

2012 Toxics Release Inventory National Analysis Overview



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Executive Summary

The Toxics Release Inventory (TRI) tracks the management of certain toxic chemicals that may pose a threat to human health and the environment. U.S. facilities in different industry sectors must report annually on how much of each chemical is released to the environment and/or managed through recycling, energy recovery and treatment. The information submitted by facilities is compiled in TRI, and can help support informed decision-making by industry, government, non-governmental organizations and the public.

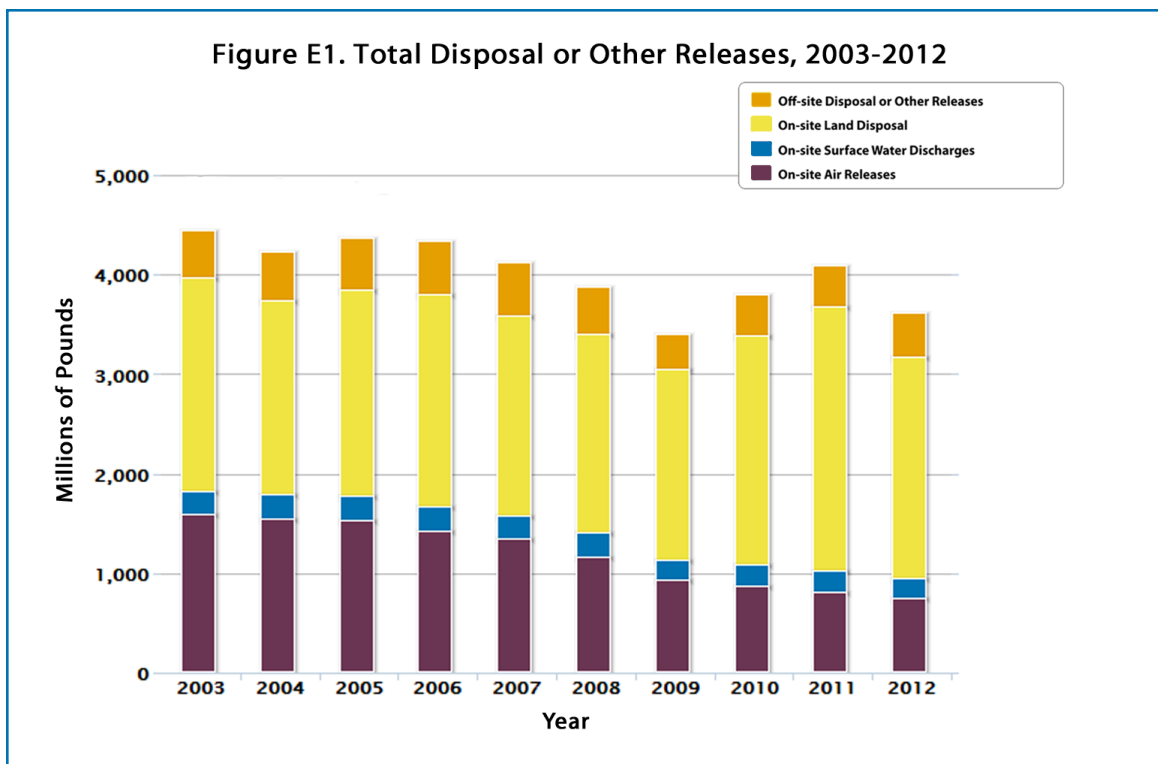
The *TRI National Analysis* is EPA's annual interpretation of TRI data. It highlights how toxic chemical wastes were managed, where toxic chemicals were released, and how the 2012 TRI data compare to data from previous years.

In 2012, 21,024 facilities reported to TRI. Together they reported total on- and off-site disposal or other releases of 3.63 billion pounds of toxic chemicals. Most were disposed of or released at the facility to air, water, or land. Figure E1 shows that disposal or other releases of TRI chemicals have generally decreased in the long-term: down 19% from 2003 to 2012. From 2011 to 2012, there was a 12% decrease in disposal or other releases, mostly due to decreases in on-site land disposal by the metal mining sector. However, disposal or other releases of chemicals to the environment focus on chemicals' final deposition and represent only a piece of the management of toxic chemicals in waste. TRI also collects information on the quantities of toxic chemicals managed through recycling, energy recovery, and treatment. This production-related waste includes the total amounts of toxic chemicals in waste managed by facilities, giving a more complete picture of what happens to chemicals at facilities.

2012 Quick Facts

TRI facilities reported disposing of or releasing 3.63 billion pounds of TRI chemicals with:

- 21% to air on-site
- 6% to water on-site
- 61% to land on-site
- 12% as off-site disposal

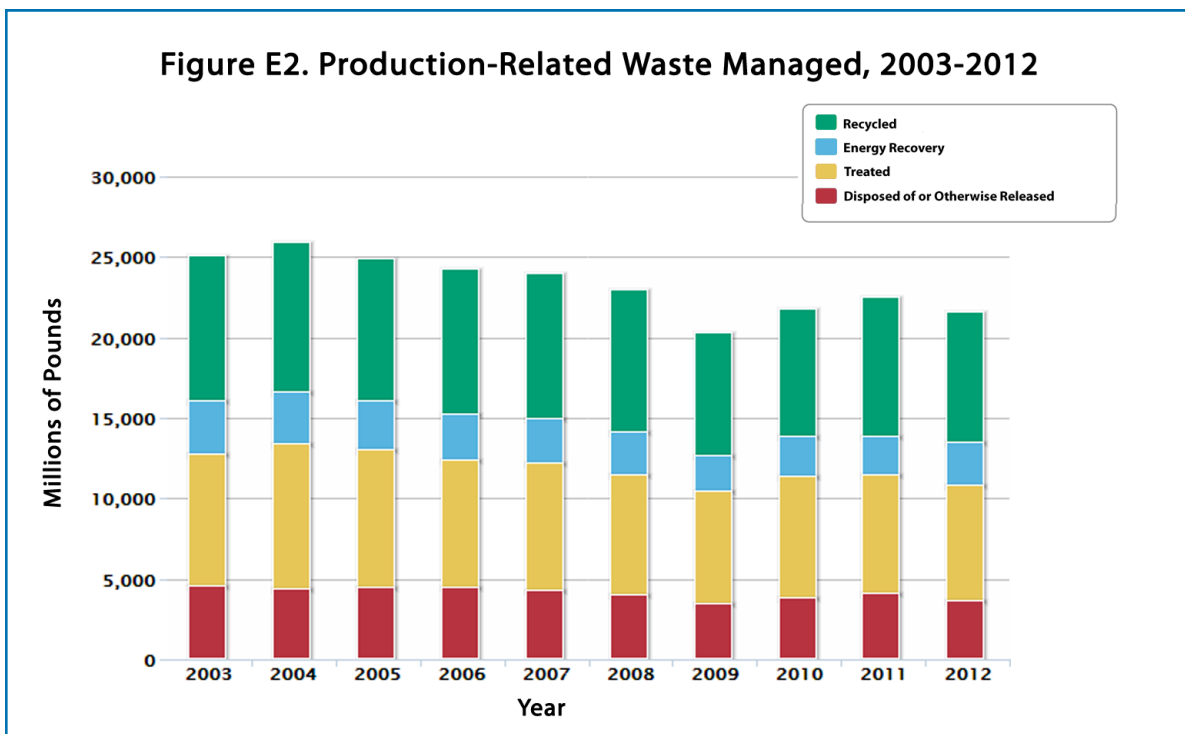


In 2012, 23.52 billion pounds of toxic chemicals were managed at TRI facilities in production-related waste. As shown in Figure E2, from 2003 to 2012, total production-related waste managed by TRI facilities declined 14% (more than 3.5 billion pounds). From 2011 to 2012, reductions occurred in the quantities of TRI chemicals in waste that were recycled, combusted for energy recovery, treated, or released.

2012 Quick Facts

23.52 billion pounds of TRI chemicals were reported as managed as waste:

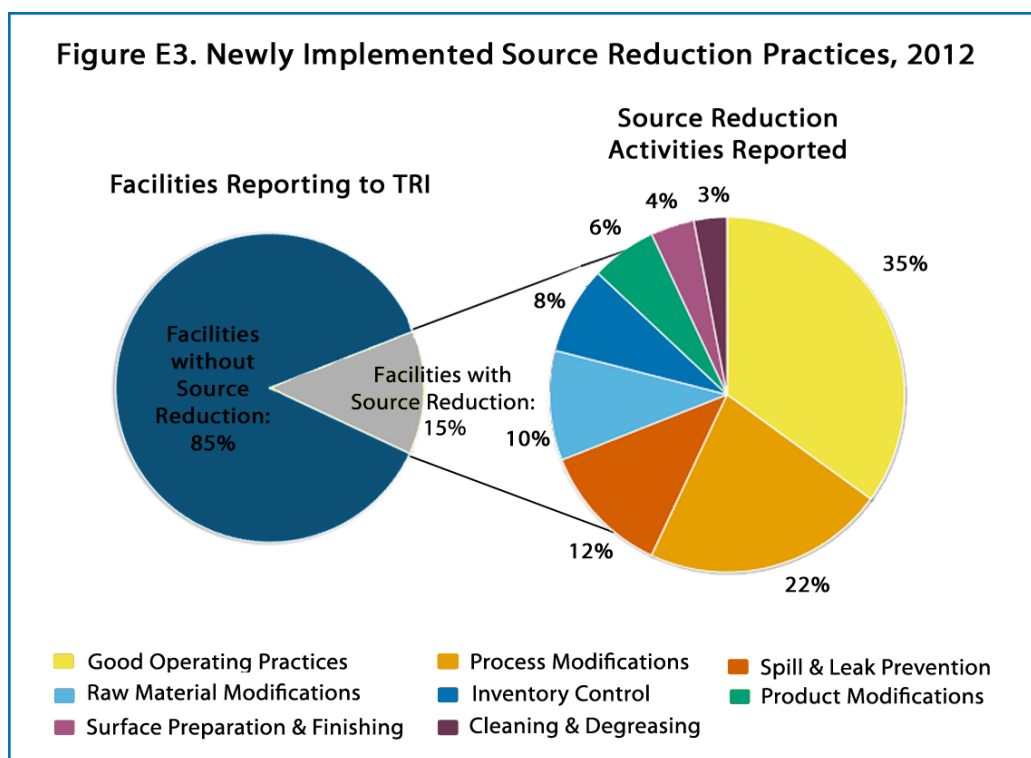
- 35% was recycled
- 12% was used for energy recovery
- 38% was treated
- 15% was disposed of or released



Facilities that report to TRI also provide information on their parent companies, if they have one. The National Analysis uses this information to highlight parent companies that reported the largest total quantity of chemicals in production-related waste managed. For 2012, the top three parent companies based on the quantities of chemicals in waste managed were: Teck American Inc (a metal mining company); Koch Industries (with facilities in paper, petroleum refining, and chemical sectors); and The Dow Chemical Company (a chemical manufacturer).

