material Substitutions and Modifications**, often associated with the elimination of lead-based solder.

Facilities may also report additional details on source reduction activities to TRI, as shown in the following examples.

Examples of optional source reduction information for 2022:

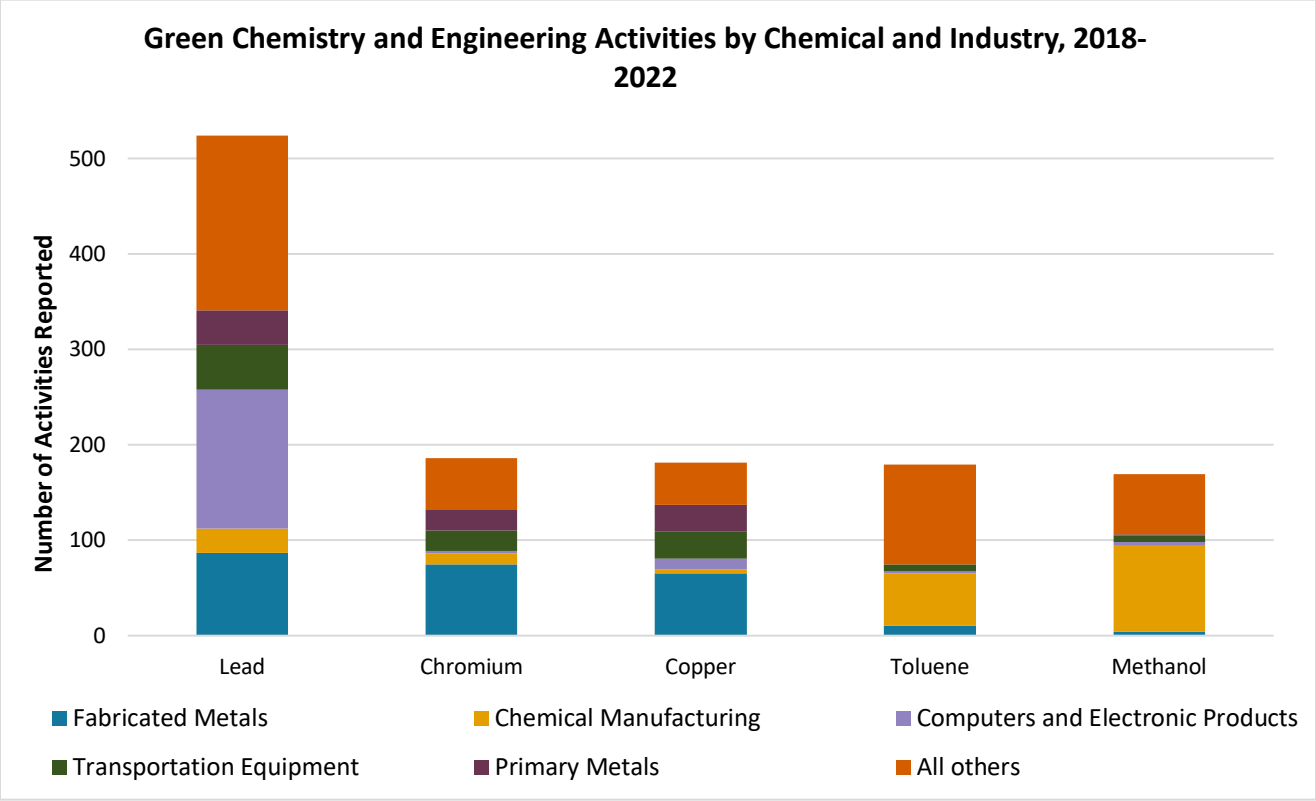
- **Plastics and Rubber Products Manufacturing:** In 2020, a rubber product manufacturer began testing alternative manufacturing aids to reduce the usage of TRI-reportable chemicals. The facility has since eliminated the use of ammonia as a manufacturing aid in a dipping process.
- **Computers and Electronic Products Manufacturing**: An optical communication device manufacturing facility increased bath life which reduced chemical drains containing N-methyl-2-pyrrolidine waste.
- **Furniture Manufacturing**: A wood cabinet manufacturer reduced its use of *n*-butyl alcohol by installing a new flat line finishing system that is recognized in the industry as state of the art technology.

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.

Green Chemistry and Engineering Activities

Green chemistry is the design of chemicals, products, and processes that use safer inputs, create more benign outputs, and minimize energy use and the creation of waste. Green engineering considers all stages of the lifecycle of a material, product, process, or system and also aims to reduce pollution, promote sustainability, and minimize risk to human health and the environment without sacrificing economic viability and efficiency. For more information, see TRI Green Chemistry and Green Engineering Reporting.

Advancements in green chemistry and green engineering allow industry to prevent pollution in innovative ways. Implementation of these techniques is required to be reported as source reduction to TRI. Ten of the codes that facilities use to report source reduction to TRI are specific to green chemistry and green engineering activities, although these practices may also fit under other codes. The figure below shows the TRI chemicals with the highest number of green chemistry and green engineering activities reported over the last five years, by sector.



Note: In this figure, the metals (lead, chromium, and copper) are combined with their metal compounds, although metals and compounds of the same metal are listed separately on the TRI list.

- Since 2018, facilities have reported 3,964 green chemistry and engineering activities for 170 TRI chemicals and chemical categories.

  - The chemical manufacturing and fabricated metals manufacturing sectors reported the highest number of activities, reporting 26% and 15% of all green chemistry and engineering activities between 2018 and 2022, respectively.

- Chemical manufacturers used green chemistry and engineering to reduce or eliminate their use of TRI solvent and reagent chemicals, such as methanol and toluene. For example:
  - A basic inorganic chemical manufacturing facility optimized process conditions which reduced the need to use toluene when cleaning equipment.
- Fabricated metal producers and transportation equipment manufacturers applied green engineering techniques to reduce or eliminate their use of metals. For example:
  - A fabricated metal parts manufacturer purchased new laser cutting machines in 2021, and in 2022 used these machines along with water jet cutting machines which reduced the amount of nickel scrap sent to recycling.

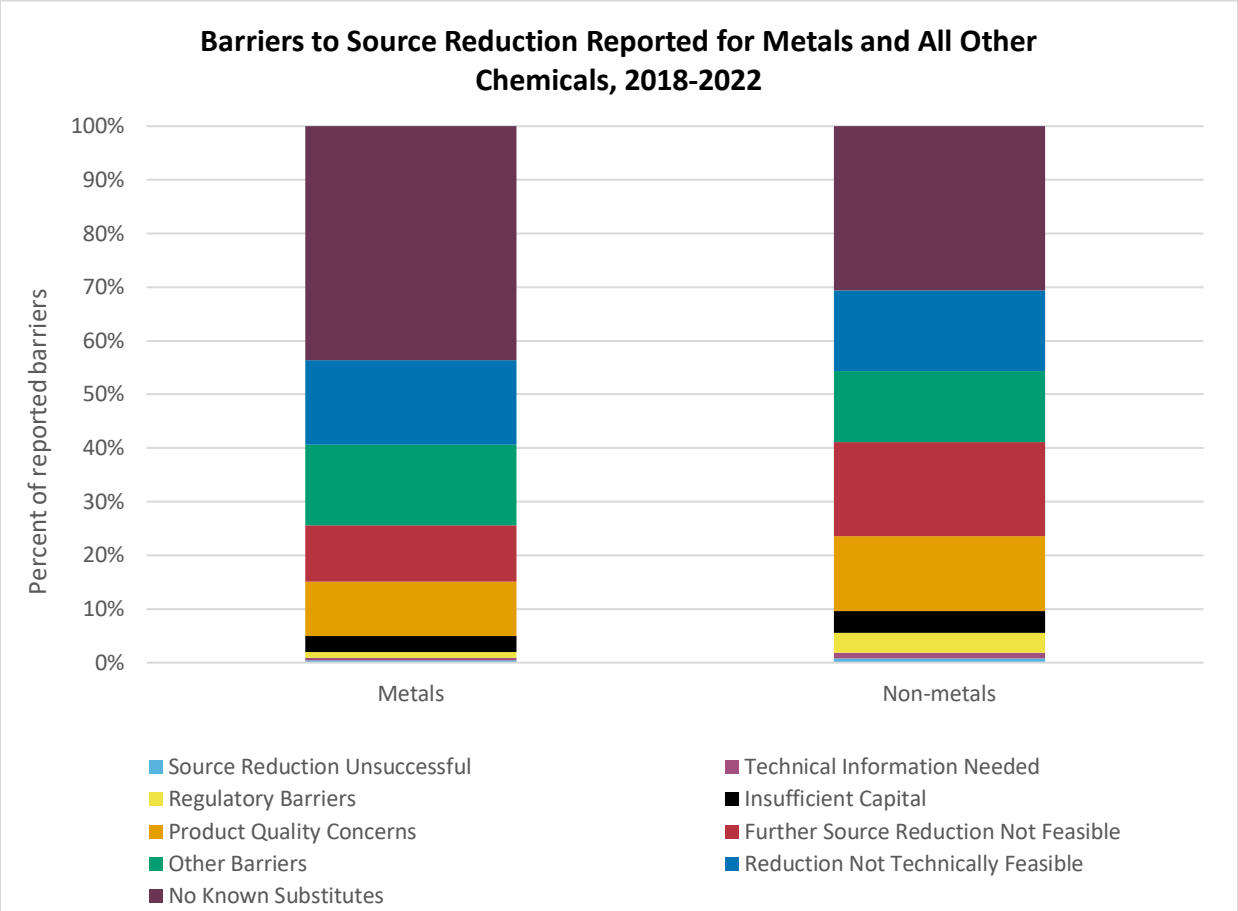
Additional Resources

Source reduction practices such as green chemistry that prevent or reduce the creation of chemical wastes are preferred to downstream pollution control technologies or waste management activities. These resources have more information on green chemistry and green engineering:

- EPA's TRI Toxics Tracker: green chemistry and green engineering examples for a specific chemical and/or industry.
- EPA's Green Chemistry program: information about green chemistry and EPA's efforts to facilitate its adoption.
- EPA's Safer Choice program: information about consumer products with lower hazard.
- For more details on the types of green chemistry activities reported to TRI and trends in green chemistry reporting, see *The Utility of the Toxics Release Inventory (TRI) in Tracking Implementation and Environmental Impact of Industrial Green Chemistry Practices in the United States*.
- Solvent Substitutions Reported to TRI: an interactive resource that allows users to find information about specific substitutions for TRI-listed solvents to other solvent chemicals, mixtures, or solvent-free processes.

Reported Barriers to Source Reduction

Facilities have the option to inform EPA of barriers that prevented them from implementing new source reduction activities by selecting from nine codes that describe common barriers. Analyzing the barrier information that facilities report helps EPA and others identify where more research is needed to address technological challenges or develop viable alternatives. It may also allow for better collaboration between those with knowledge of source reduction practices and those seeking additional assistance. This figure shows the types of barriers facilities reported for metals and for all other (non-metal) TRI chemicals.



Note: Facilities have the option to report barriers to source reduction by selecting from nine codes. These codes are defined in the *TRI Reporting Forms and Instructions*.

From 2018 to 2022:

- Facilities reported barriers to implementing source reduction for 300 TRI chemicals and chemical categories.
- **No Known Substitutes** was the most frequently reported barrier for both metals and non-metals.

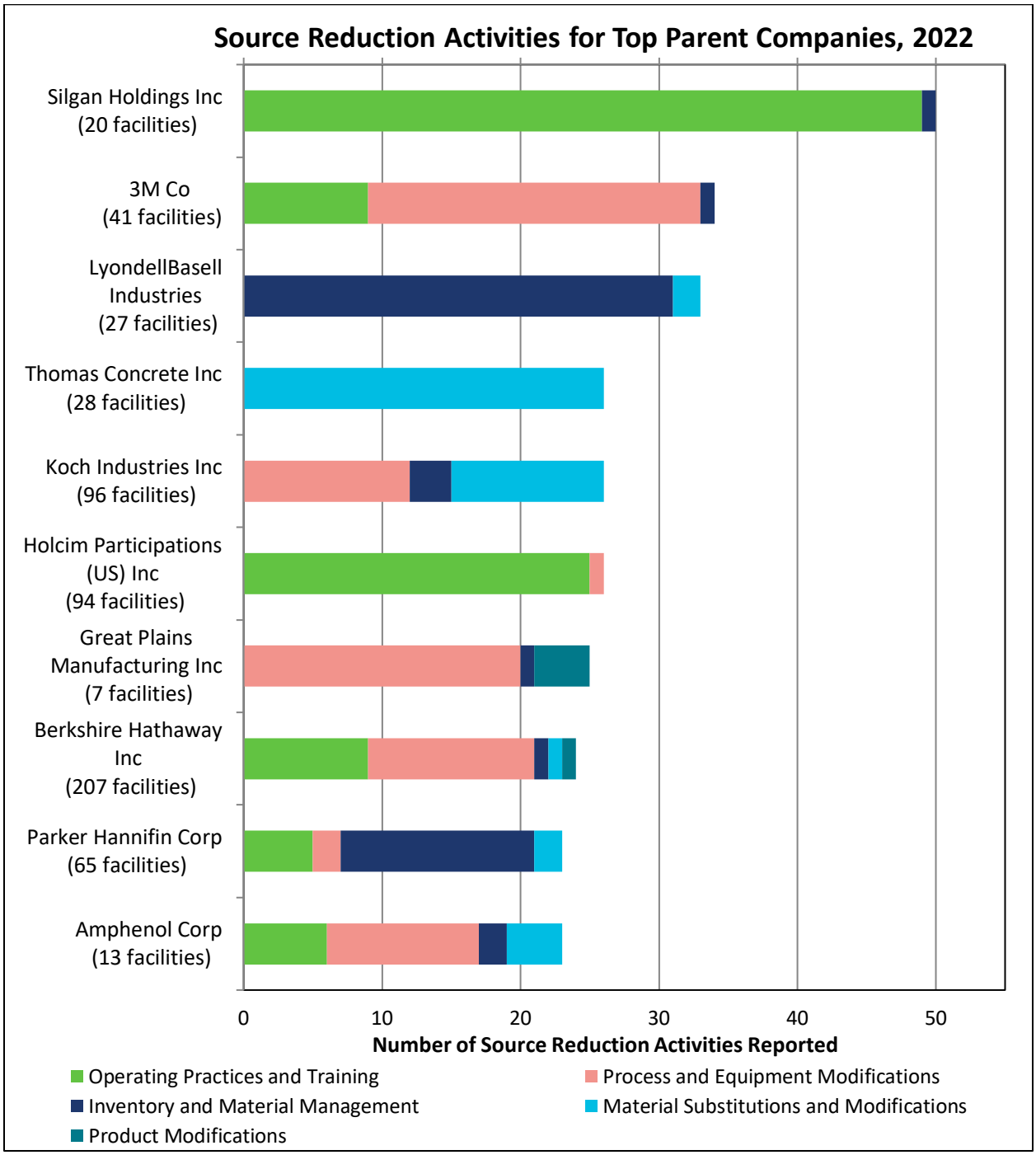
  - Excluding metals, facilities reported **No Known Substitutes** most frequently for nitrate compounds. Facilities often report that nitrate compounds are produced during sanitization or waste treatment processes for which there are no known alternatives.

- For the **No Known Substitutes** barrier for metals, many facilities reported the presence of the TRI metal in their raw materials (e.g., metal alloys) as the reason they could not implement source reduction activities. Examples include:
  - A farm equipment manufacturing facility reported that lead is an impurity in the steel purchased to manufacture equipment.
  - A basic organic chemical manufacturer is exploring alternatives, but reported that currently there are no viable substitutes nor alternative technologies for a process using chromium compounds in a catalyst.
- **Reduction Not Technically Feasible** was a common barrier for metals and non-metals. Facilities select this barrier code when additional reductions do not appear feasible. For example:
  - A dental equipment and supplies manufacturing facility reported that after implementing dry salination in the manufacturing of new composites to reduce methanol use, further source reduction is not feasible because of regulations for Class II Medical Devices.
- You can view source reduction barriers for any TRI chemical by using the TRI P2 Search Tool.

Source Reduction Activities by Parent Company

Facilities are required to report their parent company information to TRI. For TRI reporting, a parent company is defined as the highest-level company located in the United States that directly owns at least 50% of the company's voting stock. EPA groups facilities by parent company to assess waste management at the parent company level and identify companies and industries that regularly implement source reduction activities.

The figure below shows the parent companies whose facilities implemented the most source reduction activities for 2022. Facilities outside of the manufacturing sector, such as electric utilities and coal and metal mines, are not included in this chart because those facilities' activities do not lend themselves to the same source reduction opportunities as the activities at manufacturing facilities.



Note: This figure uses EPA's standardized parent company names.

Operating Practices and Training, such as improving maintenance or scheduling and installing quality monitoring systems, were the most reported types of source reduction activities for these parent companies. **Process and Equipment Modifications** were also commonly reported.

Some of the facilities in these parent companies submitted additional text to describe their pollution prevention activities. Examples include:

- A printed circuit board manufacturing facility owned by Amphenol Corp updated equipment and optimized a metal plating process to extend plating bath life and reduce nitric acid usage.
- A farm equipment manufacturing facility owned by Great Plains Manufacturing Inc. changed the layouts for sheet and plate steel cutting to be more efficient and generate less scrap metal.

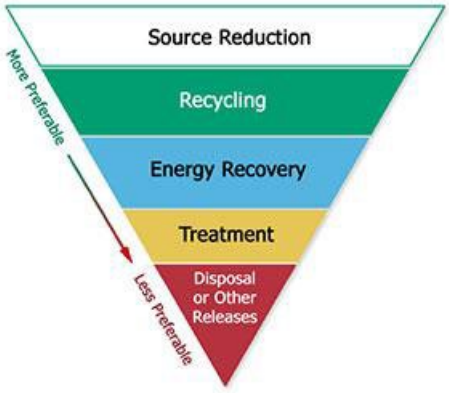
You can find P2 activities reported by a specific parent company and compare facilities' waste management methods and trends for any TRI chemical by using the TRI P2 Search Tool.

Waste Management

Each year, the Toxics Release Inventory (TRI) Program receives information from more than 21,000 facilities on the quantities of TRI-listed chemicals they recycle, combust for energy recovery, treat, and dispose of or otherwise release as part of their normal operations. These quantities are collectively referred to as production-related waste managed or 'waste managed'[1].

Looking at waste managed over time helps track facilities' progress toward reducing the amount of chemical waste they manage. Additionally, these trends show whether facilities are shifting toward waste management practices that are preferable to disposing of or otherwise releasing waste into the environment.

Waste Management Hierarchy



EPA encourages facilities to implement source reduction (or pollution prevention) to reduce or eliminate the use of TRI-listed chemicals and the resulting creation of chemical waste. For waste that is generated, the preferred management methods are recycling, followed by combustion for energy recovery, treatment, and, as a last resort, safe disposal or release of chemical waste into the environment. This order of preference, called the Waste Management Hierarchy, is consistent with the national policy established by the Pollution Prevention Act (PPA) of 1990.

How a facility manages its waste depends on multiple factors, such as its size, location, and production capacity, as well as the type of chemicals being managed. Some facilities have systems that allow them to manage their waste on site. For example, waste streams may be recycled to recapture chemicals and extend their useful life, or may be destroyed such as in incinerators or wastewater treatment systems. Facilities may also pay to transfer their wastes to specialized waste management companies.

[1] Some quantities of waste that are not related to production but are recycled, treated, or combusted for energy recovery on site may be included in a facility's "waste managed."

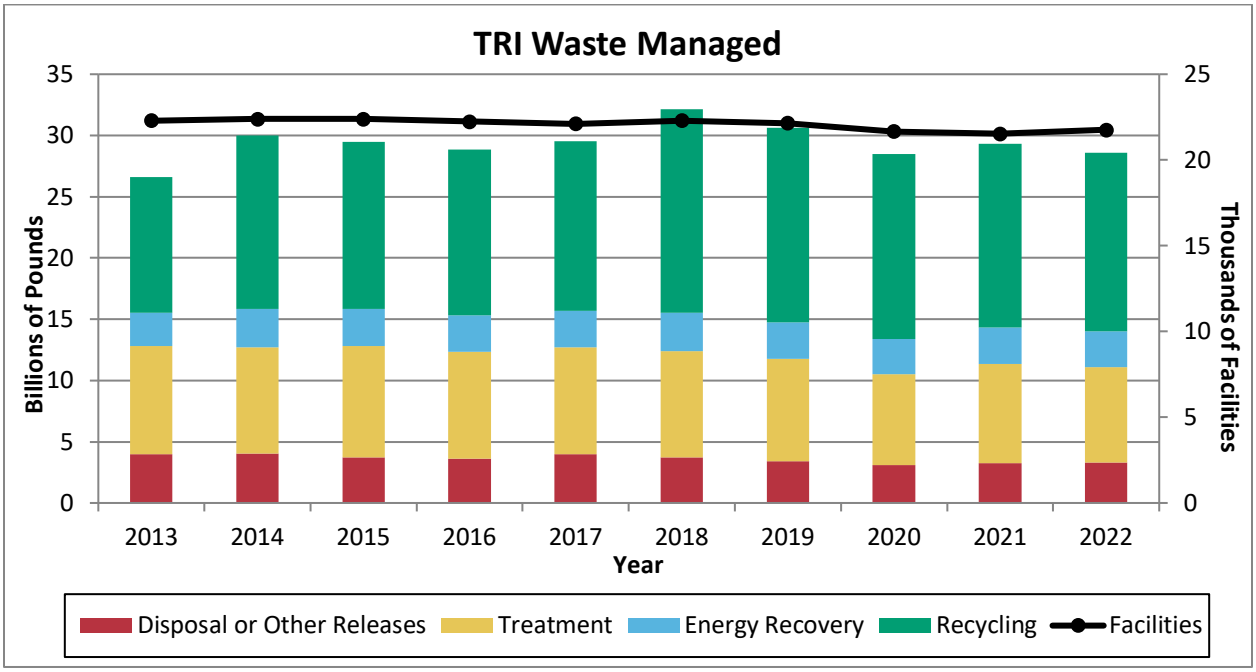
2022 Highlights

- Facilities managed 28.6 billion pounds of TRI chemical waste, 88% of which was not released into the environment due to preferred waste management practices such as recycling.
- Waste managed increased by 2.0 billion pounds (7%) since 2013, with a 3.5 billion pound (32%) increase in recycling during this time.

As with any dataset, there are many factors to consider when using TRI data. Find a summary of key factors associated with the data used in the National Analysis in the Introduction. For more information see *Factors to Consider When Using Toxics Release Inventory Data.*

Trends in Waste Management

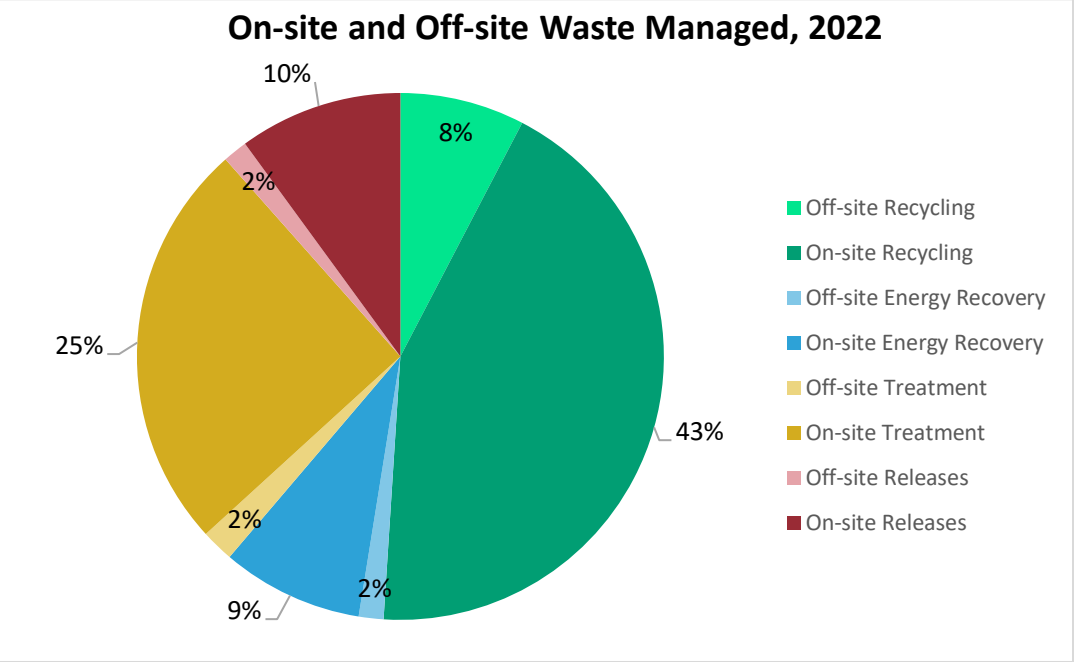
Waste streams generated during normal industrial operations may be recycled, combusted for energy recovery, treated, or released. For example, facilities report the recovery of solvents as a recycling method, or the destruction of a chemical waste through incineration as treatment. This figure shows the 10-year trend in on-site and off-site waste managed.



From 2013 to 2022:

- Waste managed increased by 2.0 billion pounds (7%).
  - Recycling increased by 3.5 billion pounds (32%), largely driven by several chemical manufacturing facilities that each reported recycling more than one billion pounds annually in recent years.
  - Disposal or other releases decreased by 703 million pounds (-18%).
  - Treatment decreased by 1.0 billion pounds (-12%).
  - Energy recovery increased by 191 million pounds (7%).
- The number of facilities that report to TRI has declined by 2% since 2013. Reasons for this decrease include facility closures, outsourcing of operations to other countries, and facilities reducing their manufacture, processing, or other use of TRI-listed chemicals to below the reporting thresholds.

Facilities report both on- and off-site waste management. The following chart shows the relative quantities of on-site and off-site waste management methods for 2022.



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

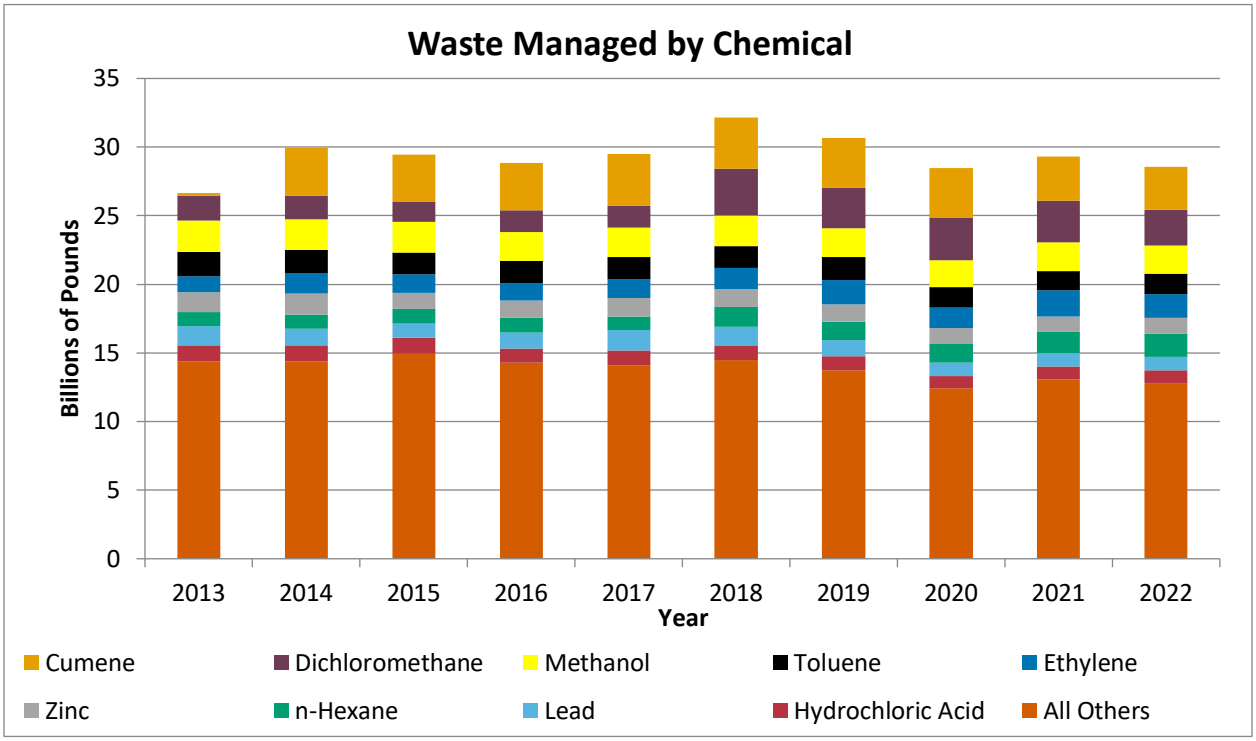
For 2022, 87% of waste was managed on site.

- Most waste managed off site is recycled. Most of this recycling is reported by the primary and fabricated metals sectors. Facilities in these sectors often send scrap metal containing TRI chemicals such as zinc and copper off site for recycling.
- The 2022 distribution of waste managed on site and off site is similar to previous years.

Waste Management by Chemical and Industry

Waste Managed by Chemical

This figure shows the TRI chemicals managed as waste in the greatest quantities from 2013 to 2022.



Note: In this figure, the metals (lead and zinc) are combined with their metal compounds, although metals and compounds of the same metal are listed separately on the TRI list.

From 2013 to 2022:

- Facilities reported waste managed for almost 600 chemicals and chemical categories. The graph above shows the nine chemicals managed as waste in the largest quantities. Together, these chemicals represent 53% of the total waste managed reported to TRI.
- Of the chemicals shown above, facilities reported increased quantities of waste managed for: cumene, dichloromethane (methylene chloride), ethylene, and *n*-hexane.
    - Cumene waste managed during 2022 was almost twenty times higher than the quantity of cumene waste managed during 2013, mostly driven by one facility in the petrochemical manufacturing sector that reported recycling over 3 billion pounds of cumene annually from 2014 to 2022.
    - Dichloromethane waste managed increased by 803 million pounds (44%). Trends in dichloromethane waste management were driven by recycling from two plastics

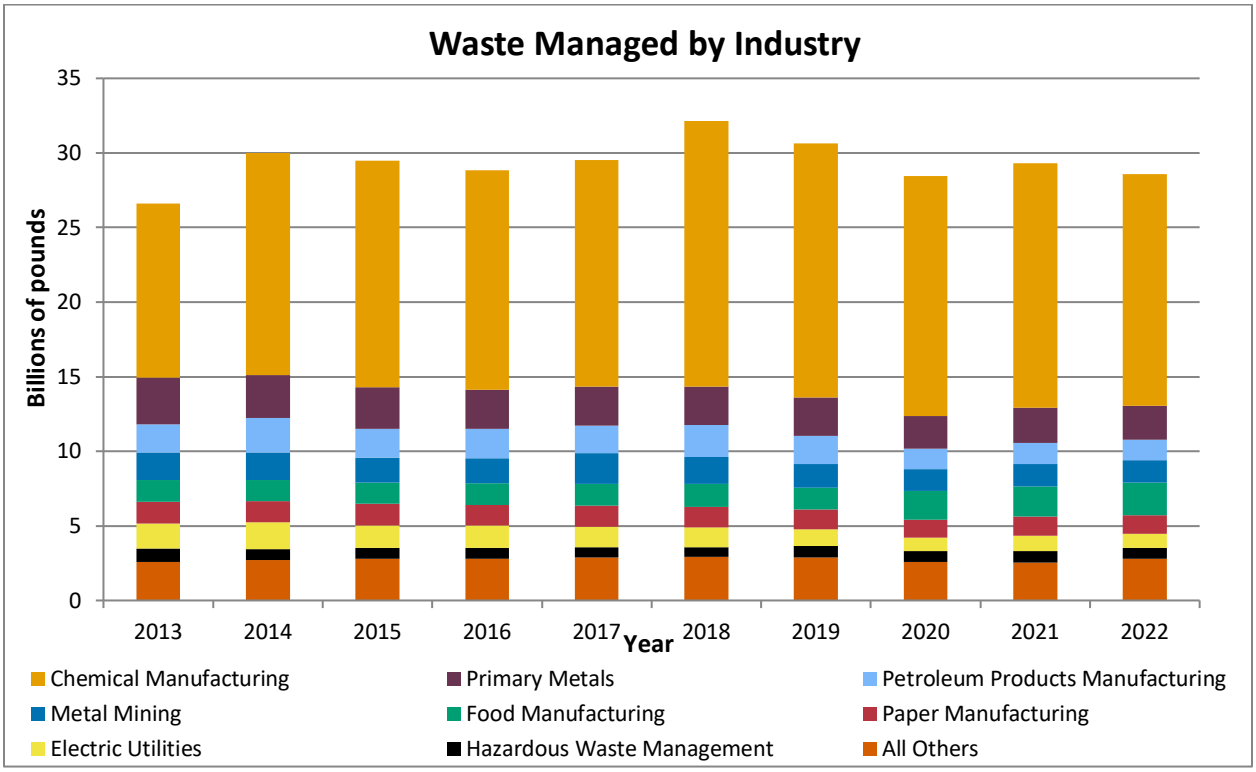
material and resin manufacturing facilities which together reported 95% of all dichloromethane waste managed for 2022.
  - Ethylene waste managed increased by 546 million pounds (46%), driven by facilities in the chemical manufacturing sector.
  - *n*-Hexane waste managed increased by 652 million pounds (63%). This was mostly driven by one soybean processing facility which increased its *n*-hexane recycling by almost 600 million pounds since 2013.

From 2021 to 2022:

- Quantities of TRI chemical waste managed increased for several chemicals including:
  - *n*-Hexane increased by 129 million pounds (8%).
  - Toluene increased by 56 million pounds (4%).
  - Lead increased by 41 million pounds (4%).
- Quantities of TRI chemical waste managed decreased for several chemicals including:
  - Dichloromethane decreased by 435 million pounds (-14%).
  - Ethylene decreased by 149 million pounds (-8%).
  - Cumene decreased by 63 million pounds (-2%).
- Quantities of TRI chemical waste managed remained about the same for zinc, methanol, and hydrochloric acid.

Waste Managed by Industry

This figure shows the industry sectors that managed the most TRI chemical waste from 2013 to 2022.



From 2013 to 2022:

- The eight sectors in this chart consistently reported managing the most waste since 2013. The amount of waste managed by these sectors has changed year to year, especially for the chemical manufacturing sector. The chemical manufacturing sector accounted for 44% of all waste managed in 2013 and increased to 54% in 2022.
- Two of the sectors shown in the graph increased their quantities of waste managed:
  - Chemical manufacturing increased by 3.8 billion pounds (33%).
  - Food manufacturing increased by 777 million pounds (54%).
- The quantity of waste generated in some industries fluctuates considerably from year to year due to changes in production or other factors. For example, quantities of waste managed reported by metal mining facilities can change significantly based on differences in the composition of waste rock.

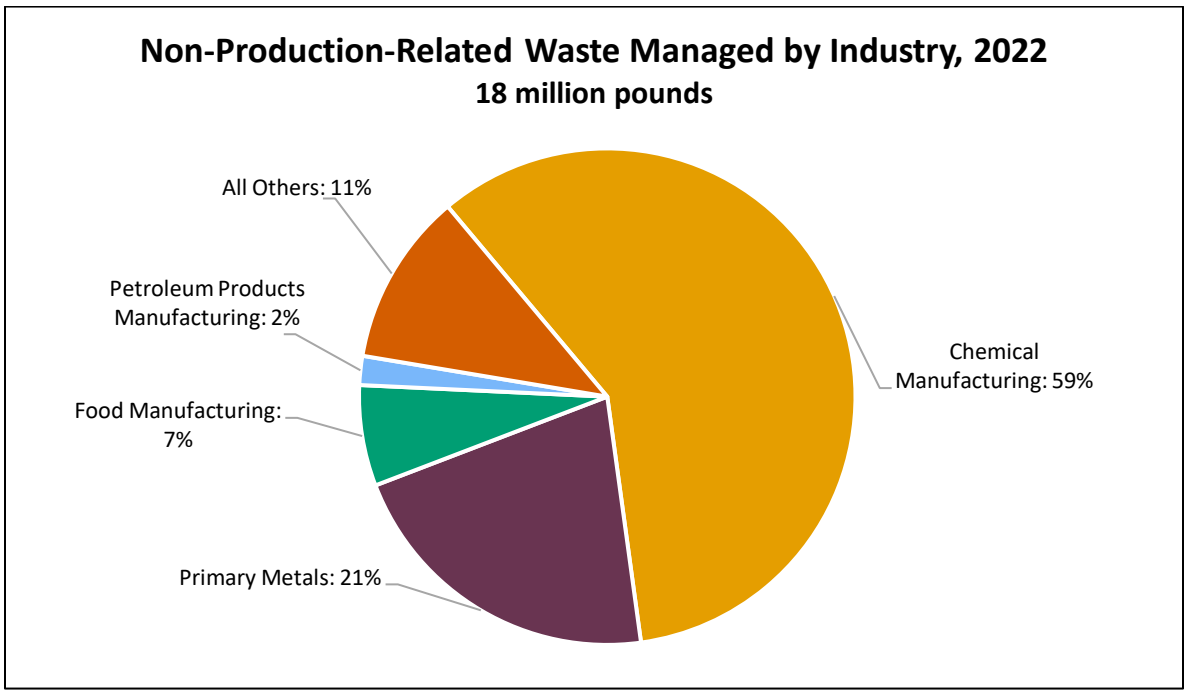
From 2021 to 2022:

- Industry sectors that reported the greatest changes in waste management quantities were:

- Chemical manufacturing decreased by 875 million pounds (-5%).
- Food manufacturing increased by 157 million pounds (8%).
- Electric utilities decreased by 100 million pounds (-10%).

Non-Production-Related Waste Managed

Sometimes, chemical waste is created by one-time events like remedial actions and natural disasters rather than routine production processes. Waste generated this way, referred to as non-production-related waste, is largely unpredictable and less amenable to pollution prevention. Non-production-related waste is typically reported separately from production-related waste. Throughout the National Analysis, non-production-related waste managed through release or disposal is included in a facility's "total disposal or other releases" but not in its "waste managed." The following graph shows the quantities of non-production-related waste reported to TRI for 2022.

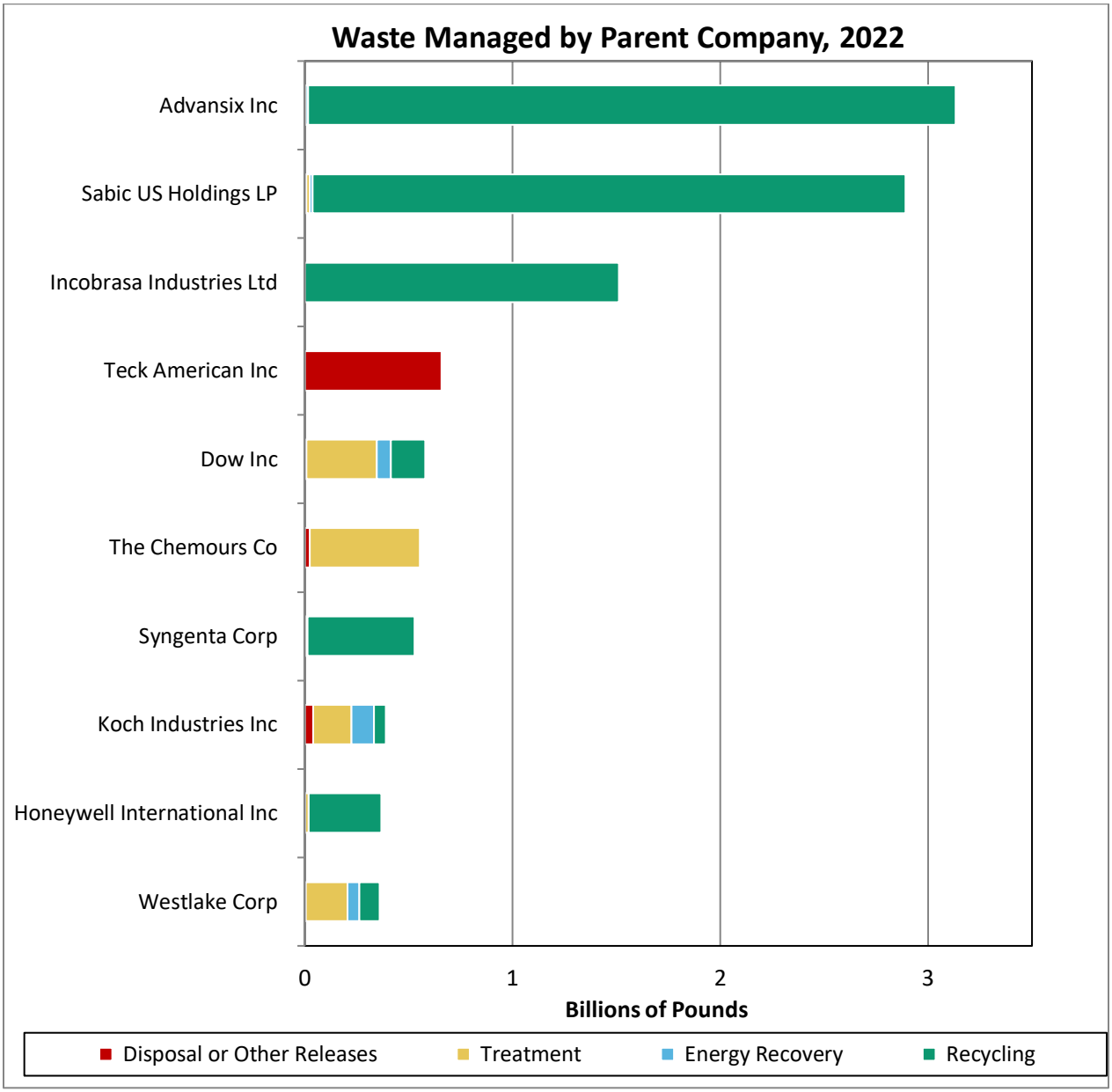


- For 2022, over 500 facilities reported managing a total of 18 million pounds of non-production-related waste. This represents 0.06% of the total amount of TRI waste managed in 2022, which is similar to other years.

Waste Managed by Parent Company

Facilities that report to the Toxics Release Inventory (TRI) must provide information about their parent company. For TRI reporting, parent company means the highest-level company (or companies) of the facility's ownership hierarchy as of December 31 of the year for which data are being reported. EPA groups facilities by parent company to assess waste management at the parent company level and identify companies that regularly implement source reduction activities.

This figure shows the parent companies whose facilities reported the most waste managed for 2022.



Notes: 1) This figure uses EPA's standardized parent company names. 2) Incobrasa Industries Ltd does not report a parent company but it is included in this figure because it reported a comparable quantity of waste managed.

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

- **Chemical manufacturing**: Sabic US Holdings LP, Advansix Inc, Dow Inc, The Chemours Company, Syngenta Corp, Westlake Corp
- **Soybean processing**: Incobrasa Industries Ltd
- **Metal mining**: Teck American Inc

- **Multiple sectors**, e.g., pulp and paper, petroleum refining, computer and electronic products, and chemical manufacturing: Koch Industries Inc, Honeywell International Inc

You can find information about 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

Release or disposal of Toxics Release Inventory (TRI) chemicals into the environment occurs in several ways. Facilities may release chemical waste directly into the air or water or dispose of it to land. Some facilities also transfer waste that contains TRI chemicals to off-site locations for disposal. Facilities releasing or disposing of TRI chemical waste must comply with a variety of regulatory requirements and restrictions that are designed to help protect human health and the environment.

Facilities must report the quantities of TRI-listed chemicals they release into the environment. Analyzing these release data along with data from other sources helps to:

- Identify potential concerns in communities.
- Better understand health impacts chemical releases may pose.
- Identify opportunities to engage with facilities or provide technical assistance on implementing pollution prevention techniques.

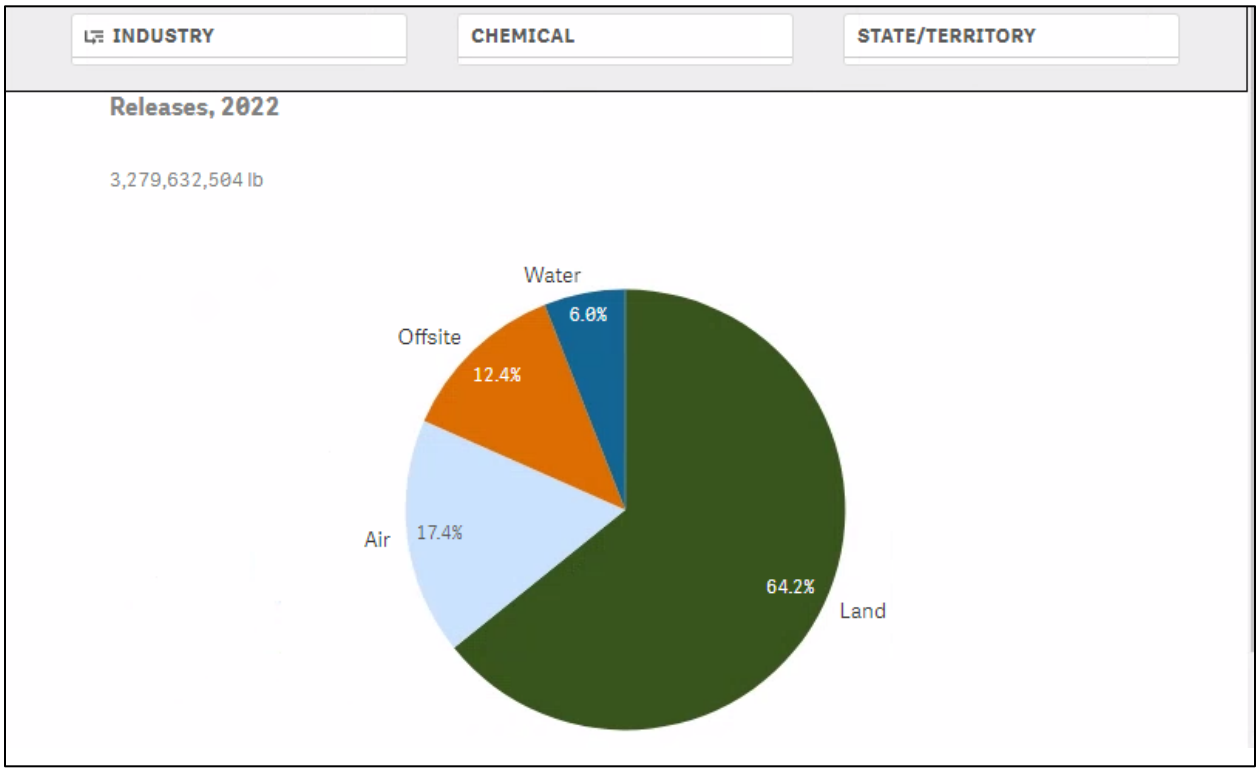
It is important to understand that the quantity of chemical releases alone is not necessarily an indicator of human health outcomes or environmental impacts. Other important factors that contribute to potential harm and risks from releases of chemicals are discussed in the Potential Risks from TRI Chemicals section.