The National Analysis also highlights waste management trends within industry sectors. In 2012, 92% of total disposal or other releases of TRI chemicals originated from just seven of the 26 TRI industry sectors. More than two-thirds originated from three industry sectors: metal mining (40%), chemicals (15%), and electric utilities (14%). Most of the metal mining releases are to on-site land disposal; this sector reported nearly two-thirds (65%) of the on-site land disposal for all industries. Electric utilities reported the largest on-site air emissions, which represented over 25% of air emissions from all industries.

In addition to submitting information on releases and waste management quantities to TRI, TRI facilities also report on newly implemented source reduction activities during the year. The term “source reduction” generally refers to any practice that reduces the total quantity of chemical waste generated at the source. In 2012, a total of 3,152 facilities (15% of all TRI facilities) reported initiating 10,250 source reduction activities. Good operating practices, process modifications, and spill and leak prevention were the types of activities reported most frequently, as shown in Figure E3.



TRI data can be used in combination with other data sources to provide a more complete picture of what is going on with chemical use, management and releases. The National Analysis highlights two examples of this: the Chemical Data Reporting rule, which collects information about the manufacture and use of chemicals in commerce, and EPA’s Greenhouse Gas Reporting Program, which requires large emitters of greenhouse gases and suppliers of certain products to submit annual reports on their emissions.

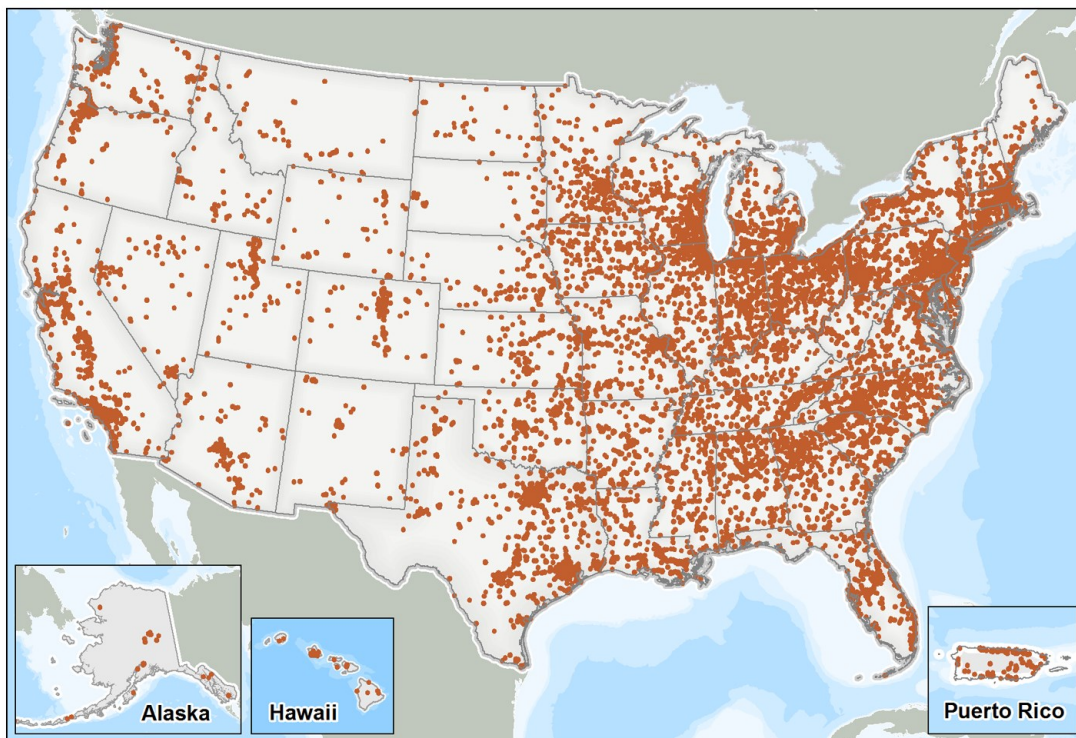
TRI can also help you find information specific to your concerns and community. In addition to this Overview document, the TRI National Analysis includes TRI information summarized by state, by urban community, by aquatic ecosystem, and by Indian Country and Native Alaska Villages. To access these analyses, go to the **2012 TRI National Analysis homepage** at www2.epa.gov/toxics-release-inventory-tri-program/2012-tri-national-analysis. For more information about the Toxics Release Inventory Program, and to access the most recent TRI data, go to **EPA’s TRI website** at www2.epa.gov/toxics-release-inventory-tri-program.

Introduction: What is the TRI National Analysis?

Tens of thousands of chemicals are used by industries and businesses in the United States to make the products on which our society depends, such as pharmaceuticals, clothing, and automobiles. Many of the chemicals needed to create these products are toxic, and some releases of toxic chemicals into the environment are inevitable.

It is your right to know what chemicals are being used in your community, how they are being disposed of, and whether their releases to the environment are increasing or decreasing over time. The Toxics Release Inventory (TRI) is an EPA program that tracks the management of certain toxic chemicals that may pose a threat to human health and the environment. This information is submitted by thousands of U.S. facilities (see Figure 1) on over 650 chemicals and chemical categories under the Emergency Planning and Community Right-to-Know Act and the Pollution Prevention Act .

Figure 1. Geographic Distribution of TRI-Reporting Facilities

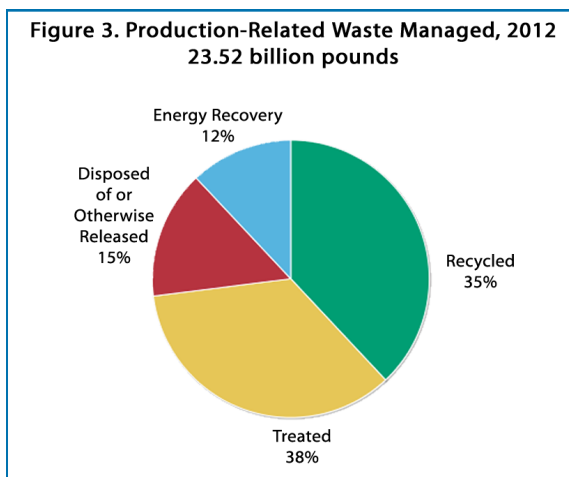
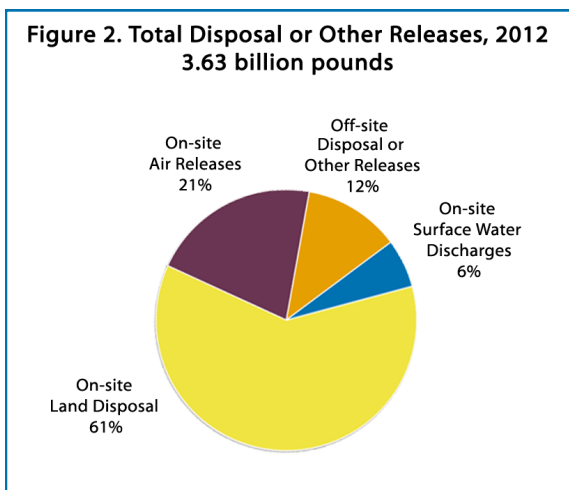


Facilities that report to TRI are typically large and are from industry sectors involved in manufacturing, metal mining, electric power generation, and hazardous waste treatment. Federal facilities are also required to report to TRI by Executive Order 13148.

The TRI National Analysis is developed on an annual basis, and the 2012 TRI National Analysis is EPA's interpretation of TRI data reported for 2012. It provides the public with valuable information on how toxic chemicals were managed, where toxic chemicals were released, and how the 2012 TRI data compare to data from previous years.

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

The National Analysis provides a snapshot of the data at one point in time. Any reports submitted to EPA after the July 1st reporting deadline may not be processed in time to be included in the National Analysis. The most recent data available are accessible in the [TRI Tools and Resources](#) listed at the end of this document.



Quick Facts for 2012

Number of TRI Facilities: 21,024

Total Disposal or Other Releases: 3.63 billion lb

- **On-site:** 3.19 billion lb
 - Air: 0.76 billion lb
 - Water: 0.21 billion lb
 - Land: 2.23 billion lb
- **Off-site:** 0.44 billion lb

Production-Related Waste Managed: 23.52 billion lb

- Recycled: 8.15 billion lb
- Energy Recovery: 2.88 billion lb
- Treated: 8.85 billion lb
- Disposed of or Otherwise Released: 3.64 billion lb

In 2012, 21,024 facilities reported to TRI. These facilities reported total on- and off-site disposal or other releases of 3.63 billion pounds of toxic chemicals. As shown in Figure 2, most were disposed of or released on-site to land (including landfills, other land disposal and underground injection).

TRI production-related waste managed is the quantity of toxic chemicals in waste that is recycled, burned for energy recovery, and treated as well as in waste that is disposed of or otherwise released. In other words, it encompasses all toxic chemicals in waste generated from facilities' processes and operations. In 2012, TRI facilities reported managing 23.52 billion pounds of toxic chemicals in production-related wastes. Of this total, 19.88 billion pounds were recycled, burned for energy recovery, or treated, and 3.64 billion pounds were disposed of or otherwise released to the environment, as shown in Figure 3.



Note that the two metrics related to disposal or other releases shown in Figures 2 and 3 are similar (3.63 billion pounds and 3.64 billion pounds, respectively), but are not the same. This is because the value reported under disposal or other releases only counts the quantity of toxic chemicals in waste once at final deposition. However, the value reported under production-related waste managed counts the toxic chemical waste as many times as it is managed during the year. For example, if a TRI facility transfers a waste off-site to another TRI facility that disposes of it to land, the waste would be counted twice (once for each facility that manages it) under production-related waste managed, but only once under disposal or other releases. Also, waste from catastrophic, remedial or one-time events (typically not related to production) is not included in production-related waste managed, while such waste is included in the total disposal or other releases amounts shown in Figure 2.

This National Analysis Overview presents information on a national scale. To help you find information specific to your community, EPA provides geographic profiles on its TRI National Analysis homepage that focus on urban communities, tribal lands, and large aquatic ecosystems. EPA's TRI Program also provides more detail about the TRI data and maintains a variety of tools and resources to help you conduct your own analysis of TRI data. Links to all of these resources can be found in the [TRI Tools and Resources](#) listed at the end of this document.

Disposal or Other Releases of TRI Chemicals

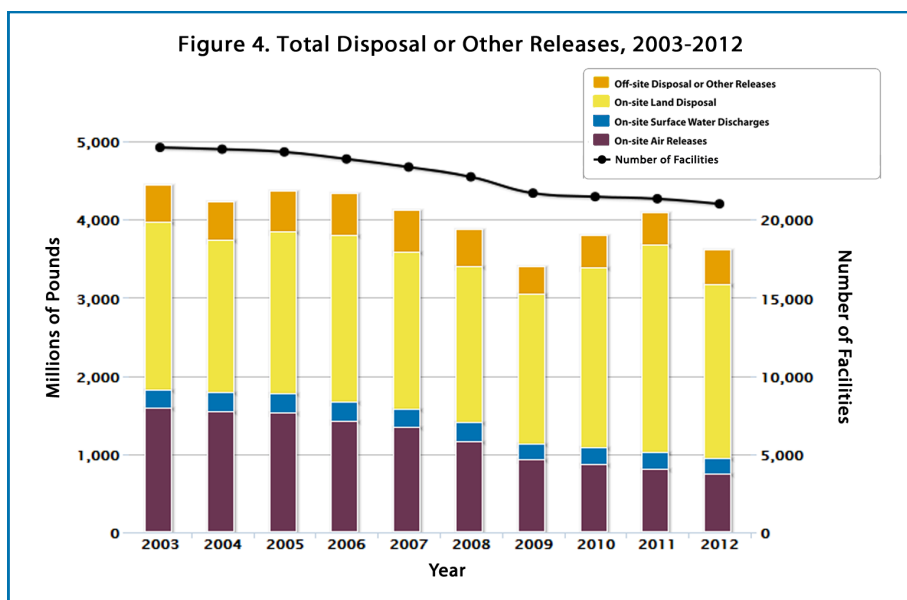
Disposal or other releases of chemicals into the environment occur through a range of practices. They may take place at a facility as an on-site disposal or other release to air, water, or land; or they may take place at an off-site location after a facility transfers waste that contains TRI chemicals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

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

What is a release?

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

Figure 4 shows that total disposal or other releases of TRI chemicals have generally decreased in the long-term: down 19% from 2003 to 2012. From 2011 to 2012, there was a 12% decrease in releases, mostly due to decreases in on-site land disposal by the metal mining sector. The number of facilities reporting to TRI has also declined steadily, decreasing by 15% from 2003 to 2012, and by 2% from 2011 to 2012.



Many factors can affect trends in total disposal or other releases, including changes in production, changes in management practices at facilities, changes in the composition of raw materials used at facilities and installation of control technologies. The long-term decreases from 2003 to 2012 in releases have been driven mainly by declining air releases, down 850 million pounds (54%) since 2003. Most of this decline was due to decreases in hazardous air pollutant (HAP) emissions, such as hydrochloric acid, at electric utilities. Reasons for the decreases include a shift from coal to other fuel sources and installation of control technologies at coal-fired power plants.

In more recent years, the large fluctuations in releases have been driven mainly by changes in on-site land disposal at metal mines. Metal mines accounted for 97% of the 696 million pound increase in total releases from 2009 to 2011, and 88% of the 483 million pound decrease in total releases from 2011 to 2012. Figure 5 shows on-site land releases over time in more detail. The fluctuations from 2009 to 2012 were mainly due to

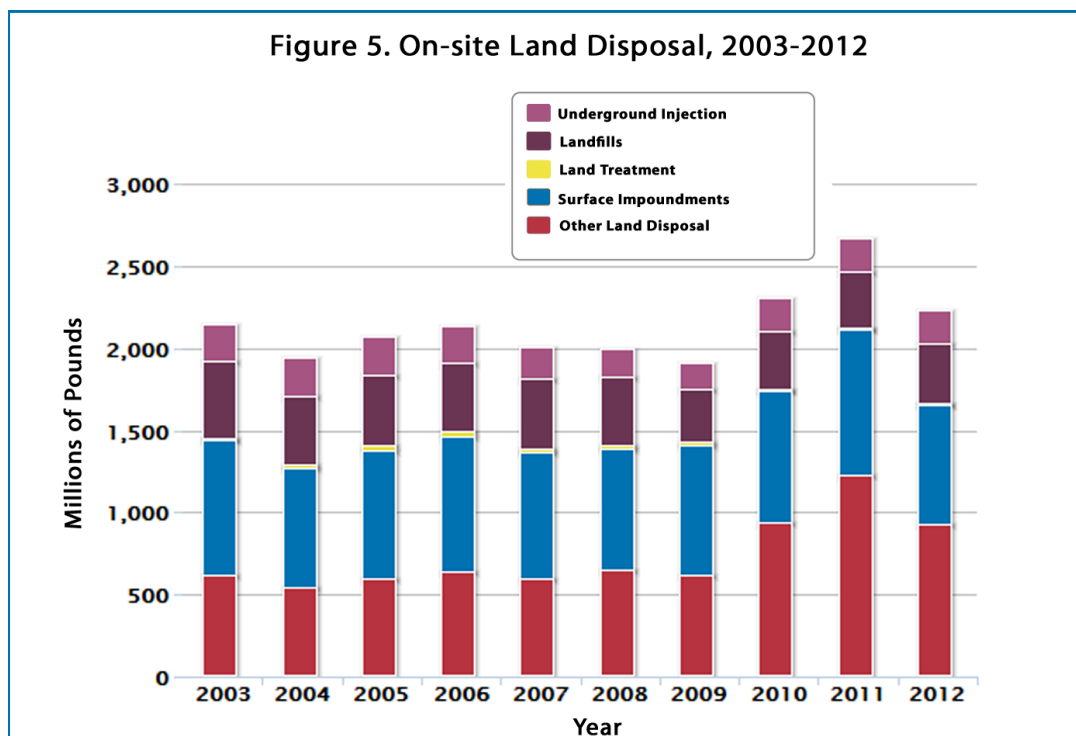
changes in waste quantities reported to TRI as “other land disposal” which generally includes toxic chemical waste disposed of in waste piles and spills or leaks. More specifically, most of the toxic chemical waste reported as other land disposal came from waste rock at metal mines.

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

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

What is waste rock?

Rock removed from a mine is called “waste rock” if it does not contain economically recoverable amounts of targeted metals (e.g., copper, gold). TRI chemicals naturally present in waste rock in small concentrations are almost all reported to TRI as “other land disposal.”

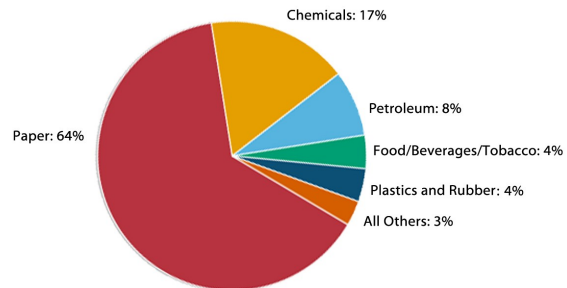


Each of these land disposal categories includes a range of disposal types that vary in nature, some of which are more tightly regulated than others.