Helpful Concepts

What is a release?

In the context of TRI, a "release" of a chemical generally refers to a chemical that is emitted to the air, discharged to water, or disposed of in some type of land disposal unit. Most TRI releases happen during routine production operations at facilities. To learn more about what EPA is doing to help limit the release of toxic chemicals into the environment, see the EPA laws and regulations webpage.

The chart below shows 2022 TRI chemical releases by medium. Visit the full TRI National Analysis data visualization dashboard to explore even more information about releases of TRI chemicals.



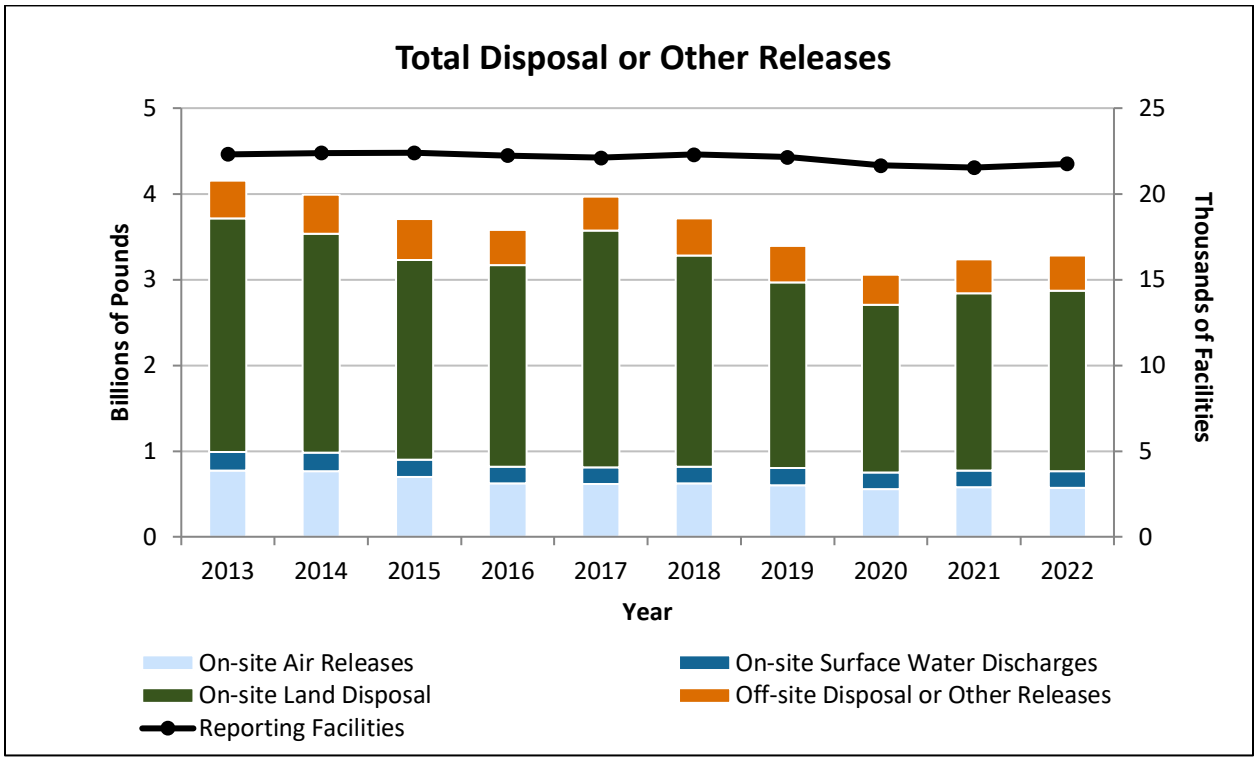
2022 Highlights

- Facilities released 3.3 billion pounds of TRI chemicals, a 21% decrease since 2013.
- Air releases decreased 26% in the last 10 years, driven by reductions from electric utilities.

As with any dataset, there are many factors to consider when using TRI data. Find a summary of key factors associated with the data used in the National Analysis in the Introduction. For more information see *Factors to Consider When Using Toxics Release Inventory Data*.

Trends in Releases

The following graph shows the latest 10-year trend in total releases (also referred to as "total disposal or other releases"). Many factors can affect the trend in releases over time, including changes in facilities' production rates, waste management practices, the composition of raw materials, and pollution control technologies.



From 2013 to 2022:

- Total releases of TRI chemicals decreased by 21%.
    - Reduced disposal to land from metal mines contributed most to this decline.
- Air releases decreased by 26%, surface water discharges decreased by 9%, on-site land disposal decreased by 23%, and off-site disposal decreased by 8%.
- Reductions in air releases from electric utilities drove the overall decrease in air releases. The number of facilities that reported to TRI declined by 2%.

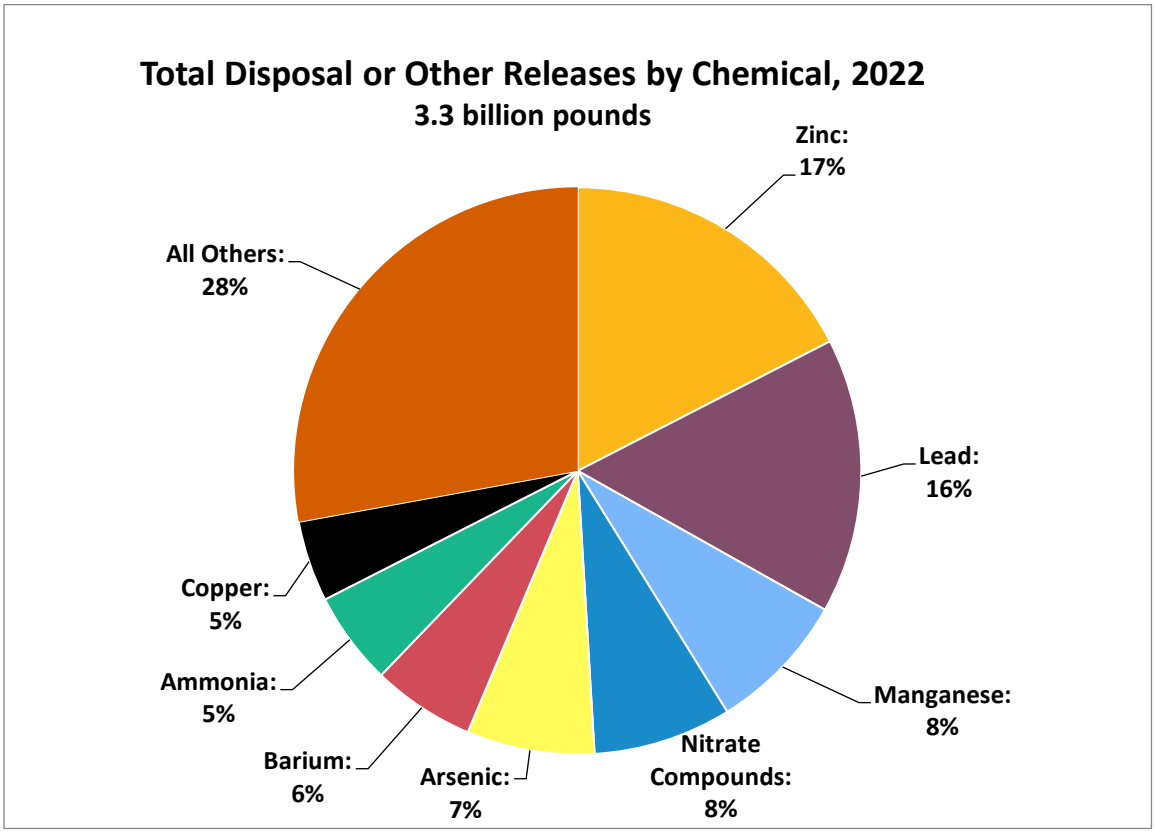
From 2021 to 2022:

- Total releases increased by 1%, driven by increased land disposal. Releases reported by facilities in the natural gas processing sector drove this increase. Many facilities in this sector reported to TRI for the first time for 2022 due to an expansion in the regulatory requirements for TRI reporting.

Releases by Chemical and Industry

Releases by Chemical

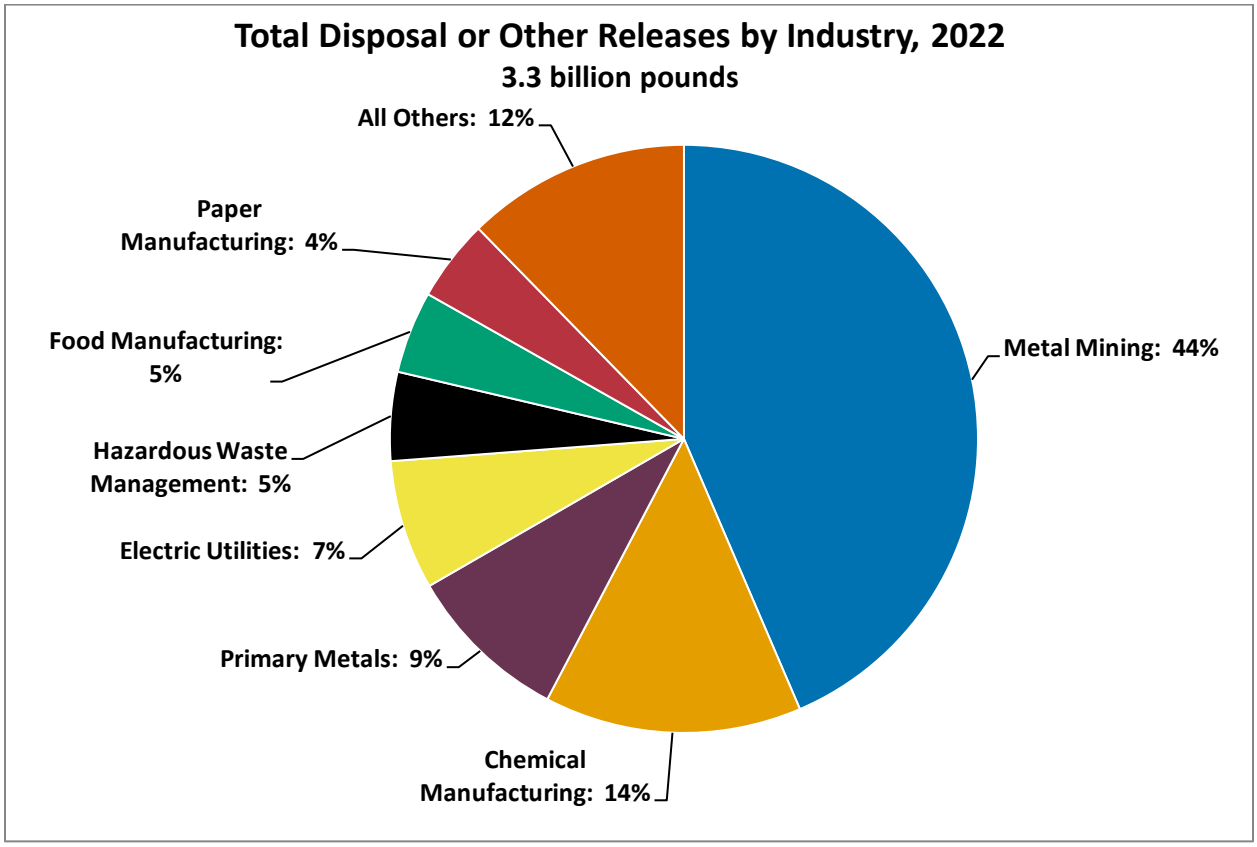
Metals accounted for nearly two-thirds of the 3.3 billion pounds of TRI chemicals released in 2022. Metals are primarily disposed of to land, while most nitrate compounds are discharged to water and ammonia is primarily released to air.



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).

Releases by Industry

The metal mining sector accounted for 44% of releases (1.43 billion pounds), which were primarily in the form of on-site land disposal. Learn more about this sector in the Metal Mining sector profile.

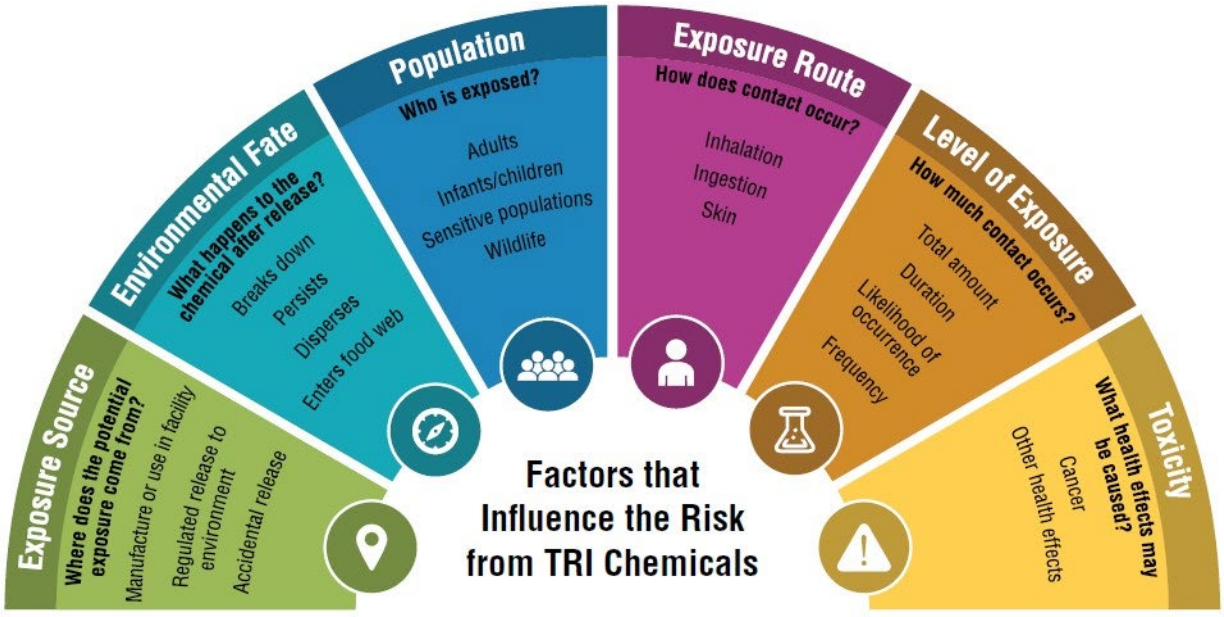


Potential Risks from TRI Chemicals

Chemicals that are included on the TRI chemical list can cause harm to humans, organisms, and ecosystems. **Risk** is the likelihood that a TRI chemical released into the environment will cause harm to humans or the environment. Many factors determine the risks that may come from exposure to toxic chemicals. The figure below lists factors that influence risks posed by TRI chemicals.

The quantities of TRI chemicals released into the environment do not indicate potential risks to health because these quantities alone do not consider the extent of exposure or the toxicity of the chemicals. The chemical release data collected through TRI reporting can be used as a starting point—along with other resources such as EPA's Risk-Screening Environmental Indicators (RSEI) model—to help evaluate potential harm and risks to health from TRI chemical exposure.

Overview of Factors that Influence Risk



EPA developed the Risk-Screening Environmental Indicators (RSEI) model to help identify geographic areas, industry sectors, and chemical releases that may be associated with significant human health risks and to examine how these potential risks change over time. RSEI incorporates information from TRI on the amount of chemicals released along with factors such as how chemicals change and where they go as they move through the environment, each chemical's relative toxicity, and the potential for human exposure.

People are most likely to be exposed to TRI chemicals through the air or water, so RSEI focuses on releases to air and water, including releases to air from waste incinerators and releases to water following transfers to publicly owned treatment works (POTWs). Using the release quantities reported to TRI, the RSEI model produces two primary results—hazard-based values (RSEI Hazard) and risk-related scores (RSEI Score)—that enable screening-level comparisons of relative potential harm and potential risks to human health from TRI chemicals.

- **RSEI Hazard** consists of the pounds of a chemical released or transferred multiplied by the chemical's toxicity weight.
- A **RSEI Score** is a calculated estimate of relative potential human health risk. It is a unitless value that accounts for the amount of a chemical released to air or water, what happens to the chemical in the environment, the size and location(s) of potentially exposed populations, and the chemical's relative toxicity.

Helpful Concepts

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

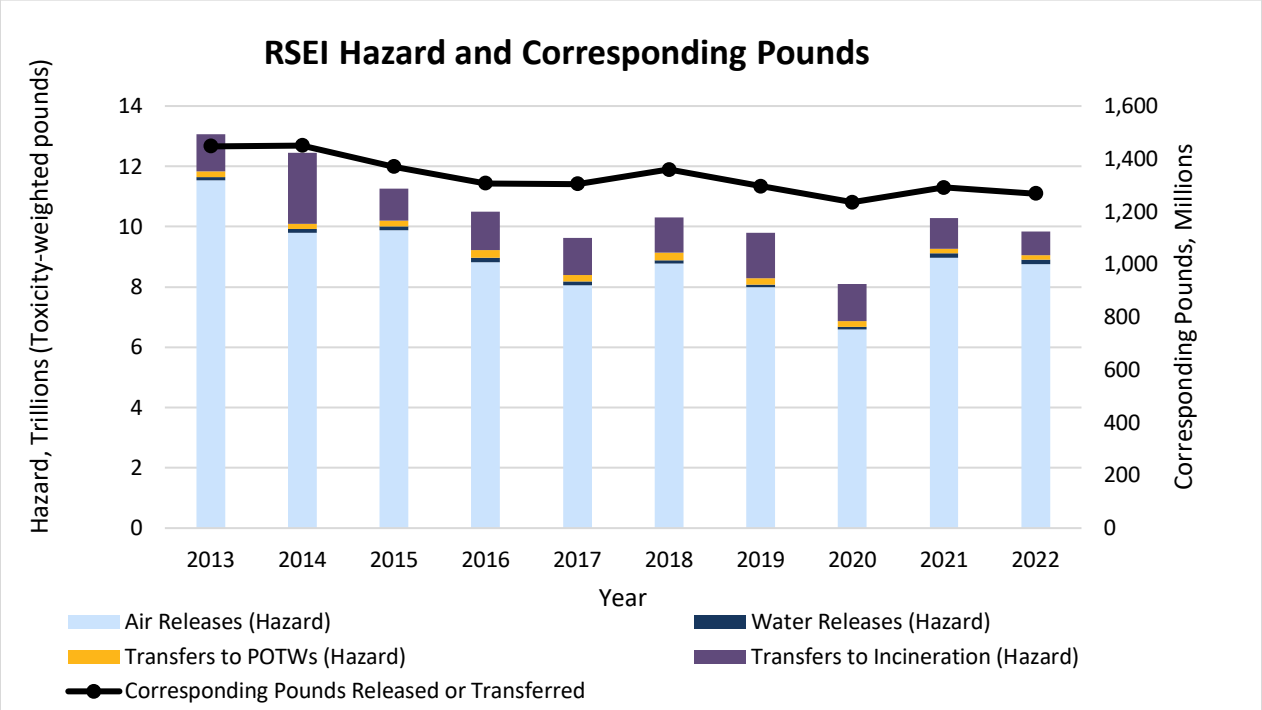
Exposure is how a person comes into contact with a chemical (e.g., inhalation, ingestion) and can be described in terms of its magnitude (how much), frequency (how often), and duration (how long).

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

Both RSEI Hazard and RSEI Score provide greater insight on potential health impacts than TRI release quantities alone. However, RSEI Hazard or RSEI Score values do not provide actual levels of harm or risks to human health from TRI chemicals. Rather, these screening-level values are used for relative comparisons, such as the analysis of trends over time or comparison of sectors. Studies and analyses that use RSEI information can help establish priorities for further investigation and to look at changes in potential human health impacts over time. More information on RSEI and its applications is available at EPA's RSEI website.

Hazard Trend

RSEI Hazard, also called toxicity-weighted pounds, is a descriptor of relative potential harm to human health. It is based on the toxicity of a chemical and the quantity of the chemical released into the environment. Weighting releases based on toxicity gives greater significance to more toxic chemicals and more context than the release quantities alone. The following graph shows the 10-year trend in calculated RSEI Hazard compared to the trend in the unweighted quantity of chemicals used to calculate RSEI Hazard (corresponding pounds).



Note: For comparability, trend graphs include only those chemicals with toxicity weights. RSEI Hazard values and corresponding pounds include only on-site air releases, on-site water releases, transfers to publicly owned treatment works (POTWs), and transfers to incineration.

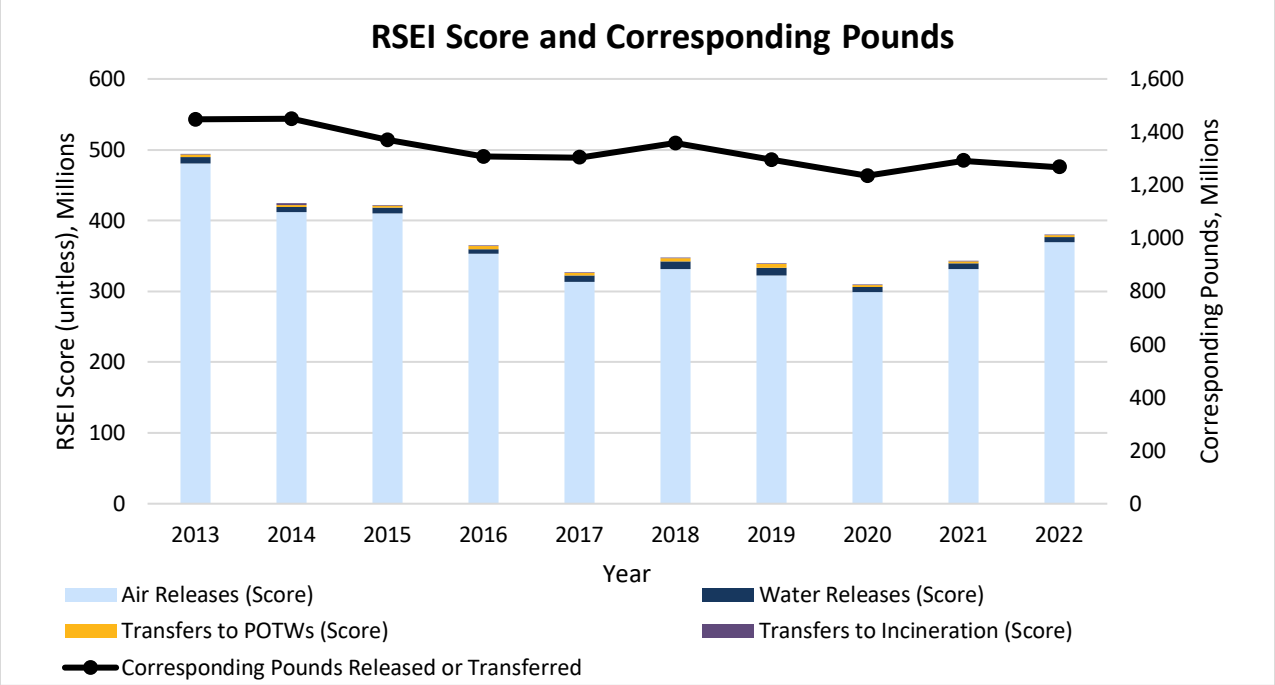
From 2013 to 2022:

- The calculated RSEI Hazard values shown in the figure above decreased by 22%, while the corresponding release quantities (in pounds) decreased by 12%. This suggests that TRI facilities are not only releasing or transferring fewer pounds of TRI chemicals for these activities, but are also releasing fewer pounds of the more toxic TRI chemicals.
- The largest decreases in RSEI hazard were from ethylene oxide, chromium, arsenic compounds, chloroprene and polycyclic aromatic compounds.

Risk-Screening Trend

RSEI Scores are indicators of relative potential risk to human health and are intended for use in comparative analysis. RSEI Scores consider the locations and quantities of TRI chemical releases as well as the number of people living in the surrounding areas. The scores also account for what happens to the chemical in the environment, where it might go, and how much of the chemical people might be exposed to.

The following graph shows the 10-year trend in calculated RSEI Score compared to the trend in the corresponding pounds of TRI chemicals released or transferred that are used to calculate the RSEI Score.



Note: RSEI Score values and corresponding pounds include only on-site air releases (Air Releases), on-site water releases (Water Releases), transfers to POTWs, and transfers to incineration.

From 2013 to 2022:

- The overall calculated RSEI Score decreased by 24%, while corresponding release quantities (in pounds) decreased by 12%. This suggests that TRI reporting facilities are: releasing or transferring fewer pounds of TRI chemicals; releasing fewer pounds of the more toxic TRI chemicals; or that releases are occurring in areas that are less populated.
- While RSEI Score does not describe actual risks to human health from TRI chemicals, the overall decrease in RSEI Score indicates that, at the national level, the relative potential risk from toxic chemicals reported to TRI has declined from 2013 to 2022.

- Of the types of releases modeled by RSEI, air releases contribute the most to potential human health risks based on calculated RSEI Scores.
- The decrease in RSEI Score from 2013 to 2022 was driven in part by large decreases in air releases of ethylene oxide and chromium and chromium compounds.

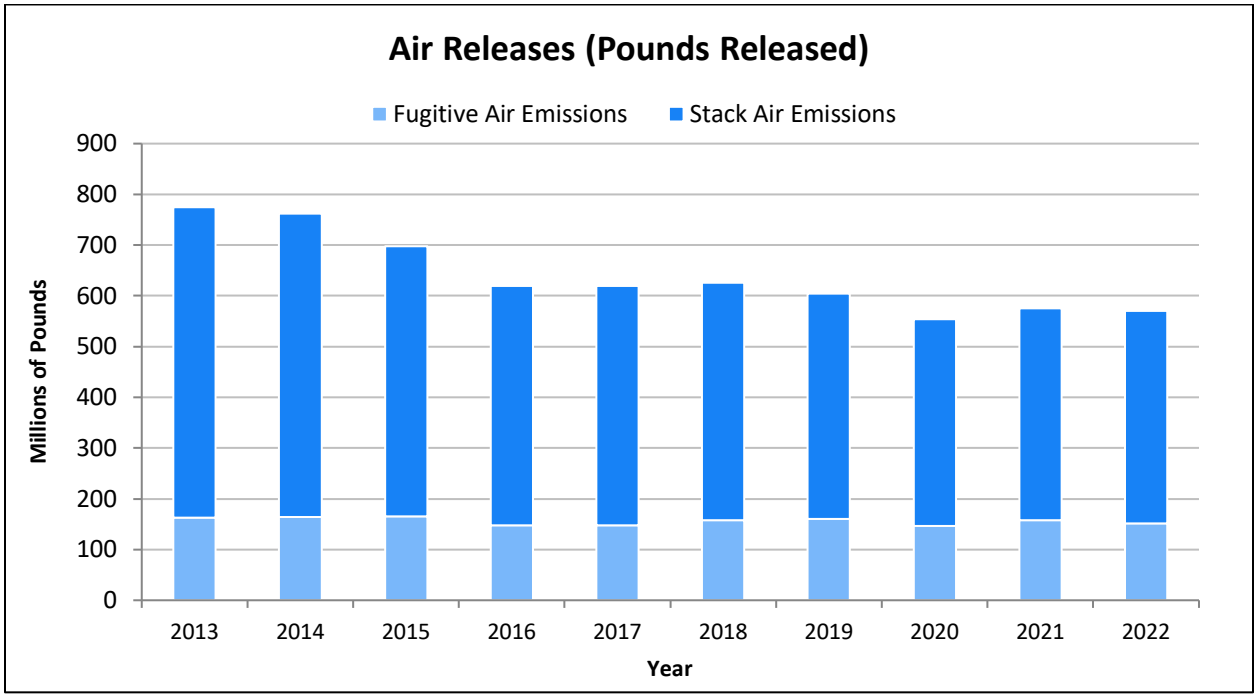
RSEI Dashboard

- Use EPA's EasyRSEI Dashboard to view the national trend in RSEI Hazard and RSEI Score, or use the Dashboard's filter capabilities to view other RSEI information for a specific chemical or location of interest.

Air Releases

Releases of TRI chemicals into the air have declined notably over the last 10 years. These releases include both fugitive air emissions and stack air emissions.

This graph shows the 10-year trend in the quantity of chemicals released into the air. EPA regulates air emissions under the Clean Air Act. Facilities must comply with permitting requirements if they meet certain criteria such as pollutant releases above specified thresholds.



From 2013 to 2022:

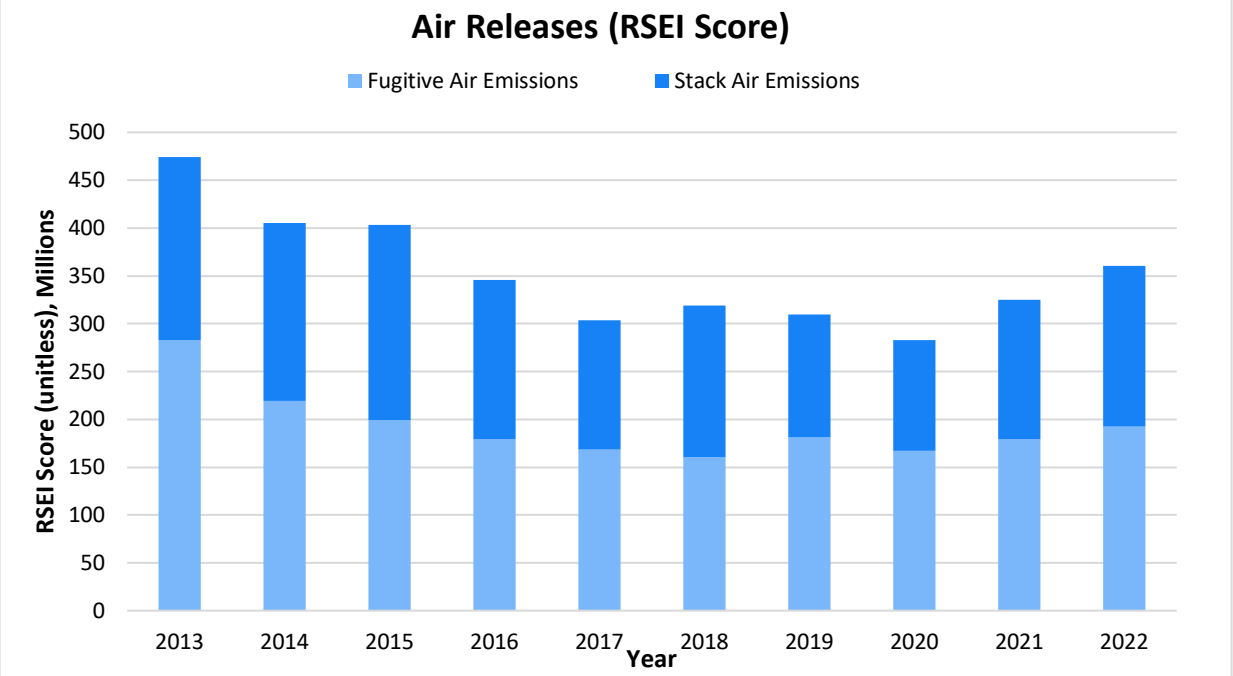
- Releases into the air decreased by 26% (-204 million pounds).
- Air releases of hydrochloric acid, sulfuric acid, hydrogen fluoride, methanol, and toluene decreased the most.
- The decrease in air releases was driven by reduced releases of hydrochloric acid and sulfuric acid to air from electric utilities due to: a shift from coal to other fuel sources (e.g., natural gas); and the installation of pollution control technologies at coal-fired power plants.
- Note that only those electric utilities that combust coal or oil to generate power for distribution into commerce are covered under TRI reporting requirements. Electric utilities that use only fuels other than coal or oil (such as natural gas) are not required to report to TRI. More information about this sector is available in the Electric Utilities sector profile.

- Air releases of chemicals classified as carcinogens by the Occupational Safety and Health Administration (OSHA) increased; see the Air Releases of OSHA Carcinogens figure.
- For trends in air releases of chemicals of special concern, including lead and mercury, see the Chemical Profiles section.

In 2022:

- The TRI chemicals released into the air in the largest quantities were ammonia and methanol.
- Air releases of TRI chemicals decreased by 1% since 2021.
- Air releases from the paper manufacturing, primary metals manufacturing, and chemical manufacturing sectors drove the decrease. For 2022, TRI reporting requirements were expanded to include additional natural gas processing facilities; air releases from these newly-covered facilities partially offset the decrease in air releases from other sectors.

This graph shows the 10-year trend in RSEI Scores for TRI air releases.



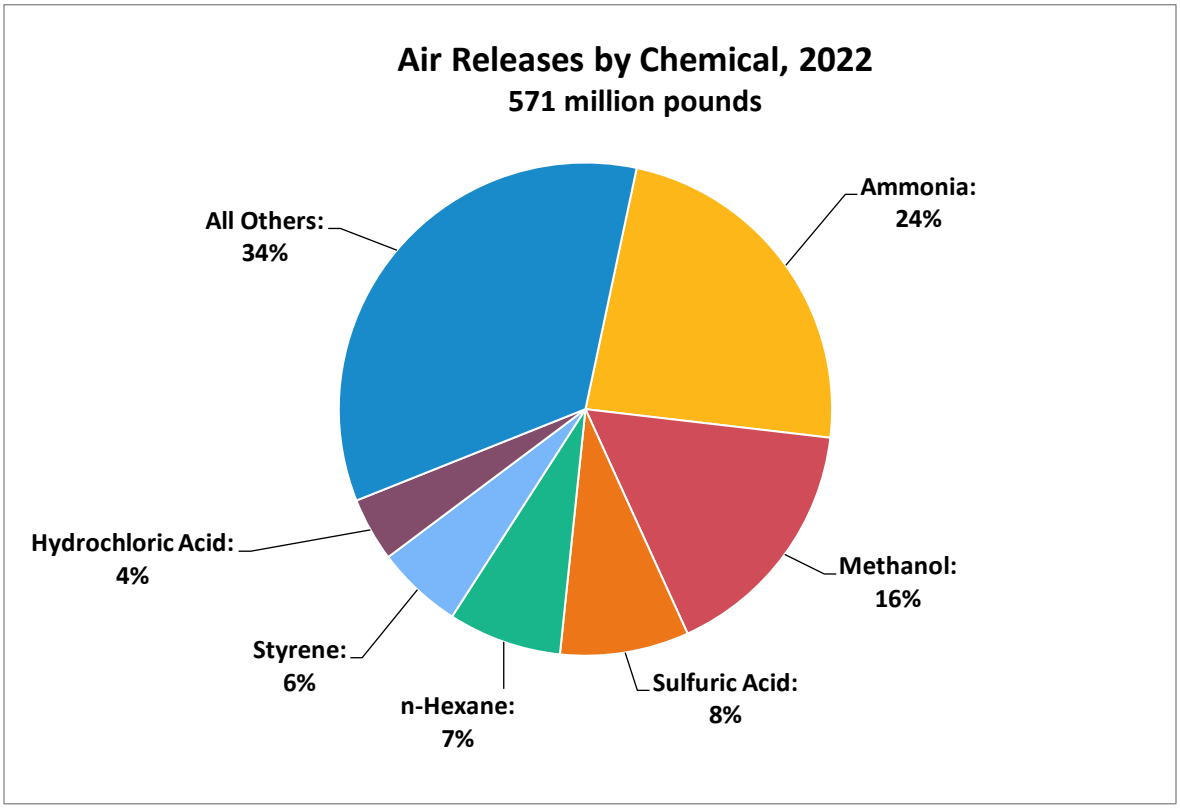
- The chemicals that contributed the most to the RSEI Score values for air releases were chromium and ethylene oxide.
    - While the combined quantities of chromium and ethylene oxide released to air accounted for less than one percent of total air releases in 2022, they accounted for 30% and 27% of total RSEI Score, respectively.

- The increase in score for air releases from 2020 to 2022 is due in part to increases in releases of ethylene oxide, nickel, and cobalt compounds.
- As shown in the "Pounds Released" chart, facilities reported considerably more stack air emissions than fugitive air emissions, but their relative contributions to the RSEI Score values have been similar in recent years, as shown in the "RSEI Score" chart. This is because chemicals released through stacks tend to be dispersed over a wider area than fugitive air emissions, resulting in lower average concentrations in the environment. As a result, surrounding populations are less likely to be exposed to chemicals released through stacks compared to fugitive emissions like leaks from equipment or releases from building ventilation systems.
- For a complete step-by-step description of how EPA's RSEI model derives RSEI Score values from stack air emissions and fugitive air emissions, see "Section 5.3: Modeling Air Releases" of EPA's Risk-Screening Environmental Indicators (RSEI) Methodology.
- For general information on how RSEI Scores are derived, see Potential Risks from TRI Chemicals.

Air Releases by Chemical and Industry

Air Releases by Chemical

This pie chart shows which TRI chemicals were released into the air in the greatest quantities during 2022.

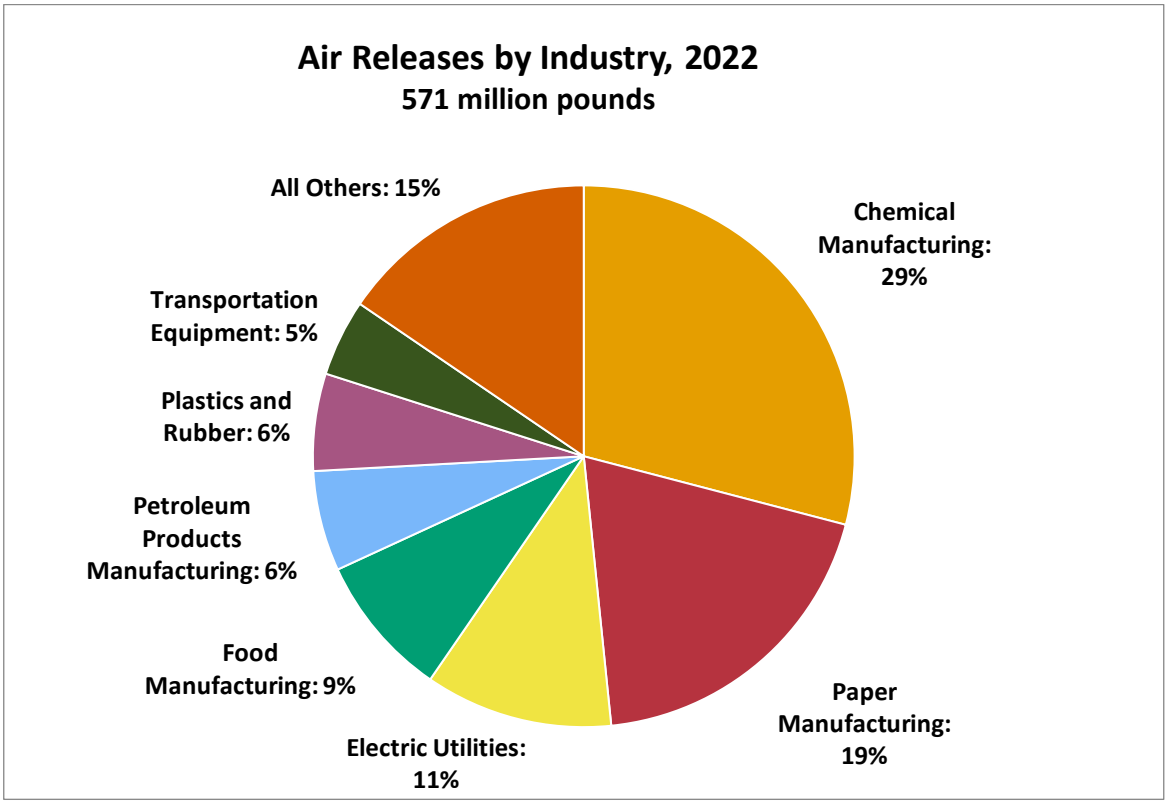


Note: Percentages do not sum to 100% due to rounding.

- The chemicals released to air in the greatest quantities during 2022 were:
  - Ammonia: Facilities that manufacture nitrogen-based fertilizers accounted for 42% of ammonia air releases.
  - Methanol: Most air releases of methanol were from paper manufacturing facilities.
  - Sulfuric acid and hydrochloric acid: Electric utilities released more of these chemicals into the air than any other sector.

Air Releases by Industry

This pie chart shows the TRI-covered industry sectors that reported the largest quantities of air releases during 2022.

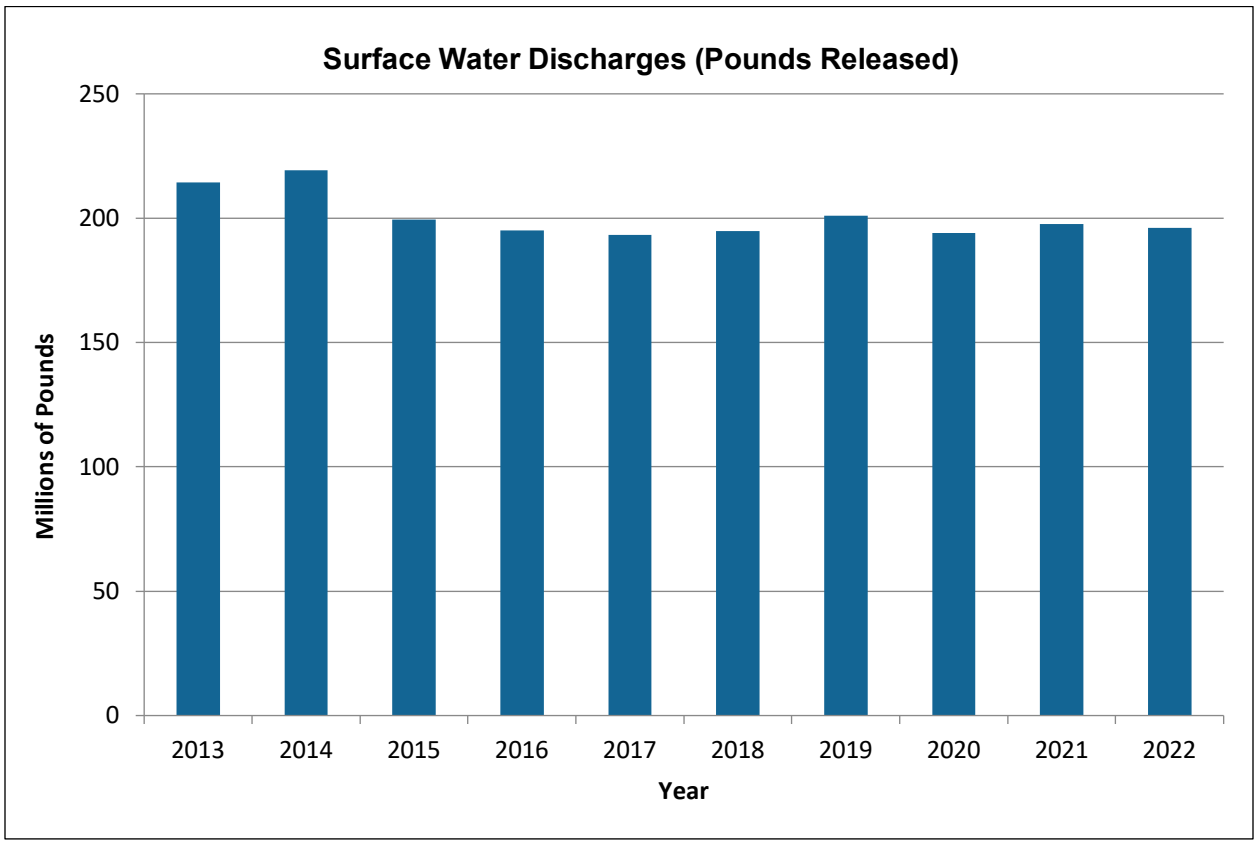


- Facilities in the following sectors accounted for the largest air releases of TRI chemicals during 2022. The chemicals released in the largest quantities by these sectors were:
  - Chemical manufacturing: ammonia and ethylene.
  - Paper manufacturing: methanol.
  - Electric utilities: sulfuric acid.

Water Releases

TRI chemicals released into streams or other water bodies are referred to as "water releases" or "surface water discharges." They are regulated by the Clean Water Act, which requires facilities that discharge pollutants into surface water to obtain permits under the National Pollutant Discharge Elimination System (NPDES).

The following graph shows the 10-year trend in the amount of TRI chemicals directly released into water bodies.



From 2013 to 2022:

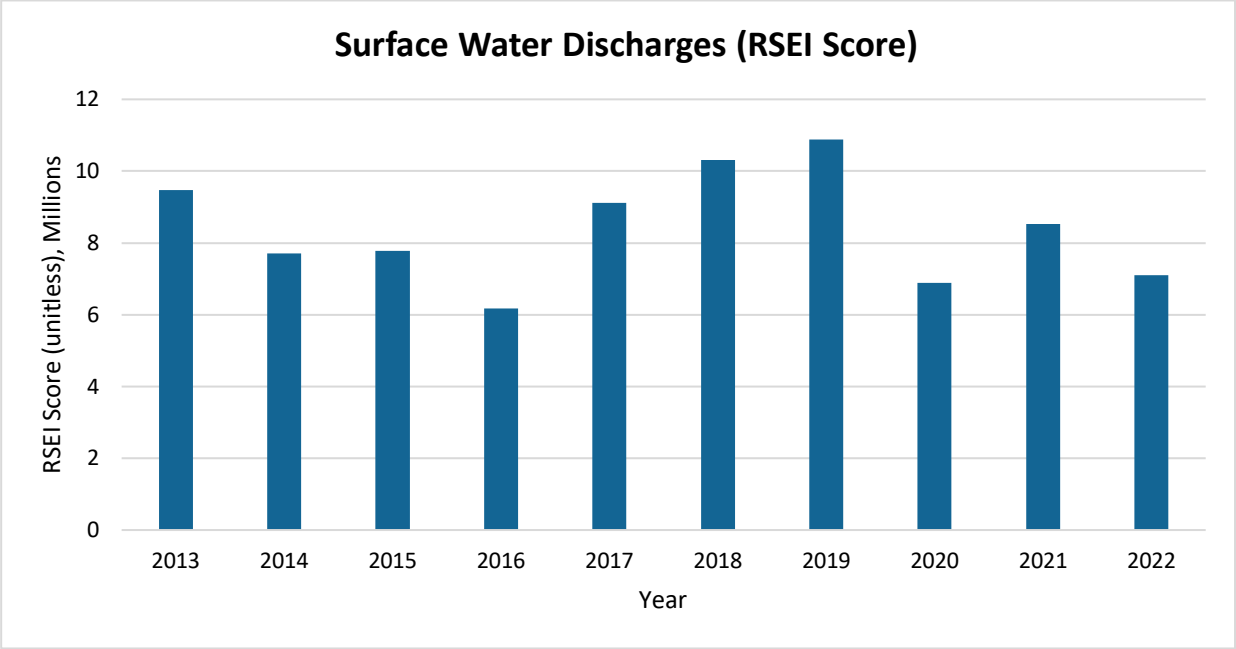
- Discharges of TRI chemicals into surface water decreased by 18 million pounds (-9%). Most of this decline was due to reductions in releases of nitrate compounds.
    - Nitrate compounds are often formed as byproducts during wastewater treatment processes such as neutralization of nitric acid, or when nitrification takes place to meet standards under EPA's effluent guidelines.