Hydrogen Sulfide Reported in 2012

Reporting Year 2012 is the first year TRI has required facilities to submit information on hydrogen sulfide. Hydrogen sulfide is a chemical commonly produced through industrial operations, oil and natural gas extraction, and from the breakdown of organic matter. It is associated with chronic health effects in humans such as neurotoxic and upper respiratory effects, as well as adverse effects in aquatic organisms. While it was added to the TRI list of reportable toxic chemicals in a 1993 rulemaking, EPA issued an Administrative Stay in 1994 that deferred reporting while the Agency completed further evaluation of the chemical. EPA lifted the Administrative Stay on hydrogen sulfide in 2011, with reports on hydrogen sulfide due to TRI for activities in 2012.

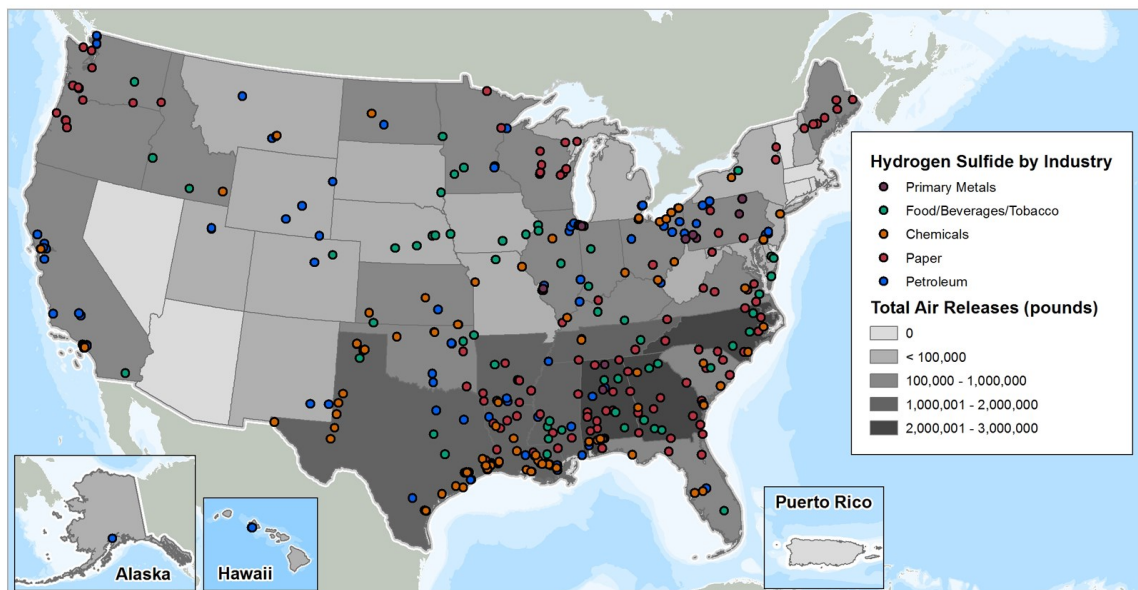
Figure 6. Hydrogen Sulfide Air Releases, 2012
20.3 million pounds



For 2012, 484 facilities submitted TRI forms for hydrogen sulfide, with the most reporters in the petroleum (142), chemical (115), and paper (114) industries. Air releases from these three industries accounted for 89% of the 20.3 million pounds of hydrogen sulfide air releases, as shown in Figure 6. Seventeen facilities also reported newly implemented pollution prevention activities for hydrogen sulfide, including establishing a monitoring program of potential spill or leak sources and making process modifications.

The map below shows the TRI facilities by sector that reported hydrogen sulfide air releases for 2012.

Figure 7. Facilities Reporting Hydrogen Sulfide Air Emissions, by Sector



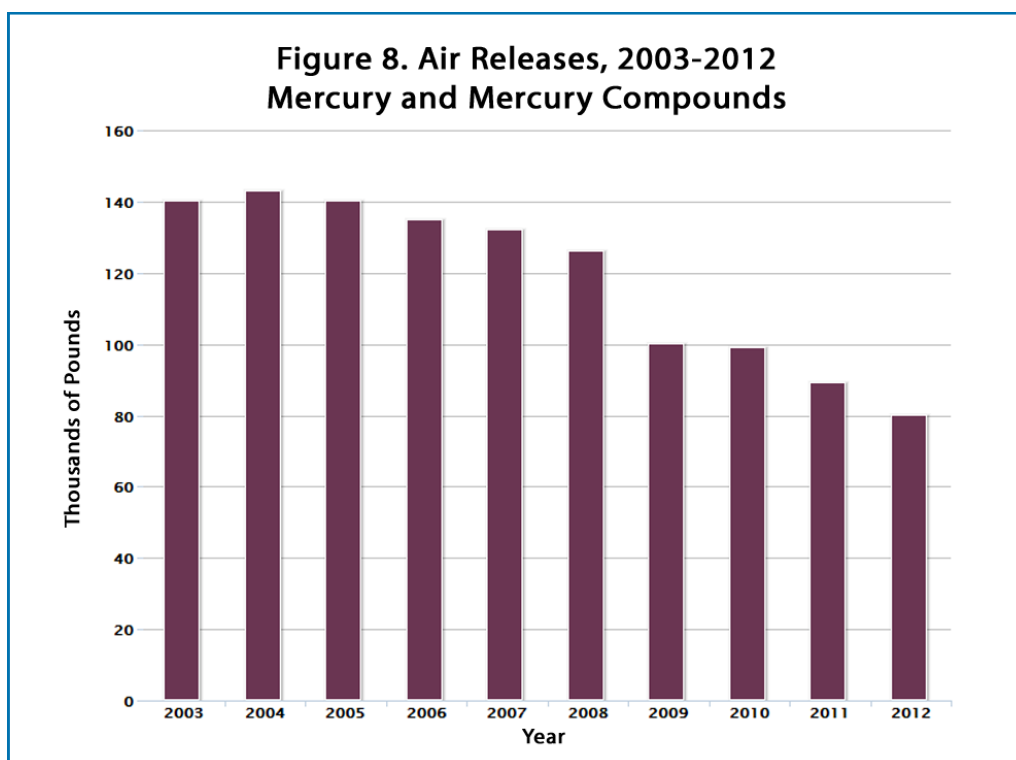
Some of the chemicals on the TRI chemical list have been designated as persistent, bioaccumulative, and toxic (PBT) chemicals. PBT chemicals are of particular concern not only because they are toxic, but also because they remain in the environment for long periods of time, and they tend to build up, or bioaccumulate, in the tissue of organisms. Here we look more closely at several PBT chemicals: lead and lead compounds; mercury and mercury compounds; and dioxin and dioxin-like compounds.

PBT Chemicals

Persistent, bioaccumulative, and toxic (PBT) chemicals have different [TRI reporting requirements](#) than other chemicals. PBT chemicals are of particular concern because they remain in the environment for long periods of time and tend to build up in the tissue of organisms.

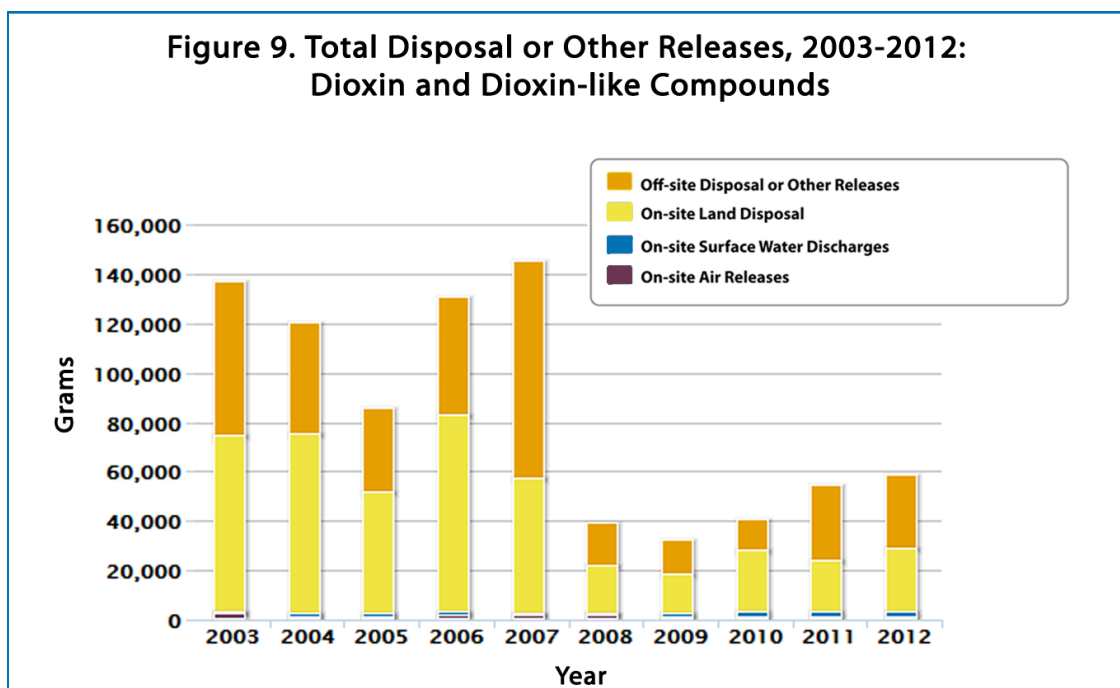
Lead and lead compounds accounted for 98% of the total disposal or other releases of PBT chemicals in 2012 and drive PBT trends over time. Releases of lead and lead compounds rose and fell between 2003 and 2012, with a substantial increase occurring from 2009 to 2011 (102%), followed by a 22% decline in 2012; trends were driven by changes in on-site land disposal or other releases from the metal mining sector.