In 2022:

- Nitrate compounds alone accounted for 90% of total releases of TRI chemicals to water.

- Many sectors release nitrate compounds, but facilities in the food manufacturing sector released the most.

The following graph shows the 10-year trend in RSEI Scores for TRI chemicals directly released into water bodies.



- While total water releases have been fairly steady from 2013 through 2022, associated RSEI Scores have fluctuated substantially. Nitrate compounds account for most water releases, and the quantity of nitrate compounds released has not changed significantly from year to year. Although nitrate compounds can cause serious problems in the environment like eutrophication, their relatively low toxicity means they do not impact RSEI Scores as much as more toxic chemicals. Relatively small changes in release quantities of more toxic chemicals can have large impacts on RSEI Scores but little impact on the trend in total pounds released.
- The largest chemical contributors to the changes RSEI Scores for water releases between 2013 and 2022 were arsenic compounds and mercury compounds.
- For a complete, step-by-step description of how EPA's RSEI model derives RSEI Score values for surface water discharges of TRI chemicals, see "Section 5.4: Modeling Surface Water Releases" of EPA's Risk-Screening Environmental Indicators (RSEI) Methodology.

- For general information on how RSEI Scores are derived, see Potential Risks from TRI Chemicals.

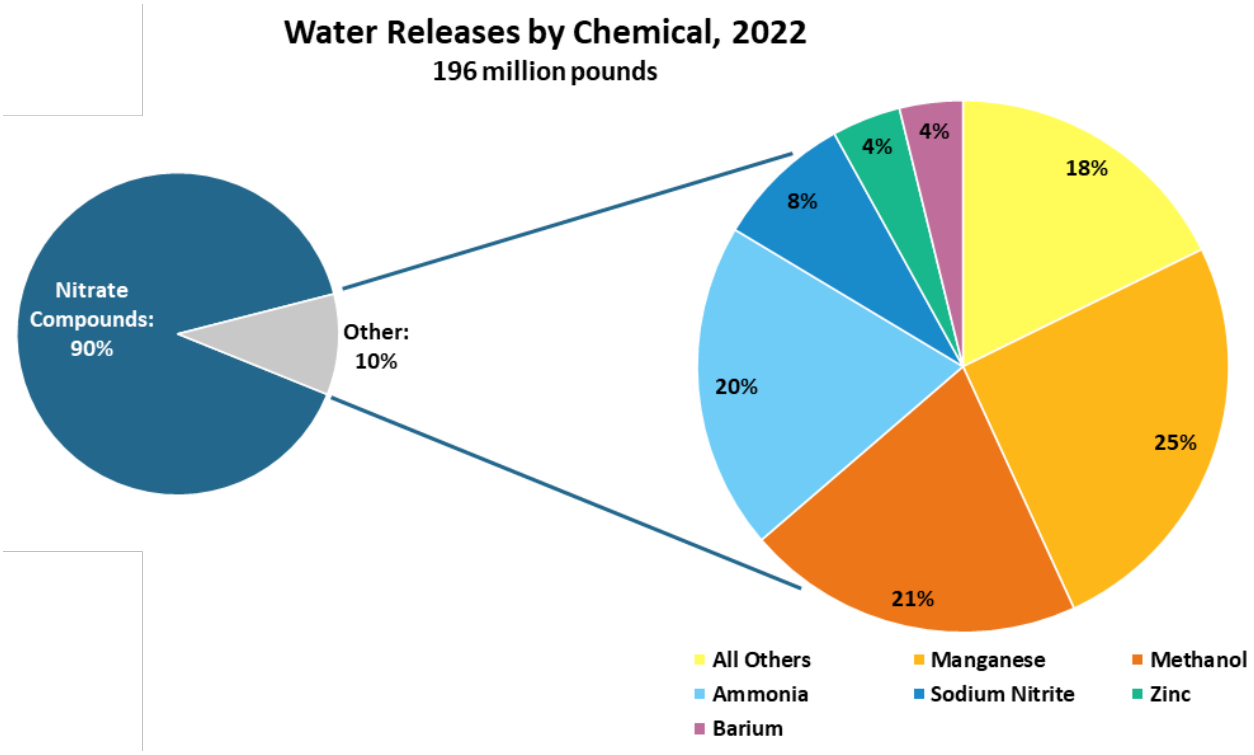
What Are Nitrate Compounds?

Nitrate compounds are a group of chemicals with relatively low toxicity to humans compared to many other TRI compounds. However, these compounds 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.

Water Releases by Chemical and Industry

Water Releases by Chemical

This pie chart shows the TRI-listed chemicals released into water bodies in the largest quantities during 2022.

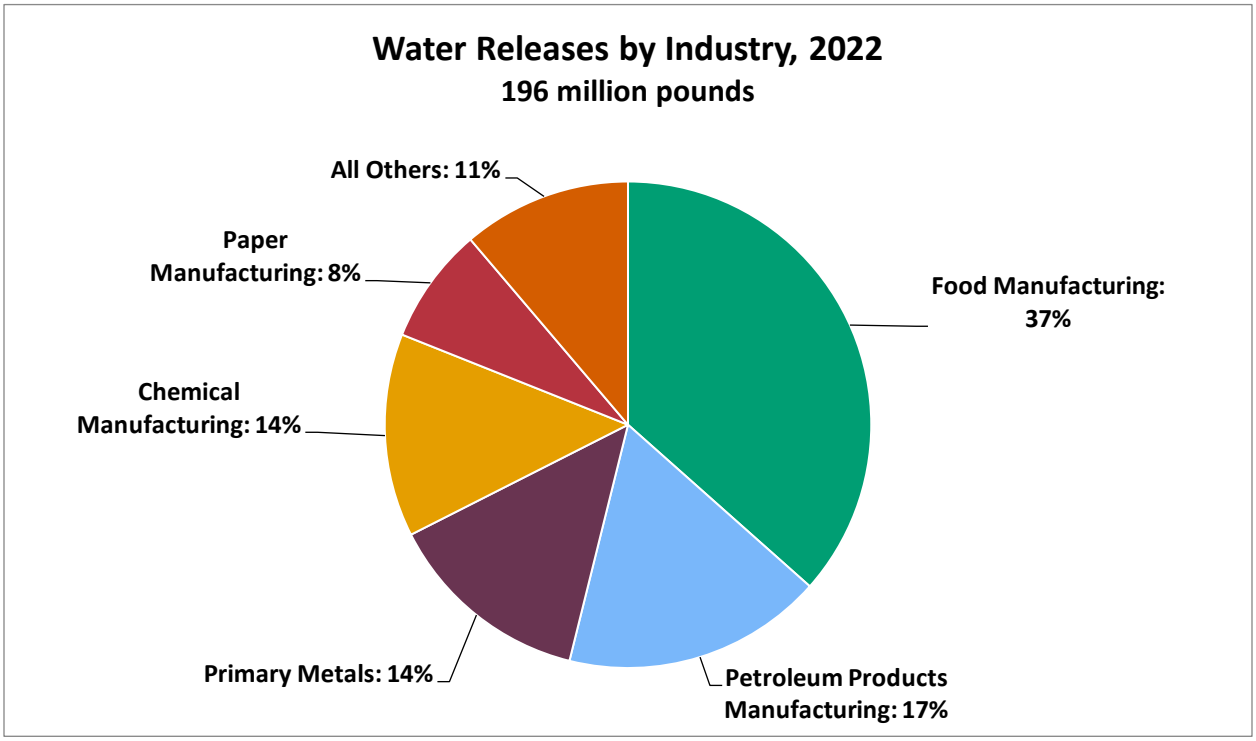


Note: 1) In this chart, metals are combined with their metal compounds, although metals and compounds of the same metal are listed separately on the TRI list (e.g., manganese is listed separately from manganese compounds). 2) The nitrate compounds category in TRI includes only water dissociable nitrate compounds.

- Nitrate compounds accounted for 90% of the total quantity of TRI chemicals released to water in 2022. Nitrate compounds are commonly formed as part of facilities' on-site wastewater treatment processes. The food manufacturing sector contributed 40% of total nitrate compound releases to water, largely due to the treatment required for biological materials in wastewater, such as from meat processing facilities.
- After nitrate compounds, manganese, methanol, and ammonia were released in the largest quantities, accounting for a combined 7% of the chemicals released into water.

Water Releases by Industry

This pie chart shows the TRI-covered industry sectors that reported the largest quantities of TRI water releases during 2022.



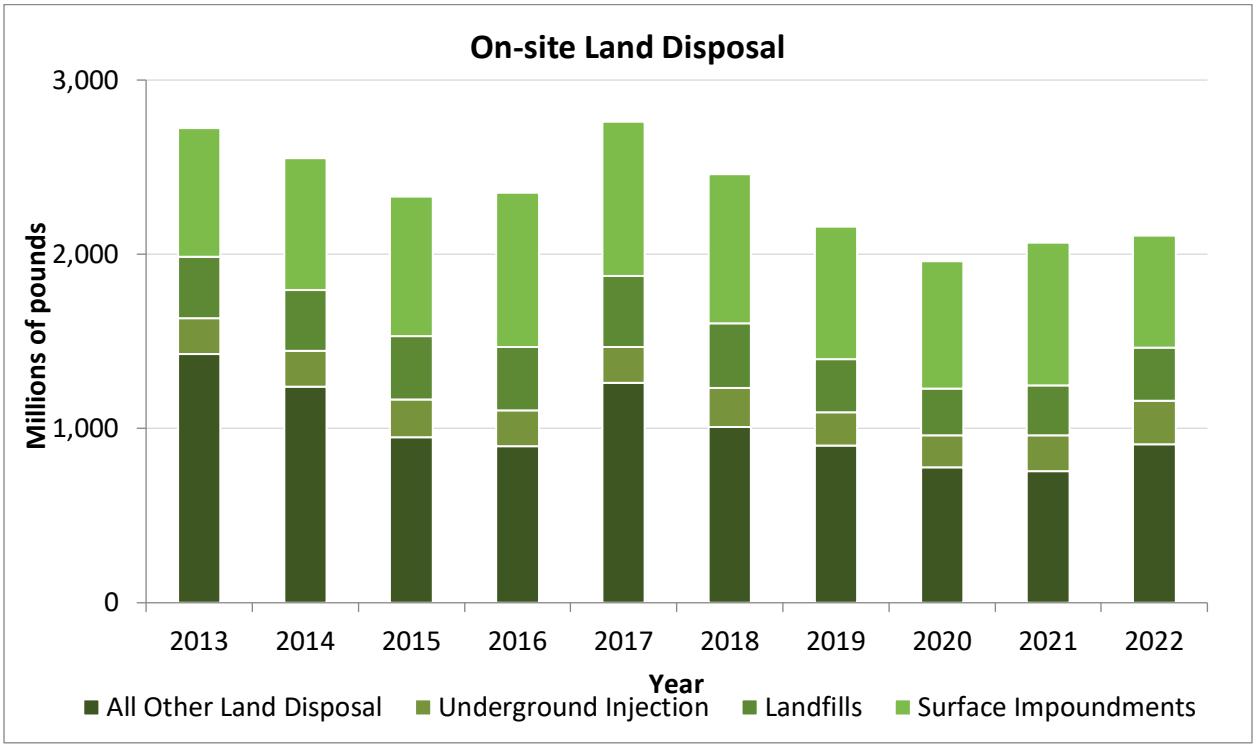
Note: Percentages do not sum to 100% due to rounding.

- Facilities in the food manufacturing sector accounted for 37% of water releases for 2022 and approximately one-third of annual water releases over the past ten years.
    - Nitrate compounds accounted for 99% of the total quantity of water releases from the food manufacturing sector.

Land Disposal

Facilities report the quantities of TRI chemical waste disposed of in landfills, underground injection wells, surface impoundments, and other types of containment. Land disposal of chemicals is often regulated by EPA under the Resource Conservation and Recovery Act (RCRA). RCRA design standards for hazardous waste landfills and surface impoundments include double liners, leachate collection and removal systems, and leak detection systems. Operators of these disposal units must also comply with RCRA inspection and monitoring requirements.

This graph shows the 10-year trend in on-site land disposal of TRI chemicals. The metal mining sector accounted for most of this disposal.



From 2013 to 2022:

- On-site land disposal has fluctuated over the last ten years, driven by year-to-year changes from metal mines.
- The "All Other Land Disposal" category in the figure includes spills and leaks to land, waste rock piles at metal mines, and application of waste to land (such as in agricultural fertilizer).

From 2021 to 2022:

- Land releases increased by 41 million pounds (2%).
- The increase in land disposal was due to the expansion of TRI reporting requirements to cover all natural gas processing facilities as of 2022. Facilities in this sector managed most of their releases through underground injection.

Land releases from metal mines:

In 2022, the metal mining sector accounted for 68% of land disposal quantities.

- The TRI chemicals disposed to land by metal mines in 2022 were primarily lead (32%), zinc (28%), and arsenic (16%).
- Metal mining facilities typically handle large volumes of material. Mines often note that changes in the chemical composition of extracted ore can result in large fluctuations in quantities of waste managed. In some cases, small changes in the ore's composition can impact whether TRI chemicals in ore qualify for a concentration-based exemption from TRI reporting in one year but not in the next year or vice versa.
- Regulations require that waste rock, which contains TRI chemicals, 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 and the "Explore a Metal Mine" webpage.

This graph shows the 10-year trend in on-site land disposal, excluding quantities reported by the metal mining sector. The metal mining sector accounts for about 70% of the quantities of TRI chemicals disposed of to land in most years.

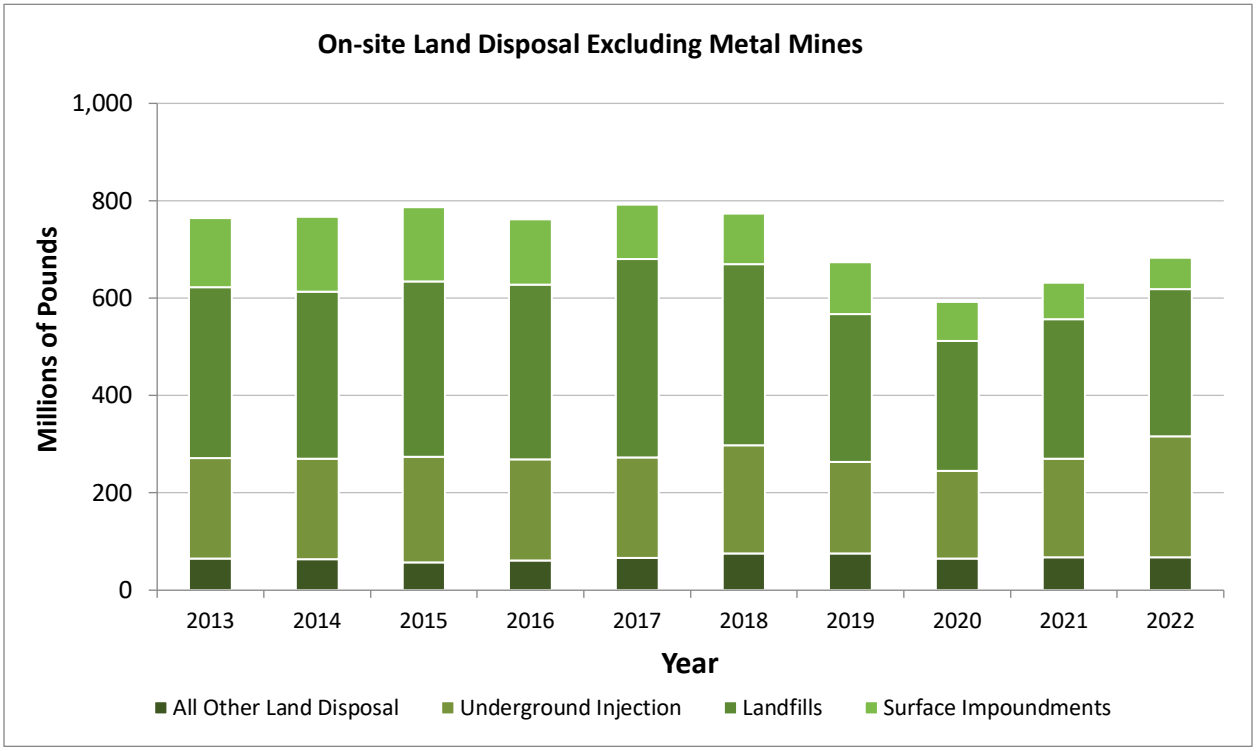
Helpful Concepts

What is underground injection?

Underground injection involves placing fluids underground in porous formations through wells. EPA regulates underground injection through its Underground Injection Control Program under the Safe Drinking Water Act.

What is a surface impoundment?

Surface impoundments are natural or artificial depressions, excavations, or diked areas used to hold liquid waste. Construction of surface impoundments must follow criteria including having a double liner and leak detection system. Surface impoundments containing hazardous waste are regulated through the Resource Conservation and Recovery Act.



From 2013 to 2022:

- Total on-site land disposal for all industries other than metal mining was relatively steady from 2013 to 2018.
- Since 2018, the decrease in land disposal for industries other than metal mining was driven by reduced land disposal by facilities in the primary metal and chemical manufacturing sectors.

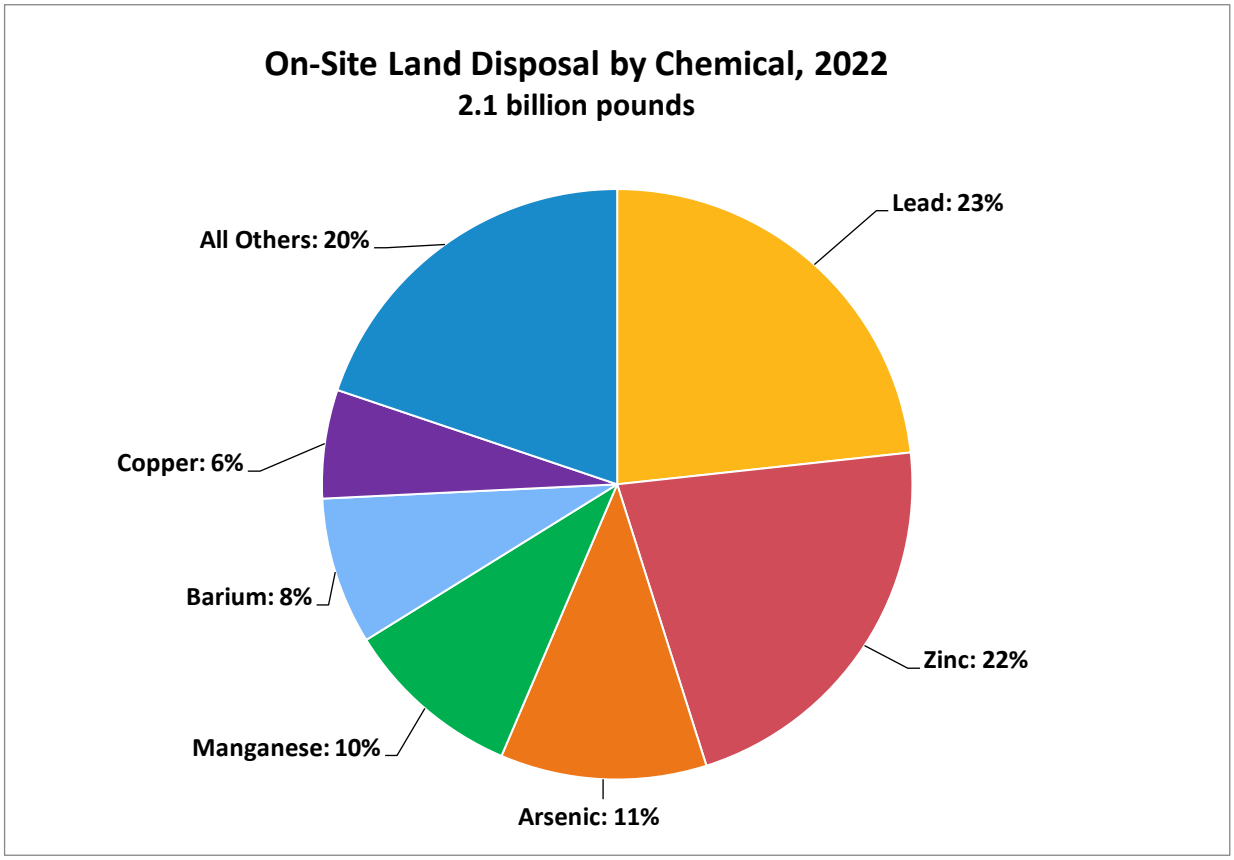
In 2022:

- Excluding the quantities of TRI chemicals disposed of to land by metal mines, the chemicals disposed of on site to land in the largest quantities were: barium (15%), manganese (11%), hydrogen sulfide (10%), and zinc (8%).
- Excluding metal mines, most on-site land disposal quantities were reported by the chemical manufacturing, hazardous waste management, electric utilities, and primary metals sectors.
- The natural gas processing sector reported 72 million pounds of land disposal, most of which was hydrogen sulfide disposed of by underground injection.

Land Disposal by Chemical and Industry

Land Disposal by Chemical

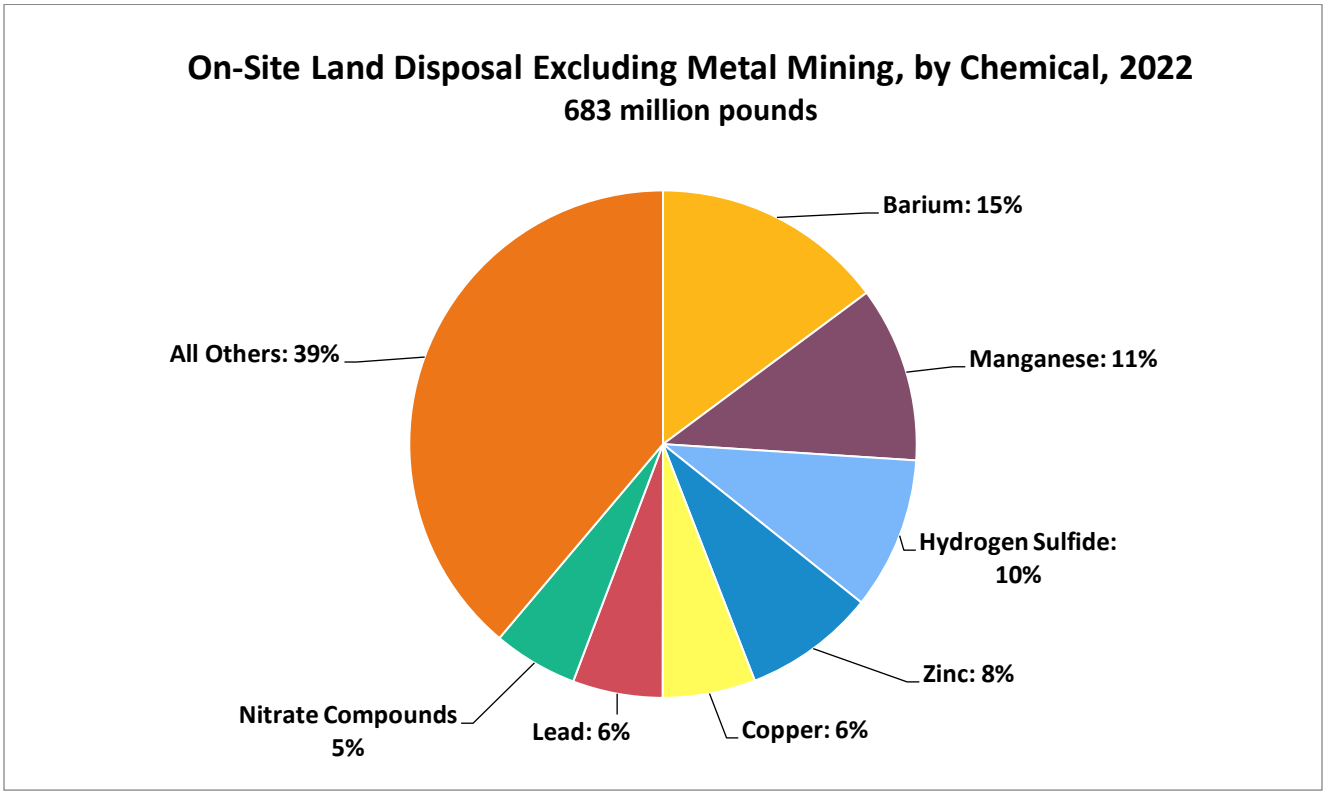
This pie chart shows the chemicals disposed of to land on site in the greatest quantities during 2022. The metal mining sector accounts for most of this disposal.



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).

The metal mining sector alone was responsible for 91% of the lead, zinc, and arsenic disposed of to land in 2022. These three chemicals made up 56% of the total quantities of TRI chemicals disposed of to land.

This pie chart shows the chemicals disposed of on site to land in the greatest quantities during 2022, excluding quantities from facilities in the metal mining sector.

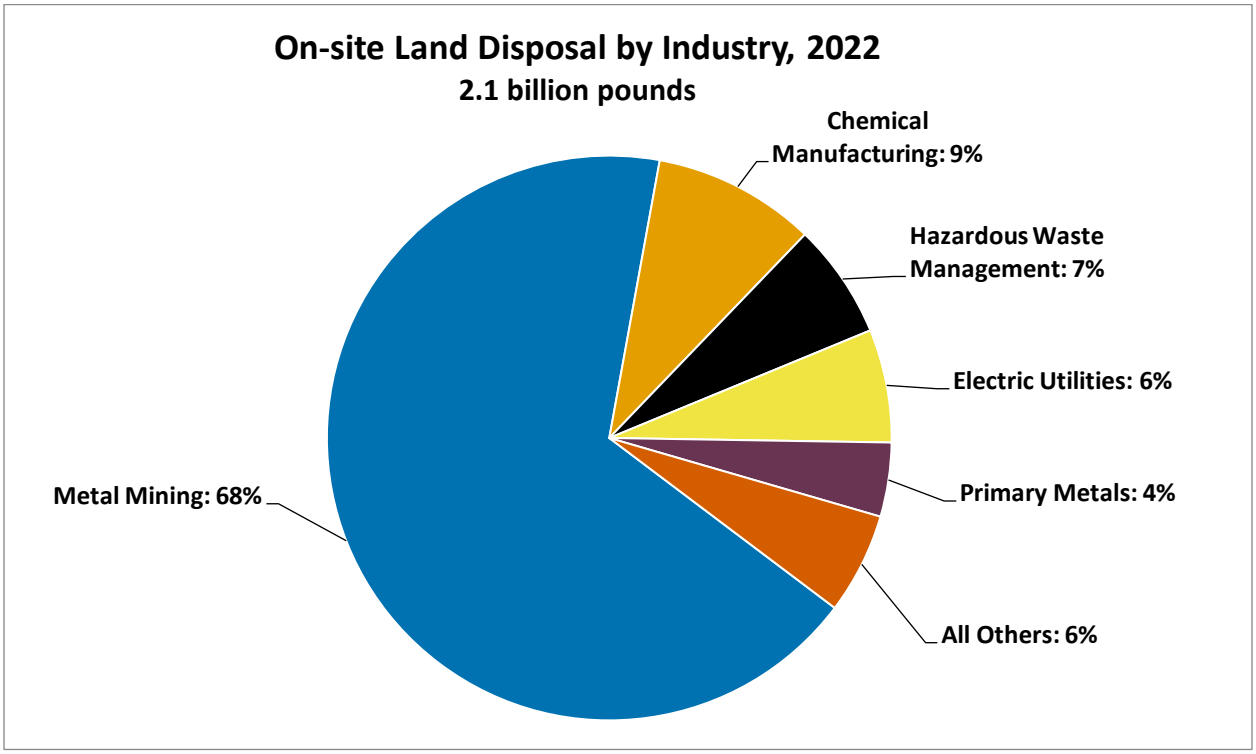


Note: In this chart, metals are combined with their metal compounds, although metals and compounds of the same metal are listed separately on the TRI list (e.g., lead is listed separately from lead compounds).

- When the metal mining sector is excluded, a wider variety of chemicals make up the majority of land releases. For example, six different chemicals made up 56% of land releases when metal mining facilities are excluded, while three chemicals made up 56% of land releases when these facilities are included (as shown on the "Land Disposal, All Sectors" chart).
- Barium: Most land releases were from the electric utilities sector.
- Manganese: Most land releases were from the chemical manufacturing, primary metals, and electric utilities sectors.
- Zinc: Most land releases were from the primary metals sector.

Land Disposal by Industry

This pie chart shows the industry sectors that reported the greatest quantities of on-site land disposal of TRI chemicals during 2022.



- Metal mines accounted for most of the land disposal in 2022.
- The relative contribution by each industry sector to on-site land disposal has not changed considerably in recent years.

Chemical Profiles

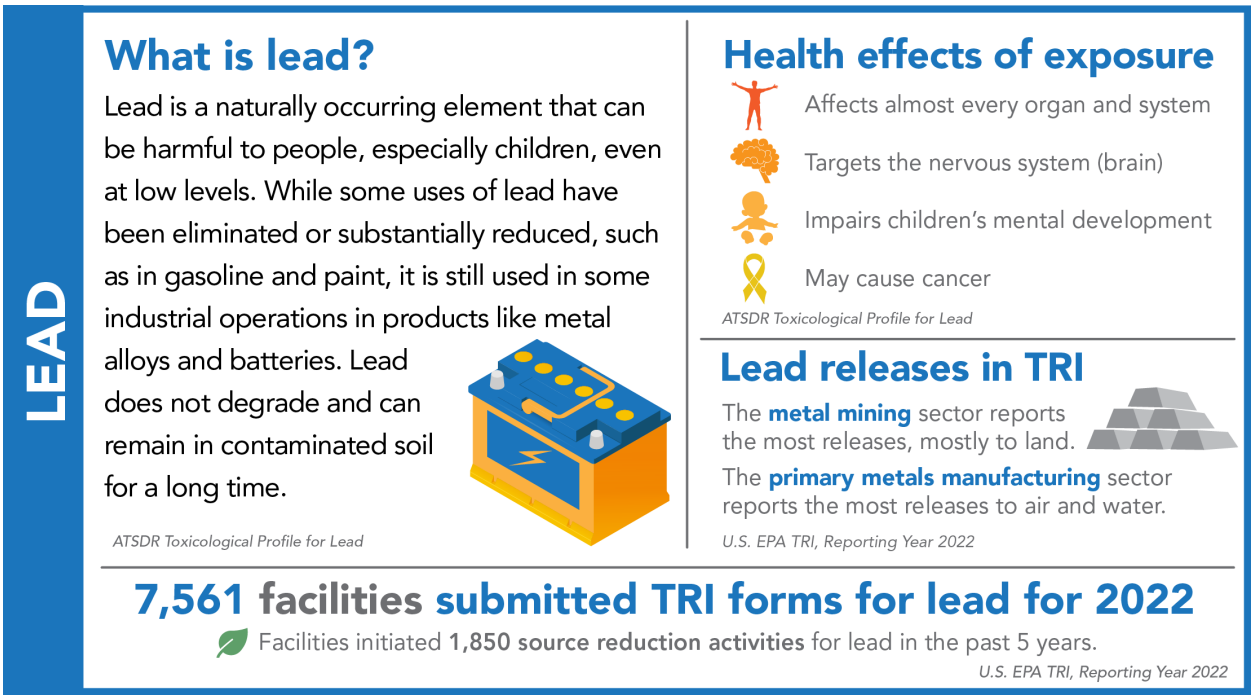
In this section, we take a closer look at some of the Toxics Release Inventory (TRI) chemicals of interest to the public, the Environmental Protection Agency (EPA), lawmakers, and industry. These profiles include chemicals that are classified by the TRI Program as chemicals of special concern, such as chemicals that are persistent, bioaccumulative, and toxic (PBTs), and carcinogens (chemicals that cause cancer).

PBT chemicals are not only toxic, but they also break down slowly in the environment and tend to build up (bioaccumulate) in organisms throughout the food web. These organisms are food sources for other organisms, including humans, which are sensitive to the toxic effects of PBT chemicals. Reporting thresholds for the PBTs on the TRI chemical list are either 10 pounds or 100 pounds, which is much lower than the reporting threshold for most TRI chemicals. For dioxin and dioxin-like compounds, the reporting threshold is even lower, at 0.1 gram. The chemicals of special concern covered in this section are lead and lead compounds, mercury and mercury compounds, dioxin and dioxin-like compounds, and per- and polyfluoroalkyl substances (PFAS).

You can generate a fact sheet for any TRI chemical using TRI Explorer.

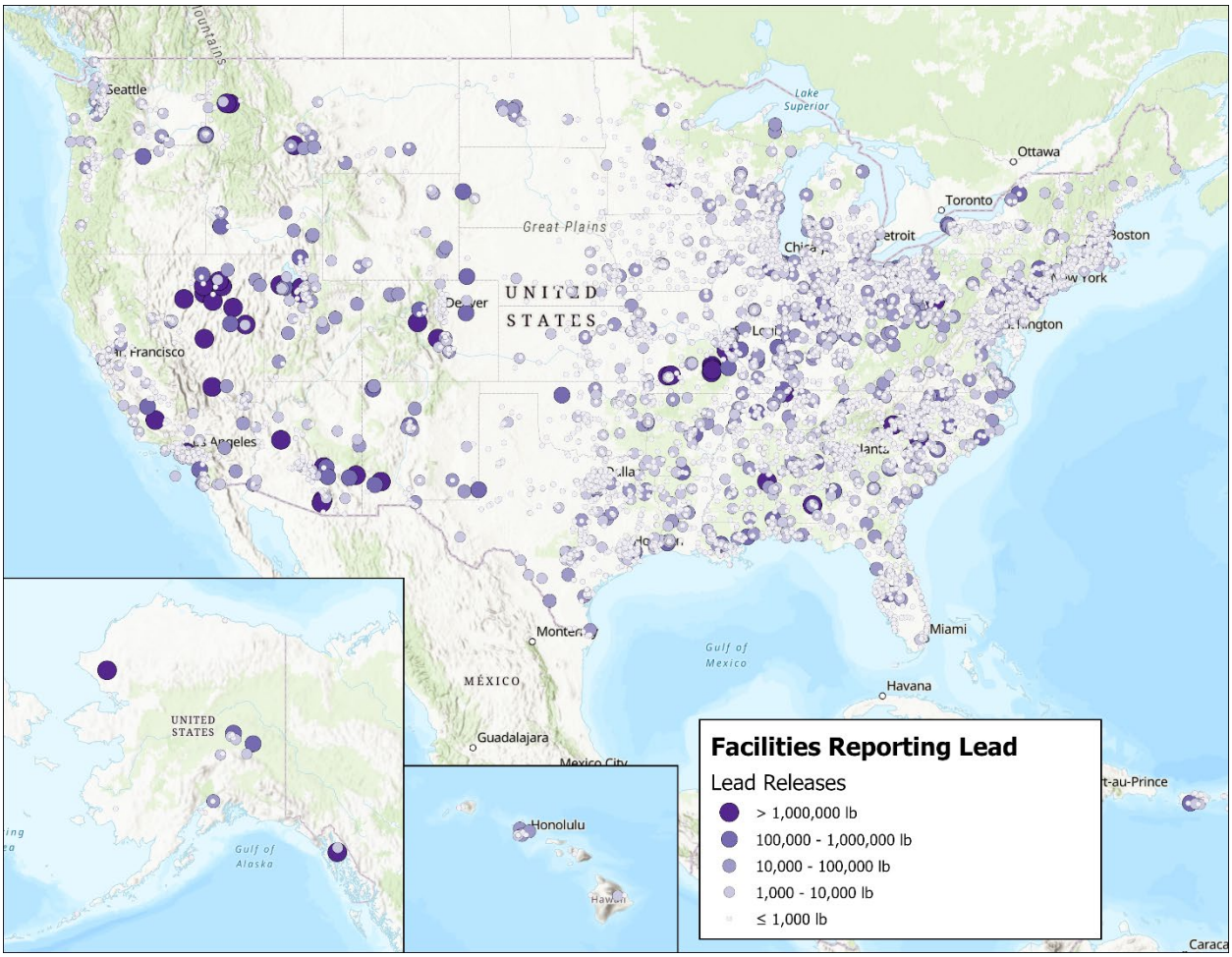
Lead

This chemical profile focuses on releases of lead and lead compounds.



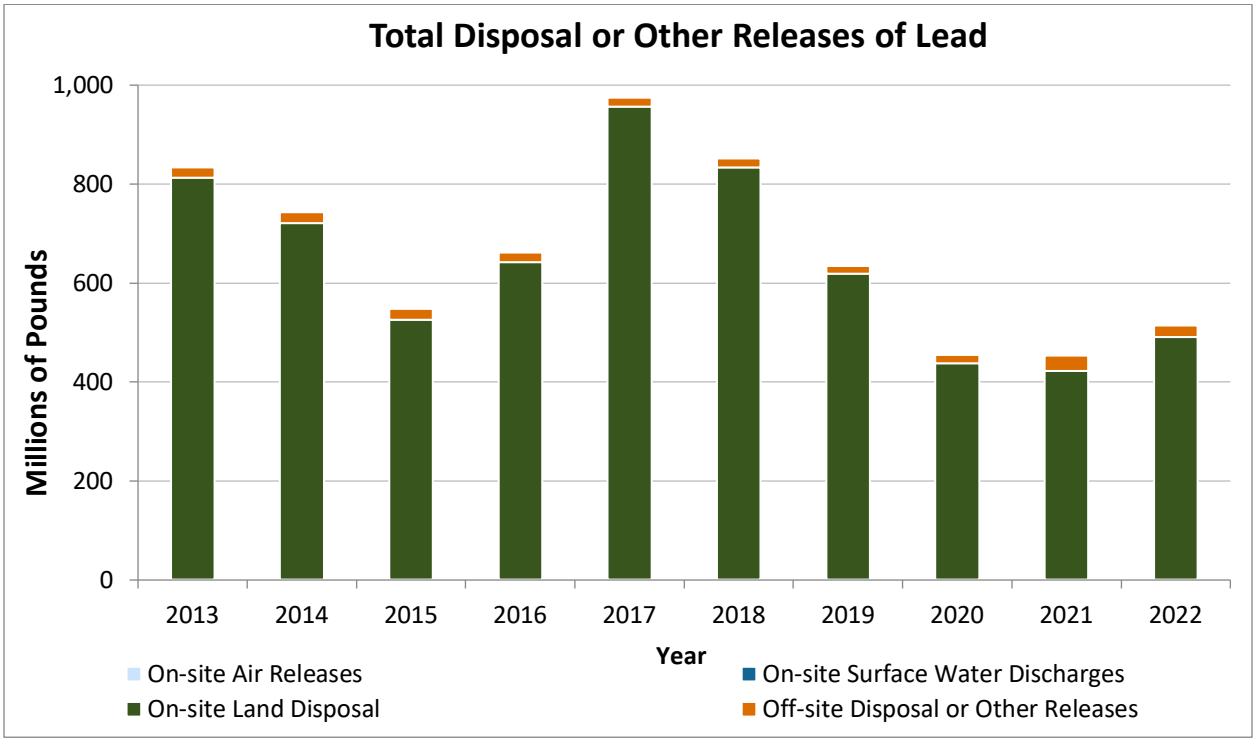
Facilities report their management of both lead and lead compounds in waste to TRI. For TRI, "lead" only includes elemental lead, while "lead compounds" includes lead that is part of another chemical. Although facilities may report for lead compounds separately from lead, the two are combined and referred to simply as "lead" in this analysis.

This map shows the locations of the facilities that reported lead to TRI for 2022, sized by their relative release quantities.



View Larger Map

Each year, EPA receives more TRI forms for lead than for any other chemical. This graph shows the 10-year trend in lead disposed of or otherwise released by facilities in all TRI reporting industry sectors.



One parent company erroneously reported tens of thousands of pounds of lead releases to air at four facilities and has since corrected these reports. These facilities are not included in this chart.

From 2013 to 2022:

- Total releases of lead fluctuated between 2013 and 2022, with substantial increases and decreases from year to year.
- Land disposal by metal mines drives annual lead releases. For 2022, metal mines reported 88% of all releases of lead, almost all of which was disposed of to land.

From 2021 to 2022:

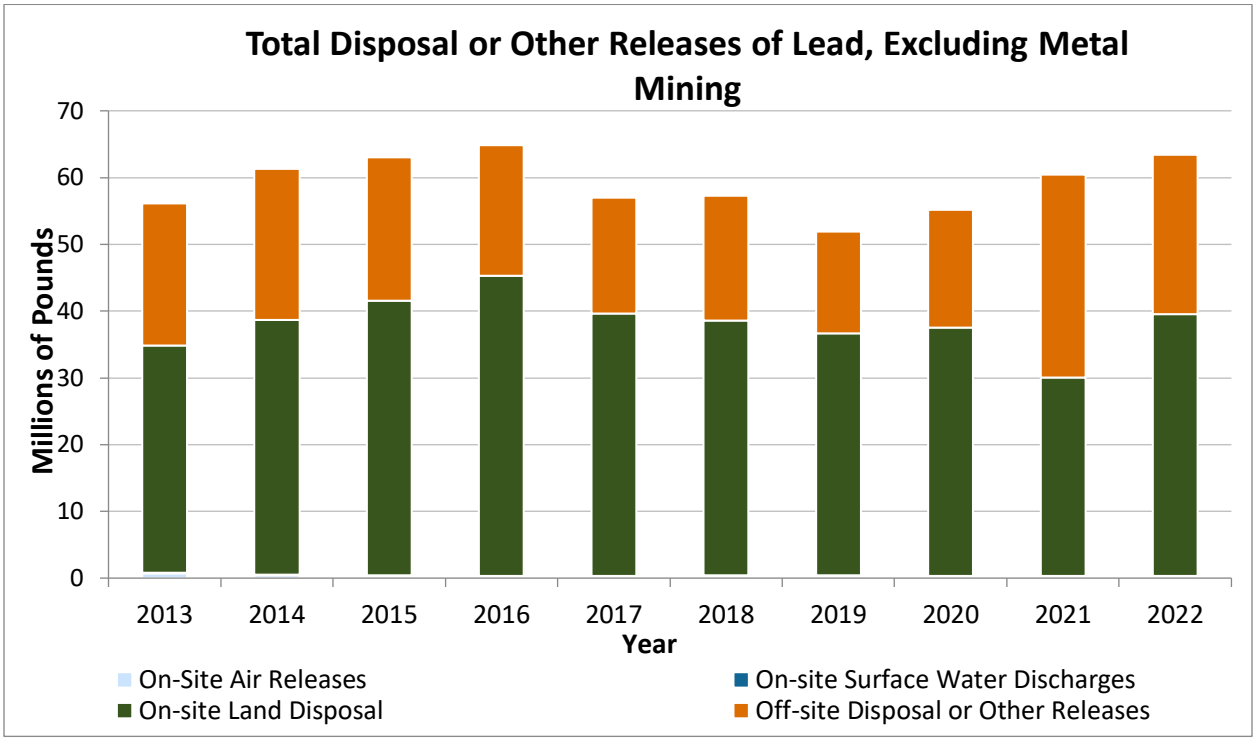
- Total releases of lead increased by 14%, driven by an increase in on site lead disposal at metal mines.

Learn more about lead

Visit EPA's lead homepage for more information about lead and EPA's actions to reduce lead exposures.

Visit the Agency for Toxic Substances and Disease Registry's ToxFAQs for lead to learn more about the effects of lead exposure and what you can do to prevent it.

This graph shows the 10-year trend in lead released, but excludes quantities reported by the metal mining sector.



Facilities from one parent company erroneously reported tens of thousands of pounds of lead releases to air at four facilities and has since corrected these reports. These facilities are not included in this chart.

From 2013 to 2022:

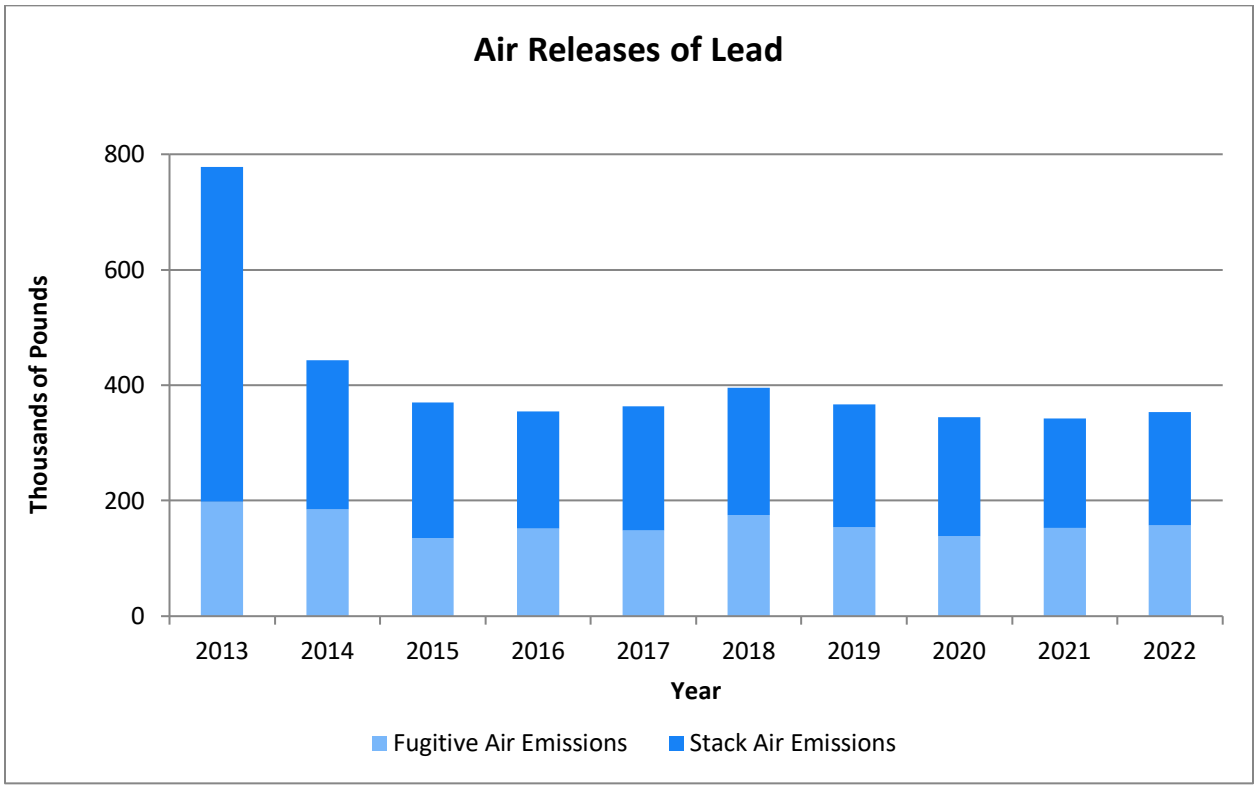
- For sectors other than metal mining, total releases of lead fluctuated between 2013 and 2022, and increased each year from 2019 to 2022.
    - On-site disposal to land and off-site transfers of lead for disposal increased from 2013 to 2022, while air and water releases of lead decreased.
- Among sectors other than metal mining, most releases of lead came from the hazardous waste management and primary metals sectors.

From 2021 to 2022:

- Air releases, land disposal, and water releases of lead all increased, while off-site disposal decreased.

Lead Air Releases

This graph shows the 10-year trend in air releases of lead.



Facilities from one parent company erroneously reported tens of thousands of pounds of lead releases to air at four facilities and has since corrected these reports. These facilities are not included in this chart.

From 2013 to 2022:

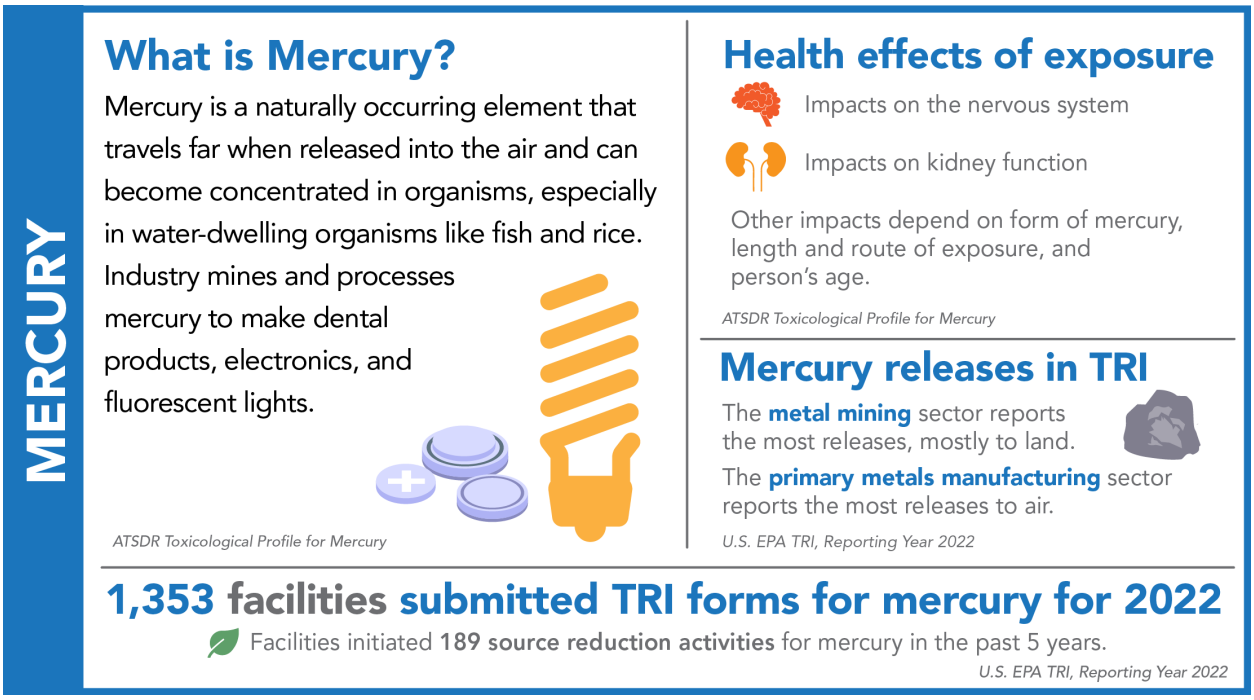
- Air releases of lead decreased by 55%. Most of this decrease comes from reduced stack emissions.
- The primary metals sector, which includes copper smelting and iron and steel manufacturing, released the largest quantities of lead to air. This sector has also been the biggest driver of reduced air releases since 2013, although lead air releases have decreased in most sectors.
- One facility ceased lead smelting operations in 2013. This facility was one of the biggest contributors to lead air releases reported to TRI, causing a substantial reduction in nationwide lead air releases for 2014 and beyond, when smelting operations had ceased.

From 2021 to 2022:

- Air releases of lead increased by 3%.
- In 2022, the primary metals sector accounted for 32% of lead released into the air.

Mercury

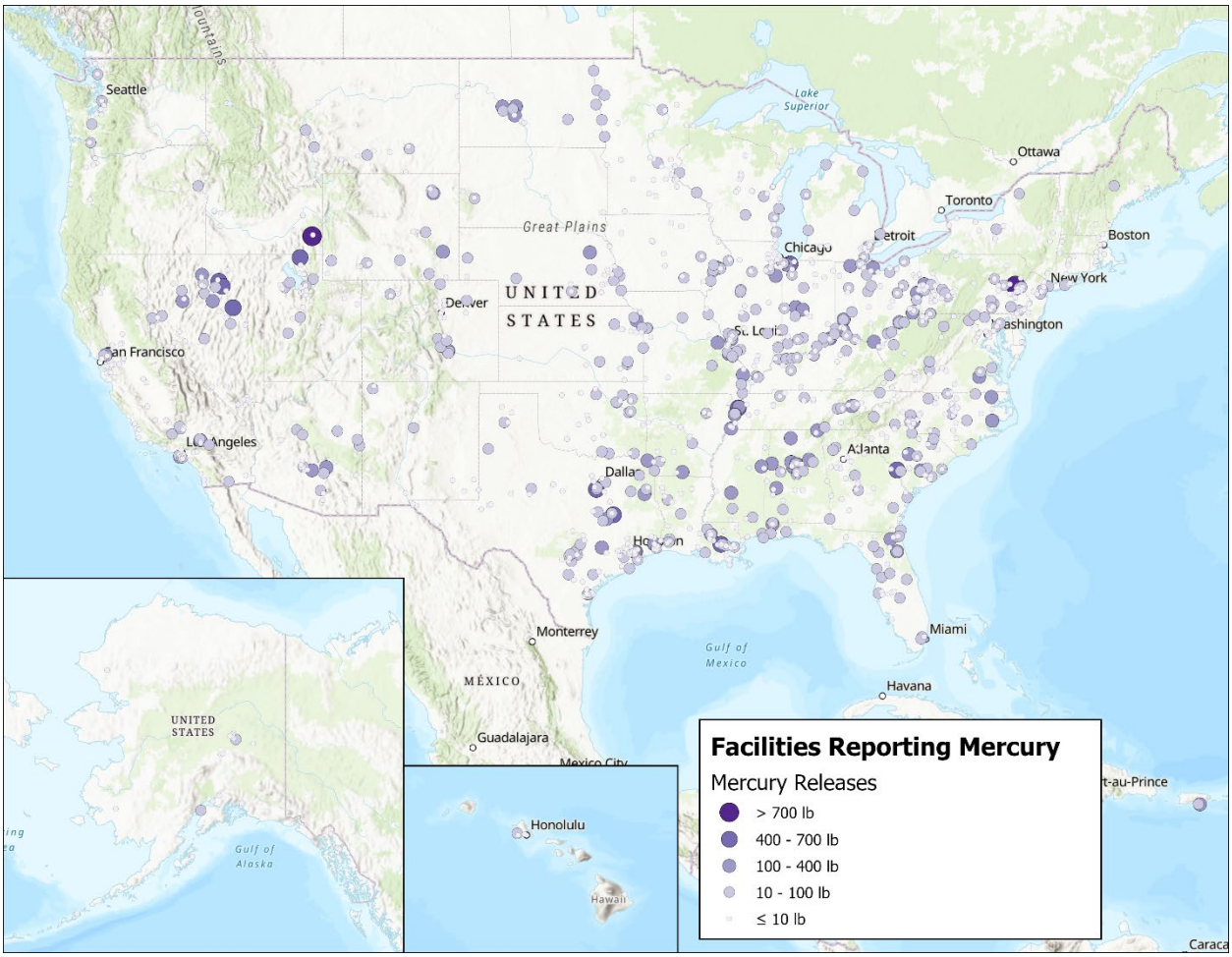
This chemical profile focuses on releases of mercury and mercury compounds.



Facilities report waste management of both mercury and mercury compounds to TRI. For TRI, "mercury" only includes elemental mercury, while "mercury compounds" includes mercury that is part of another chemical. Although facilities may report for mercury compounds separately from mercury, the two are combined and referred to simply as "mercury" in this analysis.

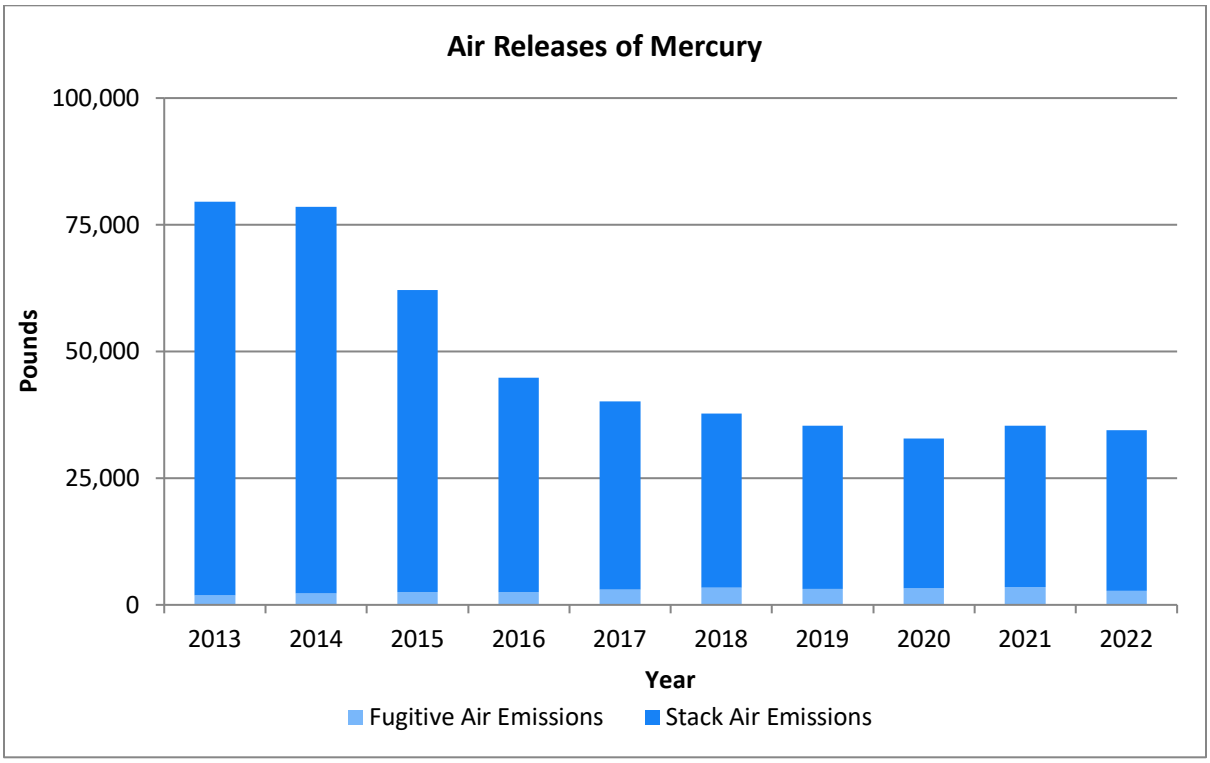
This profile focuses on air releases of mercury as they are the type of release most likely to impact human health.

This map shows the locations of the facilities that reported mercury to TRI for 2022, sized by their relative release quantities to air.



View Larger Map

This graph shows the 10-year trend in mercury released to air.



From 2013 to 2022:

- Releases of mercury to air decreased by 57%.
- An 85% reduction (-41,000 pounds) in mercury air emissions from electric utilities drove the overall decline from 2013 to 2022. The decrease was driven by a shift from coal to other fuel sources (e.g., natural gas) and by the installation of pollution control technologies at coal-fired power plants.
    - Note that only those electric utilities that burn coal or oil to generate power for distribution into commerce are covered under TRI reporting requirements. Electric utilities that do not burn coal or oil are not required to report to TRI.

Learn more about mercury

Visit EPA's mercury homepage for more information about mercury and EPA's actions to reduce mercury exposures.

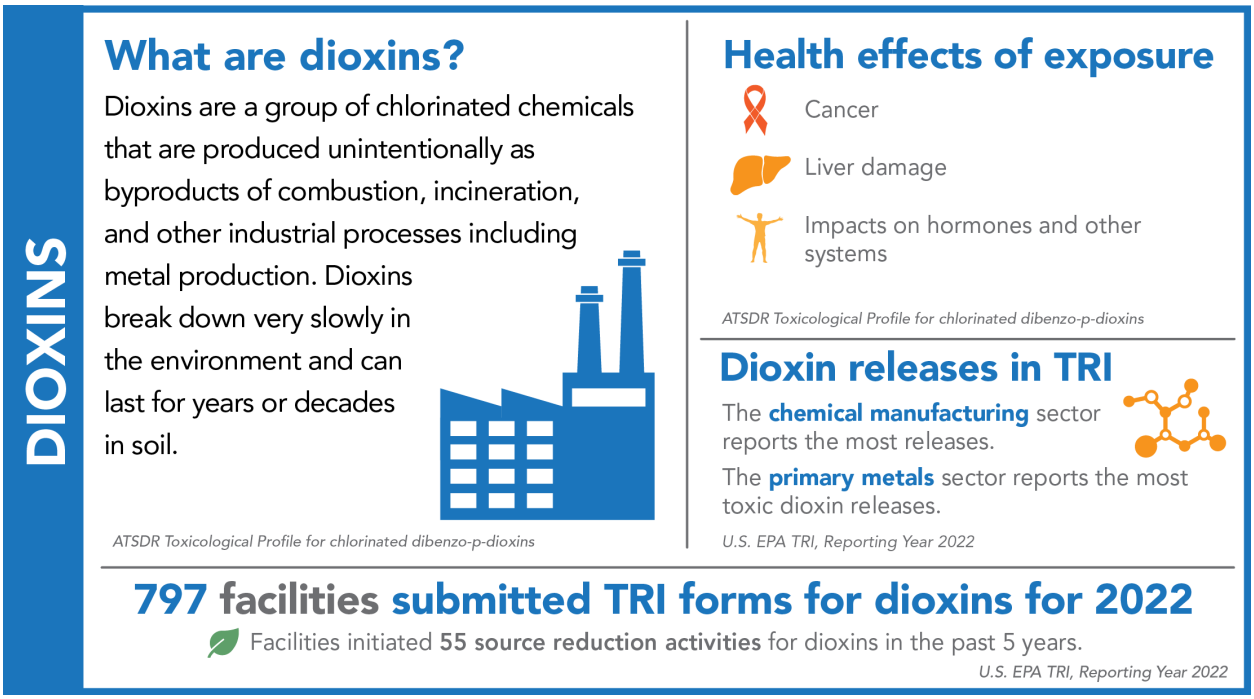
Visit the Agency for Toxic Substances and Disease Registry's ToxFAQs for mercury to learn more about the effects of mercury exposure and what you can do to prevent it.

From 2021 to 2022:

- Releases of mercury to air decreased by 3%, driven by the primary metals sector.
- For 2022, the primary metals sector, which includes iron and steel manufacturers, accounted for 36% of the air emissions of mercury. The electric utilities sector accounted for 21% of mercury air emissions.

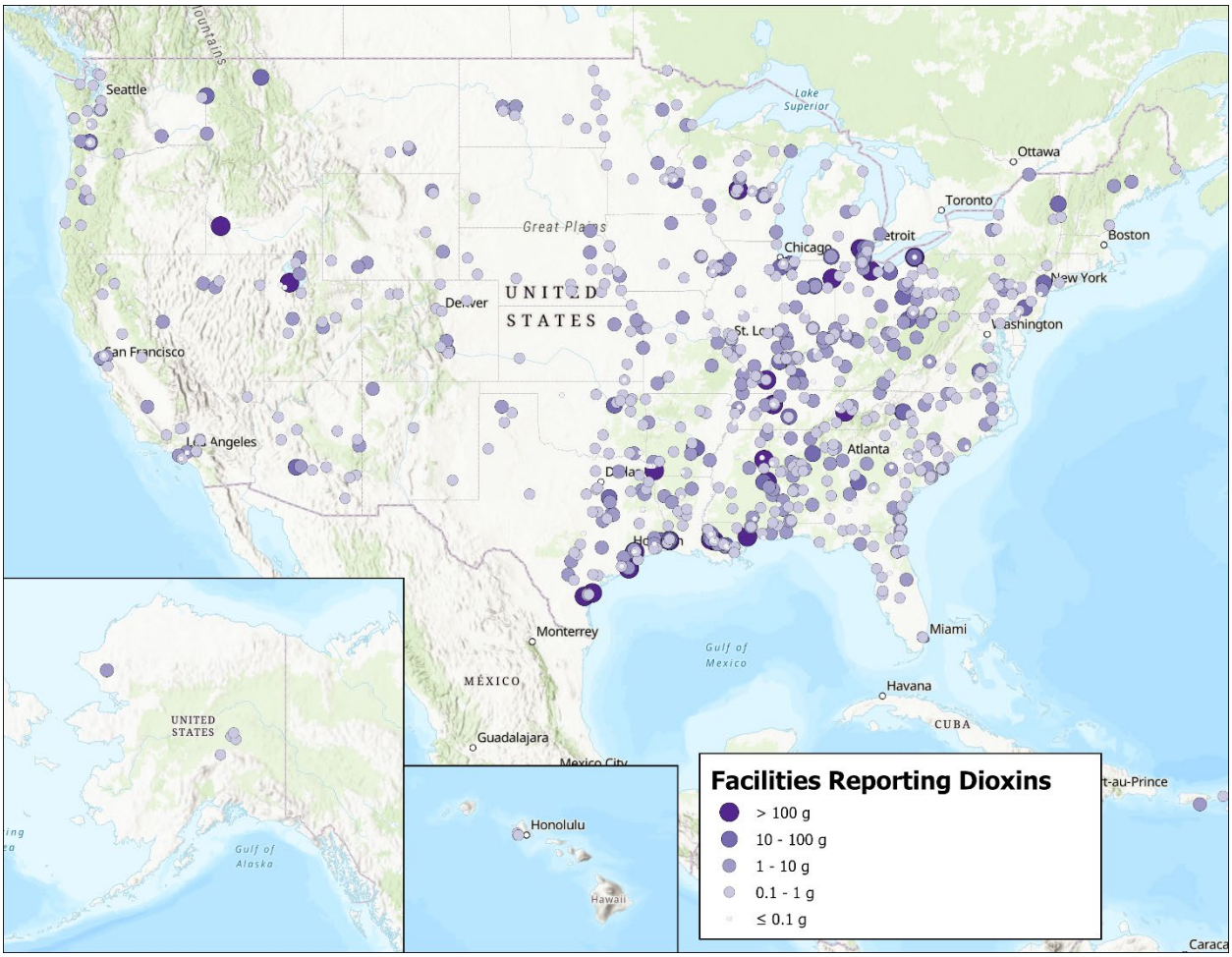
Dioxins

This chemical profile focuses on releases of dioxin and dioxin-like compounds.



Dioxin and dioxin-like compounds ("dioxins") are a group of chemically-similar compounds that are typically produced in very small quantities but are toxic at much lower concentrations than most other chemicals. Additionally, they persist in the environment and bioaccumulate in the food chain. Dioxins have a lower reporting threshold and are reported in grams instead of pounds to capture smaller amounts of these chemicals.

This map shows the locations of the facilities that reported dioxins to TRI for 2022, sized by their relative release quantities.



View Larger Map

TRI requires facilities to report data on the 17 individual members of the TRI dioxin and dioxin-like compounds category. While each chemical in the dioxin and dioxin-like compounds category causes the same toxic effects, some cause these effects at lower levels of exposure than others because the chemicals have different toxicities. As a result, one mixture of dioxins can have a very different toxic potency than the same amount of a different mixture. Facilities in different sectors tend to release different mixtures of dioxins depending on their operations, so the potential for harm from their releases may also be different.

EPA accounts for the varying toxicities of the different dioxins by using Toxic Equivalent Factor (TEF) and Toxic Equivalency (TEQ) values. TEFs help to understand the toxic potency of each dioxin. TEFs are then used to derive TEQs, which add context to releases of different mixtures of dioxins. TEQs are most useful when comparing releases of dioxins from different sources or different time periods, where the mix of congeners may vary.

Helpful Concepts

Toxic Equivalent Factor (TEF)

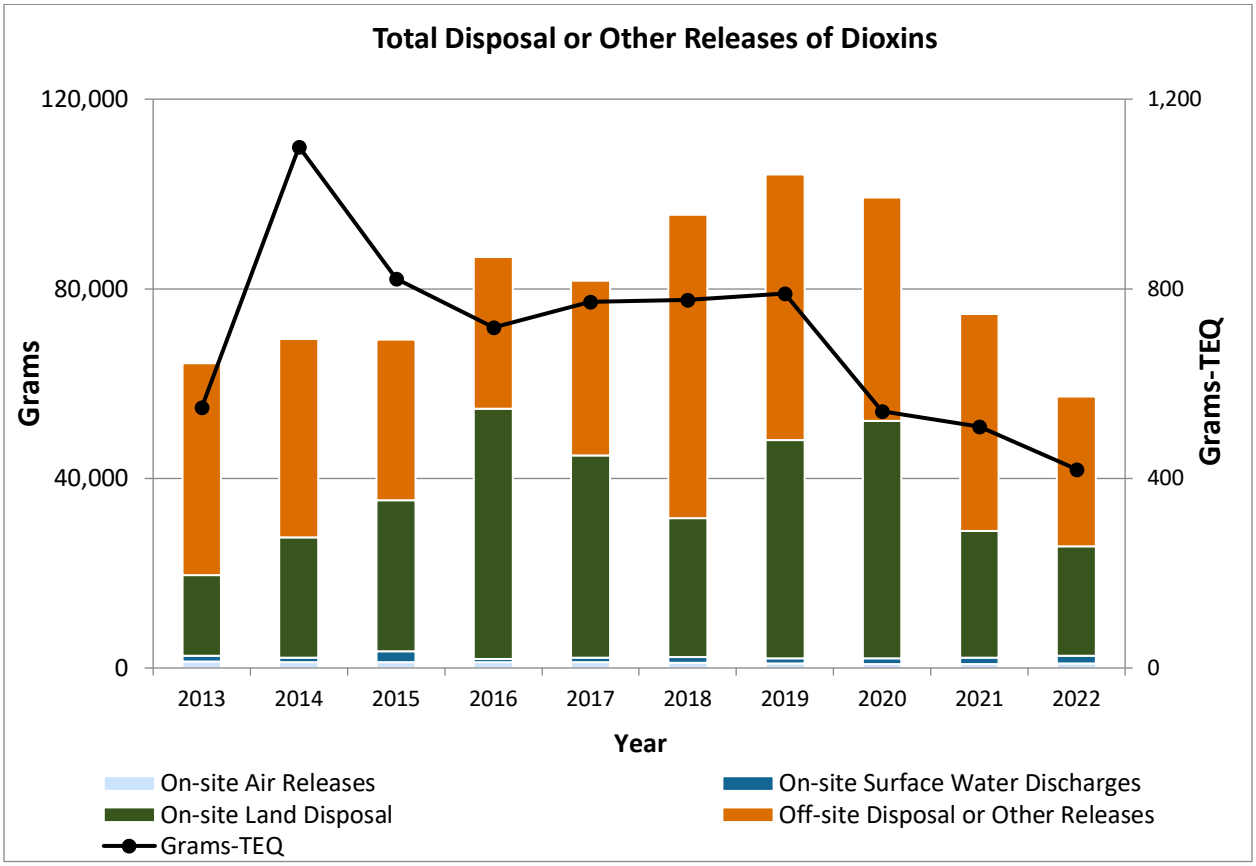
Each individual dioxin is assigned a TEF that compares that compound's toxicity to the most toxic dioxin in the category.

Toxic Equivalency (TEQ)

A TEQ is calculated by multiplying the reported grams of each compound by its corresponding TEF and summing the results, referred to as grams-TEQ.

Learn more about dioxins at EPA's Dioxins homepage and ATSDR's dioxins ToxFAQs.

This graph shows the 10-year trend in the quantity of dioxins that facilities released from 2013 to 2022.



From 2013 to 2022:

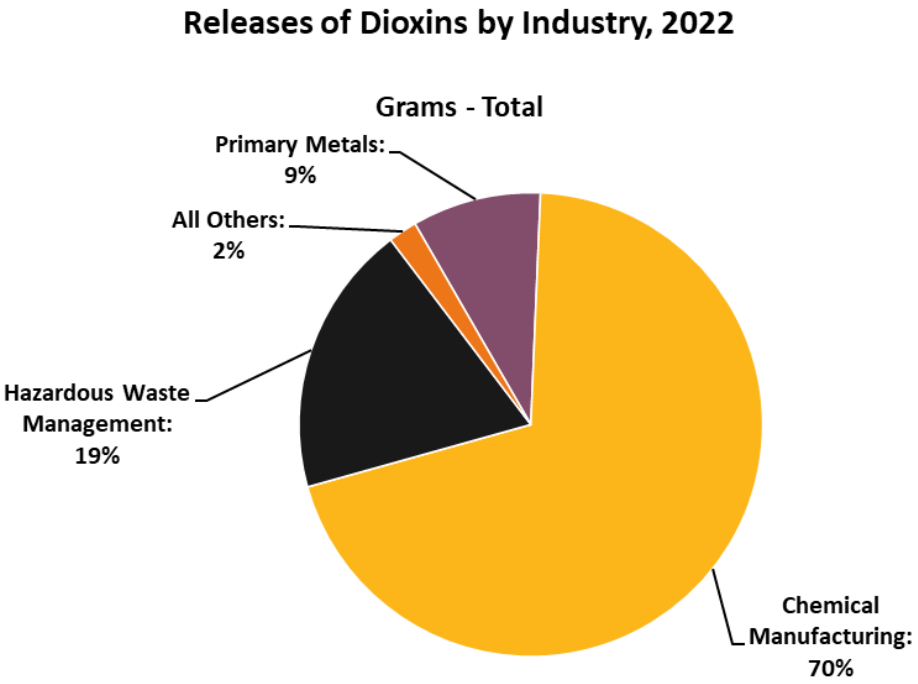
- Dioxin releases fluctuated over the last ten years, with a decrease of 11% between 2013 and 2022. Toxicity equivalents (grams-TEQ) decreased by 24%, indicating that the overall **toxicity** of dioxin releases decreased even more than the **quantity** released. This is due to changes in which dioxin congeners were released.

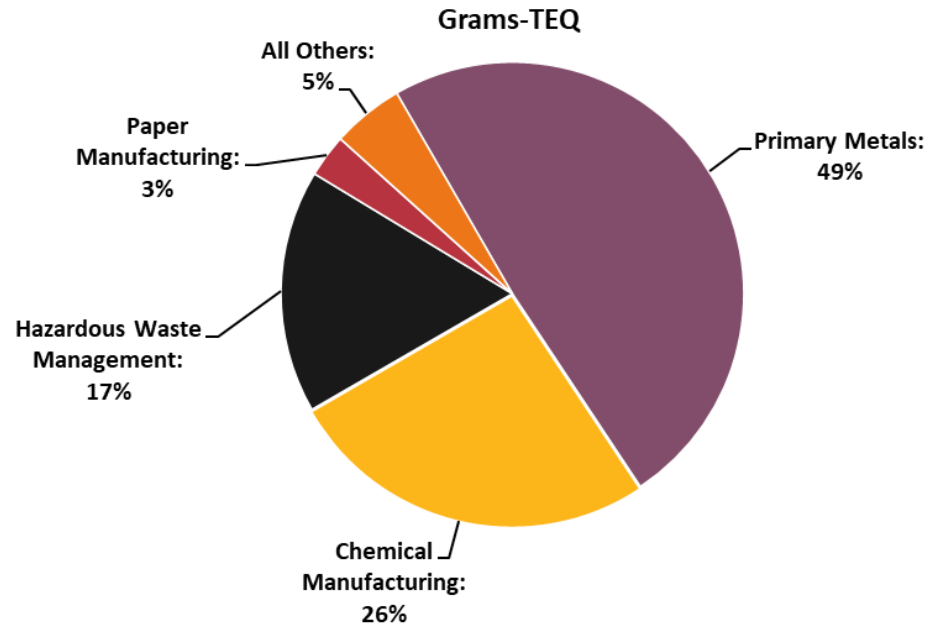
From 2021 to 2022:

- Grams released of dioxins decreased by 23%, driven by decreased releases reported by an organic chemical manufacturing facility.
    - Toxicity equivalents (grams-TEQ) decreased by 18%, similar to the decrease in grams released.
- In 2022, 55% of dioxin releases were disposed of at off-site locations, primarily in landfills.

Dioxins Releases by Industry

The following two pie charts compare the industry sectors that reported the greatest releases of dioxins (in grams) to those that reported the greatest releases of dioxins based on toxicity equivalency (in grams-TEQ).

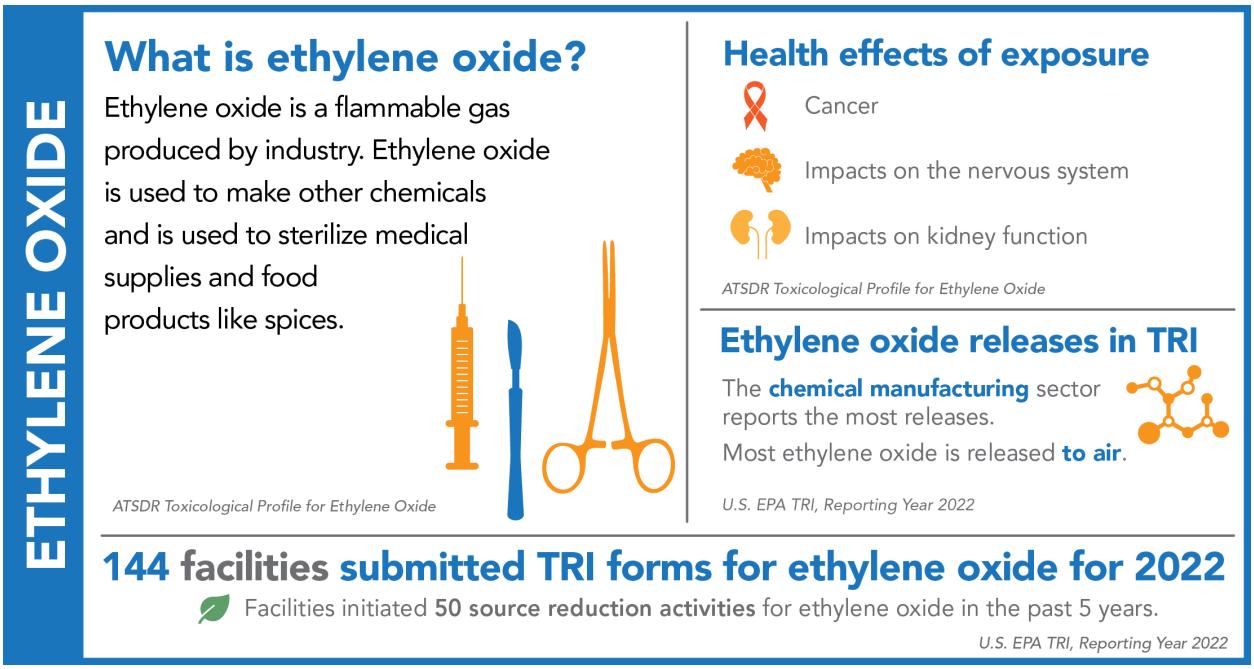




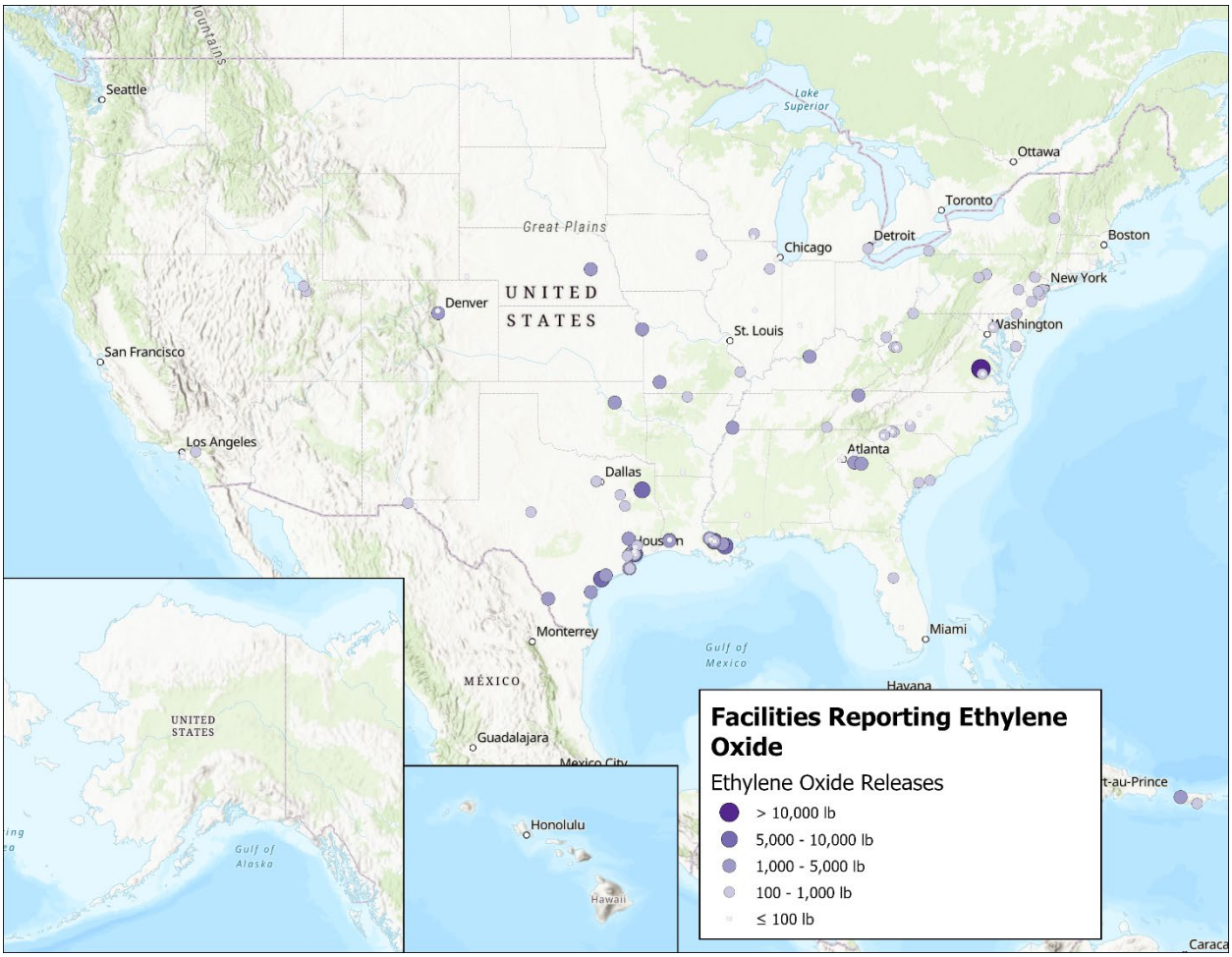
- The mix of dioxins released varies across industry sectors.
- The chemical manufacturing industry accounted for 70% and the primary metals sector for 9% of total grams of dioxins released. In terms of toxicity equivalents, however, the primary metals sector accounted for 49% and the chemical manufacturing sector for 26% of the total grams-TEQ.

Ethylene Oxide

This section focuses on ethylene oxide, a human carcinogen.

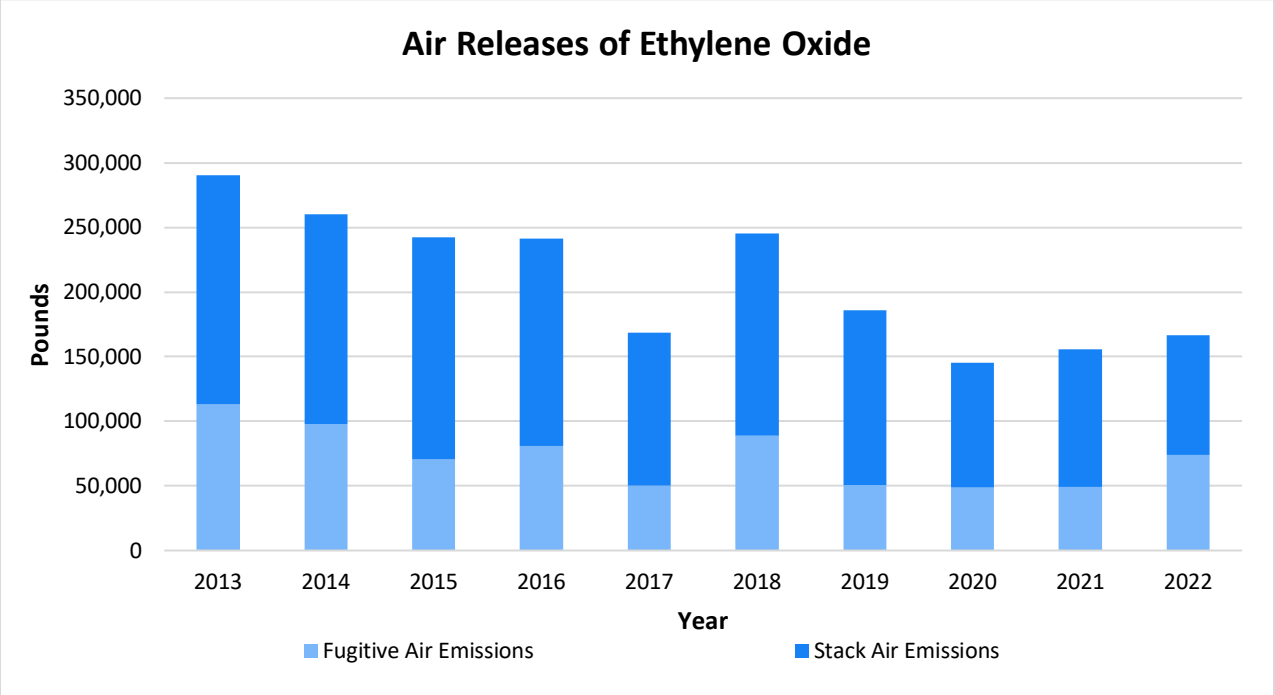


This map shows the locations of the facilities that reported ethylene oxide to TRI for 2022, sized by their relative release quantities to air.



View Larger Map

The figure below presents the 10-year trend in air releases of ethylene oxide.



- From 2013 to 2022, releases of ethylene oxide to air decreased by 124,000 pounds (-43%).
- EPA recently extended TRI reporting requirements to specific contract sterilization facilities that use ethylene oxide. These facilities reported for the first time for 2022.
    - These facilities reported a total of 9,166 pounds of ethylene oxide released to air in 2022.
- While the chemical manufacturing sector accounts for most of the ethylene oxide air releases, the 7% increase in air releases of ethylene oxide from 2021 to 2022 was driven by the newly-reporting contract sterilization facilities.

Learn More About Ethylene Oxide

Ethylene oxide is a human carcinogen, meaning that it is known to cause cancer in humans. It is used for a variety of industrial purposes including sterilizing food and medical equipment and producing other chemicals.

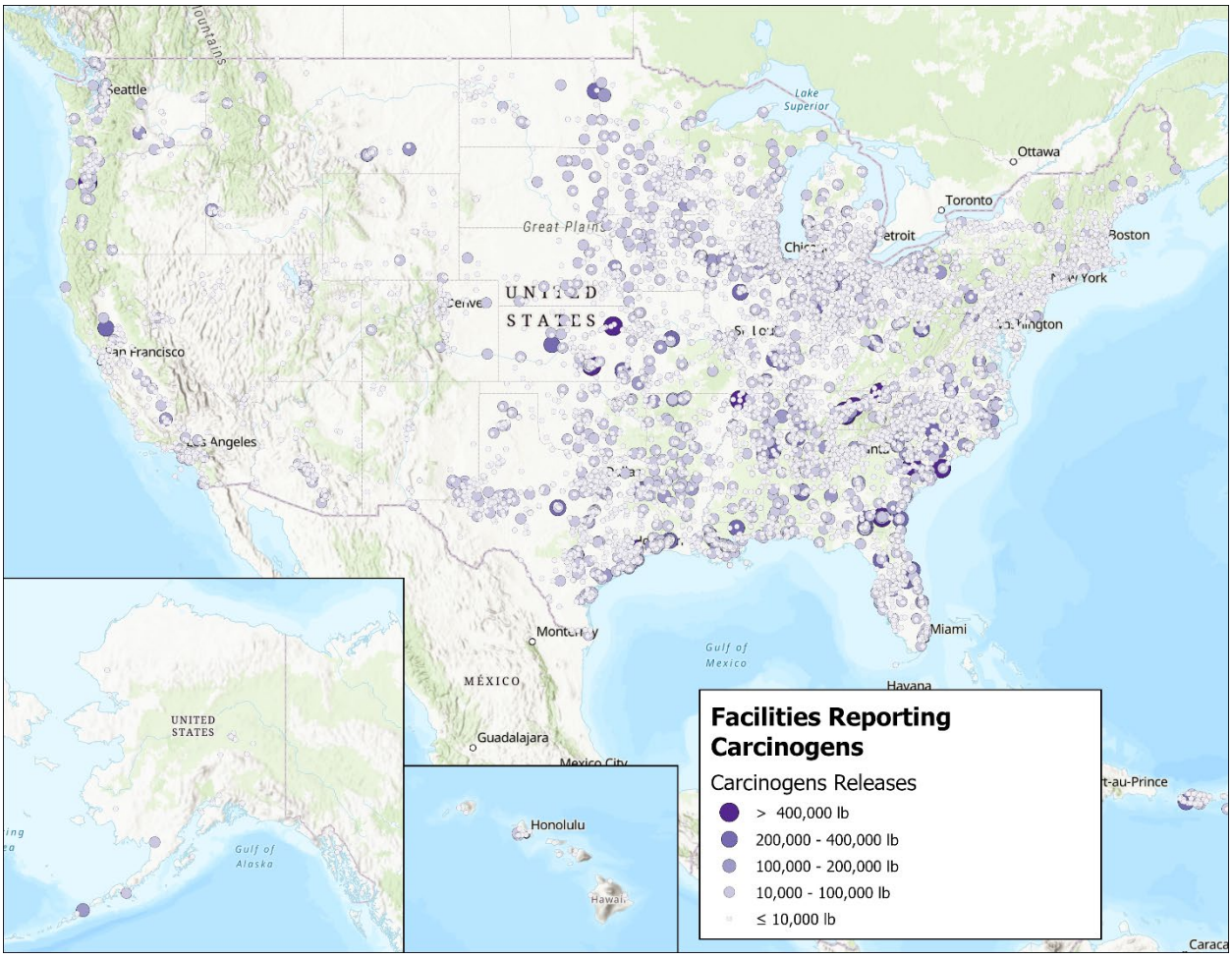
Visit EPA's ethylene oxide homepage for more information and to learn about EPA's actions to reduce exposures.

Visit ATSDR's ToxFAQs for ethylene oxide to learn more about the effects of exposure.

Occupational Safety and Health Administration (OSHA) Carcinogens

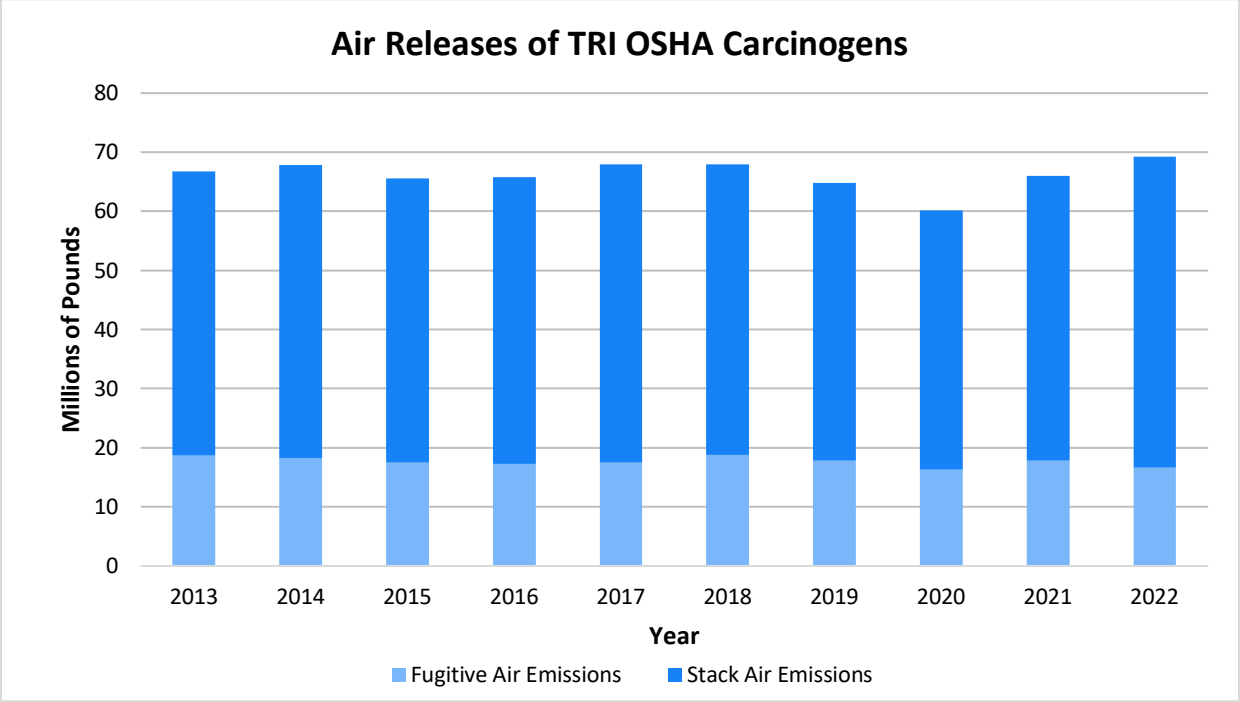
Some chemicals that are reportable to the TRI Program are included on OSHA's list of carcinogens. EPA refers to these chemicals as TRI OSHA carcinogens. These chemicals are either known or believed to cause cancer in humans. A list of the TRI carcinogens can be found in the TRI basis of OSHA carcinogens technical document.