Mercury, another PBT chemical of concern, has traditionally been used to make products such as thermometers, switches, and some light bulbs. It is also found in many naturally occurring ores and minerals, including coal. The overall trend in total disposal or other releases of mercury and mercury compounds is also driven by metal mines, which accounted for 97% of on-site land disposal of mercury in 2012. In the United States, coal-burning power plants are the largest source of mercury emissions to the air. Since 2003, air releases of mercury and mercury compounds decreased by 42%, including a 10% decrease from 2011 to 2012, as shown in Figure 8. Electric utilities, which include coal- and oil-fired power plants, accounted for 60% of the mercury and mercury compounds air emissions reported to TRI in 2012. This sector is also driving the decline in mercury air emissions, with a 47% reduction since 2003, and a 17% reduction from 2011 to 2012.



Some reasons for the decreases include a shift from coal to other fuel sources and installation of control technologies at coal-fired power plants.

Dioxin and dioxin-like compounds (dioxins) are PBTs and characterized by EPA as probable human carcinogens. Dioxins are the unintentional byproducts of most forms of combustion and several industrial chemical processes. Figure 9 shows the amount of dioxin total disposal or other releases in grams. Releases of dioxins decreased by 57% from 2003 to 2012, but increased 8% from 2011 to 2012. This increase in 2012 was largely due to an increase in dioxins reported by one primary metals manufacturer. In 2012, most (72%) of the quantity released was disposed of in landfills on- and off-site.

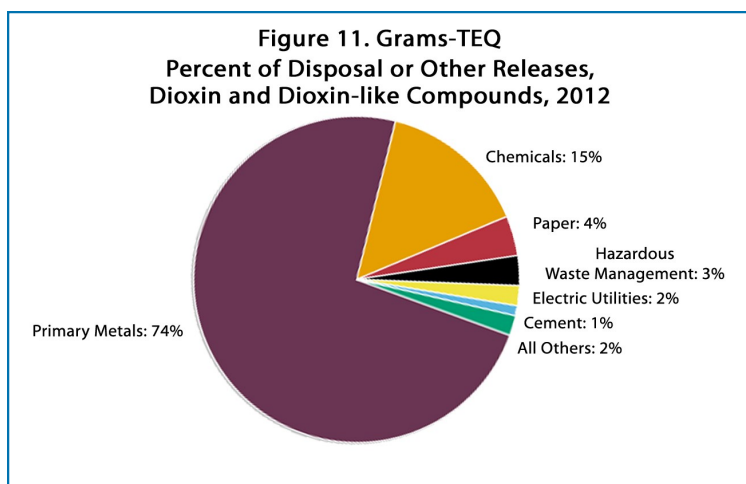
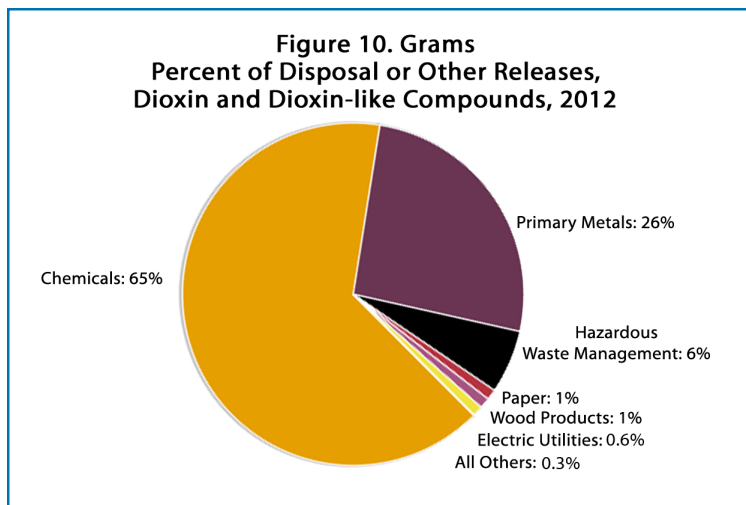


TRI requires facilities to report on 17 types of dioxin and dioxin-like compounds (or congeners). These congeners have a wide range of toxicities. The mix of dioxins from one source can have a very different level of toxicity than the same total amount, but different mix, from another source. These varying toxicities can be taken into account using Toxic Equivalency Factors (TEFs), which are based on each congener's toxicity. The total grams of each congener can be multiplied by its TEF to obtain a toxicity weight. The results can then be summed for a total of grams in toxicity equivalents (grams-TEQ). Analyzing dioxins in grams-TEQ is useful when comparing disposal or other releases of dioxin from different sources, or different time periods, where the mix of congeners may vary. Since 2010, when TEQ was first included in TRI for dioxins, grams-TEQ have increased by 49% while dioxin grams released have increased by 45%. This similar increase in grams and grams-TEQ indicates that there has been little change in the overall toxicity of the mix of dioxins released over the past three years.

What is grams-TEQ?

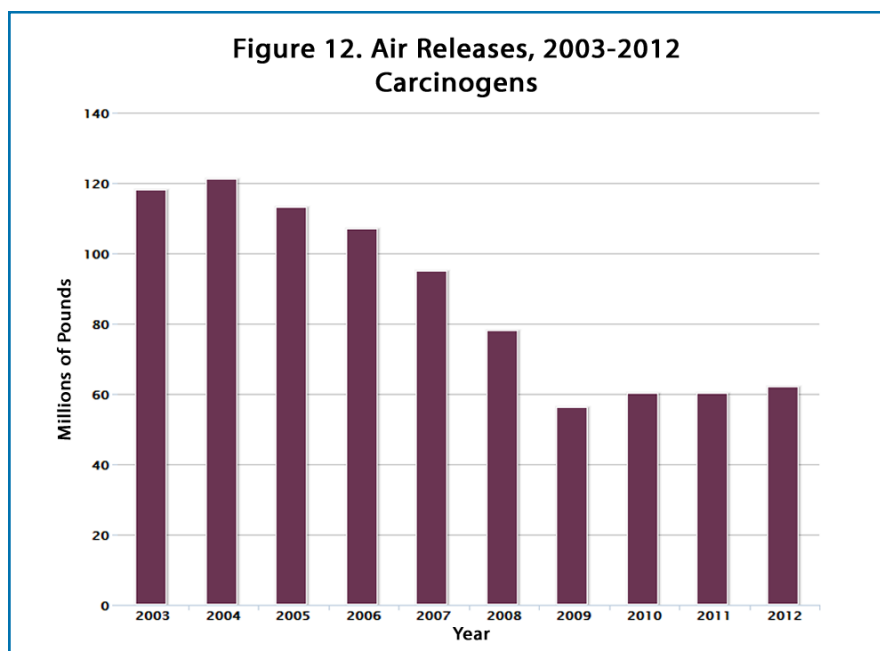
To account for how different dioxin compounds vary in toxicity, EPA multiplies the mass reported for each compound by a compound-specific toxicity factor. The results are summed for a total of grams in toxicity equivalents (TEQ), called "grams-TEQ." Grams-TEQs allow for a better understanding of the toxicity of the releases.

Various industry sectors may dispose of or otherwise release very different mixes of dioxin congeners. Four industry sectors accounted for most of both the grams and grams-TEQ of dioxin released in 2012; however, their ranking in terms of percentage of the total is quite different for grams and grams-TEQ, as shown in Figures 10 and 11.



In 2012, the chemical manufacturing industry accounted for 65% of the total grams of dioxin and dioxin-like compounds released, while the primary metals sector accounted for 26% of the total grams. However, when TEFs are applied, the primary metals sector accounted for 74% of the total grams-TEQ and the chemical manufacturing industry for 15% of the total grams-TEQ.

Among the chemicals that are reported to TRI, there are about 180 known or suspected carcinogens, which EPA sometimes refers to as Occupational Safety & Health Administration (OSHA) carcinogens. Figure 12 shows that the air releases of these carcinogens decreased by 47% between 2003 and 2012, although there was a 5% (2.7 million pounds) increase from 2011 to 2012. The long-term decreases in air releases of OSHA carcinogens were driven mainly by decreases in styrene air releases from the plastics and rubber, and transportation equipment industries.



Trends in pounds of disposal or other releases do not account for potential risk of chemical releases. Risk can vary depending on chemical toxicity, how chemicals are released (e.g., to the air or water), where chemicals travel, and where human populations are located.

To provide information on the potential risk of disposal or other releases, the TRI Program presents its data from a risk-related perspective using EPA’s publicly-available Risk-Screening Environmental Indicators (RSEI) model. The model produces unitless “scores,” which represent relative chronic human health risk and can be compared to RSEI-generated scores from other years or geographical regions.