This map shows the locations of the facilities that reported carcinogens to TRI for 2022, sized by their relative release quantities to air.



View Larger Map

This graph shows the 10-year trend in air releases of TRI OSHA carcinogens.

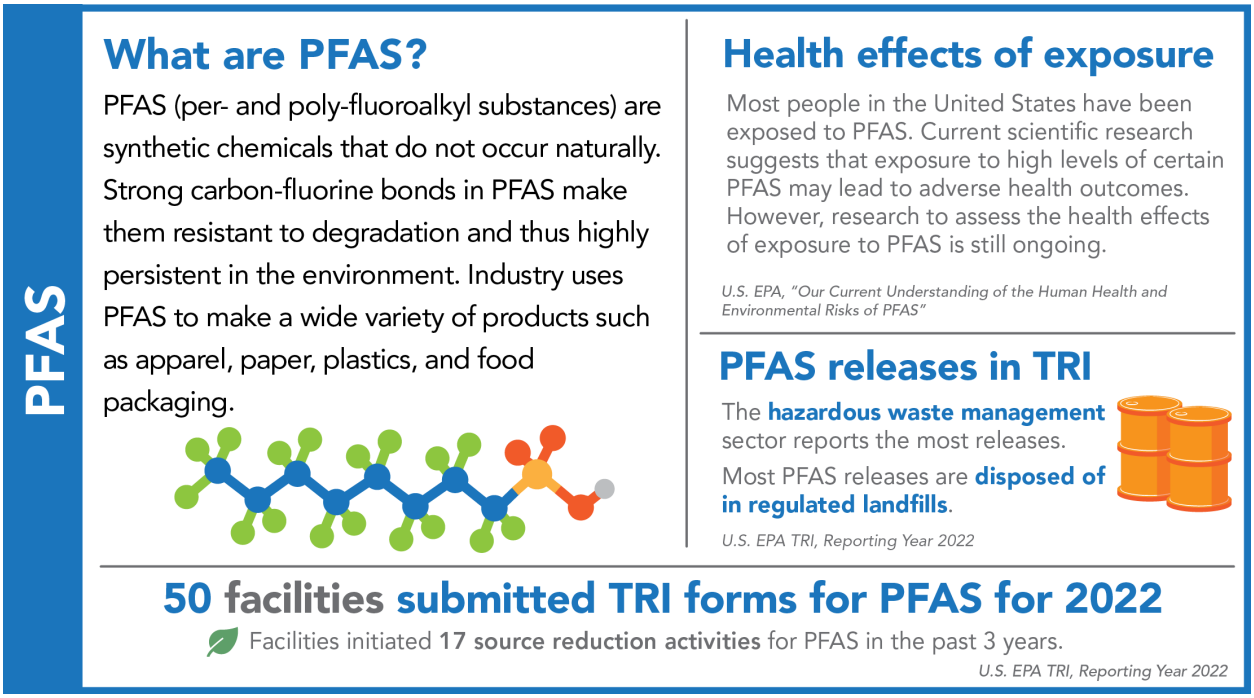


From 2013 to 2022:

- Air releases of TRI OSHA carcinogens increased by 4% since 2013.
- While most sectors reduced their air releases of many of these carcinogens, these decreases were offset by increased releases of styrene by the plastics and rubber products manufacturing sector and the transportation equipment manufacturing sector.
- In 2022, the TRI OSHA carcinogens released into air in the highest quantities were styrene, acetaldehyde, and formaldehyde.
- EPA recently added natural gas processing facilities to the scope of facilities required to report to TRI. These facilities reported for the first time for 2022, contributing to the increase in reported air releases of TRI OSHA carcinogens.

Per- and Polyfluoroalkyl Substances (PFAS)

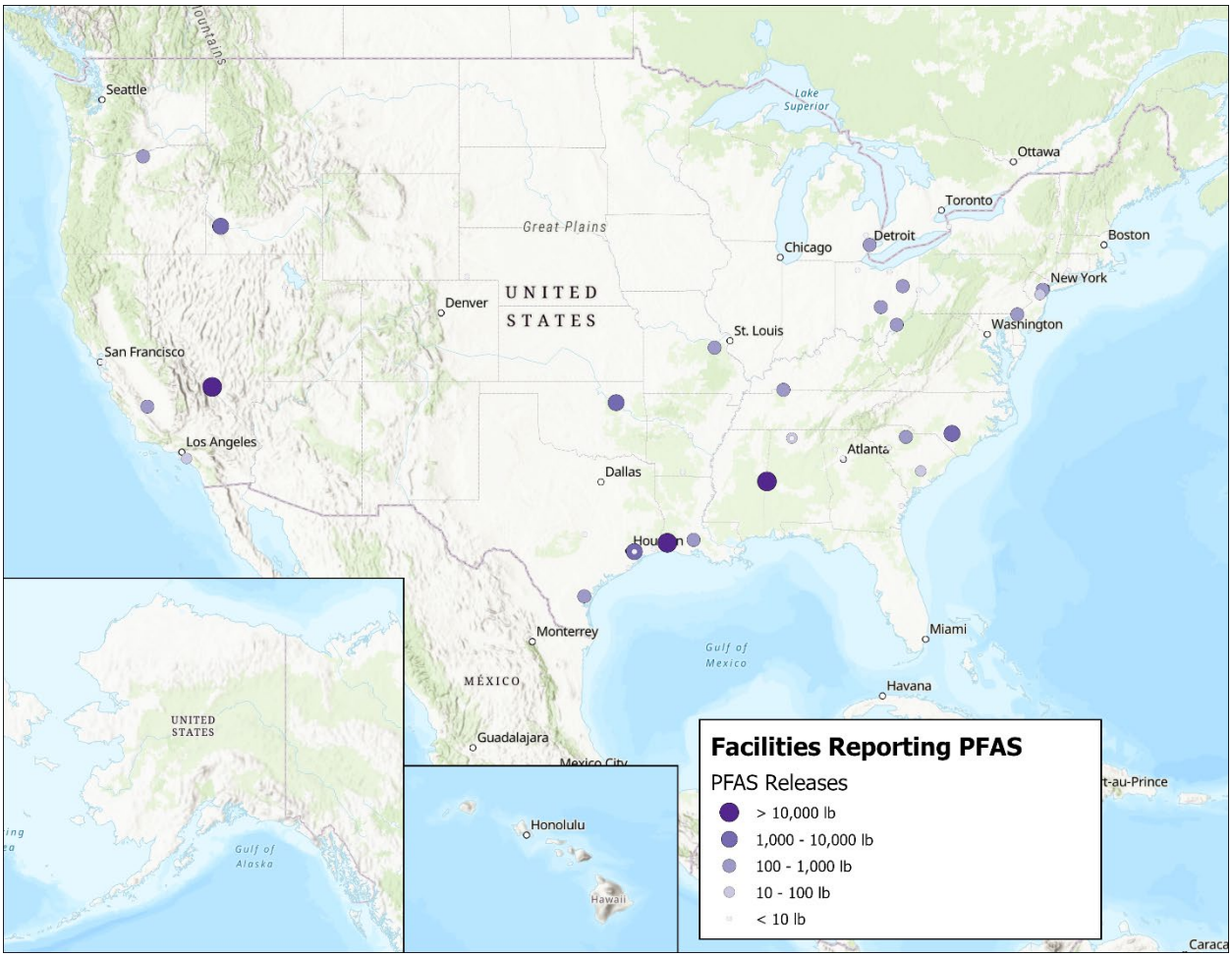
The TRI chemical list for reporting year 2022 includes 180 per- and polyfluoroalkyl substances (PFAS). Each year, the TRI Program reviews newly available information and adds PFAS to the TRI chemical list if they meet certain criteria.



Facilities reported their releases and other waste management practices for these PFAS for the first time for 2020. Additional PFAS have been added to the list for each subsequent reporting year. The TRI reporting threshold for PFAS is 100 pounds, which is lower than the thresholds for most TRI chemicals. PFAS were also recently designated as chemicals of special concern, which changes certain reporting requirements beginning in 2024. Read more about the rule.

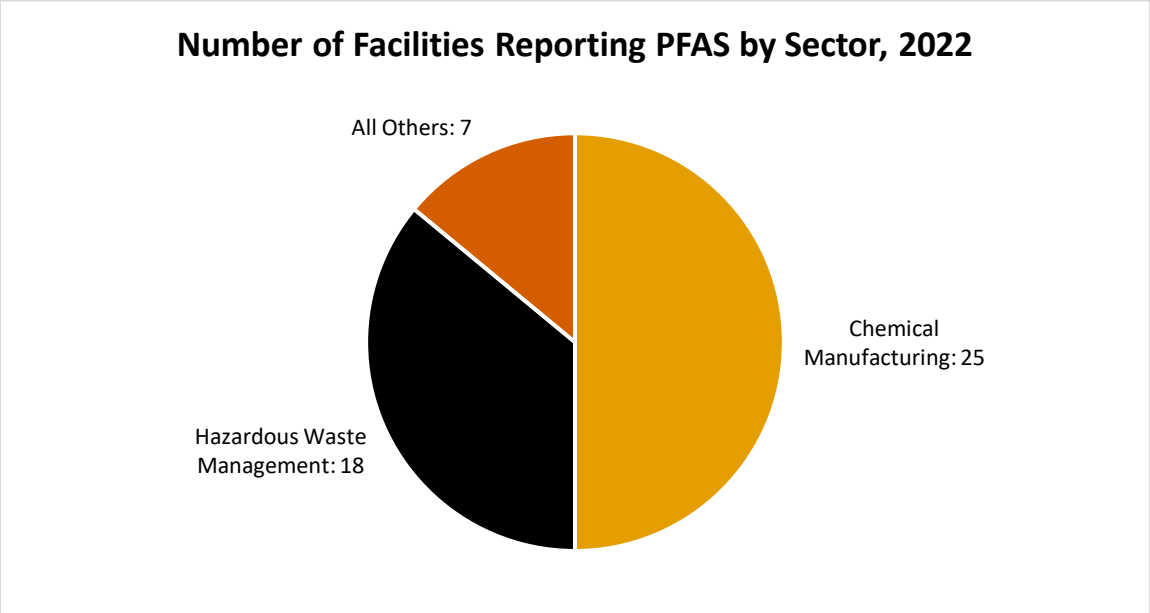
Note that definitions of which chemicals are considered PFAS vary, and that the PFAS on the TRI chemical list do not include all known per- and polyfluoroalkyl substances. See EPA's *PFAS Explained* page for more information about these chemicals and EPA actions related to PFAS.

This map shows the locations of the facilities that reported a PFAS to TRI for 2022, sized by their relative release quantities.



View Larger Map

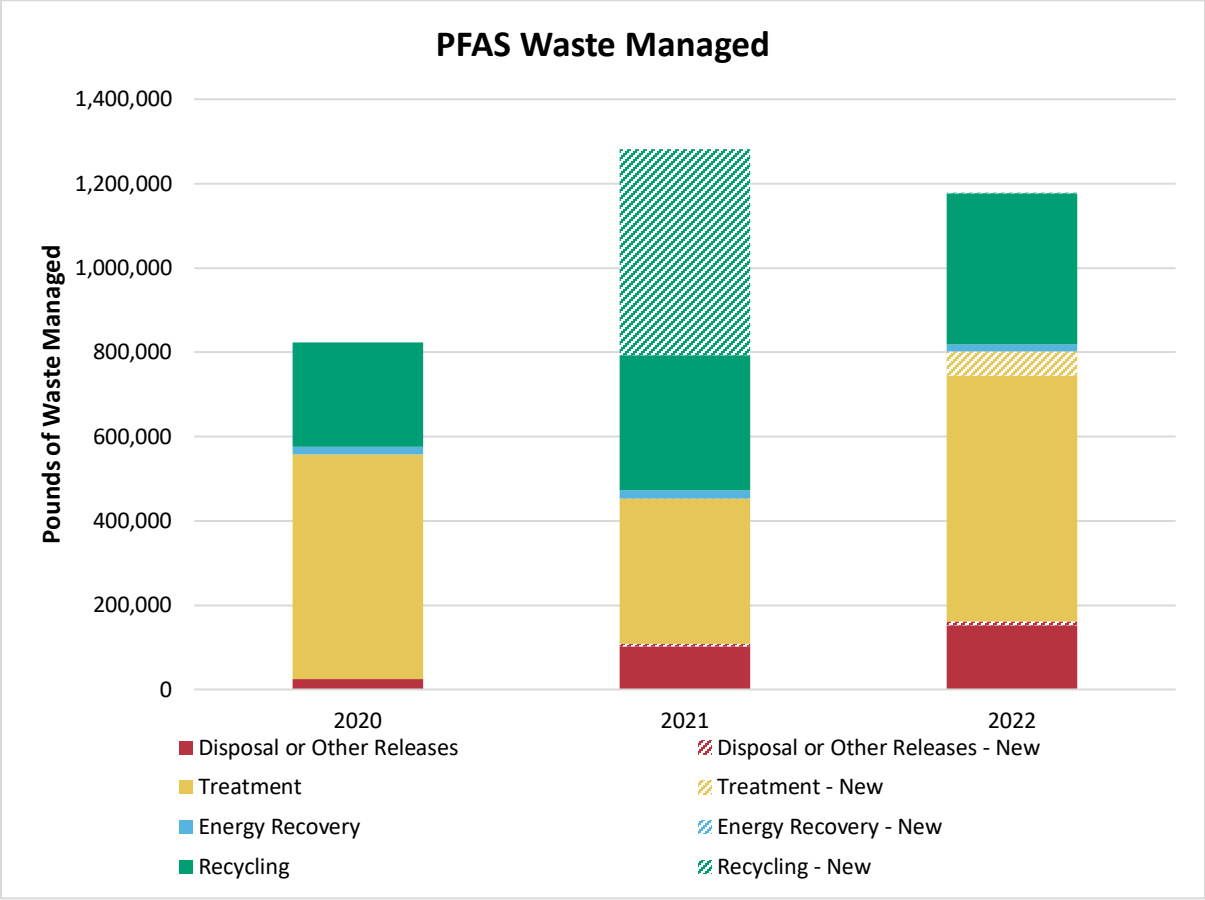
This chart shows the number of facilities in each sector reporting any of the 180 PFAS for 2022.



- Most facilities reporting PFAS were in the chemical manufacturing sector or the hazardous waste management sector.
- Facilities have reported 63 different PFAS since 2020. The most-reported PFAS from 2020-2022 were perfluorooctanoic acid (PFOA), perfluorooctane sulfonic acid (PFOS), and hexafluoropropylene oxide dimer acid (HFPO-DA).

PFAS Waste Management

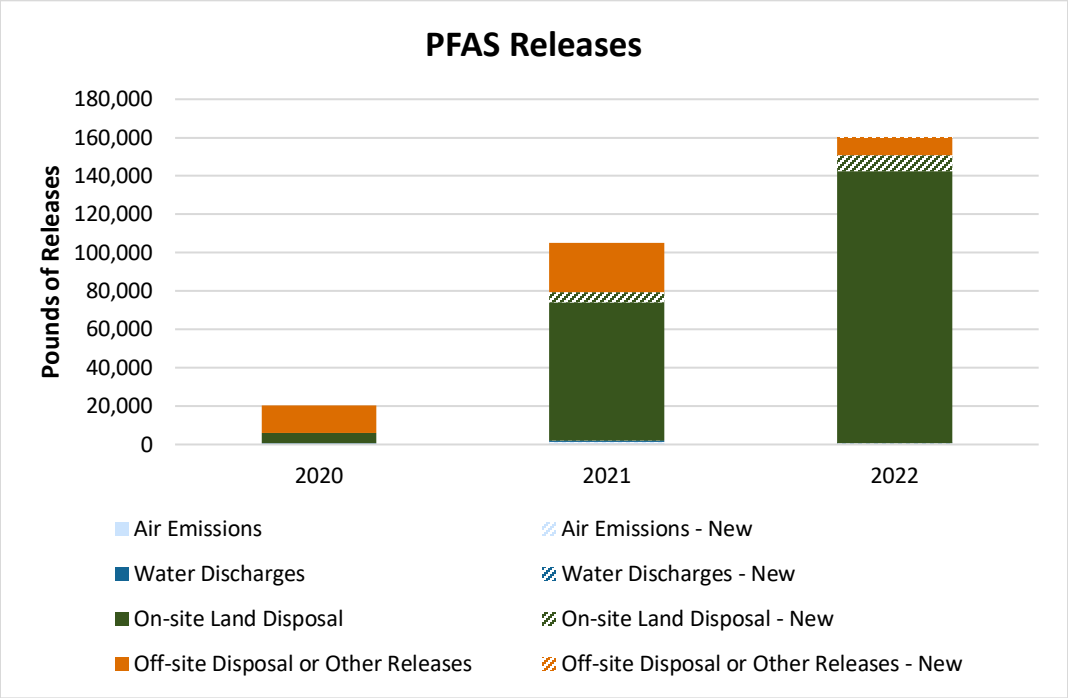
This chart shows how facilities managed PFAS waste.



Note: The dashed areas in this chart show waste of PFAS that were not reportable for 2020.

- The quantity of PFAS reported as managed as waste increased by 354,000 pounds from 2020 to 2022.
- The year-to-year changes in PFAS waste management have been driven primarily by one chemical manufacturing facility.
- Each year, combined quantities of hexafluoropropylene oxide dimer acid (HFPO-DA) and its ammonium salt accounted for more waste managed than any other PFAS.
- The chemical manufacturing and hazardous waste management sectors have reported managing the most PFAS waste each year.

This chart shows PFAS releases by environmental medium.



Note: The dashed areas in this chart show releases of PFAS that were not reportable for 2020.

- Releases of PFAS were almost eight times greater in 2022 compared to 2020.
- Releases of PFAS newly added to the TRI chemical list for 2021 or 2022 accounted for only a small portion of the increase.
- The increase in PFAS releases was mainly driven by the hazardous waste management sector.
- The hazardous waste management sector reported 98% of all PFAS releases for 2022.

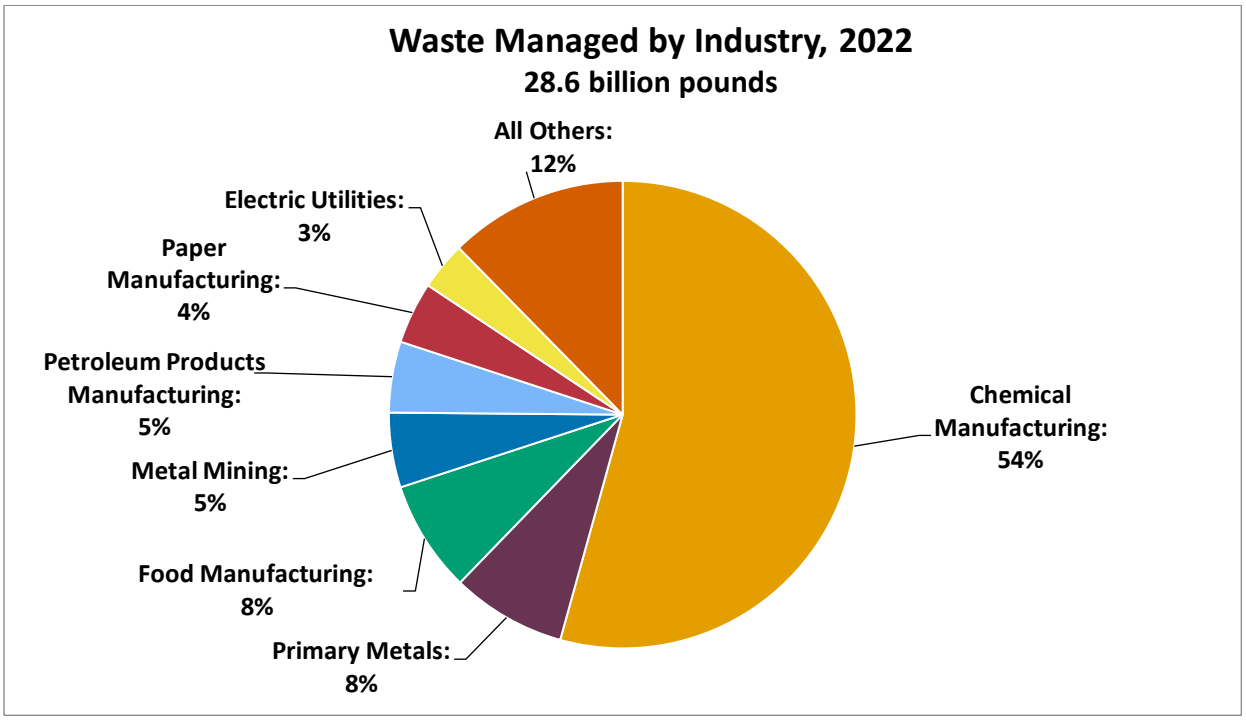
Comparing Industry Sectors

This section examines how industry sectors manage Toxics Release Inventory (TRI) chemical waste. Looking at data from individual sectors can highlight progress in improving environmental performance and reveal opportunities for better waste management practices within individual sectors.

Industries subject to TRI reporting requirements vary substantially in size, scope, and business type. As a result, the amounts and types of chemicals managed as waste by facilities across industrial sectors often differ. For facilities in the same sector, however, the processes, products, and regulatory requirements are often similar, resulting in similar use and handling of TRI chemicals.

This section presents trends in key sectors' waste managed, including TRI chemical releases into the environment. For analytical purposes, the TRI Program has combined the North American Industry Classification System (NAICS) codes at the 3- and 4-digit levels, creating 30 industry sector categories. To learn more about which business activities are subject to TRI reporting requirements, see this list of covered NAICS codes.

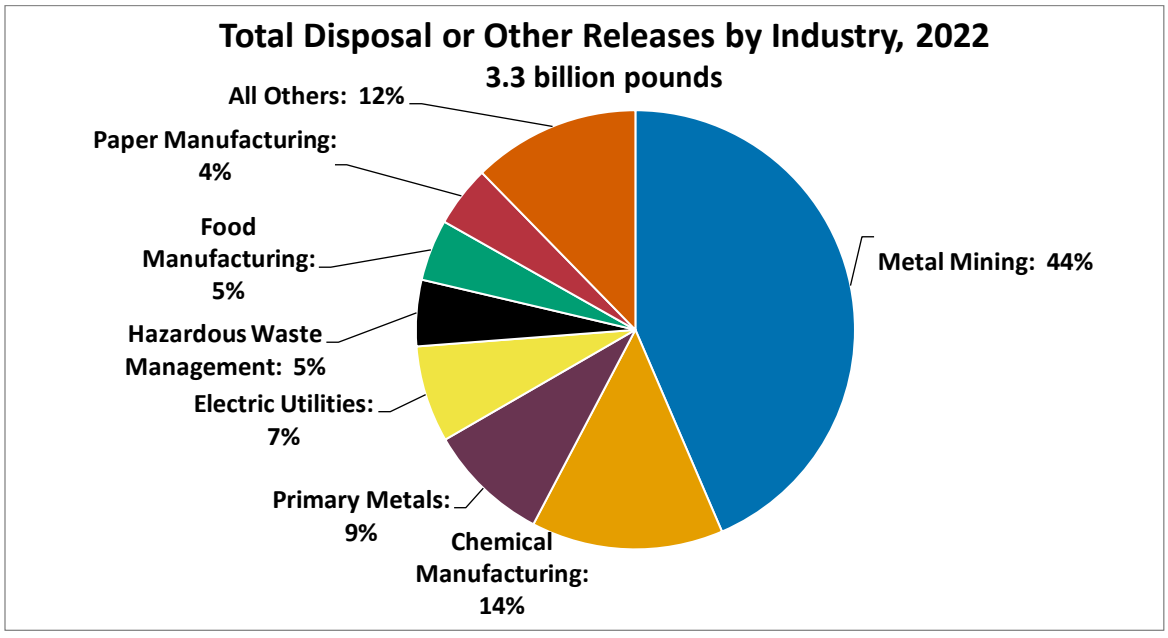
The following pie chart shows the total quantities of TRI chemical waste managed through recycling, energy recovery, treatment, and disposal or other release by sector.



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

Seven industry sectors reported 88% of the TRI waste managed in 2022. Most of this waste originated from the chemical manufacturing sector (54%). See the Chemical Manufacturing Sector Profile for more information on this sector.

The following pie chart shows the industry sectors that reported the most releases for 2022.



This pie chart shows that the metal mining, chemical manufacturing, primary metals, and electric utilities sectors reported the most releases. This section of the National Analysis features these sectors in more detail.

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

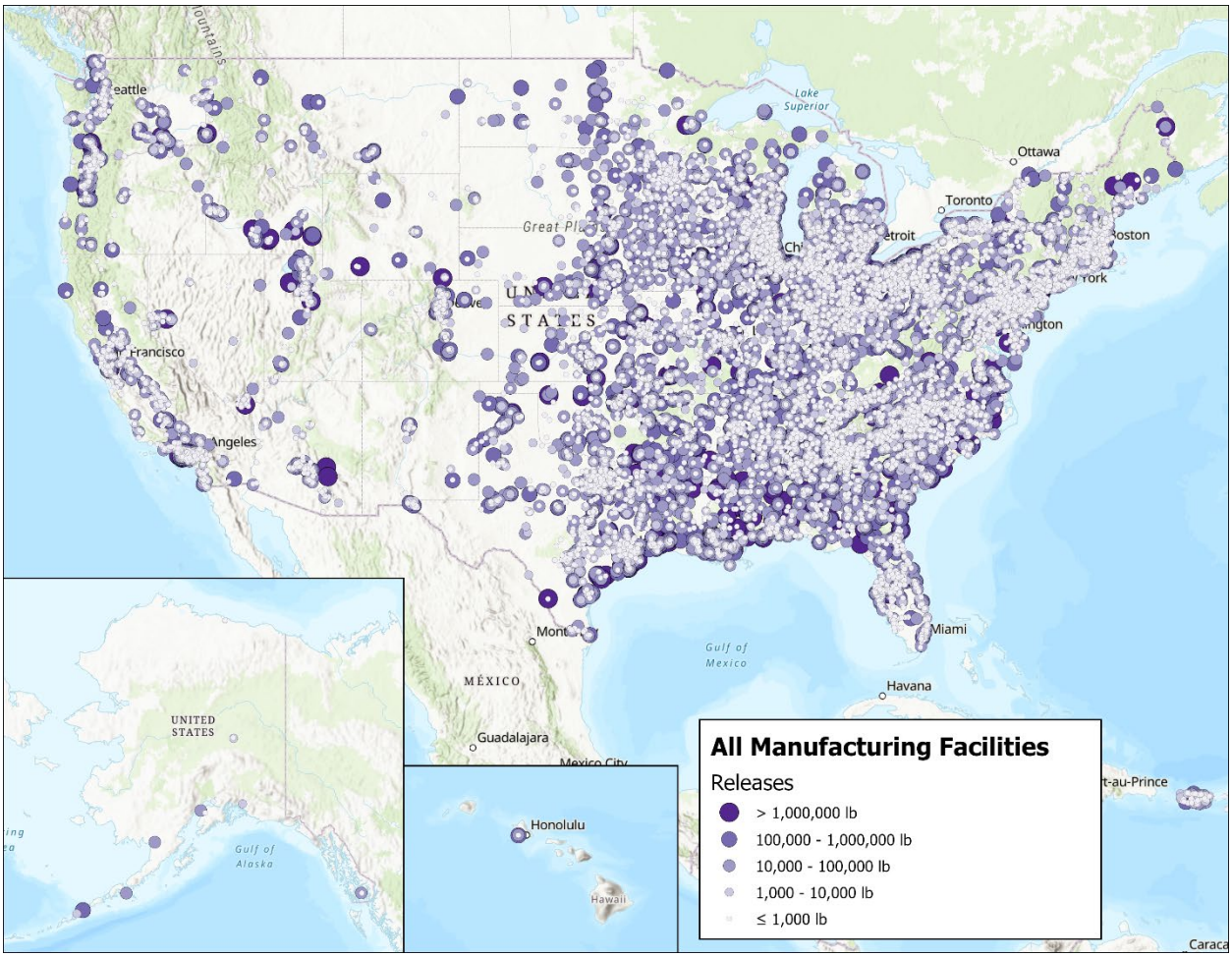
For more information on the breakdown of these releases by environmental medium, see air releases by industry, water releases by industry and land disposal by industry.

As with any dataset, there are multiple factors to consider when using the TRI data. Find a summary of key factors associated with data used in the National Analysis in the Introduction. For more information see *Factors to Consider When Using Toxics Release Inventory Data.*

Manufacturing Sectors

This section examines how TRI chemical wastes are managed in manufacturing sectors (defined as facilities reporting their primary NAICS codes as 31-33).

This map shows the locations of the manufacturing facilities that reported to TRI for 2022, sized by their releases.



Manufacturing Facilities Reporting to TRI, 2022

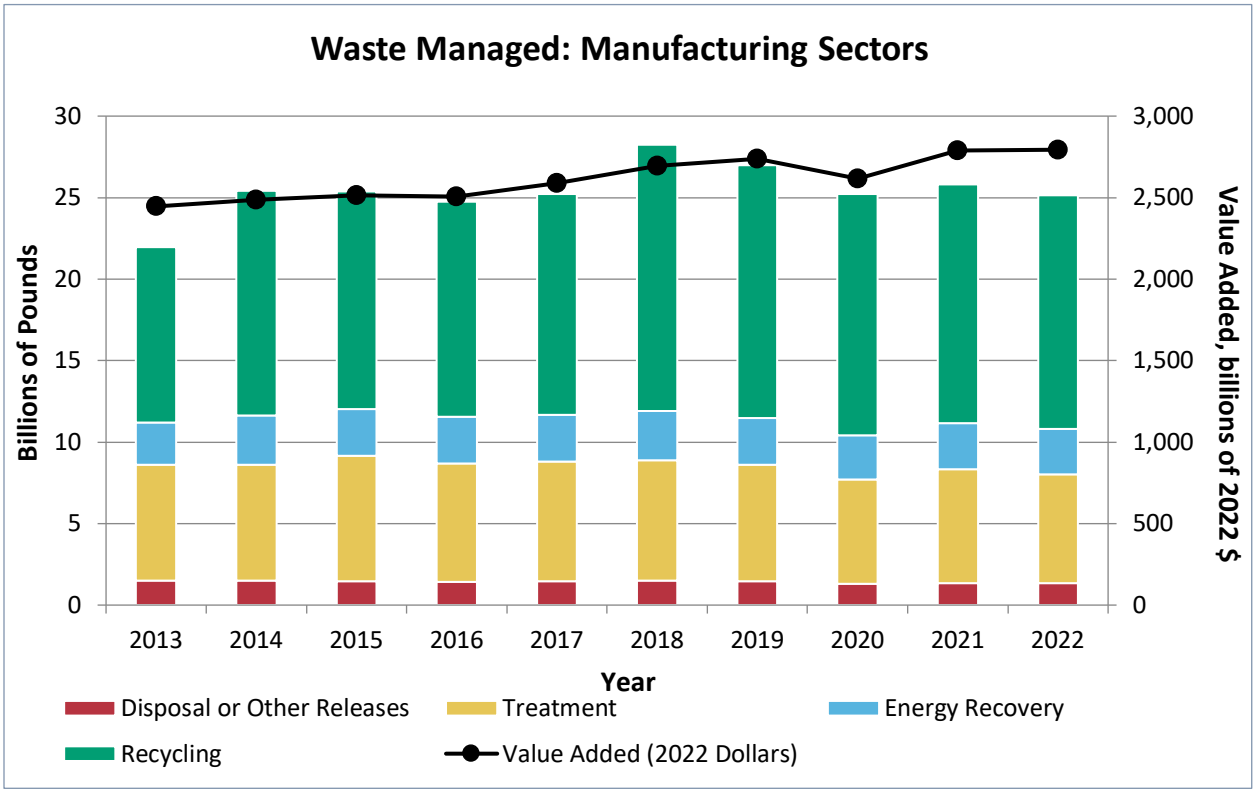
View Larger Map

For 2022, 88% of the facilities that reported to TRI were in a manufacturing sector and manufacturing sectors accounted for most (88%) of the 28.6 billion pounds of waste managed for 2022. Two manufacturing sectors, chemical manufacturing and primary metals manufacturing, are highlighted in more detail later in this section.

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

Manufacturing Waste Management Trend

The following graph shows the 10-year trend in TRI chemical waste managed through recycling, energy recovery, treatment, and disposal or other releases by the manufacturing sectors.



From 2013 to 2022:

- Quantities of waste managed by the manufacturing sectors generally increased from 2013 to 2018. Since then, these quantities have decreased.
- Releases and treatment of chemical waste decreased, while recycling and combustion for energy recovery increased. Recycling and combustion for energy recovery are preferred to disposal and treatment, because recycling and energy recovery use waste materials for a useful purpose instead of destroying or disposing of them.
- It is important to consider how the economy influences waste generation at facilities. This figure includes the trend in the manufacturing sectors' value added (represented by the black line, as reported by the Bureau of Economic Analysis, Value Added by Industry).

- Since 2013, value added by the manufacturing sectors and waste managed by these sectors both increased by 14%. The overall increase in waste management was caused by large increases in recycling that started in 2014, driven by several facilities that each reported recycling one billion pounds or more annually.
- Waste managed and value added both increased, which suggests that manufacturing facilities managed about the same quantity of waste per unit of product in 2022 compared to 2013.

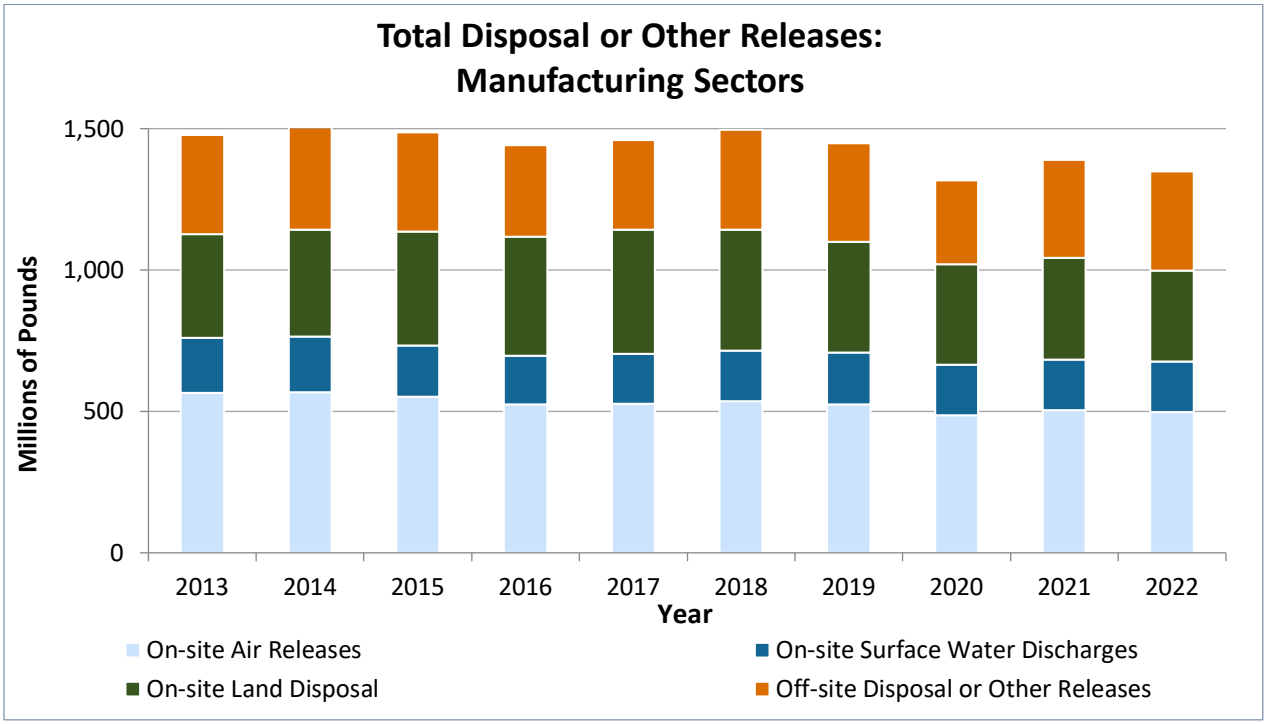
What is Value Added?

An industry's value added is the market value it adds in production; it is the difference between the price at which it sells its products and the cost of its inputs. Value added for all U.S. industries combined is equal to the nation's gross domestic product.

From 2021 to 2022:

- Waste managed decreased by 694 million pounds (-3%), while value added remained about the same, which may suggest that manufacturers managed less waste per unit of product made in 2022 than in 2021.
- In 2022, only 5% of the manufacturing sectors' waste generated was released into the environment, while the rest was managed through treatment, energy recovery, and recycling.

The following graph shows the 10-year trend in quantities of TRI chemicals released by facilities in manufacturing sectors.



From 2013 to 2022:

- TRI chemical releases from manufacturing sectors decreased by 9%, primarily due to reduced air releases (69 million pounds) and on-site land disposal (47 million pounds).
- Off-site disposal or other releases remained about the same.

From 2021 to 2022:

- Releases decreased by 41 million pounds (-3%), driven by the chemical manufacturing sector.

Pollution Prevention in the Manufacturing Sectors:

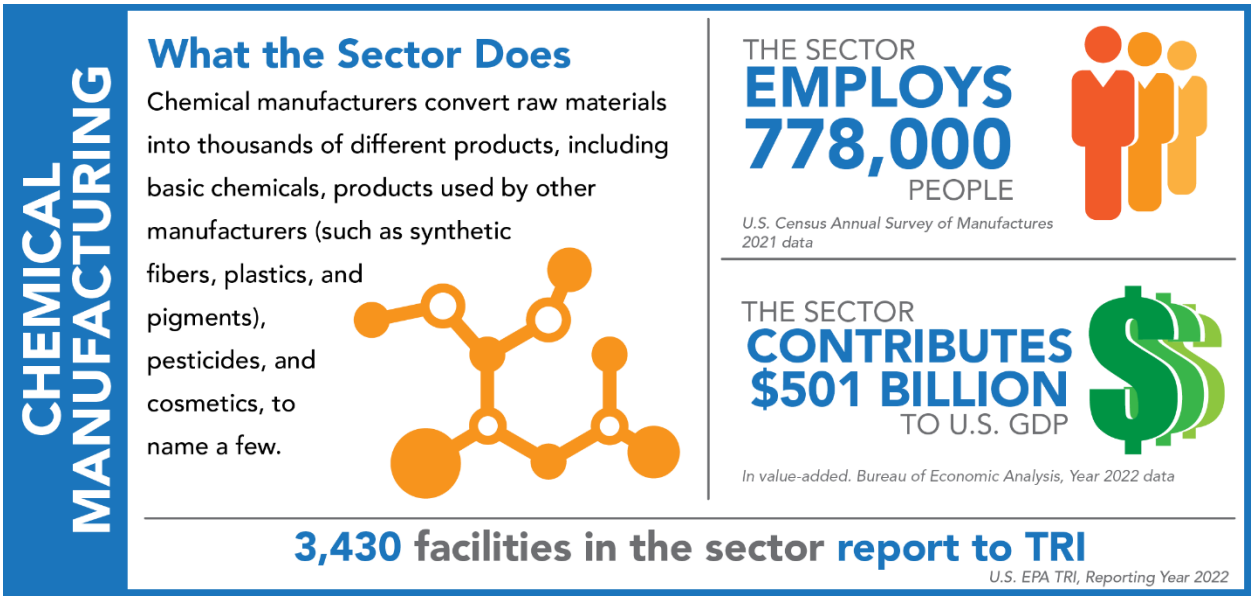
In 2022, 1,674 manufacturing facilities initiated over 3,400 pollution prevention activities to reduce TRI chemical use and waste creation. The most commonly reported type of pollution prevention activity was Process and Equipment Modifications. For example:

- A fabric coating mill implemented a new enterprise resource planning (ERP) system in 2022 which improved onsite inventory management and helped reduce the amount of toluene managed as waste.

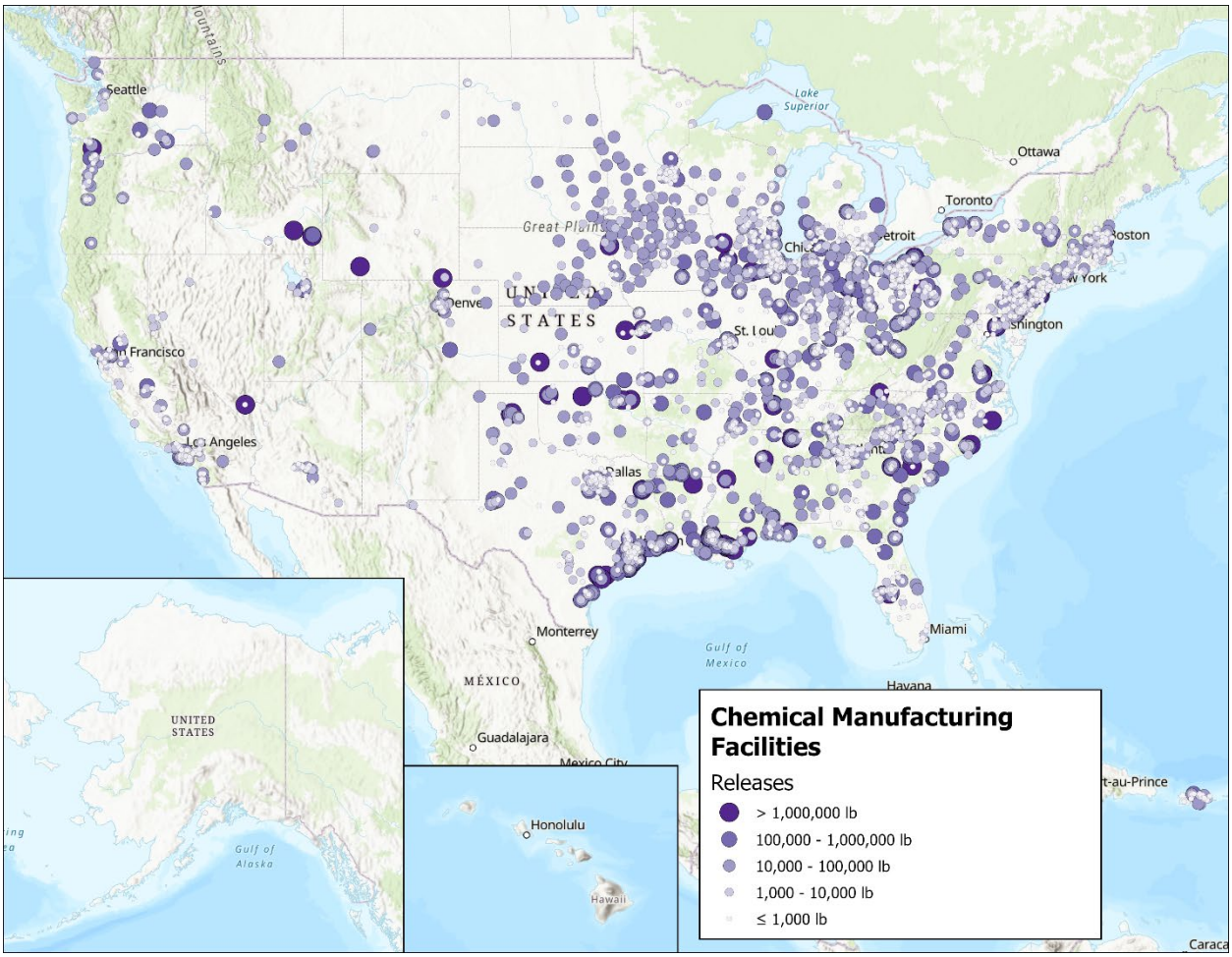
You can learn more about pollution prevention opportunities in this sector by using the TRI P2 Search Tool. Facilities interested in exploring pollution prevention opportunities at their site can contact their Regional P2 Coordinator to arrange a free on-site P2 assessment.

Chemical Manufacturing

This section examines how TRI chemical wastes are managed in the chemical manufacturing sector (defined as facilities reporting their primary NAICS code as 325).



This map shows the locations of the chemical manufacturing facilities that reported to TRI for 2022, sized by their releases.

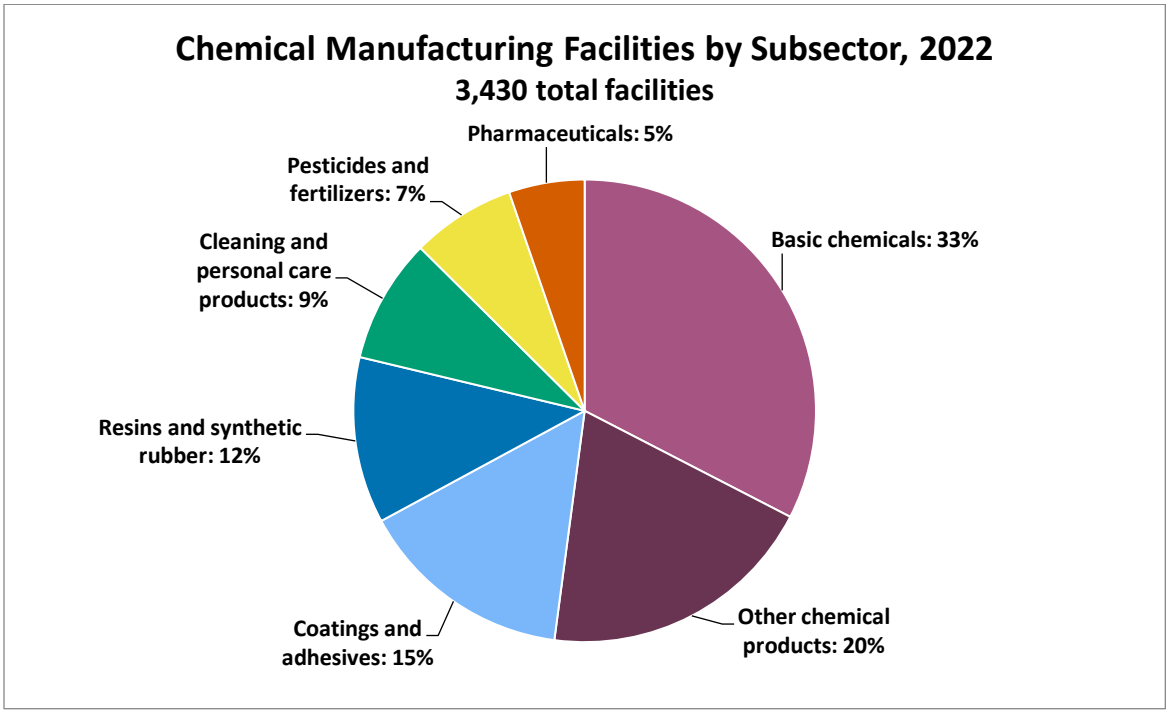


Chemical Manufacturing Facilities Reporting to TRI, 2022

View Larger Map

For 2022, more facilities reported to TRI from the chemical manufacturing sector than from any other industry sector (3,430 facilities; 16% of all facilities that reported to TRI for 2022). This sector reported 54% of all waste managed, more than any other sector.

This large and diverse sector includes facilities producing basic chemicals and those that manufacture products through further processing of chemicals. The chart below shows the number of facilities by chemical manufacturing subsectors that reported to TRI for 2022.

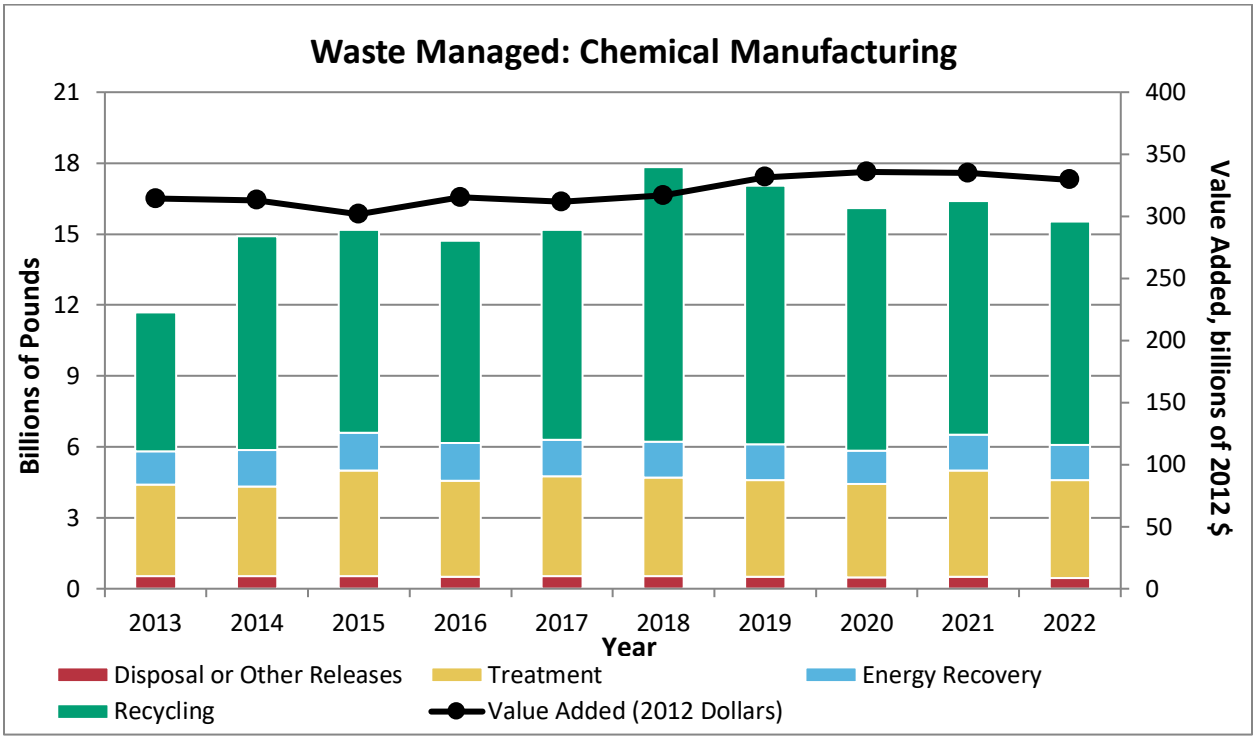


Operations in the chemical manufacturing sector include:

- Basic chemicals facilities produce large quantities of chemicals that are often used to make other chemicals or products. Basic chemicals include petrochemicals, industrial gases, and synthetic dyes and pigments.
- Coatings and adhesives facilities mix pigments, solvents, and binders into architectural and industrial paints; manufacture paint products such as paint removers and thinners; and manufacture adhesives, glues, and caulking compounds.
- Resins and synthetic rubber facilities manufacture resins, plastic materials, synthetic rubber, and fibers and filaments.
- Facilities in the "Other Chemical Products" subsector make chemicals for a wide variety of applications. These include chemicals used in photography, explosives, inks and toners, and transportation equipment like antifreeze or brake fluid.

Chemical Manufacturing Waste Management Trend

The following graph shows the quantities of TRI chemical waste managed through recycling, energy recovery, treatment, and disposal or other releases by the chemical manufacturing sector.



From 2013 to 2022:

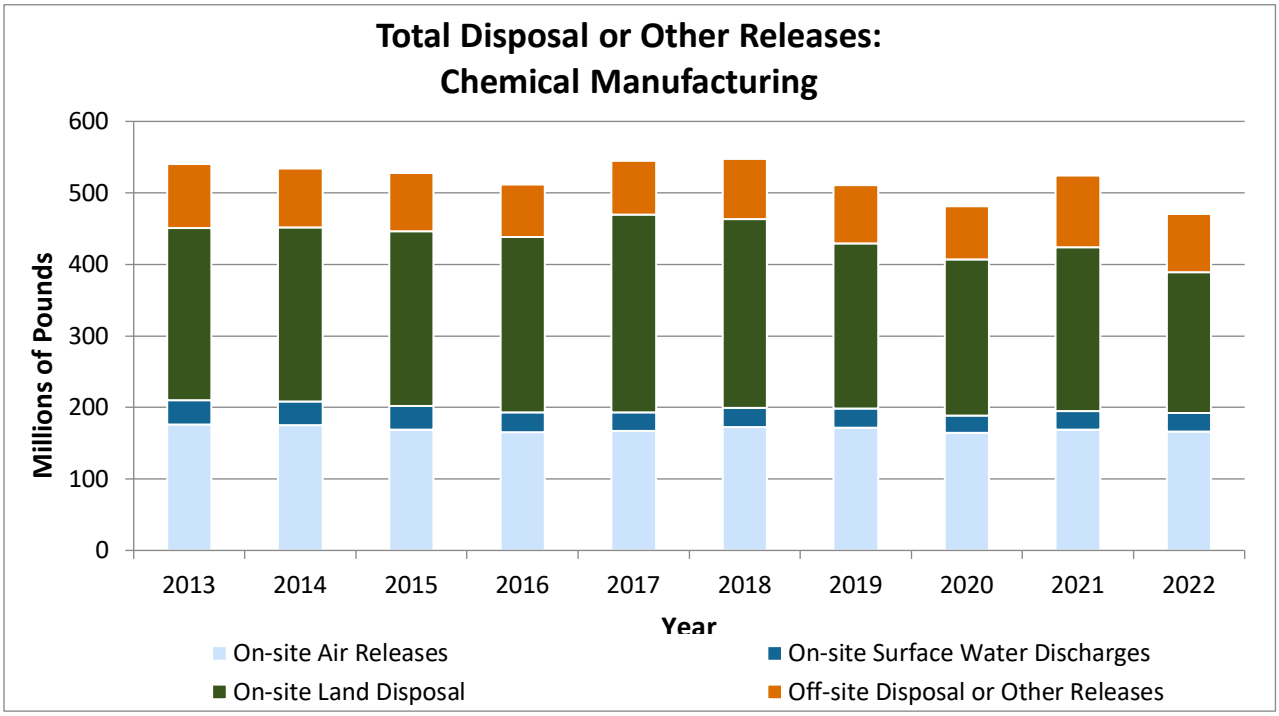
- Quantities of waste managed by the chemical manufacturing sector increased by 33%, while the sector's value added (represented by the black line), as reported by the Bureau of Economic Analysis, Value Added by Industry, increased by 5%.
    - The increase in waste recycled was driven by a few facilities. For example, the large increase in chemical waste recycled in 2014 compared to 2013 was primarily due to one petrochemical manufacturing facility that began reporting large quantities of on-site cumene recycling annually from 2014 to present.
- Quantities of TRI chemicals recycled, treated, and combusted for energy recovery increased, while the quantities of TRI chemicals released decreased.

From 2021 to 2022:

- Waste managed at chemical manufacturing facilities decreased by 875 million pounds (-5%).

- In 2022, facilities in this sector released 3% of their waste into the environment and managed the other 97% through treatment, energy recovery, and recycling.

The following graph shows the 10-year trend in quantities of TRI chemicals released by facilities in the chemical manufacturing sector.

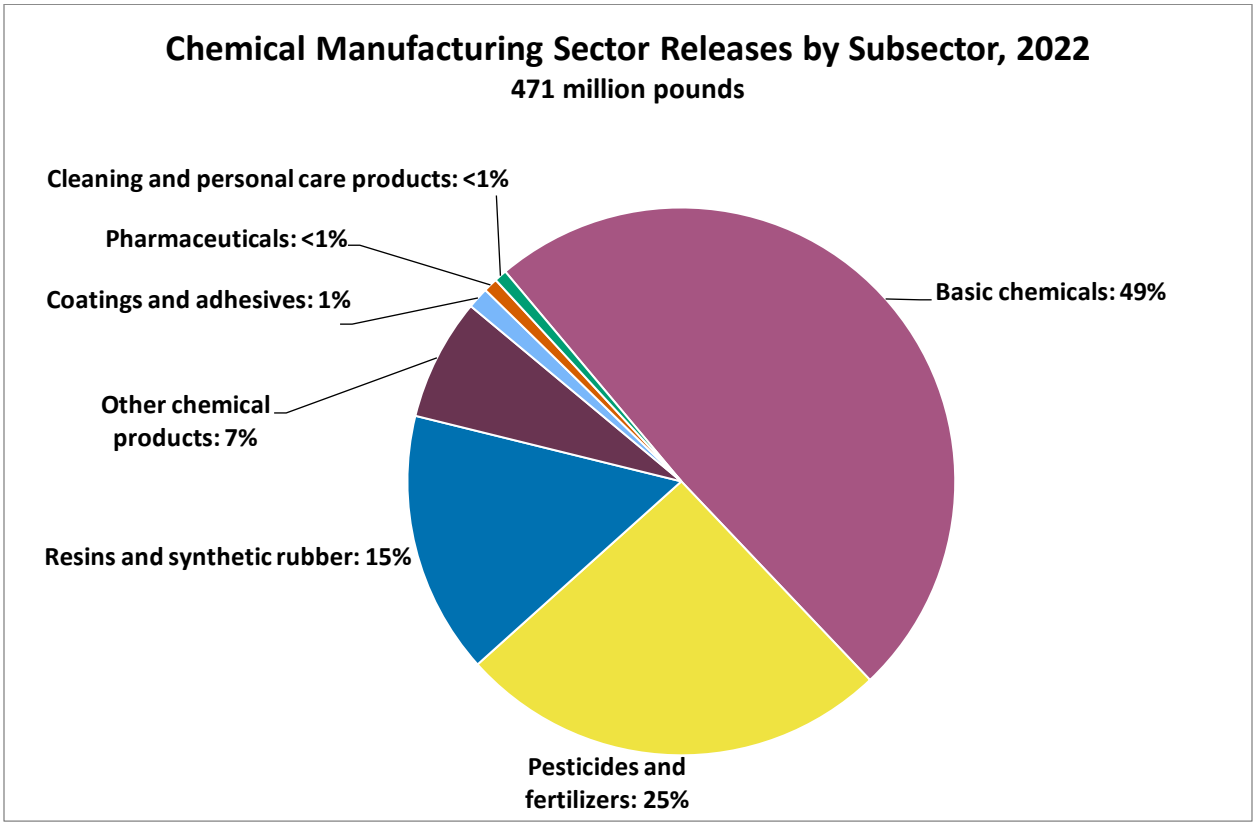


From 2013 to 2022:

- Releases reported by chemical manufacturing facilities decreased by 13%.
- Quantities of on-site releases to all media decreased, as did off-site disposal.

From 2021 to 2022:

- Releases decreased by 53 million pounds (-10%), partly driven by one facility reporting a large decrease in off-site disposal of zinc compounds and another facility that changed its primary NAICS code (i.e., the facility previously reported as a chemical manufacturer but determined that chemical manufacturing did not account for most of its value added in 2022). Excluding these facilities, releases from chemical manufacturing still decreased.
- For 2022, one-third of the 3,430 chemical manufacturing facilities were in the basic chemicals manufacturing subsector, which accounted for almost half (49%) of the chemical manufacturing sector's releases.



Pollution Prevention in the Chemical Manufacturing Sector:

In 2022, 336 facilities in this sector initiated 864 pollution prevention activities. The most commonly reported types of pollution prevention activities were Process and Equipment Modifications and Operating Practices and Training. For example:

- A basic chemical manufacturer successfully piloted a new formulation that does not contain barium compounds, and will use the barium compound-free formulation for all future production of these products.
- A pharmaceutical manufacturing facility substituted methanol with ethanol for several cleaning processes, reducing the amount of methanol managed as waste.

Additional Resources on Pollution Prevention

- To find more examples of chemical manufacturers' pollution prevention activities and the pollution prevention barriers they reported, visit TRI's P2 Search Tool.
- EPA's Smart Sectors Program is partnering with chemical manufacturing trade associations to develop sensible approaches to industrial operations that better protect the environment and public health.
- For more information on how this and other industry sectors can choose safer chemicals, visit EPA's Safer Choice Program.

- EPA supports the adoption of green chemistry and green engineering practices that reduce the environmental impacts from this sector, including reductions in the use of toxic chemicals, water, and electricity. For more information, see the TRI Green Chemistry and Green Engineering Reporting webpage.
- Facilities interested in exploring P2 opportunities or getting technical assistance can contact their regional P2 coordinator. Find the P2 coordinators for your state and region.

Greenhouse Gas Reporting in the Chemical Manufacturing Sector

While many chemical releases are required to be reported to TRI, the TRI Program does not cover all chemicals released by industrial activities. Notably, most greenhouse gas (GHG) emissions are not reported to TRI. Industrial emissions of GHGs increase the concentration of these gases in the atmosphere, which alter the amount of heat trapped by the Earth's atmosphere and contribute to climate change.

From the Fifth National Climate Assessment:

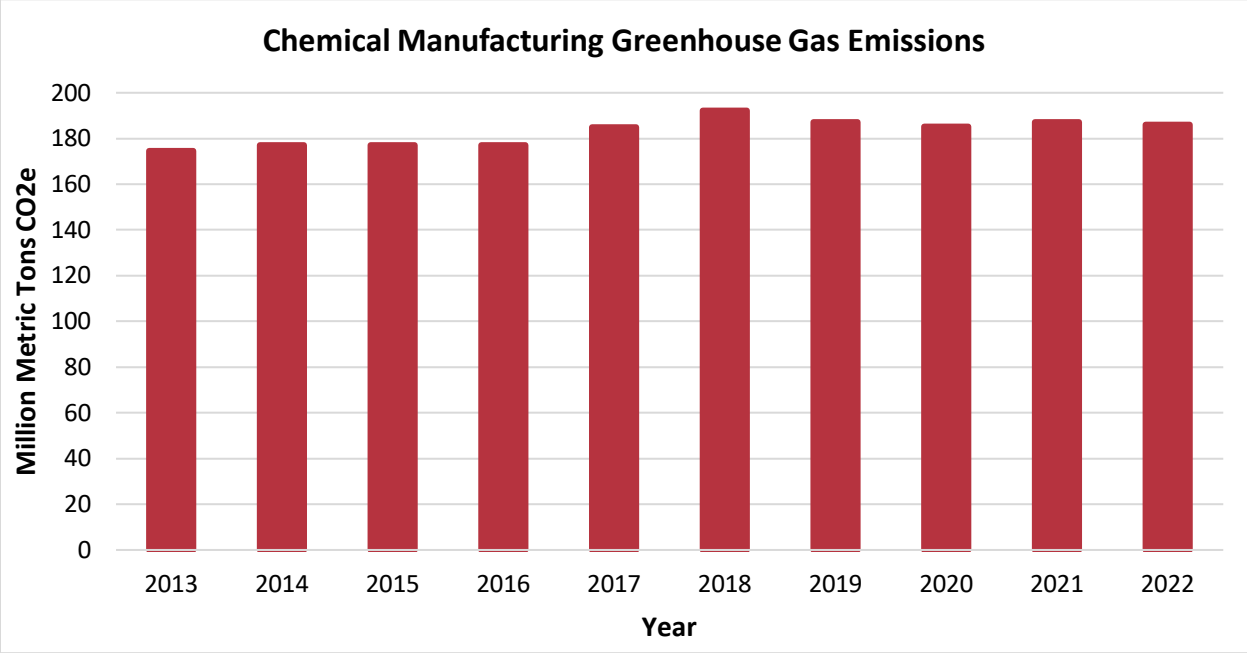
Climate change is already harming human health across the US, and impacts are expected to worsen with continued warming. Climate change harms individuals and communities by exposing them to a range of compounding health hazards, including the following:

- More severe and frequent extreme events
- Wider distribution of infectious and vector-borne pathogens
- Air quality worsened by smog, wildfire smoke, dust, and increased pollen
- Threats to food and water security
- Mental and spiritual health stressors

Climate change is projected to reduce US economic output and labor productivity across many sectors, with effects differing based on local climate and the industries unique to each region. Climate-driven damages to local economies especially disrupt heritage industries (e.g., fishing traditions, trades passed down over generations, and cultural heritage–based tourism) and communities whose livelihoods depend on natural resources.

Source: Fifth National Climate Assessment

EPA's Greenhouse Gas Reporting Program (GHGRP) tracks facility-level emissions from the largest U.S. sources of GHGs. The chart below shows GHG emissions reported to the GHGRP by facilities in the chemical manufacturing sector from 2013 to 2022.



- Note that while most TRI chemical quantities are reported in pounds, the GHGRP collects GHG emissions data measured in metric tons of carbon dioxide equivalents ($MTCO_2e$), as shown in this chart.
- The chemical manufacturing sector reported emissions of 186 million $MTCO_2e$ for 2022, a 6% increase since 2013.
- 459 facilities in the sector reported to the GHGRP for 2022, most of which also reported to TRI.

What are carbon dioxide equivalents (CO_2e)?

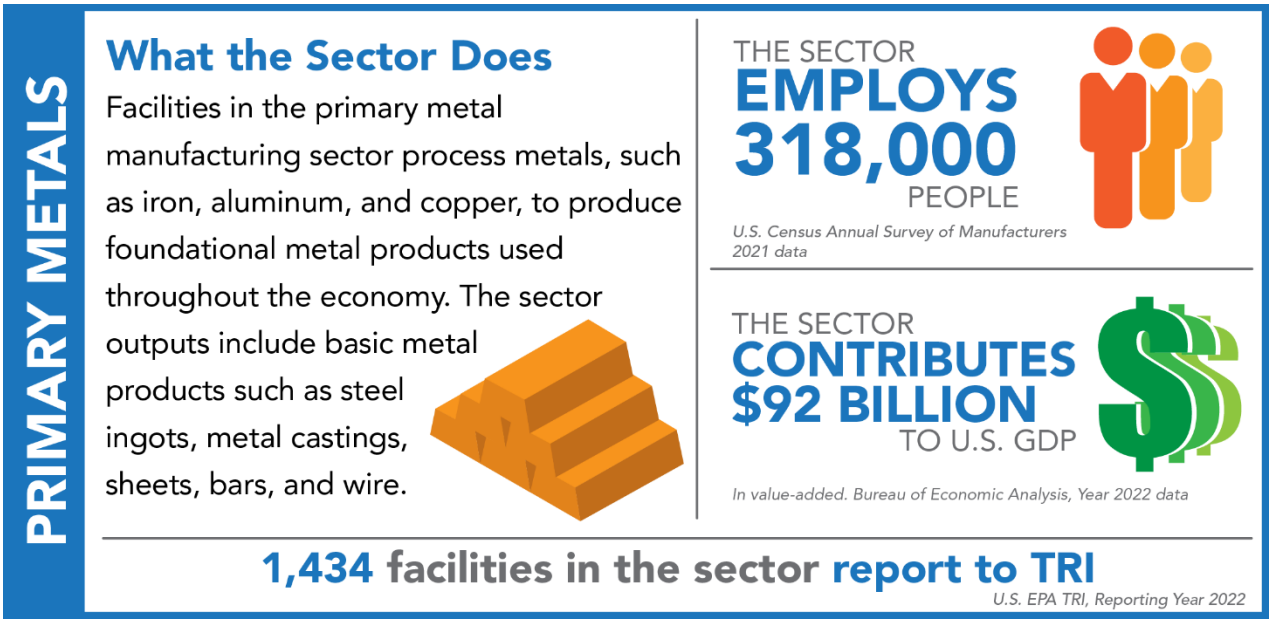
Different GHGs can have different effects on the Earth's warming; Global Warming Potential (GWP) values allow for comparisons of the global warming impacts of different gases. $MTCO_2e$ is a weighted measurement that considers the tonnes of the gases and their associated global warming potentials.

Additional Resources on GHGs and Climate Change

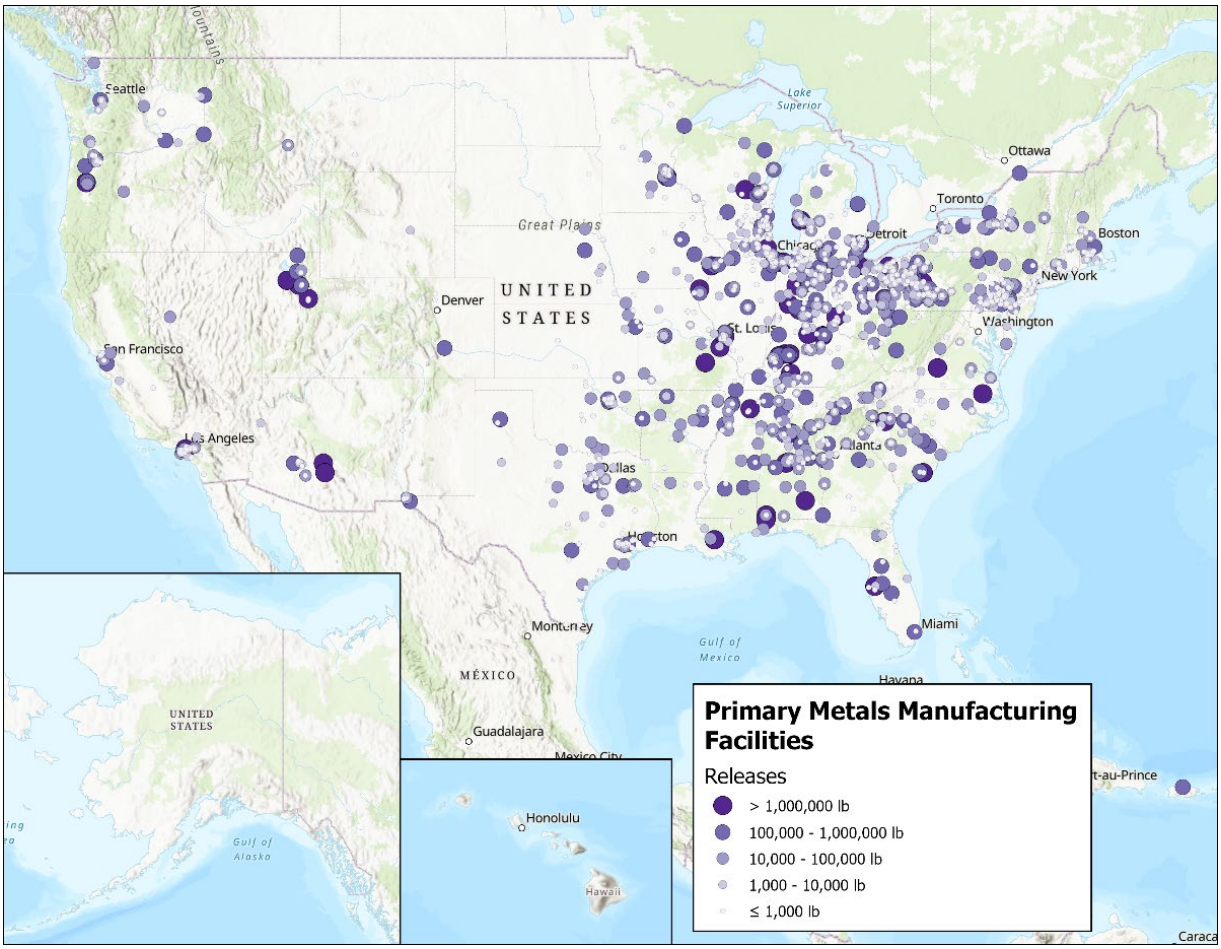
- To explore the data reported to EPA on GHG emissions, see the Facility Level Information on GreenHouse gases Tool (FLIGHT).
- See the Fifth National Climate Assessment for information on climate change impacts, risks, and responses.
- For more details on the chemical manufacturing sector's GHG emissions, visit GHGRP Chemicals.
- The TRI P2 Search Tool lets you compare facilities' waste management reported to TRI and their GHG emissions reported to the GHGRP.

Primary Metals Manufacturing

This section examines how TRI chemical wastes are managed within the primary metals manufacturing sector (defined as facilities reporting their primary NAICS code as 331).



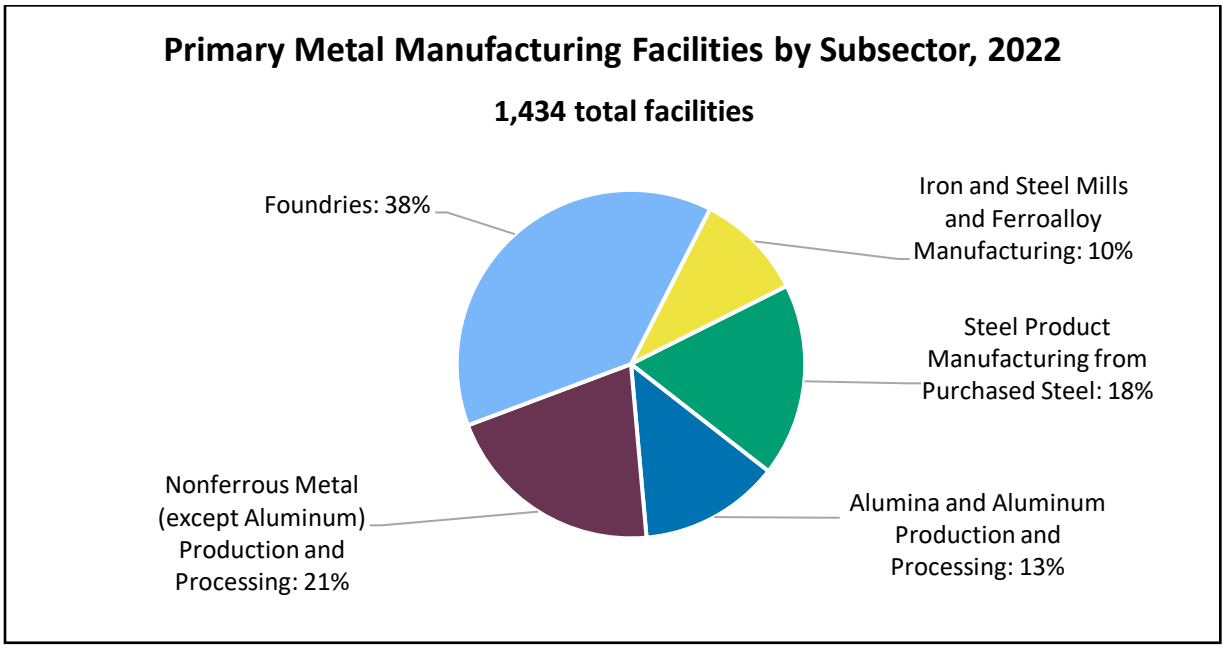
This map shows the locations of the primary metals manufacturing facilities that reported to TRI for 2022, sized by their releases.



Primary Metals Manufacturing Facilities Reporting to TRI, 2022

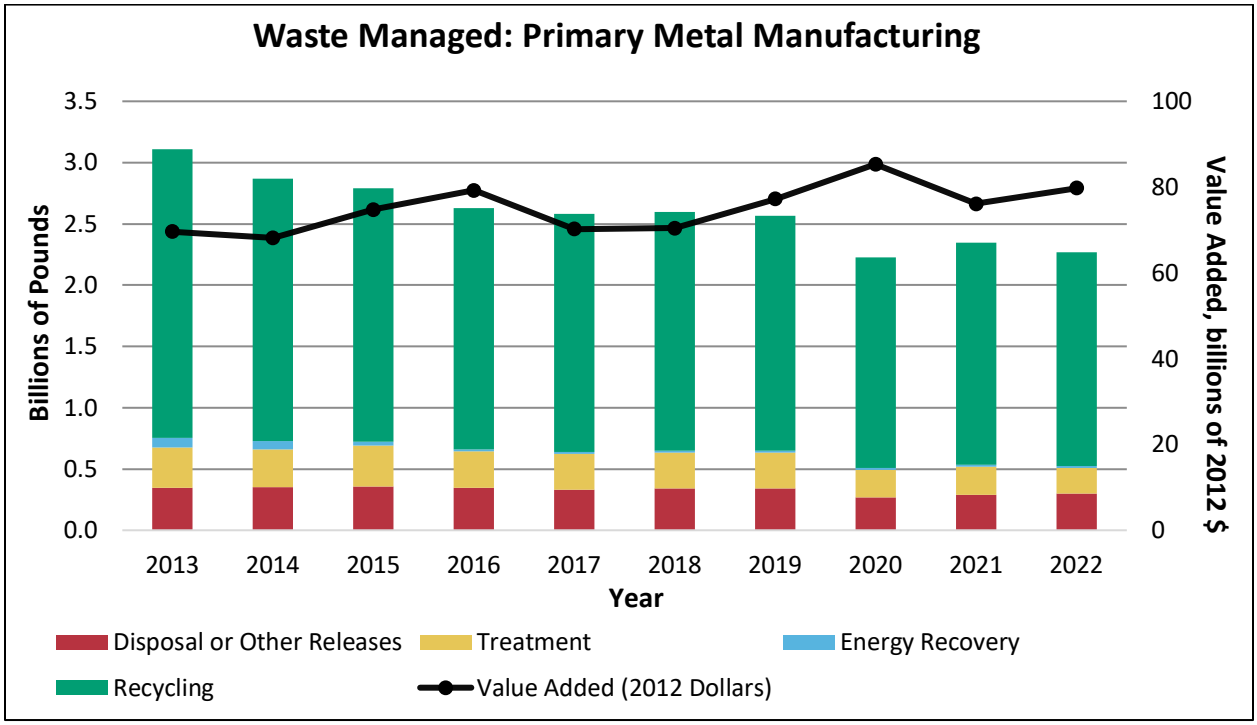
View Larger Map

For 2022, 1,434 facilities in the primary metal manufacturing sector reported to TRI. The sector includes iron and steel mills; facilities producing steel products such as pipes, plates, and wire; foundries; and facilities that make nonferrous metal and metal products. The chart below shows the number of facilities and the TRI releases by primary metals subsector for 2022. While iron and steel mills account for few (10%) of the sector's facilities, this subsector reports more releases than any other subsector. Conversely, foundries account for the most (38%) facilities reporting to TRI in the sector but only report 8% of the releases.


Primary Metal Manufacturing Facilities by Subsector, 2022
1,434 total facilities
Foundries: 38%
Iron and Steel Mills and Ferroalloy Manufacturing: 10%
Steel Product Manufacturing from Purchased Steel: 18%
Alumina and Aluminum Production and Processing: 13%
Nonferrous Metal (except Aluminum) Production and Processing: 21%

Primary Metals Waste Management Trend

The following graph shows the 10-year trend in quantities of TRI chemical waste managed through recycling, energy recovery, treatment, and disposal or other releases by facilities in the primary metals manufacturing sector.



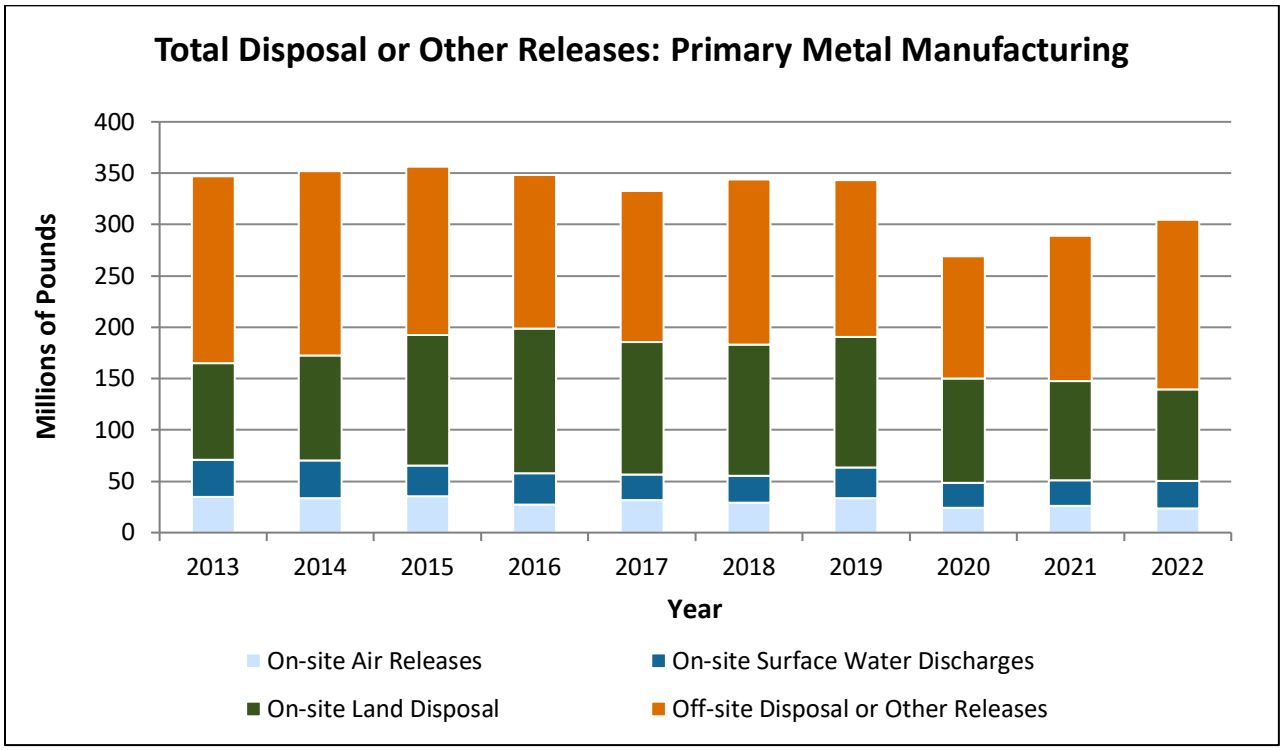
From 2013 to 2022:

- Chemical waste reported by primary metals manufacturing facilities was largely metals which were mostly recycled.
- Quantities of waste managed by the primary metals manufacturing sector decreased by 27% since 2013 (843 million pounds), while the sector's value added (represented by the black line), as reported by the Bureau of Economic Analysis, Value Added by Industry, increased by 15%.
- The overall decrease in waste managed was largely driven by a 609 million pound decrease in quantities of waste recycled over this time. Quantities of TRI chemical waste managed by all methods decreased as well.

From 2021 to 2022:

- Waste managed at primary metals manufacturing facilities decreased by 3% (80 million pounds), driven by decreases in waste recycled. Nonetheless, in 2022 the sector recycled 1.6 billion pounds of metals, more than any other sector.
- Zinc, copper, and lead accounted for 55% of the sector's TRI waste managed.

The following graph shows the quantities of TRI chemicals released by facilities in the primary metals manufacturing industry.



From 2013 to 2022:

- TRI chemical releases by the primary metals manufacturing sector decreased by 43 million pounds (-12%), driven mainly by reductions in off-site disposal.
- Each year since 2013, about half of the primary metal manufacturing sector's releases have been transferred for off-site disposal.

From 2021 to 2022:

- Releases increased by 16 million pounds (5%), driven by increased off-site disposal of metals.
- In 2022, zinc, manganese, and copper accounted for 62% of the sector's releases.

Pollution Prevention in the Primary Metals Manufacturing Sector:

In 2022, 93 facilities in the sector initiated 252 pollution prevention activities to reduce TRI chemical use and waste creation. The most commonly reported types of pollution prevention activities were Process and Equipment Modifications followed by Operating Practices and Training. For example:

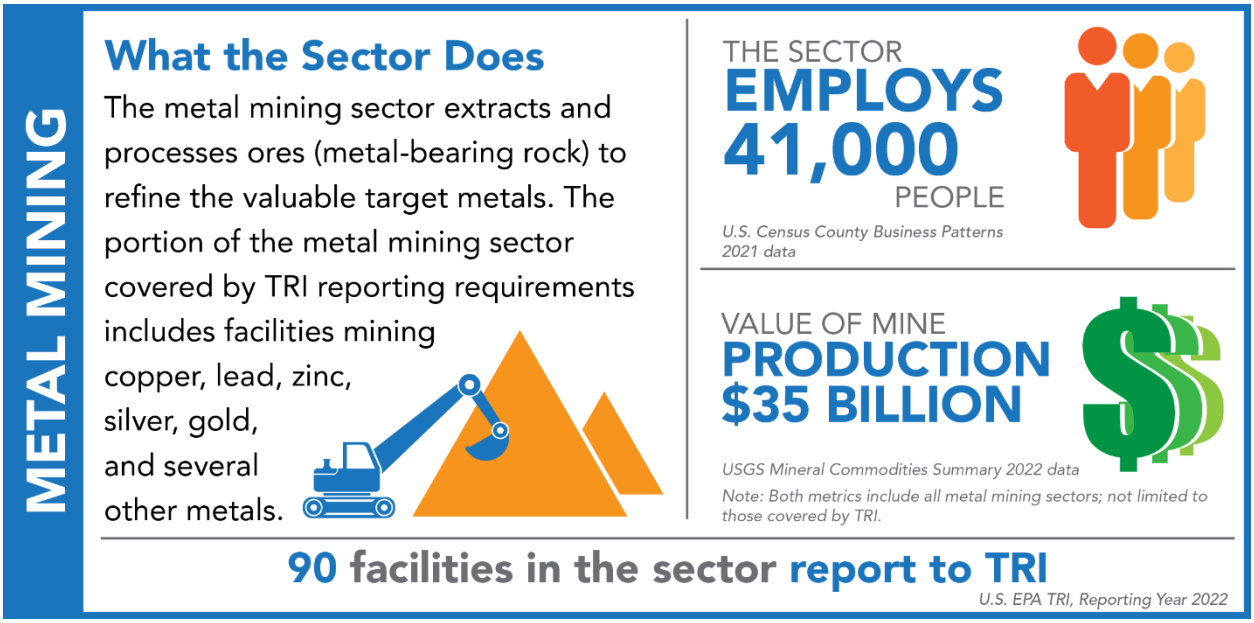
- A wire manufacturing facility installed new machinery and modified its plant layout to increase efficiency and minimize copper scrap.

- A specialty metal tubing manufacturer implemented a new surface etching process that reduces the amount of nitric acid needed to etch a specific line of tubes used for aerospace applications. The facility expects the impact of this alternative will grow in the next 5-10 years as their customers begin placing orders for this method of production.

To find other examples of the sector's pollution prevention activities and the pollution prevention barriers they face, visit TRI's P2 Search Tool.

Metal Mining

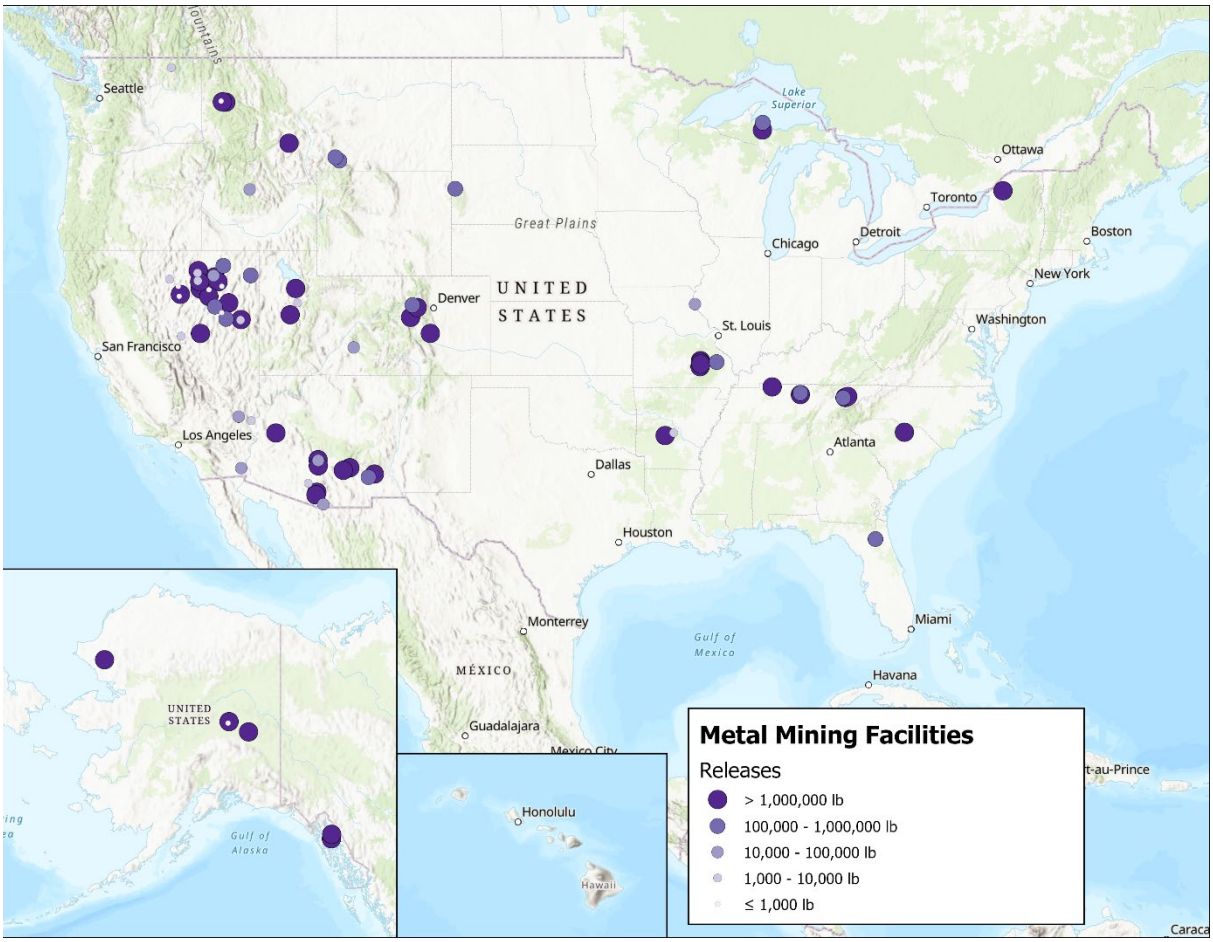
This section examines how TRI chemical wastes are managed by facilities in the metal mining sector (defined as facilities reporting their primary NAICS code as 2122).



Although the number of metal mines reporting to TRI makes up only a small portion of the total number of TRI-reporting facilities, the sector accounted for 44% of all releases reported to TRI for 2022.

This map shows the locations of the metal mining facilities that reported to TRI for 2022, sized by their releases.

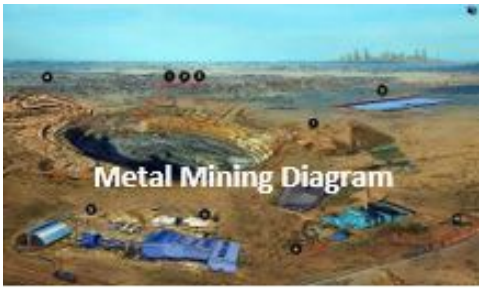
Note: Mines are shown on this map based on their longitude/latitude, which may be miles from the city identified on the mine's TRI reporting forms. Mines can qualify their location relative to the city by noting the distance in the street address data field of their TRI reporting forms.



Metal Mines Reporting to TRI, 2022

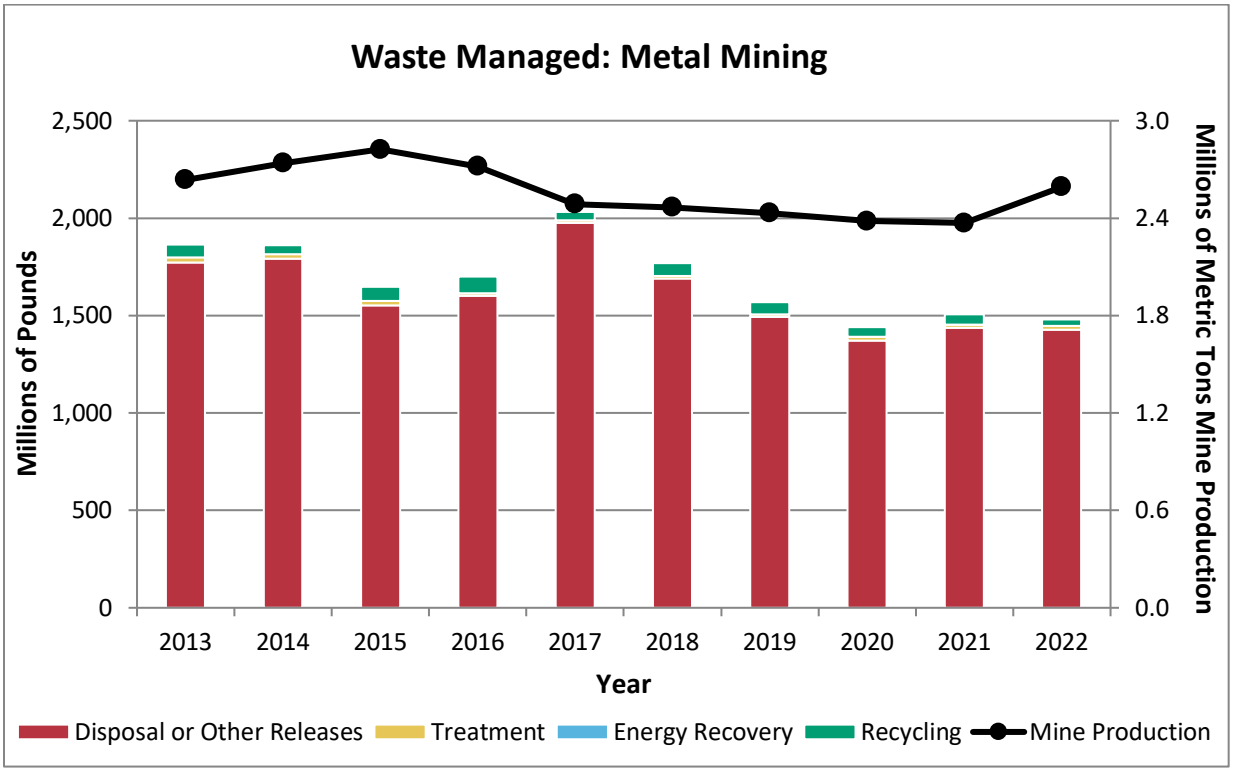
View Larger Map

For 2022, 90 metal mining facilities reported to TRI. Most are in the western states, where copper, silver, and gold mining are most common. Farther east, some metal mines in Missouri and Tennessee extract zinc and lead. U.S. mining operations extract metals that are used in a wide range of products, including automobiles, electric and industrial equipment, jewelry, and decorative objects. The extraction and processing of these minerals generate large amounts of on-site land disposal, primarily of metal-bearing rock (called ore) and waste rock. To learn more about metal mining operations and their TRI reporting, explore the interactive metal mining diagram.