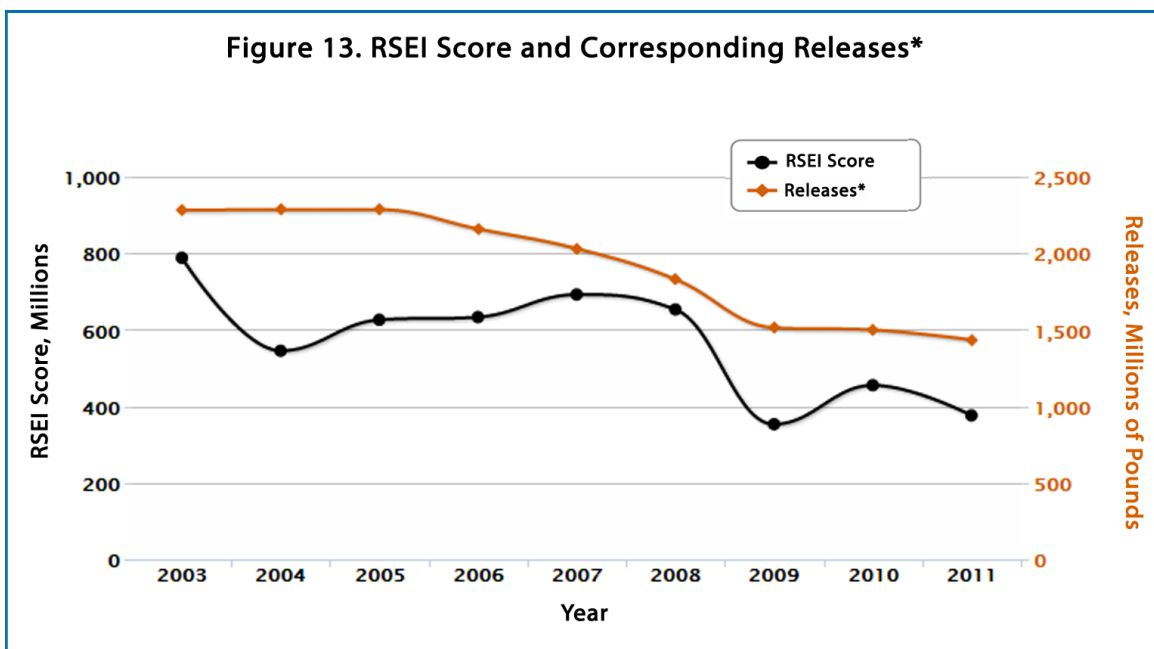
RSEI scores are calculated using on-site releases to air and water, transfers to Publicly Owned Treatment Works (POTWs) and transfers for off-site incineration as reported to TRI. Note that other release pathways, such as land disposal, are not currently modeled in RSEI. The scores are calculated based on many factors including the amount of chemical released, the location of the release, the chemical’s toxicity, its fate and transport through the environment, and the route and extent of human exposure. Because modeling the exposure of TRI chemicals is time and resource intensive, RSEI data through 2011 are currently available, and updates through 2012 are scheduled to be available later in 2014.

RSEI

The Risk-Screening Environmental Indicators (RSEI) model considers more than just chemical quantities released, including:

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

Figure 13 shows the trend in the RSEI score from 2003 to 2011. Over this time period, the RSEI score decreased by 52%, while the corresponding pounds released over the same time period decreased by 37%. These results suggest that TRI reporters are making progress in reducing their use of higher toxicity chemicals and/or reducing releases in areas that would result in higher human exposure.



*Includes only those pounds currently modeled through RSEI which are on-site releases to air and water, transfers to POTWs, and off-site transfers for incineration.

Note that RSEI is a screening-level model that uses simplifying assumptions to fill data gaps and reduce the complexity of calculations in order to quickly evaluate large amounts of data and produce a simple score. The model focuses on chronic human toxicity. It should be used for screening-level activities such as trend analyses that compare relative risk from year to year, or ranking and prioritizing chemicals or industry sectors for strategic planning. RSEI is not a formal risk assessment, which typically requires site-specific information on the toxicity of TRI chemicals and detailed population distributions to predict exposures for estimating potential health effects. Instead, RSEI is commonly used to quickly screen and highlight situations that may lead to potential chronic human health risks. More information about the model can be accessed at www.epa.gov/opptintr/rsei/. Analyses using RSEI data providing a quantitative relative estimate of risk posed by a facility can be generated in EPA's Envirofacts database using the following link: www.epa.gov/enviro/facts/topicsearch.html#toxics.

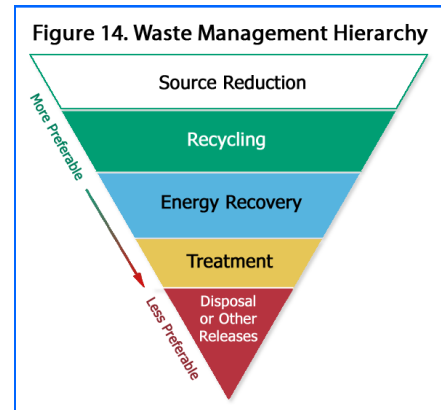


Most disposal or other release practices are subject to a variety of regulatory requirements designed to limit environmental harm. To learn more about what EPA is doing to help limit the release of harmful chemicals to the environment see EPA's laws and regulations page at www2.epa.gov/laws-regulations.

Management of TRI Chemicals

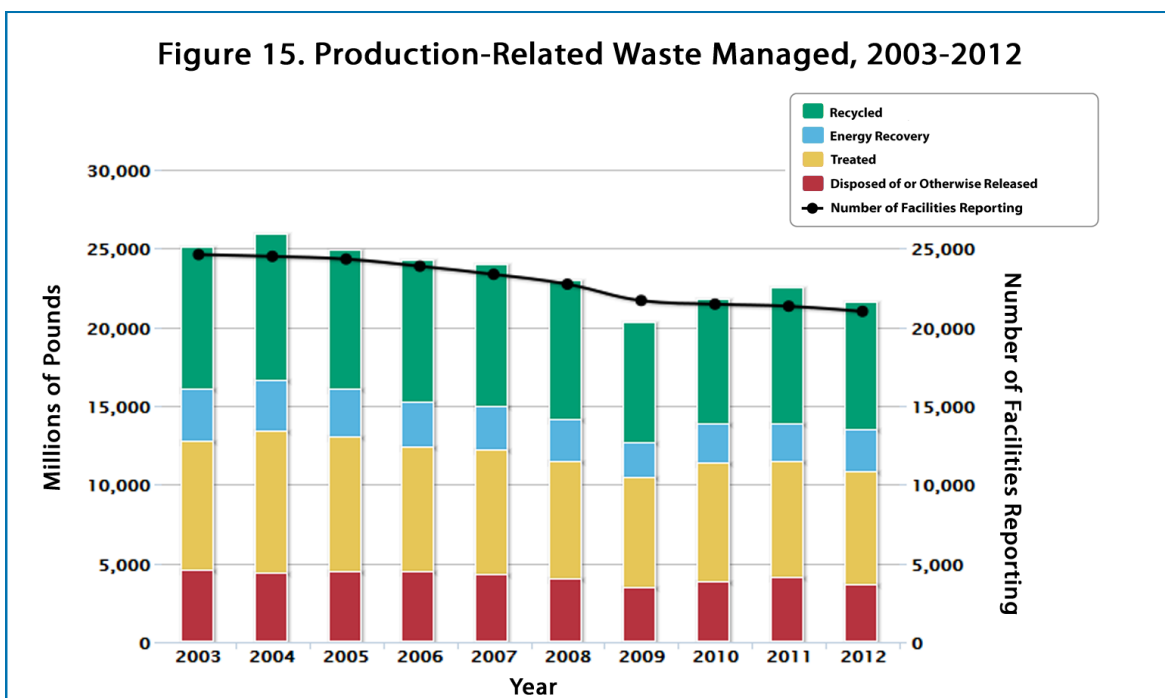
In addition to collecting information on the disposal or other releases of chemicals to the environment, TRI collects information on the quantities of toxic chemicals in waste that are recycled, combusted for energy recovery, and treated for destruction, whether on- or off-site. This production-related waste managed includes the total amounts of toxic chemicals in waste managed by facilities, giving a more complete picture of what happens to chemical wastes at facilities, rather than focusing only on their final disposition.

Looking at production-related waste managed over time helps track industry progress in reducing waste generation and in moving towards safer waste management methods. For example, EPA encourages facilities to first eliminate waste at its source. However, for waste that is generated, the preferred management methods are recycling, followed by burning for energy recovery, treating, and, as a last resort, disposing of or otherwise releasing the waste. The goal is that, when possible, waste management techniques will shift over time from disposal or other releases toward the preferred techniques in the waste management hierarchy. These waste management priorities are illustrated in the waste management hierarchy (Figure 14) established by the Pollution Prevention Act of 1990.



As shown in Figure 15, from 2003 to 2012, production-related waste managed by TRI facilities declined by 14% (more than 3.5 billion pounds) to 23.52 billion pounds, with decreases occurring for every management method:

- recycling decreased by 11%
- combustion for energy recovery decreased by 19%
- treatment decreased by 11% and
- disposal and other releases decreased by 21%.



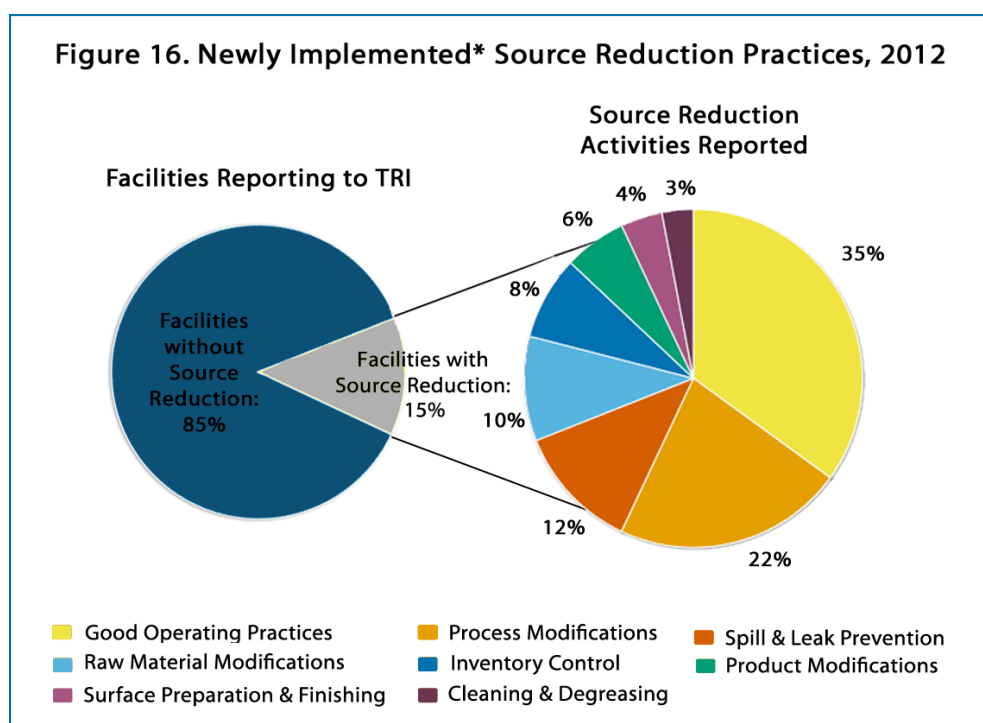
As with disposal or other releases, production-related waste managed can increase or decrease due to factors like changes in operations at facilities that alter the chemicals they use, the adoption of pollution prevention activities, or changes in business activity.