Metal Mining Waste Management Trend

The following graph shows the quantities of TRI chemical waste managed by the metal mining industry from 2013 to 2022, mainly in the form of on-site land disposal. The nature of metal mining operations limits the feasibility of other methods of waste management.



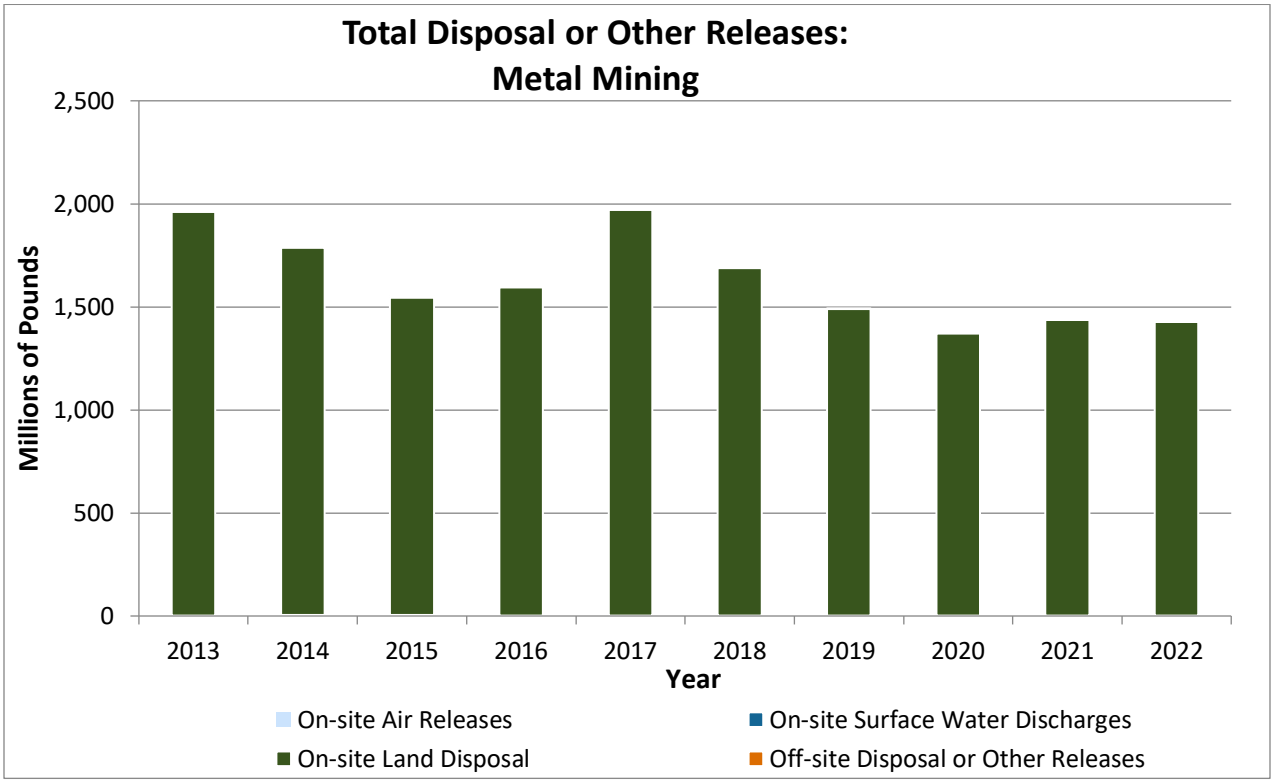
From 2013 to 2022:

- The TRI waste managed by the metal mining sector consists mostly of metals. The year-to-year fluctuations in waste managed do not closely reflect changes in the sector's production (as reported by the United States Geological Survey).
- Mining facilities often cite changes in the chemical composition of the ore they extract as one reason for annual fluctuations in the quantities of waste they manage. In some cases, small changes in the ore's composition can impact whether TRI chemicals in ore qualify for a concentration-based TRI reporting exemption in one year but not in the next year or vice versa.

From 2021 to 2022:

- The quantity of TRI chemical waste managed by this sector decreased by 28 million pounds (-2%).
- During 2022, 97% of the metal mining sector's waste was disposed of or otherwise released, primarily to land on site at the mine.

The following graph shows the 10-year trend in quantities of TRI chemicals released by the metal mining industry, primarily through on-site land disposal.



From 2013 to 2022:

- More than 99% of the metal mining sector's releases of TRI chemicals were on site and to land. Quantities of on-site land disposal by metal mines fluctuated from year to year.
    - Facilities have the option to indicate whether reported land releases represent disposal of TRI chemicals in waste rock piles. For 2022, waste rock piles accounted for at least 49% of the on-site land disposal of TRI chemicals at metal mines.
- The quantity of TRI chemicals released alone is not an indicator of health risks posed by the chemicals, as described in the Potential Risks from TRI Chemicals section. For more information, see the document, Factors to Consider When Using Toxics Release Inventory Data.

In 2022:

- Among the sectors reporting to TRI, the metal mining sector reported the largest quantity of waste disposed of or otherwise released, accounting for 44% of total TRI releases and 68% of on-site land disposal for all industries.
- The chemicals released in the greatest quantities by metal mines were lead, zinc, and arsenic compounds.

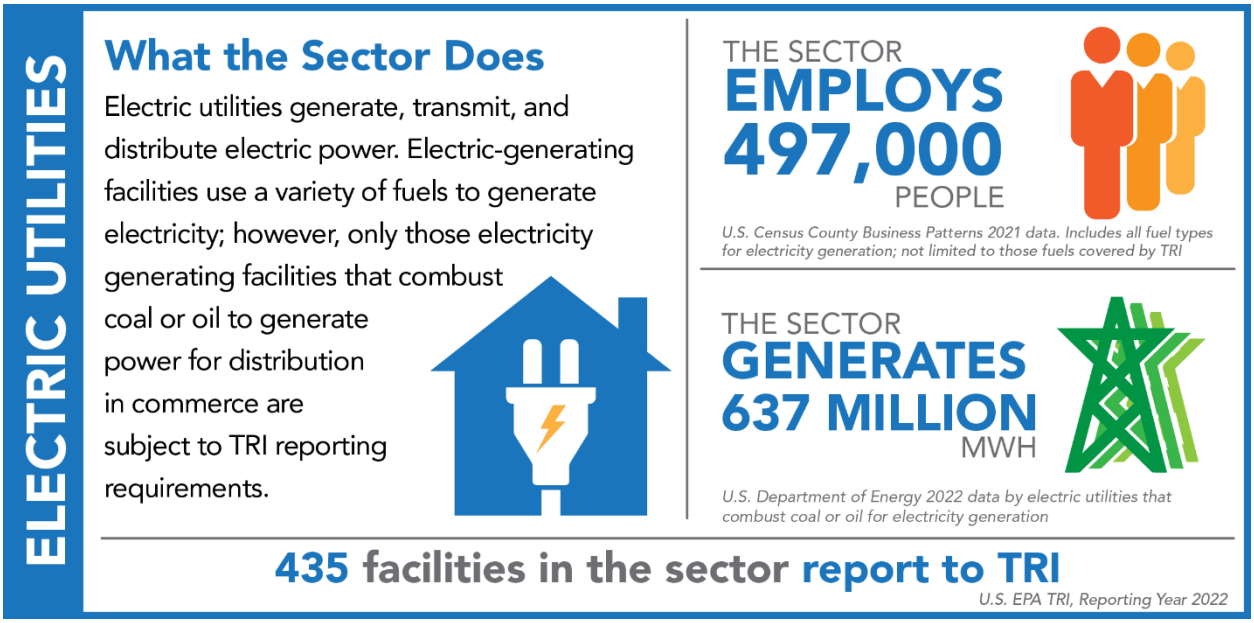
Pollution Prevention in the Metal Mining Sector:

Unlike manufacturing, the nature of mining—the necessary movement and disposal of large volumes of rock to access the target ore—does not lend itself to pollution prevention. To find examples of metal mining pollution prevention activities and the pollution prevention barriers mining facilities face, visit the TRI P2 Search Tool.

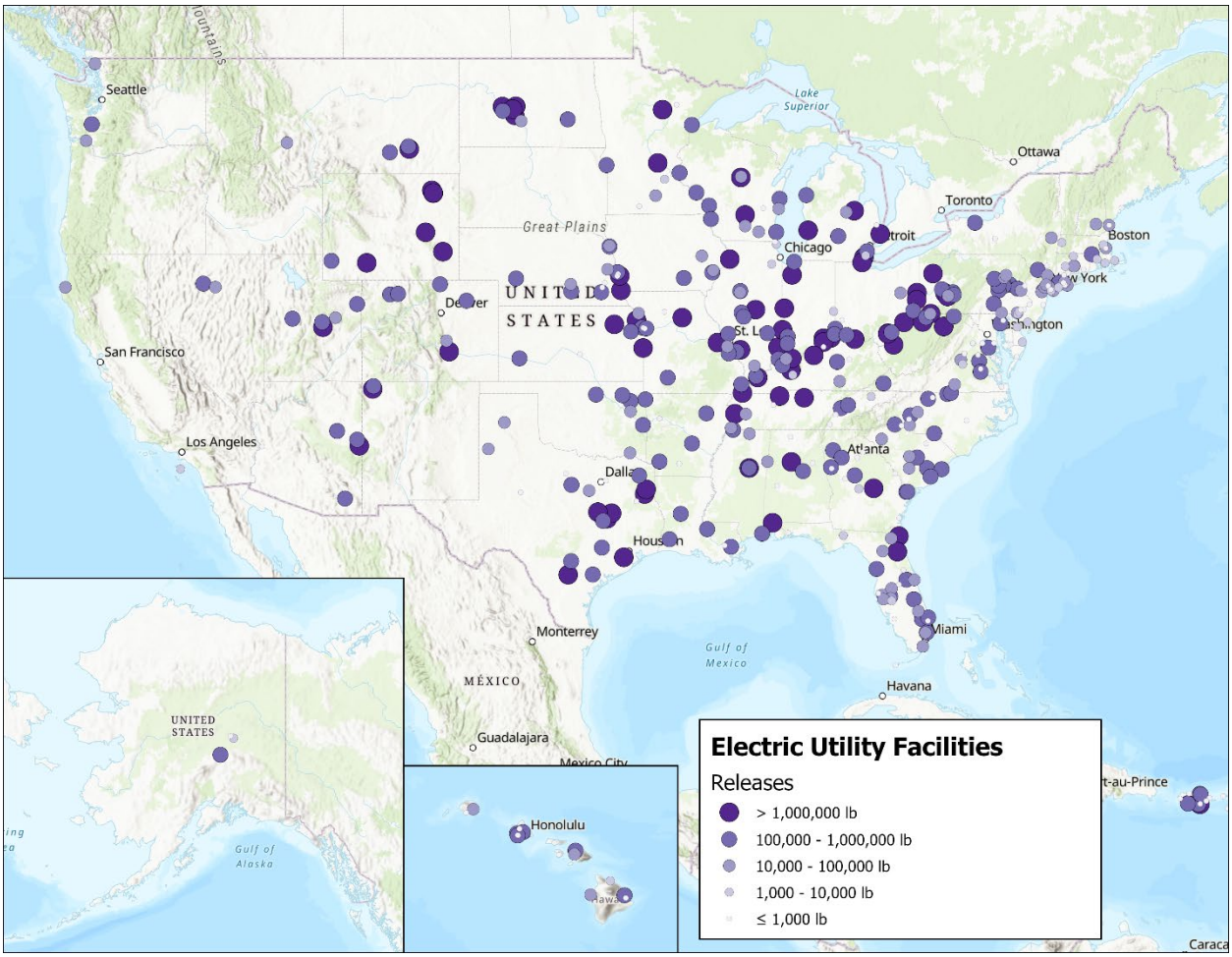
EPA's Smart Sectors Program has partnered with the mining sector to develop sensible approaches to better protect the environment and public health.

Electric Utilities

This section examines how TRI chemical wastes are managed by facilities in the electric utilities sector (defined as facilities reporting their primary NAICS code as 2211).



This map shows the locations of the electric utilities that reported to TRI for 2022, sized by their releases.



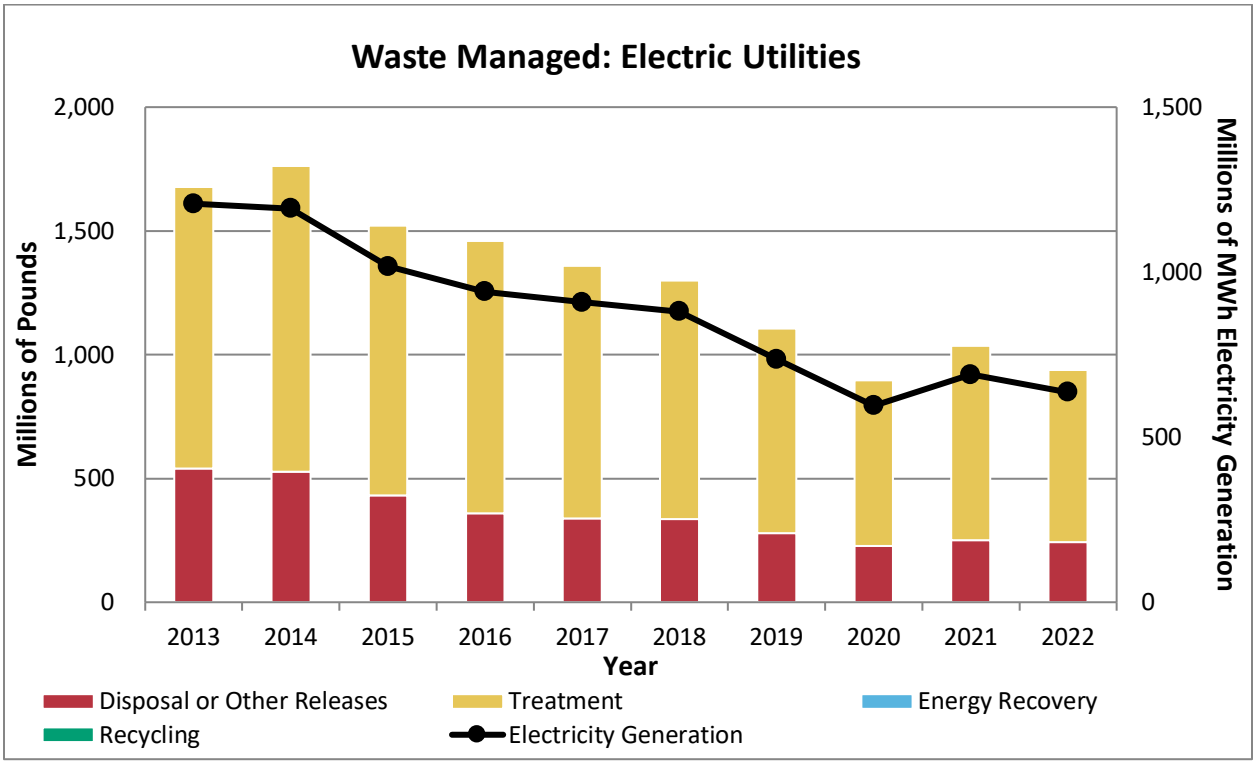
Electric Utilities Reporting to TRI, 2022

View Larger Map

For 2022, 435 electricity generating facilities reported to TRI. Facilities in the sector use different fuels to produce electricity, but only those that combust coal or oil to generate electricity for distribution in commerce are subject to TRI reporting requirements.

Electric Utilities Waste Management Trend

The following graph shows the 10-year trend in quantities of TRI chemical waste that electric utility facilities managed, primarily through treatment or release.



From 2013 to 2022:

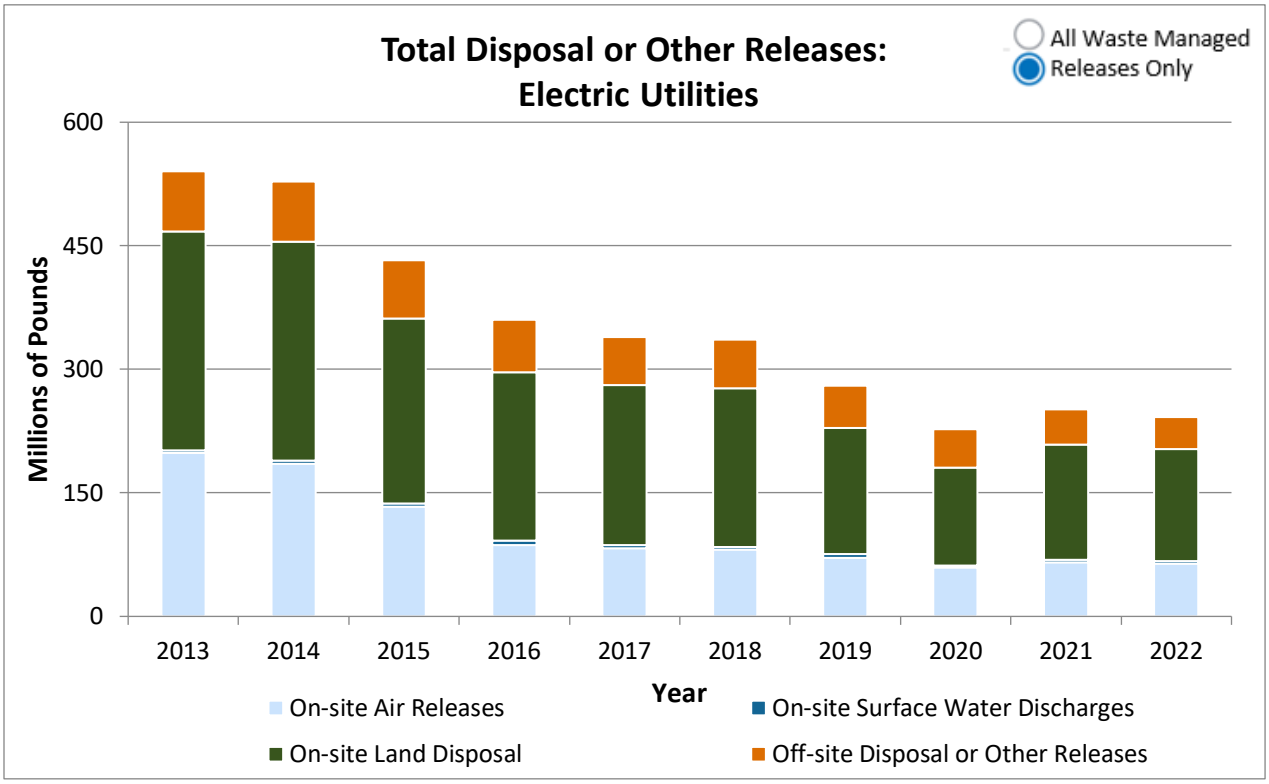
- Quantities of waste managed decreased by 740 million pounds (-44%) since 2013, driven by reduced releases and treatment.
- Net electricity generation by electric utilities from coal and oil fuels decreased by 47% (as reported by the U.S. Department of Energy's Energy Information Administration). Note that only facilities that combust coal or oil to generate electricity are covered under TRI reporting requirements.
    - Data from the Energy Information Administration indicate that the mix of energy sources for U.S. electricity generation has changed over time. Natural gas and renewable energy sources account for an increasing share of U.S. electricity generation, while coal-fired electricity generation has declined. Use of oil for electric power generation continues to contribute a small percentage of total U.S. electricity generation.
    - In recent years, the amount of electricity generated has been the main driver of the amount of waste generated by electric utilities. Waste generation from TRI-

reporting electric utilities has decreased in line with decreasing U.S. electricity generation from coal and oil.

In 2022:

- Approximately three-quarters of the sector's waste was treated, while about one-quarter was released into the environment. Facilities in this sector most commonly reported using scrubbers and/or electrostatic precipitators to treat their gaseous waste streams.

The following graph shows the annual quantities of TRI chemicals released by electric utilities.



From 2013 to 2022:

- Releases from the electric utilities sector decreased by 298 million pounds (-55%). This decrease was driven by a 135 million pound (-68%) decrease in air releases and a 129 million pound (-49%) decrease in on-site land disposal. Surface water discharges and off-site disposal also decreased, but to a lesser extent.

From 2021 to 2022:

- Releases by electric utilities decreased by 9 million pounds (-4%), driven by decreased air releases of sulfuric acid and decreased off-site disposal of metals.

Pollution Prevention in the Electric Utilities Sector:

Of the 435 facilities in the electric utilities sector that reported to TRI for 2022, 8 initiated pollution prevention activities to reduce their generation of wastes containing TRI chemicals. In this sector, implementing these activities may also lead to reduced greenhouse gas emissions. For example, one facility reported that they retired their coal combustion unit, and another facility reported that they are experimenting with biomass alternatives to the fuels currently combusted.

To find examples of electric utilities' pollution prevention activities and the pollution prevention barriers they face, visit TRI's P2 Search Tool.

EPA's Smart Sectors Program is partnering with this sector to develop sensible approaches to industrial operations that better protect the environment and public health.

Greenhouse Gas Reporting in the Electric Utilities Sector

While many chemical releases are required to be reported to TRI, the TRI Program does not cover all chemicals released by industry. Notably, most greenhouse gas (GHG) emissions are not reported to TRI. Industrial emissions of GHGs increase the concentration of these gases in the atmosphere, which alter the amount of heat trapped by the Earth's atmosphere and contribute to climate change.

From the Fifth National Climate Assessment:

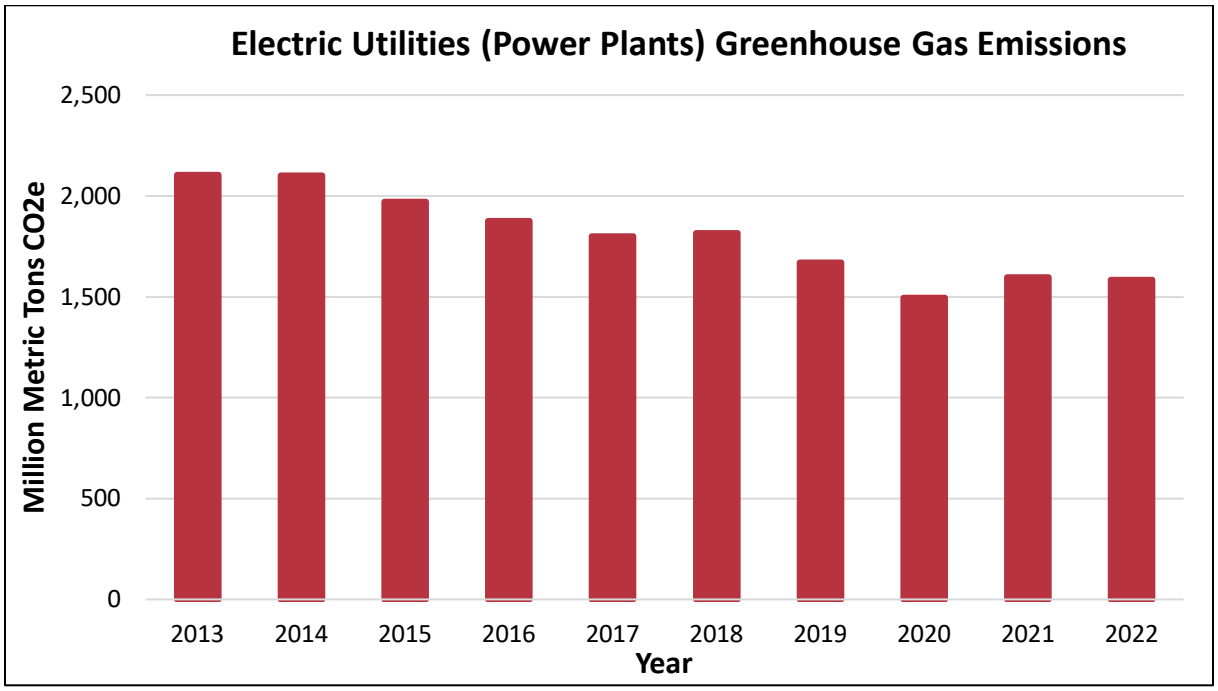
Climate change is already harming human health across the US, and impacts are expected to worsen with continued warming. Climate change harms individuals and communities by exposing them to a range of compounding health hazards, including the following:

- More severe and frequent extreme events
- Wider distribution of infectious and vector-borne pathogens
- Air quality worsened by smog, wildfire smoke, dust, and increased pollen
- Threats to food and water security
- Mental and spiritual health stressors

Climate change is projected to reduce US economic output and labor productivity across many sectors, with effects differing based on local climate and the industries unique to each region. Climate-driven damages to local economies especially disrupt heritage industries (e.g., fishing traditions, trades passed down over generations, and cultural heritage–based tourism) and communities whose livelihoods depend on natural resources.

Source: Fifth National Climate Assessment

EPA's Greenhouse Gas Reporting Program (GHGRP) tracks facility-level emissions from the largest U.S. sources of GHGs. Under the GHGRP, the Power Plants Sector consists mainly of facilities that produce electricity by burning fossil fuels such as coal, oil, and natural gas, or biomass. The sector also includes facilities that burn fossil fuels to produce steam, heated air, or cooled air. The chart below shows GHG emissions reported to the GHGRP by facilities in the Power Plants sector from 2013 to 2022.



- Note that while almost all TRI data are reported in pounds, the GHGRP collects GHG emissions data in metric tons of carbon dioxide equivalents ($MTCO_2e$), as shown in this chart.
- In 2022, 1,332 facilities in the Power Plants sector submitted GHG reports while 435 facilities in this sector reported to TRI. Some facilities report to only one of these programs due to different applicability requirements. TRI covers only electric utilities that burn coal or oil to generate electricity (i.e., natural gas power plants are not covered by TRI) while the GHGRP covers all power plants that meet the applicability requirements, including natural gas-fueled power plants.
- Total reported GHG emissions from the sector were 1,585 million $MTCO_2e$ in 2022, which represented more than half of total direct emissions reported to the GHGRP.
- From 2013 to 2022, GHG emissions from this sector have decreased by 25%. According to data from the U.S. Department of Energy's Energy Information Administration, use of renewables, such as wind and solar, and of natural gas increased during this time while the use of coal decreased. These trends likely contributed to the decreased emissions from this sector.

What are carbon dioxide equivalents (CO_2e)?

Different GHGs can have different effects on the Earth's warming; Global Warming Potential (GWP) values allow for comparisons of the global warming impacts of different gases. $MTCO_2e$ is a weighted measurement that considers the tonnes of the gases and their associated global warming potentials.

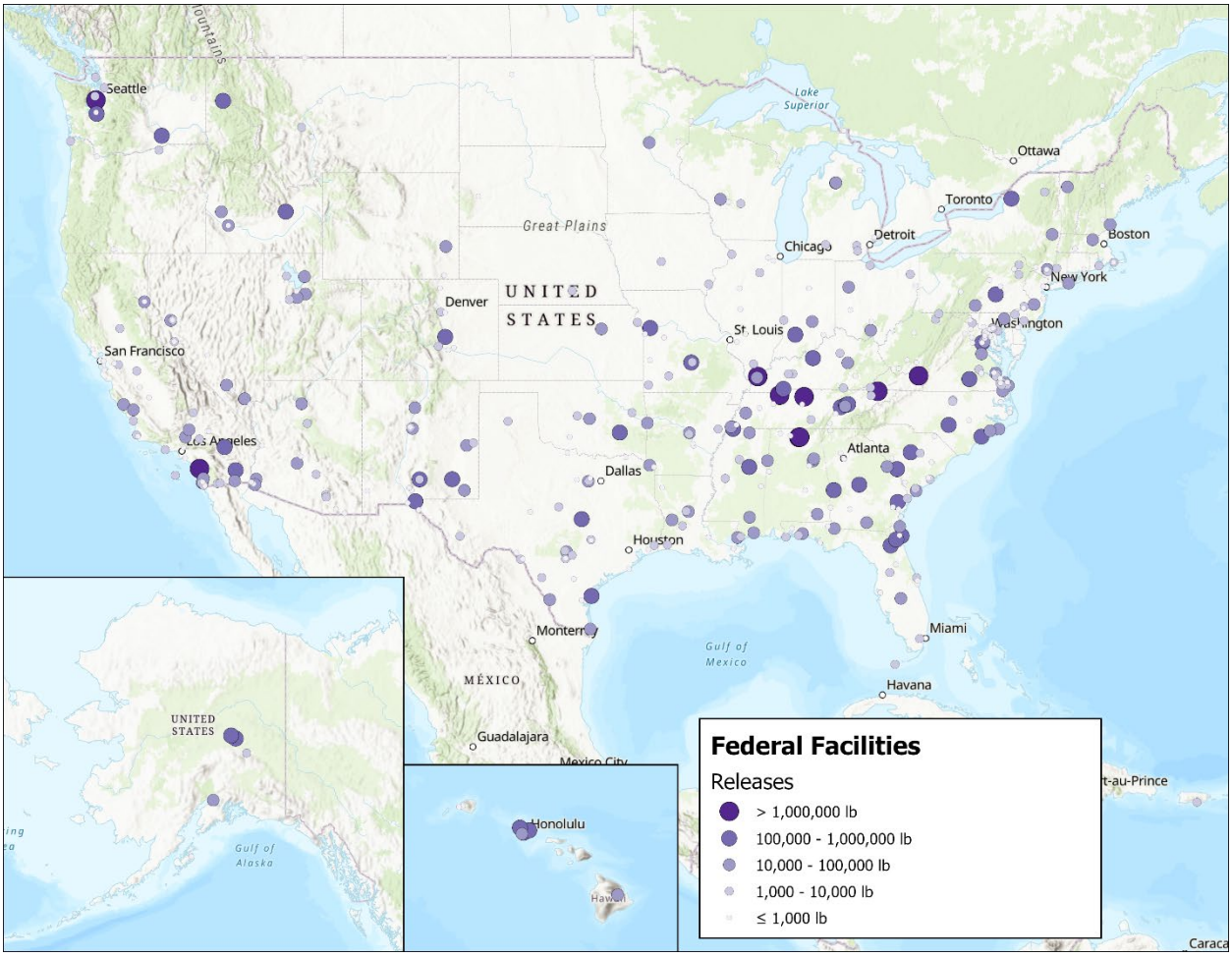
Additional Resources on GHG Emissions and Climate Change

- To explore the data reported to EPA on GHG emissions, see the Facility Level Information on GreenHouse gases Tool (FLIGHT).
- See the Fifth National Climate Assessment for information on climate change impacts, risks, and responses.
- For more details on the electric utility sector's GHG emissions, visit GHGRP Power Plants.
- The TRI P2 Search Tool lets you compare facilities' waste management reported to TRI and their GHG emissions reported to the GHGRP.

Federal Facilities

All federal facilities, including those operated by the EPA, the Department of Defense, and the Department of the Treasury, are subject to TRI reporting requirements, regardless of the type of operations at the facility.

This map shows the locations of the 444 federal facilities that reported to TRI for 2022, sized by their releases.

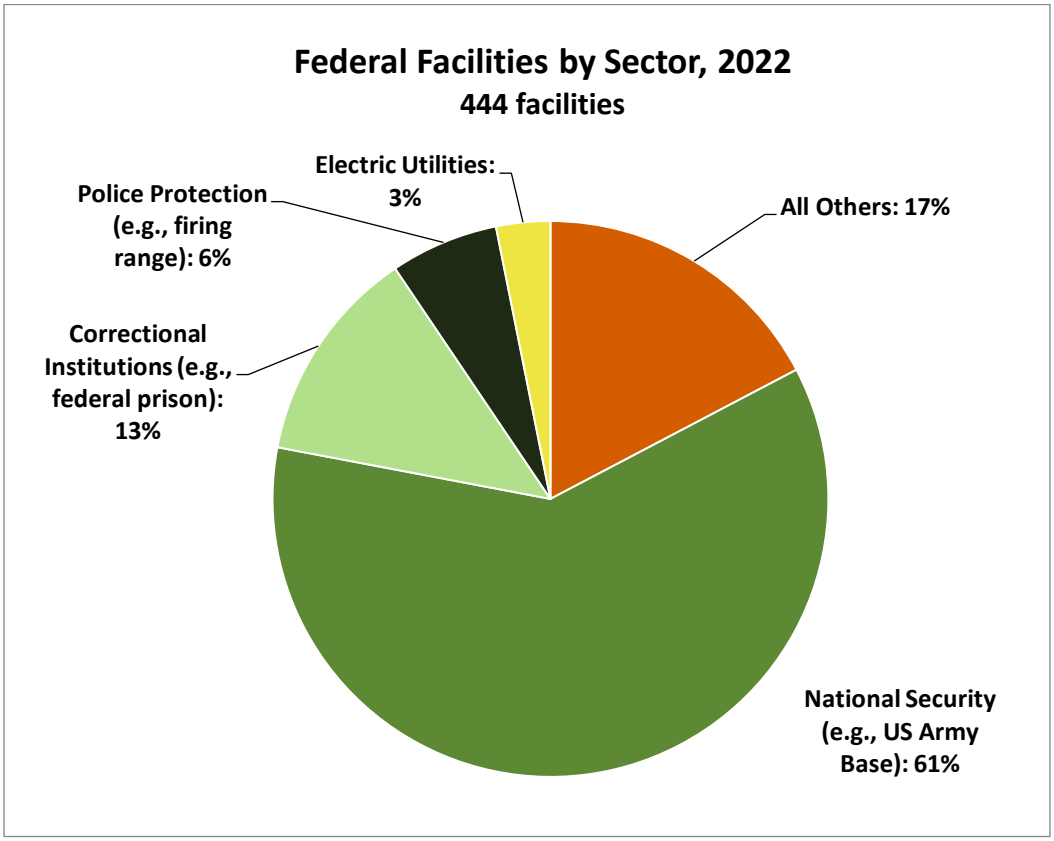


Federal Facilities Reporting to TRI, 2022

View Larger Map

Federal Facilities by Industry

The following chart shows the number of federal facilities reporting to TRI by sector for 2022.

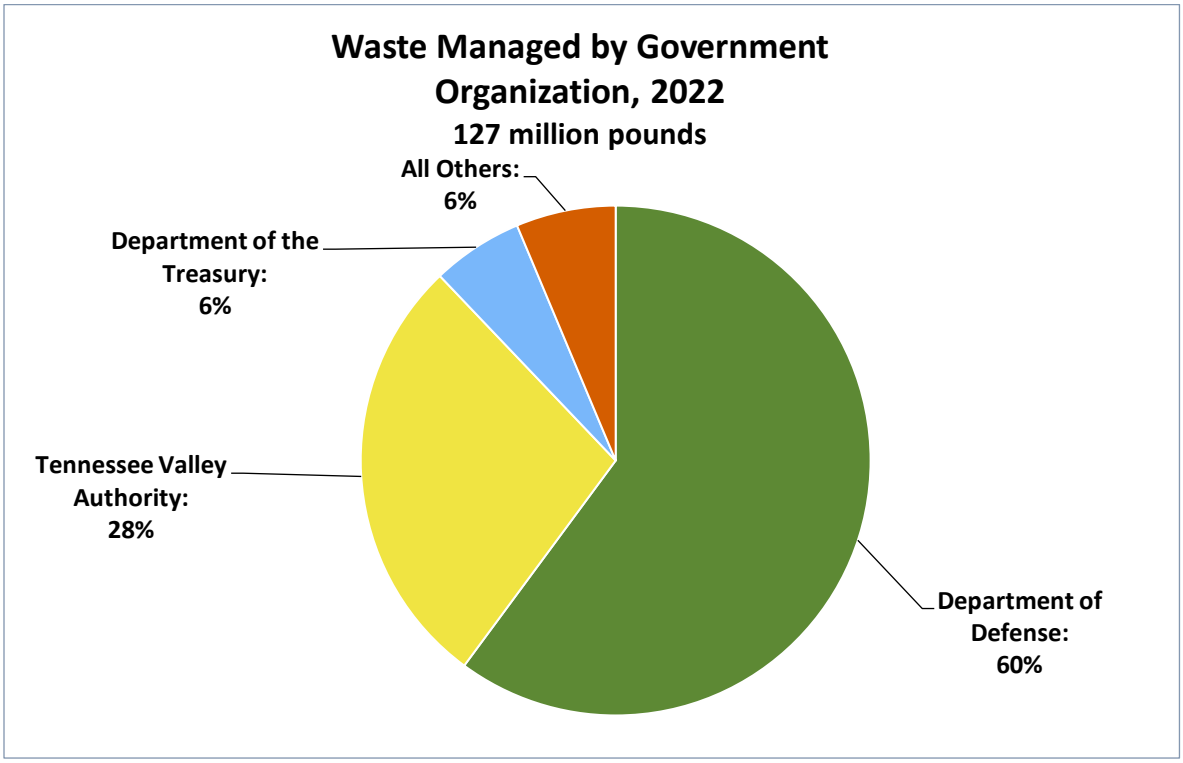


For 2022, 444 federal facilities in 41 different types of operations (based on their 6-digit NAICS codes) reported to TRI. Unlike non-federal facilities, federal facilities are subject to TRI reporting requirements regardless of their industry sector. Many federal facilities that report to TRI operate in sectors where federal facilities are the only facilities required to report to TRI, including military bases; correctional institutions; and police protection, such as training sites for border patrol stations. Almost two-thirds of the federal facilities that reported for 2022 are in the National Security sector, which includes Department of Defense facilities such as Army and Air Force bases.

As with non-federal facilities, the type of activities occurring at federal facilities determines the amount of chemical waste managed and the management methods used. Some activities occurring at federal facilities are similar to those at non-federal facilities, such as electricity production. In other cases, federal facilities may report waste managed from specialized activities. For example, the federal facilities included under police protection and correctional institutions almost exclusively reported for lead and lead compounds, likely due to the use of lead ammunition on their firing ranges.

Waste Management by Federal Facilities

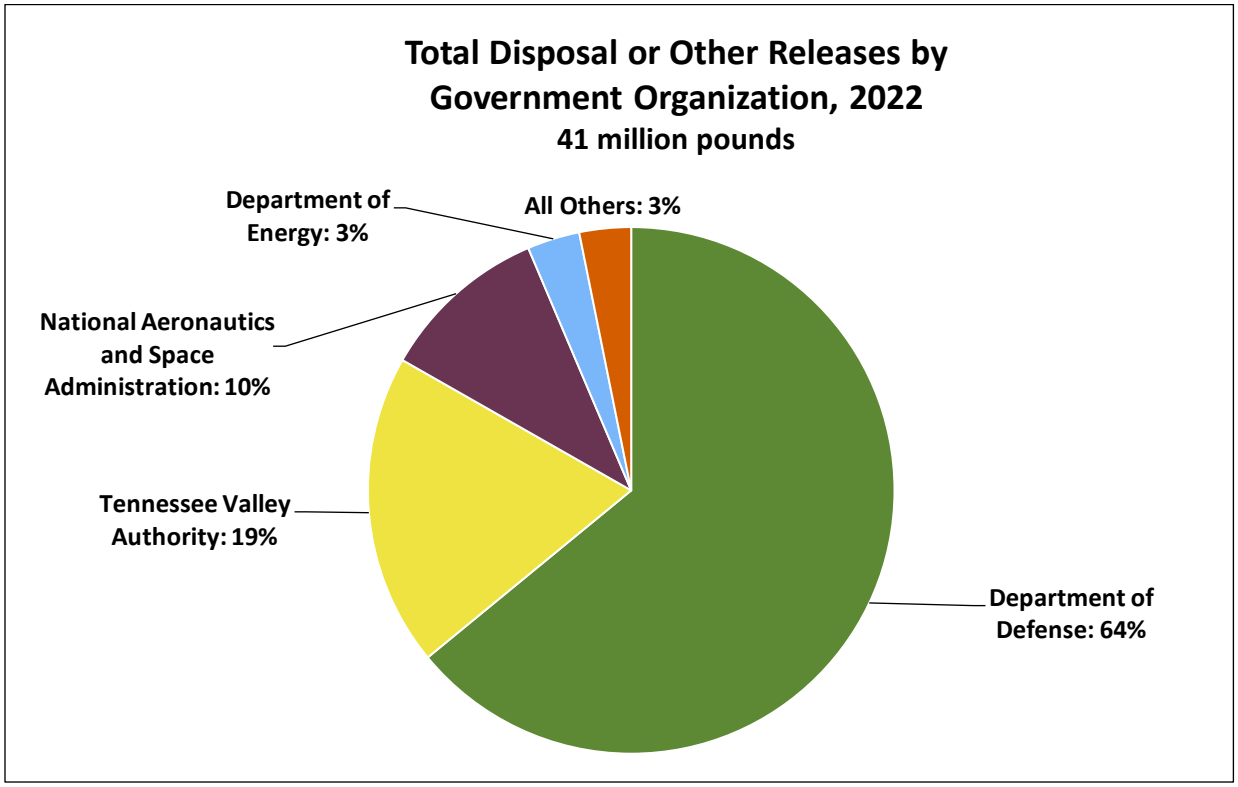
The following pie chart shows the percentages of total TRI chemical waste managed through recycling, energy recovery, treatment, and disposal or other releases by federal government organizations in 2022.



- The types of waste reported by federal facilities vary by the type of operation. For example:
  - Department of Defense facilities include Army, Marine, Navy and Air Force bases, and other military establishments. The majority of TRI waste managed by these facilities come from the use of lead- or copper-containing ammunition used in firing ranges.
  - The Tennessee Valley Authority, a government-owned electric utility, provides power to southeastern states. 80% of its reported waste was hydrochloric and sulfuric acid aerosols, which were mostly treated on site.
  - The Department of the Treasury facilities reporting to TRI are mints for manufacturing currency and, accordingly, they report metals (e.g., copper and nickel) to TRI. Almost all their metal waste was recycled off site.

Releases by Federal Facilities

The following graph shows the percentages of TRI chemicals released by federal government organizations in 2022.



- Most of the Department of Defense's releases were on-site releases of nitrate compounds to water and on-site land disposal of metals and metal compounds.
- The chemicals released by the Tennessee Valley Authority are similar to the chemicals released by other electric utilities that report to TRI. On-site land disposal of barium compounds and air releases of sulfuric acid make up a large portion of releases from the Tennessee Valley Authority and other electric utilities.

Pollution Prevention at Federal Facilities:

Federal facilities' operations are diverse and few focus on manufacturing processes. Due to the varied functions, operations at some federal facilities are better suited to pollution prevention strategies than others. For the 2022 reporting year, 32 federal facilities reported implementing pollution prevention activities.

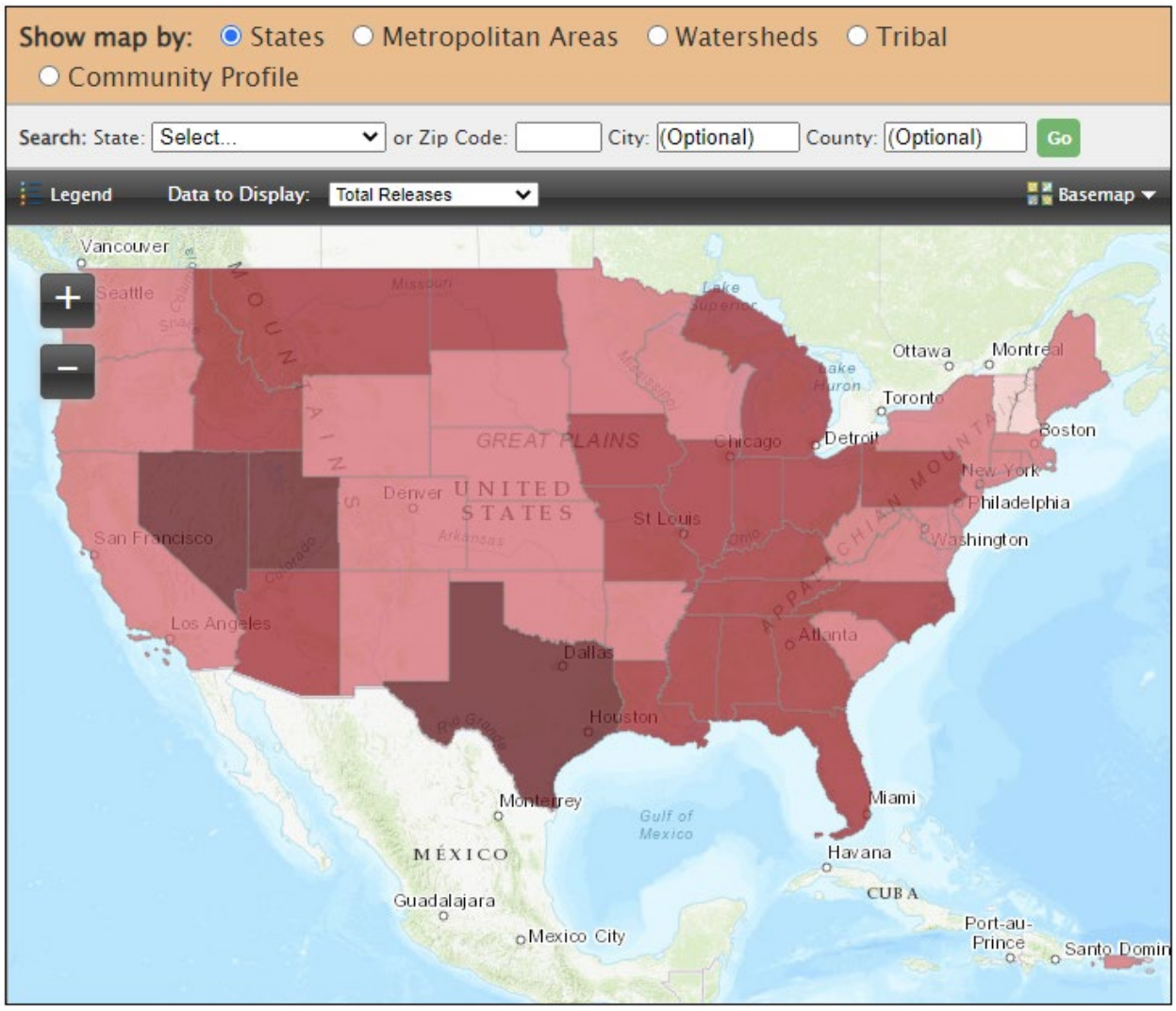
Federal facilities have often reported difficulties when trying to reduce their use of lead because it is contained in ammunition used at National Security and Park Service facilities. For 2022,

several federal facilities reported using non-lead ammunition in accordance with National Park Service policy to do so where feasible.

To find more examples of federal facilities' pollution prevention activities and the pollution prevention barriers they face, visit TRI's P2 Search Tool and select industry sectors such as National Security, Correctional Institutions, or Police Protection from the dropdown menu under "Search Criteria."

Where You Live

Use the online Where You Live tool to explore releases of Toxics Release Inventory (TRI) chemicals reported throughout the United States for 2022.



View Larger Map

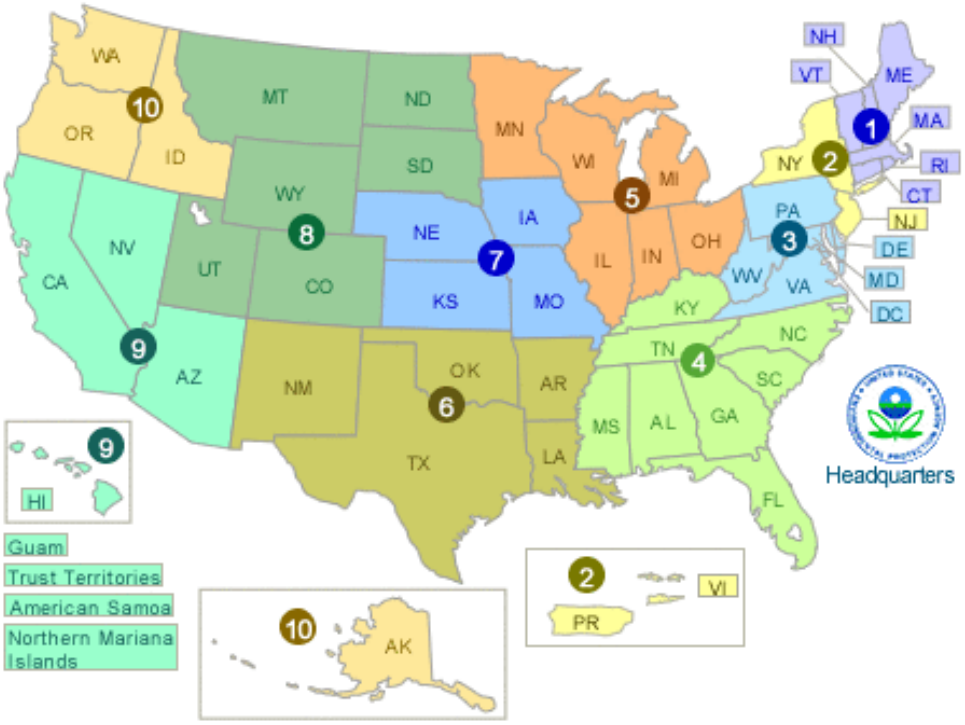
In the Where You Live tool, you can view TRI information by state, tribe, metropolitan area, and watershed. You can also view TRI facility locations along with demographic characteristics of the surrounding communities. Choose the "Community Profile" option to see community demographics using EPA's demographic index or supplemental demographic index. Use the "Data to Display" dropdown to select the metric to display. Use the Search bar to generate a fact sheet about an area of interest.

In addition to viewing maps based on release quantities, you can view maps based on risk-screening environmental indicator score (RSEI Score) which is an indicator of relative potential risks to human health following exposure to TRI chemical releases. RSEI Scores are generated by EPA's Risk-Screening Environmental Indicators (RSEI) model to allow you to compare the relative potential for impacts to human health across various locations. For more on RSEI, see the Potential Risks from TRI Chemicals section.

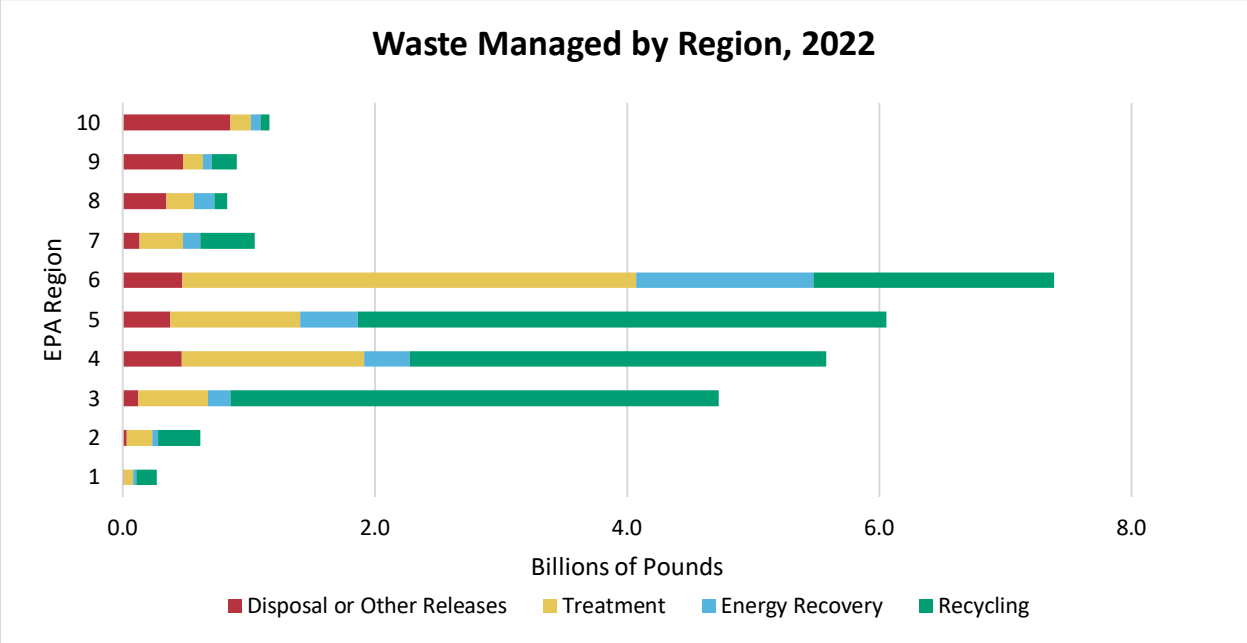
As with any dataset, there are many factors to consider when using the TRI data. A summary of key factors associated with data used in the National Analysis is in the Introduction. For more information, see *Factors to Consider When Using Toxics Release Inventory Data*.

EPA Regions

EPA has 10 regional offices, each of which is responsible for managing the TRI Program across multiple states. Some regional offices are also responsible for territories and tribes.



EPA regions vary in the type and number of facilities located in each. This results in significant differences in TRI chemical waste management practices and quantities, as shown in the figure below.



The differences in quantities of waste managed across EPA regions are largely due to the types and number of industrial facilities in each region. For example:

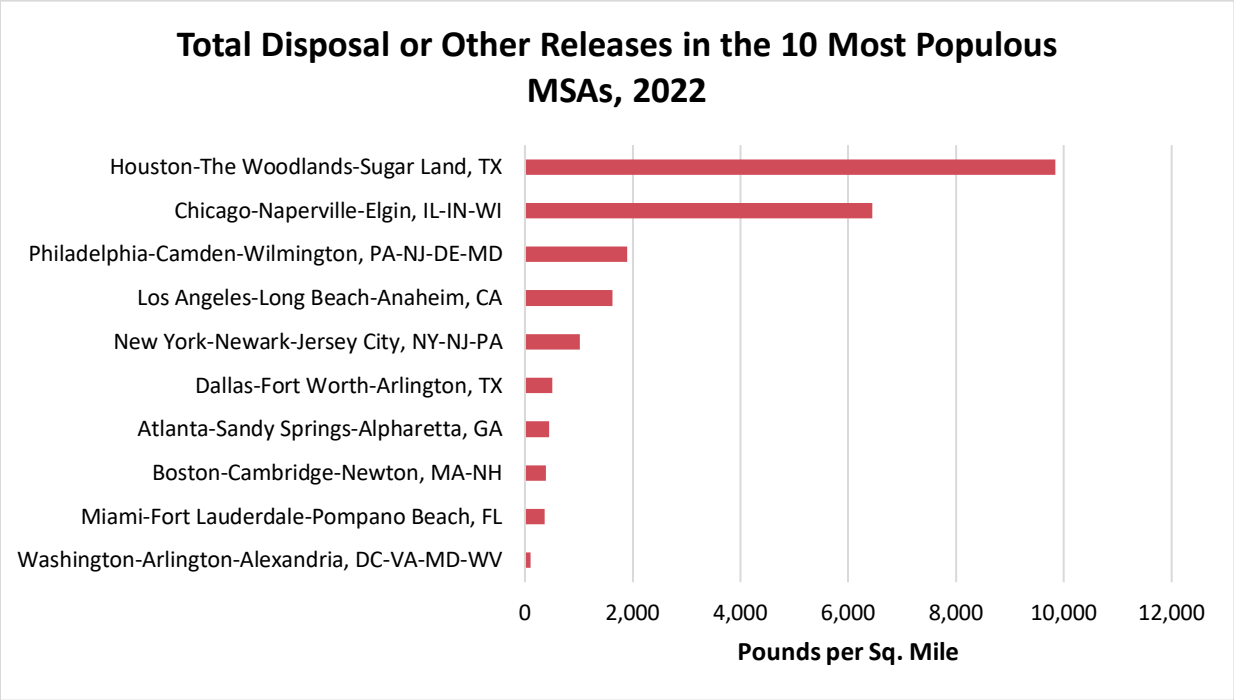
- **Region 10** facilities reported more releases for 2022 than those in any other region, totaling 855 million pounds.
    - Release quantities were driven by one metal mine in Alaska.
- In **Regions 8, 9, and 10**, the metal mining sector accounted for more releases than any other sector.
    - Metal mines tend to report high releases due to the large quantities of metals disposed of on site to land. The extraction and processing of minerals generates large amounts of on-site land disposal, primarily of metal-bearing rock (called ore) and waste rock.
    - Metal mines manage very little of their waste through treatment, combustion for energy recovery, or recycling. As a result, regions with significant metal mining operations tend to have higher releases but lower treatment, recycling, and energy recovery quantities than other regions.
- In **Region 7,** metal mines reported more releases than almost all other sectors, although only five metal mining facilities in the region reported to TRI for 2022.
- **Region 6** reported the most waste managed, driven by facilities in the chemical manufacturing sector. This sector also accounted for more of the region's releases than any other sector.

- Waste managed in **Regions 3, 4, and 5** was driven by recycling in the chemical and food manufacturing sectors. These regions all have one or two facilities reporting high quantities (i.e., more than a billion pounds) of chemicals recycled on site for 2022.
- **Regions 4 and 5** had the most facilities reporting for 2022: 4,737 and 5,275 facilities, respectively. Combined, almost half of all facilities that reported to TRI are in these two regions.
- **Regions 1 and 2** had the lowest releases and total waste managed. Nationally, most releases and waste managed are reported by facilities in the metal mining, chemical manufacturing, primary metals manufacturing, electric utilities, food manufacturing, or hazardous waste sectors. Relatively few facilities in these sectors operate in **Regions 1 and 2**, contributing to lower release and waste management quantities in these two regions.

States and Metropolitan Areas

For 2022, facilities located in all 56 states and territories reported to the TRI Program. Texas, Ohio, and California had the most facilities report to TRI, and together accounted for 20% of the total number of facilities that reported for 2022.

Approximately 80% of the U.S. population and many industrial and federal facilities that report to TRI are in urban areas. The Office of Management and Budget defines Metropolitan Statistical Areas (MSAs) as areas consisting of the county or counties "associated with at least one urban area of at least 50,000 population, plus adjacent counties having a high degree of social and economic integration" as measured through commuting ties. All MSAs are displayed on the "Where You Live" map. The chart below shows TRI chemical releases for 2022 for the 10 most populous MSAs.



Watersheds

To assess U.S. water resources, the U.S. Geological Survey divides the nation into 22 hydrologic regions, or watersheds, based on the flow of water throughout the country. Each watershed represents a major river drainage area (e.g., the Missouri region) or combines rivers' drainage areas (e.g., the Texas-Gulf region which includes several rivers draining into the Gulf of Mexico).

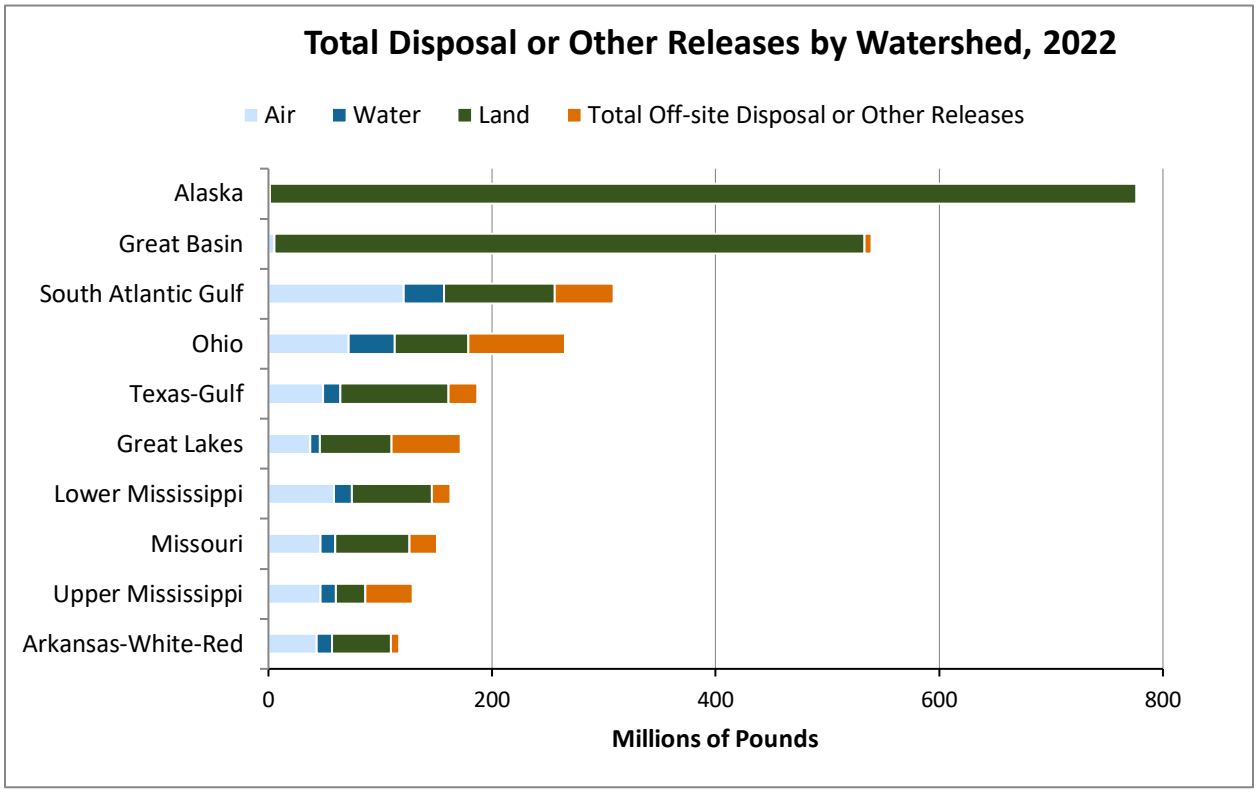
Source: USGS Science in Your Watershed

Note that the South Pacific region, consisting of Guam, the Northern Mariana Islands, and American Samoa, is not shown on this map.

Hydrologic regions are connected by the complex movement of water, such as rainwater draining into streams that flow into rivers. Every part of the US is part of a hydrologic region because water systems are connected; even chemicals released to land far from any lakes, rivers, or oceans, can eventually be carried into a faraway water body. Releases to air, land, or water can all end up impacting fish, wildlife, and other living things that depend on a water body.

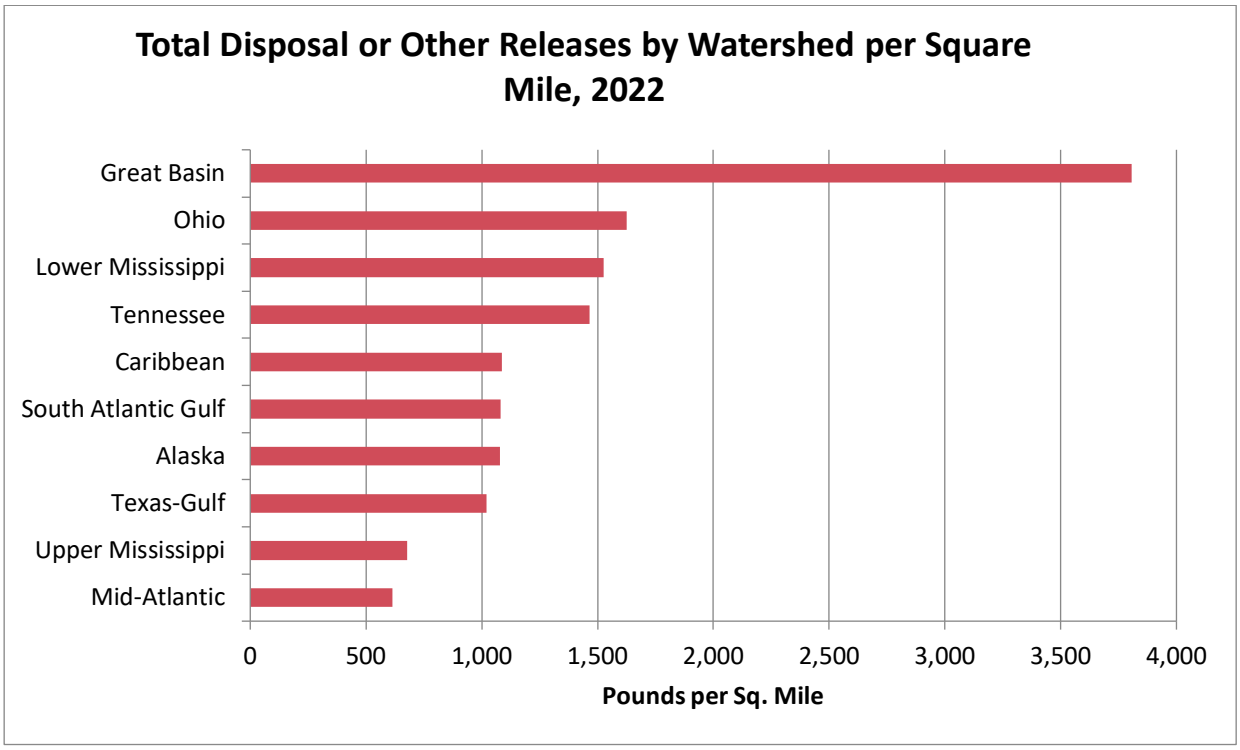
Certain chemicals can remain in the environment for a long time after they are released and build up in the tissues of wildlife living in or drinking contaminated water. These chemicals can become more concentrated as predators farther up the food chain eat these organisms. This process, called bioaccumulation, sometimes causes health problems for wildlife and humans.

All 22 watersheds are displayed on the Where You Live map. The chart below shows the ten watersheds with the most TRI chemical releases in 2022. Releases were highest in the Alaskan and Great Basin regions. In these regions, most releases were from metal mines.



Note: Chart shows the ten watersheds with the most TRI chemical releases in pounds.

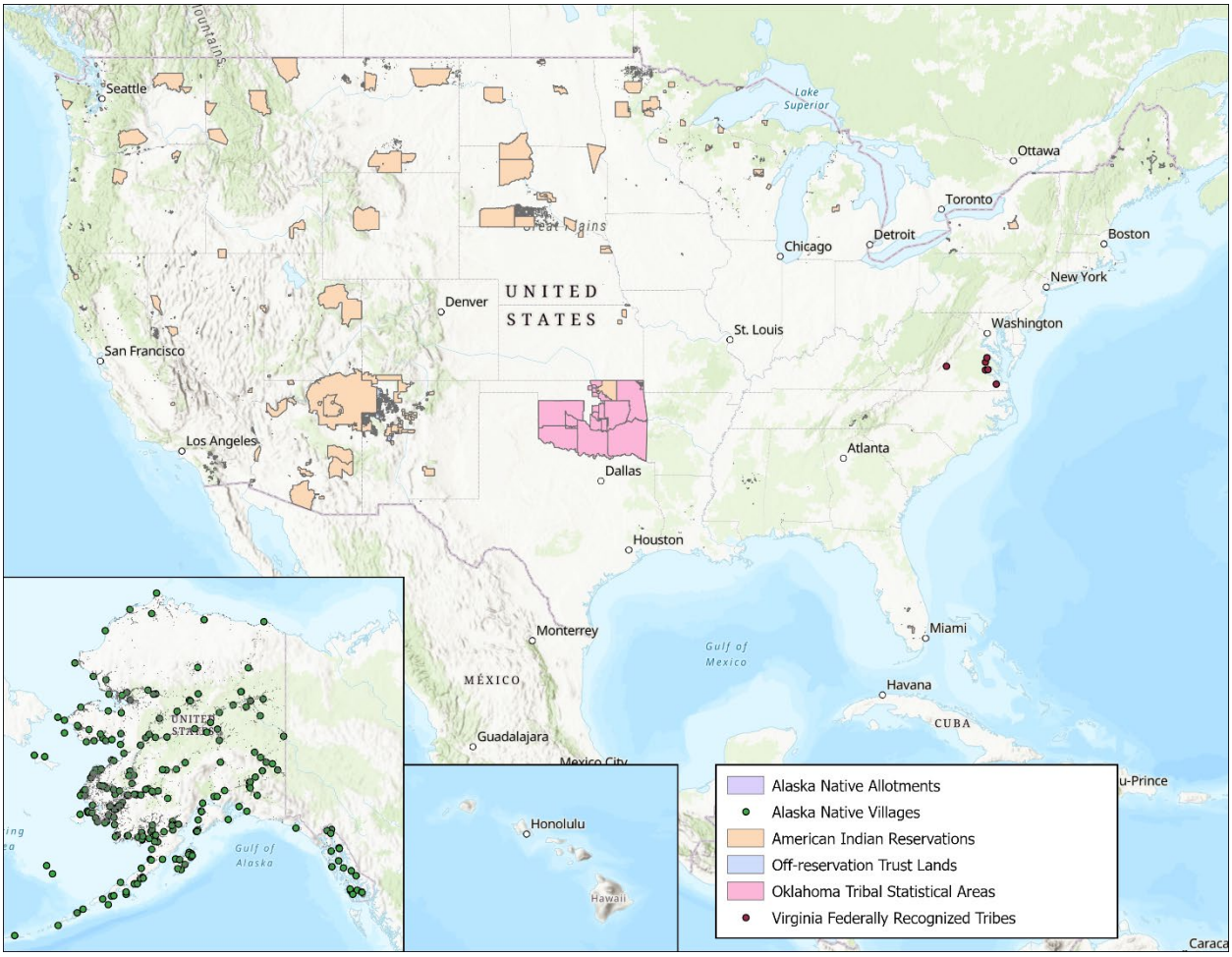
The chart below shows the ten watersheds with the most TRI chemical releases per square mile. Releases per square mile were greatest in the Great Basin region, which encompasses much of Nevada and Utah. Releases from metal mines made up 90% of the releases in this region.



Note: Chart shows the ten watersheds with the most TRI chemical releases in pounds per square mile.

Tribal Communities

Under EPA policy, the agency works with federally recognized tribes on a government-to-government basis to protect the land, air, and water in Indian Country and Alaska Native villages and to support tribal assumption of program authority.



In 2022, 374 facilities located on the land of 49 federally recognized tribes reported to TRI. These facilities collectively managed 250 million pounds of waste, 36 million pounds (14%) of which were disposed of or otherwise released. Of these releases, 60% were disposed of on site by metal mining, electric utilities, paper, and chemical manufacturing facilities. These facilities primarily disposed of metal compounds such as lead and barium. Lead is often present in the mineral ore disposed of by metal mines, and barium is present in coal and oil combusted at electric utilities.

Many more facilities are located within a 10-mile radius of tribal land. 2,150 facilities on or within 10 miles of tribal land reported to TRI for 2022, representing 250 different federally recognized tribes. These facilities collectively managed 1.29 billion pounds of waste, 207 million pounds (16%) of which were disposed of or otherwise released. Of the releases reported, 53% were released on site by chemical manufacturing, primary metals, and metal mining manufacturing facilities.

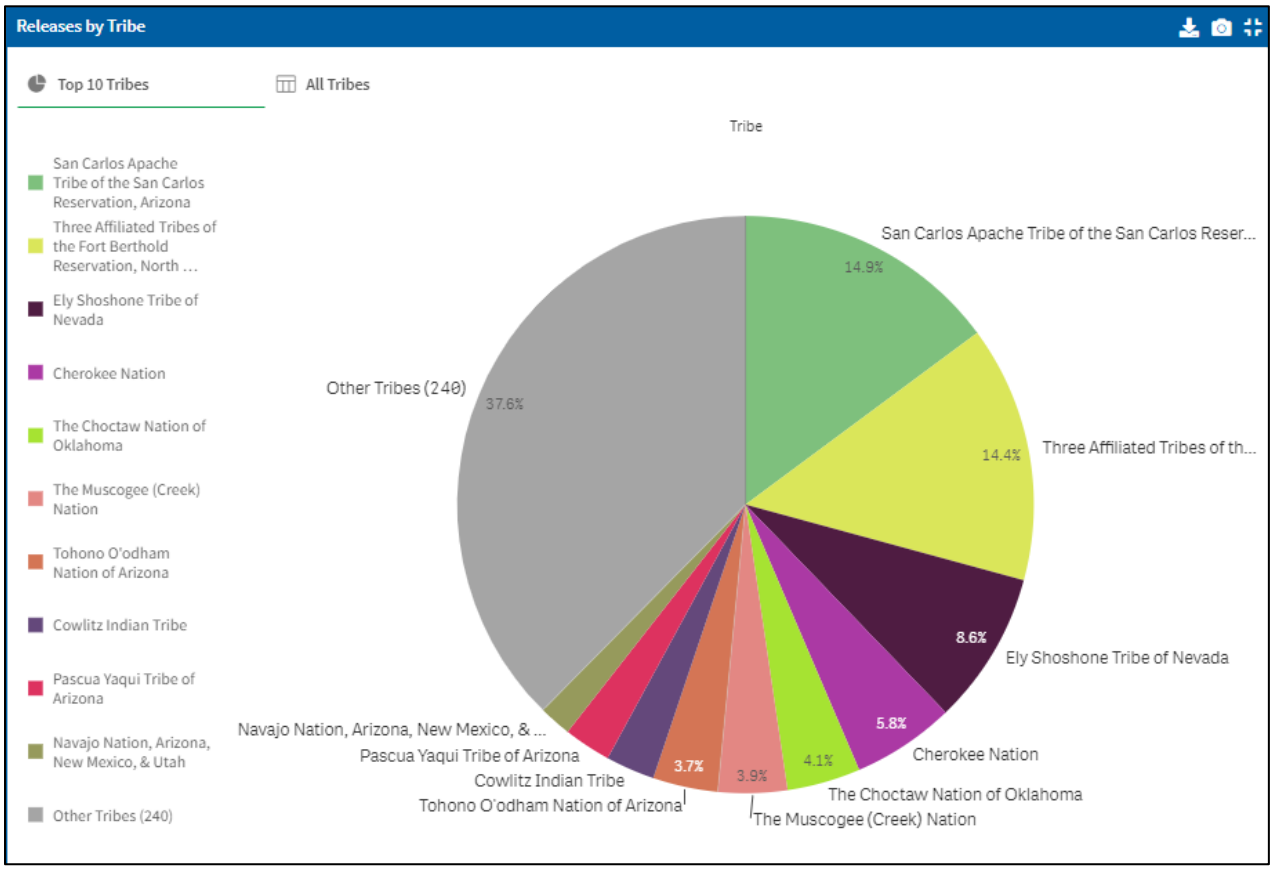
The table below provides more details about the types of releases and other waste management reported by facilities on federally recognized tribal lands.

Quick Facts for 2022: Facilities on Tribal Lands

Measure	*Facilities on Tribal Land*	*Facilities on or within 10 miles of tribal land*
Number of Facilities that Reported to TRI	**374**	**2,150**
Number of Tribes	49	250
Waste Managed	**249.9 million lb**	**1.29 billion lb**
Recycling	86.4 million lb	441 million lb
Energy Recovery	39.3 million lb	164 million lb
Treatment	88.3 million lb	475 million lb
Disposal or Other Releases	36.0 million lb	206 million lb
Total Disposal or Other Releases	**36.0 million lb**	**207 million lb**
On-site	**30.7 million lb**	**171 million lb**
Air	12.6 million lb	64.6 million lb
Water	4.1 million lb	14.4 million lb
Land	13.9 million lb	92.3 million lb
Off-site	**5.4 million lb**	**35.4 million lb**

Note: The amount of waste managed by disposal or other releases may differ from the amount shown as "total disposal or other releases" because several facilities reported managing large quantities of non-production-related waste, which is included in "total disposal or other releases" but not in "waste managed."

The TRI Toxics Tracker is one way to explore information about releases and other waste management of TRI chemicals from facilities on or near tribal lands. The chart below shows the type of TRI information in the Tribal Lands section of the TRI Toxics Tracker.



The table below lists the federally recognized tribes that had at least one TRI-reporting facility on their lands, along with the total releases and waste managed on the tribe's lands.

Total Disposal or Other Releases on Tribal Lands by Tribe, 2022

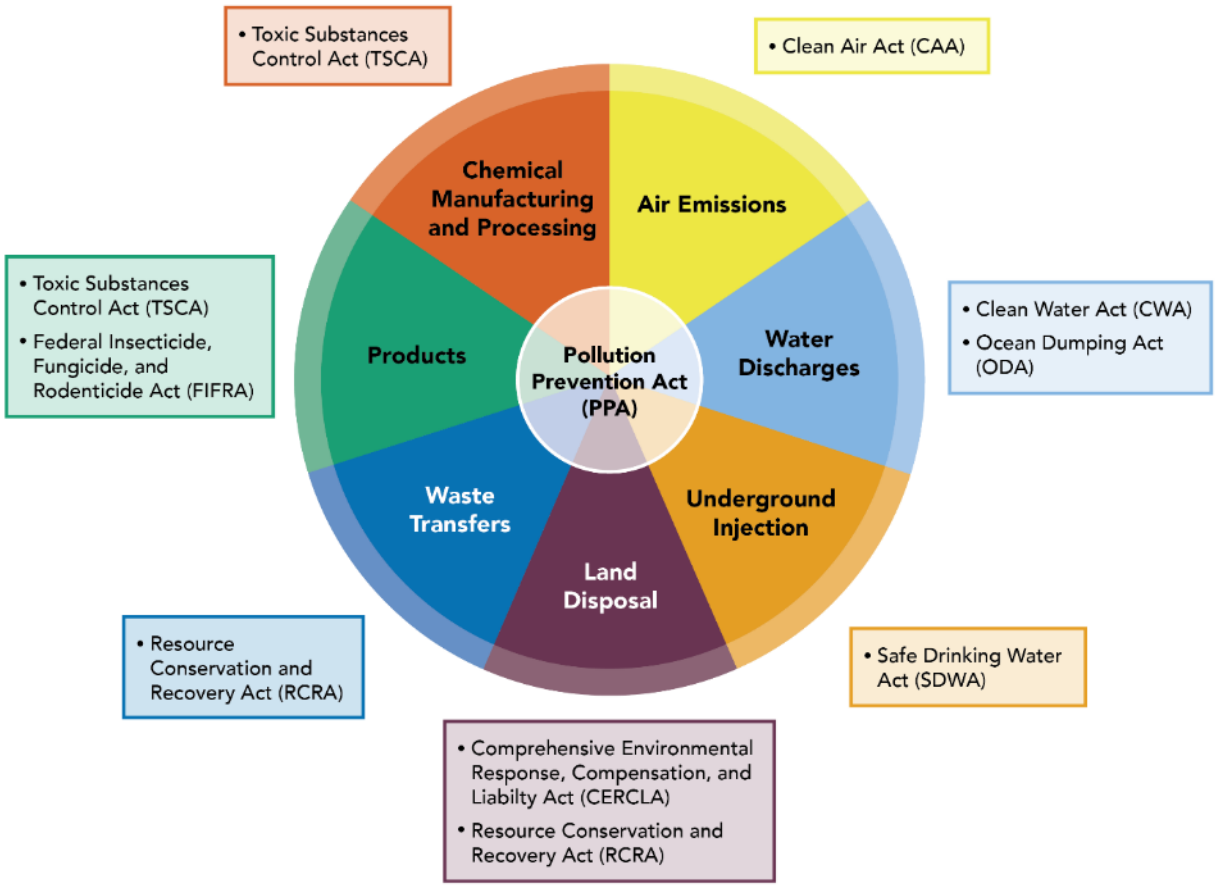
	Totals	
	Releases (lb)	Waste Managed (lb)
Totals	206,717,488	1,286,868,725
⊕ Absentee-Shawnee Tribe of Indians of Oklahoma	197,501	1,777,420
⊕ Agua Caliente Band of Cahuilla Indians of the Agua Caliente Indian Reservation, California	5	27
⊕ Ak-Chin Indian Community	40,923	146,171
⊕ Alabama-Coushatta Tribe of Texas	72,758	204,228
⊕ Apache Tribe of Oklahoma	602,247	3,424,837
⊕ Augustine Band of Cahuilla Indians, California	32,865	106,654
⊕ Bad River Band of the Lake Superior Tribe of Chippewa Indians of the Bad River Reservation, Wisconsin	2	69,245
⊕ Bay Mills Indian Community, Michigan	0	0
⊕ Bear River Band of the Rohnerville Rancheria, California	149,686	235,566
⊕ Big Valley Band of Pomo Indians of the Big Valley Rancheria, California	374	374
⊕ Blackfeet Tribe of the Blackfeet Indian Reservation of Montana	106	106

You can also view a fact sheet for each tribe using TRI Explorer.

Additional resources for tribes are available on the TRI for Tribal Communities webpage, including more detailed analyses of TRI data, links to other online tools, and contact information for EPA's Tribal Program Managers.

TRI Connections

Beyond TRI, there are many other EPA programs that collect information about regulated chemicals. The figure below is an overview of key laws that EPA implements with some associated regulated activities or industrial processes.

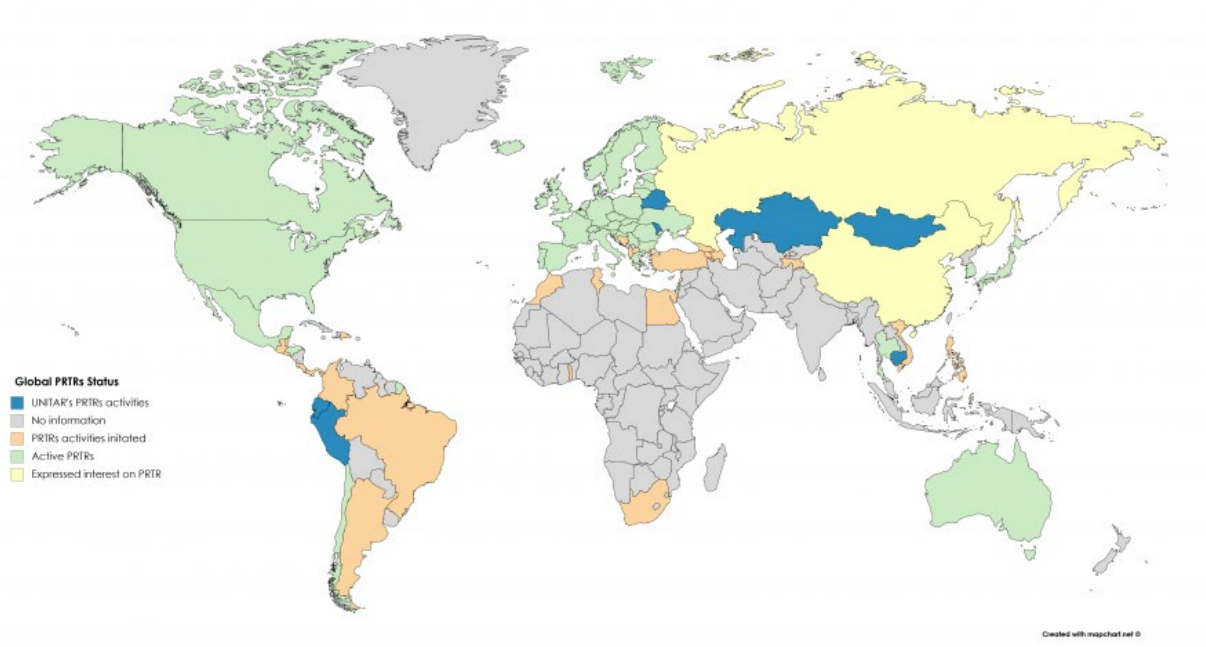


The Toxics Release Inventory (TRI) is a uniquely powerful resource that collects information about how toxic chemicals are managed by certain facilities in the United States. While most EPA programs focus on one environmental medium, the TRI Program covers all environmental media by tracking toxic chemical releases to air, water, and land, as well as chemical waste transfers. TRI also tracks other waste management practices and the implementation of pollution prevention. Since facilities report annually, TRI is one of EPA's most up-to-date sources of data. The data can be used with other datasets to provide a more complete understanding of national trends in chemical waste management practices.

Throughout EPA, offices use TRI data to support their mission to protect human health and the environment. These uses include technical analysis for regulation, informing program priorities, providing information to stakeholders, and many other applications.

TRI Around the World

In 1986, with the enactment of the Emergency Planning and Community Right-to-Know Act (EPCRA), TRI was established as the first national Pollutant Release and Transfer Register (PRTR) in the world. Since then, environmental agencies in other countries have implemented their own PRTR programs modeled after the TRI Program. Currently, at least 50 countries have fully established PRTRs or have implemented pilot programs (see map below). With assistance from international organizations like the United Nations Institute for Training and Research (UNITAR), more countries are expected to develop PRTRs, particularly in Asia, South America, and Africa.



Source: United Nations Institute for Training and Research PRTR Global Map

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

- Assist in the development of new PRTR programs.
- Promote data standards and core data elements to improve PRTR comparability and harmonization as well as to support global scale analyses.
- Showcase the usefulness of PRTR data for assessing progress towards sustainability.

See the TRI Around the World webpage for more information on the TRI Program's international partners.

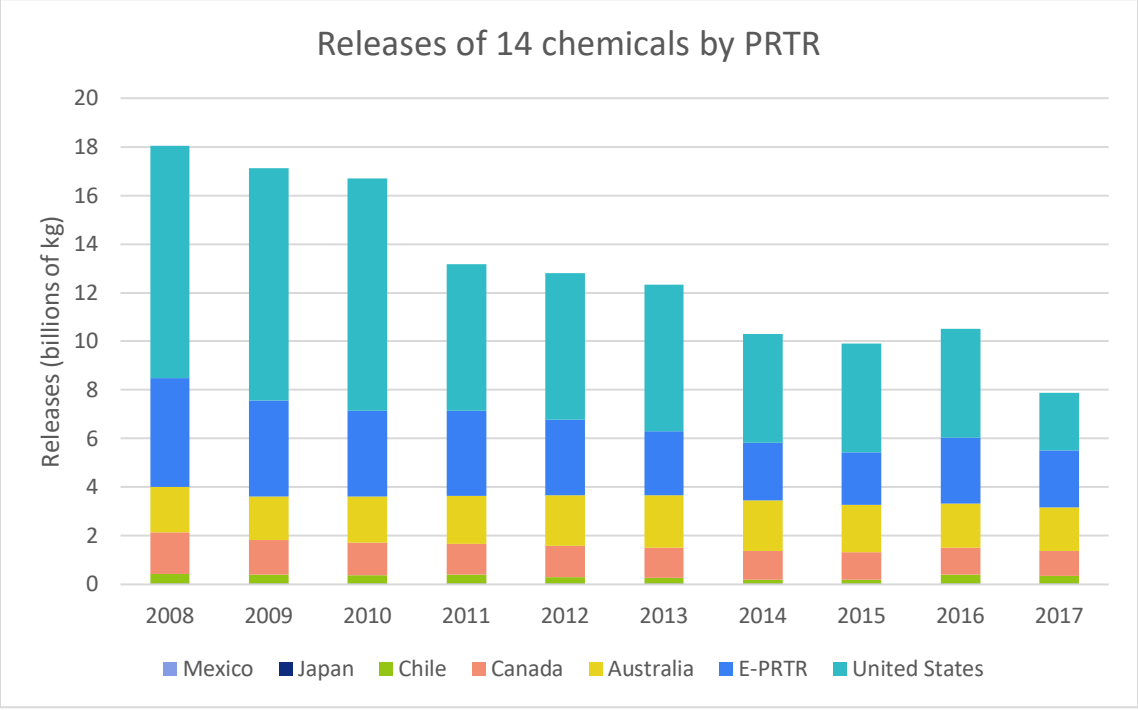
International Project Spotlight: Using PRTR Data to Assess Progress toward the U.N. Sustainable Development Goals

Watch a short video on the report on global PRTRs

Background. The TRI Program collaborates with the Organization for Economic Cooperation and Development (OECD) on PRTR projects, including a project to use global PRTR data to assess progress toward the United Nations' (U.N.) Sustainable Development Goals (SDGs). These goals are designed to "shift the world on to a sustainable and resilient path" by setting targets that encompass the economic, environmental, and social dimensions of sustainability. As stakeholders work toward the SDGs, the U.N. will measure progress using existing data where possible. Existing data sources for tracking some of the SDGs may include countries' PRTR data.

Project Focus. The U.N. SDG Target 12.4 was identified as most relevant to PRTR data; it focuses on reducing chemical releases to the environment.

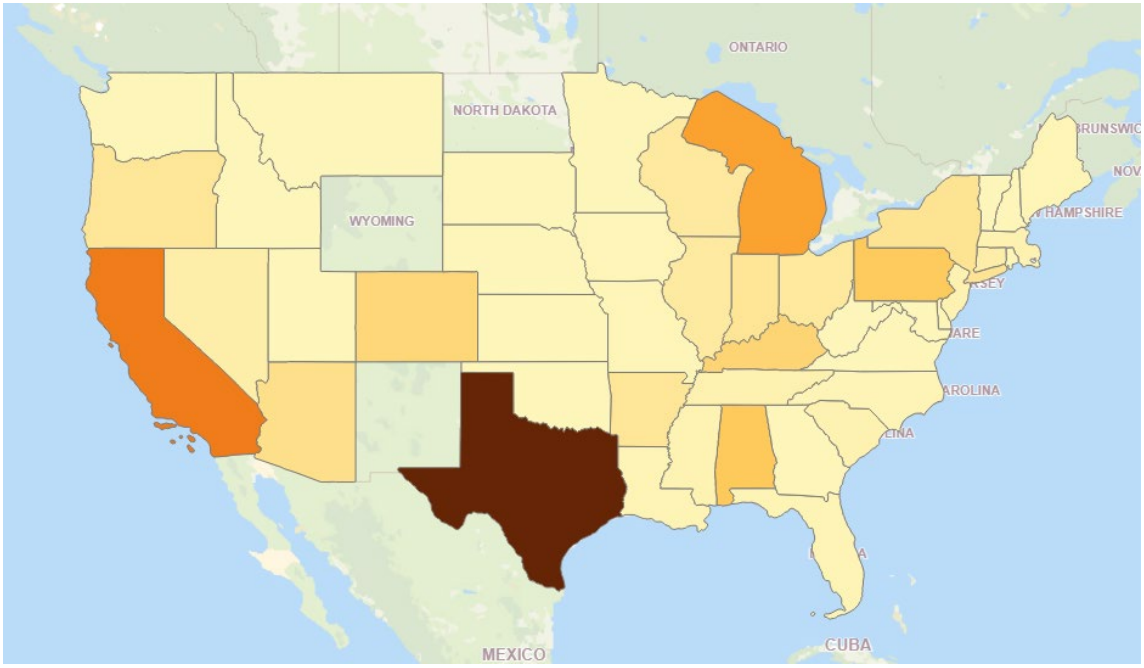
Project Status. OECD published the project report (including Spanish, French, and Japanese versions of the Executive Summary) based on aggregated data for 14 chemicals from multiple countries to assess progress toward achieving SDG Target 12.4. EPA is working with OECD to define the next steps for building on this work. Users can explore the report's underlying data using the interactive data tool on the OECD PRTR webpage.



Note: PRTRs included in the analyses: Australia – National Pollutant Inventory (NPI), Canada – National Pollutant Release Inventory (NPRI), Chile – Registro de Emisiones y Transferencia de Contaminantes (RETC), European Union – European Pollutant Release and Transfer Register (E-PRTR), Japan Pollutant Release and Transfer Register (PRTR), Mexico – Registro de Emisiones y Transferencia de Contaminantes (RETC), United States – Toxics Release Inventory (TRI). *Chemicals included in the analyses*: 1,2-Dichloroethane, Benzene, Cadmium, Chromium, Di-(2-ethylhexyl) phthalate, Dichloromethane, Ethylbenzene, Mercury, Nickel, Particulate matter, Styrene, Sulfur oxides, Tetrachloroethylene, Trichloroethylene.

Mapping Cross-Border Transfers

Facilities must report on the TRI chemicals in wastes they transfer off site for further management at other facilities, including the name and address of the receiving facility and how the waste is managed. This map shows states with TRI facilities that shipped waste containing TRI chemicals outside of the U.S. Explore the data in more depth in the full TRI National Analysis Dashboard.



- Transfers of TRI chemical waste to Mexico and Canada accounted for 84% of all cross-border transfers by weight for 2022.
    - Almost all TRI chemical waste transfers (99%) to Mexico were for recycling, primarily of metals and metal compounds. Zinc made up 77% of all transfers to Mexico by weight.
    - Most transfers to Canada were from northeastern and midwestern states. About two-thirds of the TRI chemicals sent to Canada were transferred for recycling. Transfers to Canada were mostly metals (e.g., copper, nickel) and chemicals commonly used as solvents (e.g., acetonitrile, methanol).
- The North American Commission for Environmental Cooperation (CEC) is an international collaboration between the U.S., Canada, and Mexico focused on environmental issues of common interest. Among other activities, the CEC develops *Taking Stock* reports that combine data from TRI and the equivalent programs in Mexico

and Canada. The most recent Taking Stock report includes a feature on cross-border transfers, supported by a cross-border transfers tool.