The adoption of pollution prevention activities can help eliminate waste at the source. Progress in implementing these activities can be tracked, in part, through the source reduction practices that are reported to TRI. The term “source reduction” generally refers to any practice that reduces the total quantity of chemical waste generated at the source. TRI facilities report newly implemented* source reduction activities each year. Examples of these include: good operating practices (e.g., improving maintenance scheduling), process modifications (e.g., instituting re-circulation within a process), and raw materials modifications (e.g., increasing the purity of raw materials).

What is source reduction?

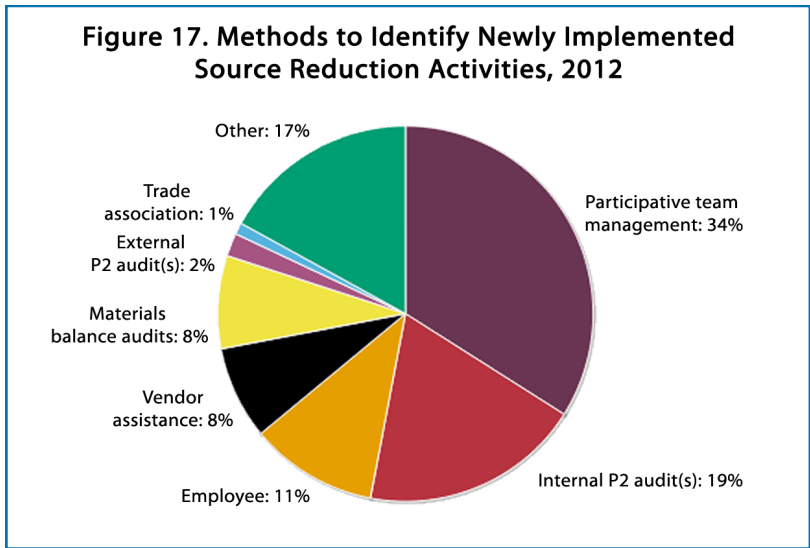
Source reduction includes activities that eliminate or reduce the generation of chemical waste.

In 2012, a total of 3,152 facilities (15% of all TRI facilities) reported initiating 10,250 source reduction activities. Good operating practices, process modifications, and spill and leak prevention were the types of activities reported most frequently, as shown in Figure 16. For 2012, EPA added six new types of source reduction activities as options to the TRI form that are more closely aligned with green chemistry practices. These additional “green chemistry” source reduction activities were added within the existing categories and accounted for 4% of all source reduction activities reported in 2012, and fell into the good operating practices and raw material, process and product modifications categories featured in Figure 16.

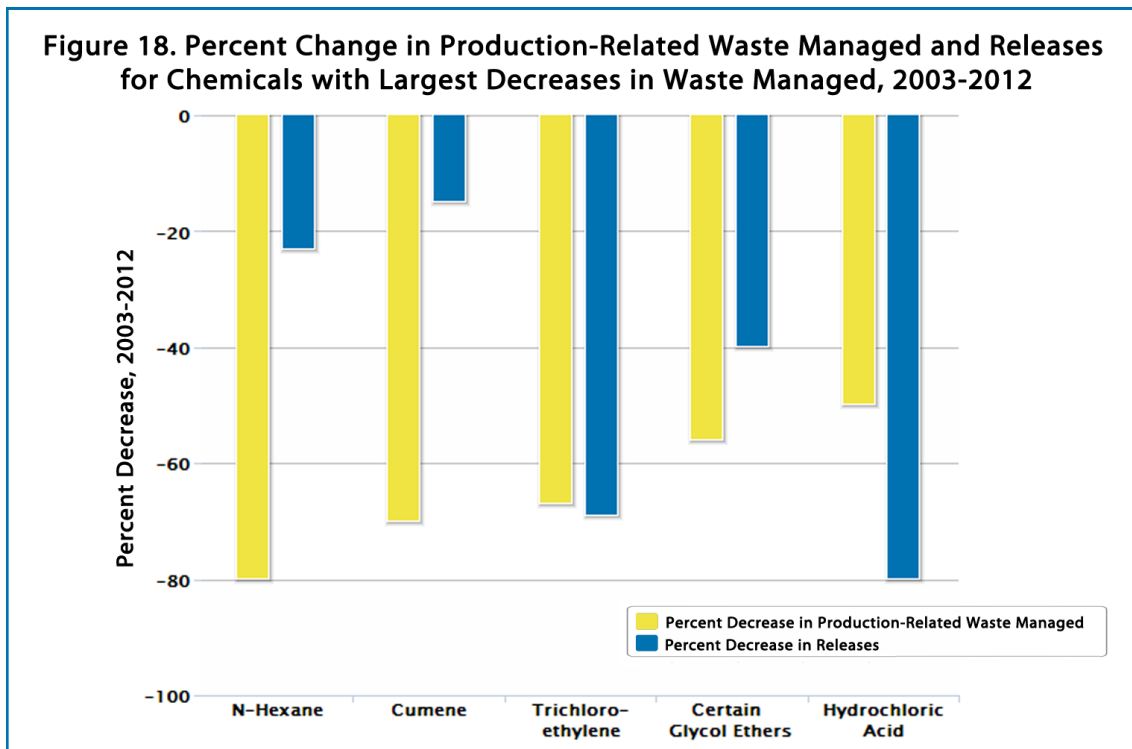


* Facilities may have ongoing source reduction activities initiated in previous years that are not captured in the graphs in this document. To find data on previously implemented source reduction activities see the TRI Pollution Prevention Website (www2.epa.gov/toxics-release-inventory-tri-program/pollution-prevention-p2-and-tri).

For each of the source reduction activities, facilities also provide information about how they identified the opportunity for source reduction. Facilities most commonly identified these opportunities through participative team management (e.g., team training to identify process improvements) and internal audits (Figure 17).



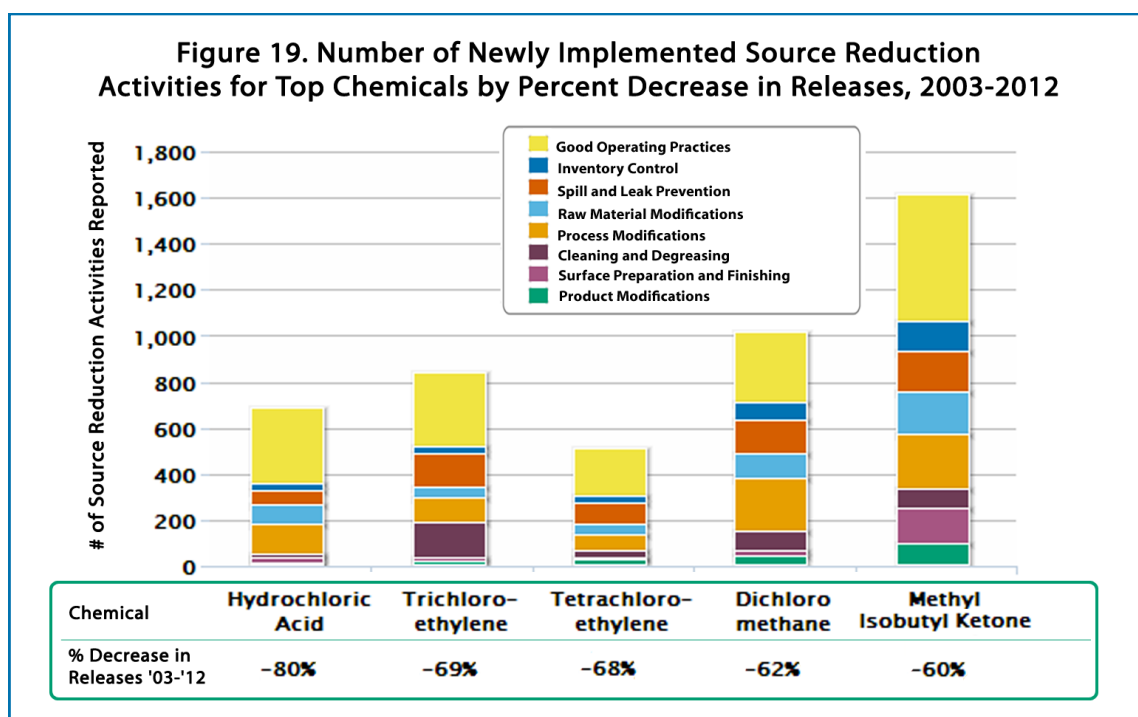
For many chemicals, source reduction activities have contributed to substantial decreases in waste generation in recent years. The five chemicals with the greatest percent decrease in waste management quantities from 2003 to 2012 are displayed in Figure 18.* Although decreases in waste management quantities can be due to other factors, including changes in estimation methods and facility closures, source reduction appears to have played a significant role in limiting waste generation for these and many other toxic chemicals.



* Limited to chemicals with at least 25 forms reporting source reduction in 2012, and at least 100 total forms submitted in 2012.

In many cases, reducing the generation of waste at its source is an effective way to reduce the amount of the chemical that is ultimately released to the environment. For example, releases of trichloroethylene (a carcinogen that is released primarily to air) declined by 69% over the same period that total waste managed declined by 67%. In other instances, pollution is already being effectively controlled through methods such as treatment and recycling, so source reduction reduces the amount of the chemical being managed but does not significantly decrease the amount released to the environment. Cumene, for example, is managed almost exclusively through recycling and treatment at TRI facilities, with less than 0.5% of the waste released, so decreases in cumene waste do not necessarily correlate with reductions in releases.

Figure 19 shows the newly implemented source reduction activities reported from 2003 through 2012 for chemicals with the greatest percent decrease in releases over this time period.* Trichloroethylene, tetrachloroethylene, dichloromethane, and methyl isobutyl ketone are all industrial solvents, while releases of hydrochloric acid (which is only reportable in aerosol form) are most commonly a byproduct of fuel combustion. All five chemicals are primarily released to air. As shown in the figure, the type of source reduction activity implemented varies depending on the chemical's use in industrial operations and the chemical's characteristics. For example, cleaning and degreasing activities, like changing to aqueous cleaners, are more commonly implemented for trichloroethylene, while process modifications, like instituting re-circulation within a process, are more commonly implemented for dichloromethane.



* Limited to chemicals with at least 25 forms reporting source reduction in 2012, and at least 100 total forms submitted in 2012.

Facilities may also report additional details to TRI about their source reduction, recycling, or pollution control activities. For the chemicals profiled in Figure 19, examples of additional pollution prevention-related information reported are shown below with a link to each facility's pollution prevention report in Envirofacts.

Source Reduction Activities

The type of source reduction activity implemented for each chemical depends on how the chemical is used in industrial operations and the chemical's characteristics.

- **Hydrochloric Acid:** A facility in the food and beverage sector reduced its use of coal for generating steam and relied more on its natural gas boiler instead. This change corresponded with a 30% decrease in the generation of hydrochloric acid aerosols from 2011 to 2012 and reduced greenhouse gas emissions even though production increased. [[facility details](#)]
- **Trichloroethylene:** To reduce the amount of solvent used, the production team at a plastics facility modified the facility's process to allow for an additional cycle of trichloroethylene distillation and use prior to disposal. The change was made in 2011, and from 2010 to 2012, the facility's trichloroethylene releases declined by 71%. [[facility details](#)]
- **Tetrachloroethylene:** An aircraft manufacturer substituted an alkaline cleaning process for some of its tetrachloroethylene degreasing in 2011. Its tetrachloroethylene releases and production-related waste managed declined by about 30% from 2010 (prior to the change) to 2012, even though production increased by more than 30% during this time period. [[facility details](#)]
- **Dichloromethane:** Based on an employee recommendation, a fabricated metals facility decommissioned its dichloromethane degreaser in 2012 after purchasing a new parts washer that uses hydrocarbons. This change will entirely eliminate the facility's use of dichloromethane. [[facility details](#)]
- **Methyl Isobutyl Ketone:** In 2012, a commercial printer added a more efficient and automated solvent still to improve its recovery of solvents and also installed a more efficient printing press. From 2011 to 2012, the facility reduced its methyl isobutyl ketone waste by 20% while production increased by 15%. [[facility details](#)]

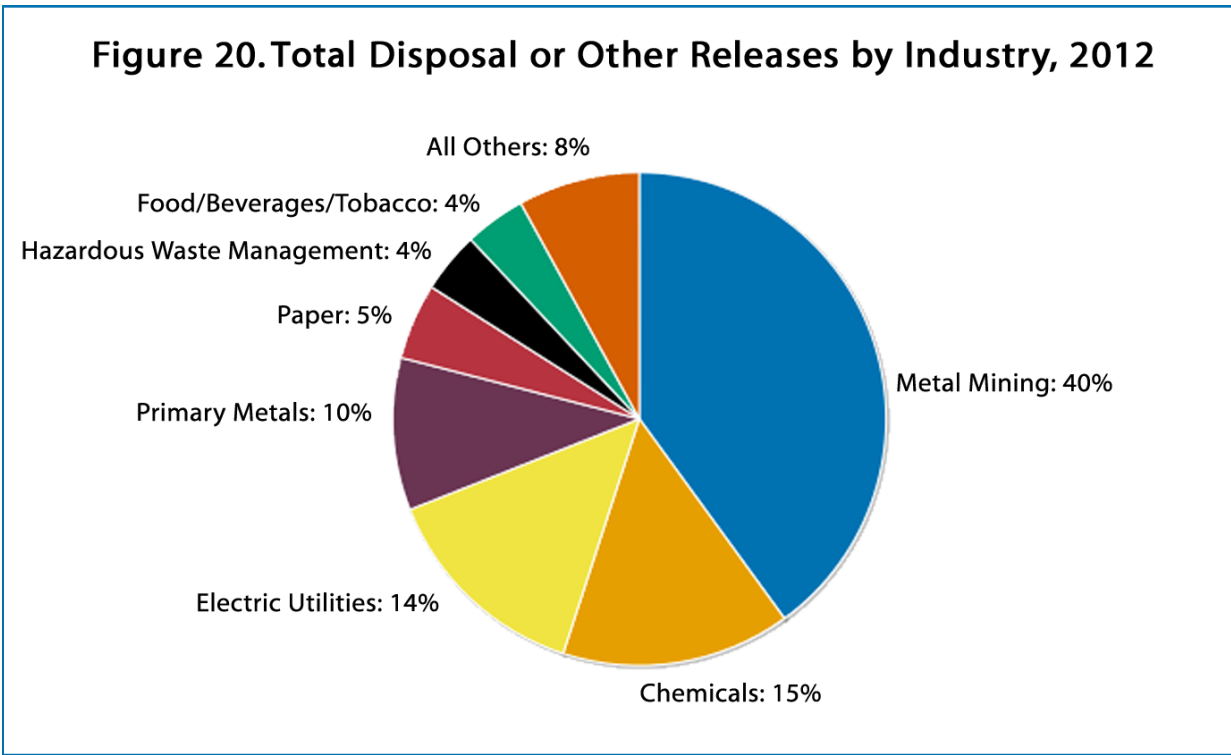
You can view all reported pollution prevention activities and compare facilities' waste management methods and trends for any TRI chemical by using the [TRI P2 Search Tool](#).

Industry Sector Profiles

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

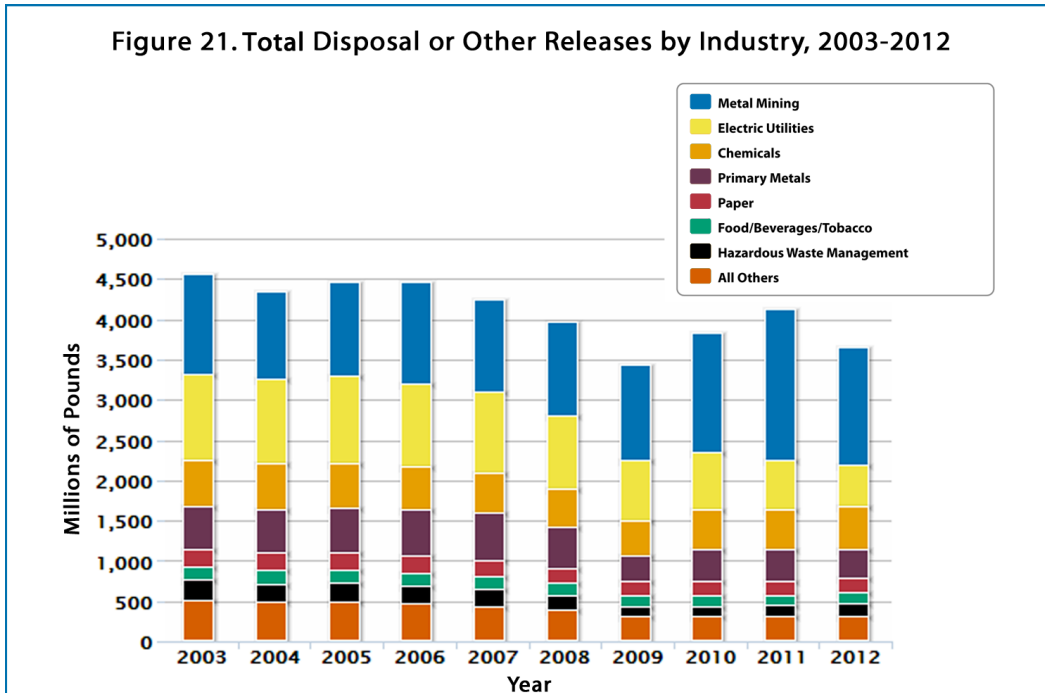
TRI Sectors
TRI covers 26 industry sectors including manufacturing sectors, as well as metal mining, electric utilities, chemical wholesalers and hazardous waste treatment.

To take a closer look at the individual sectors, Figure 20 shows that in 2012, 92% of total disposal or other releases of TRI chemicals originated from just seven of the 26 TRI industry sectors. More than two-thirds originated from just three industry sectors: metal mining (40%), chemicals (15%), and electric utilities (14%).

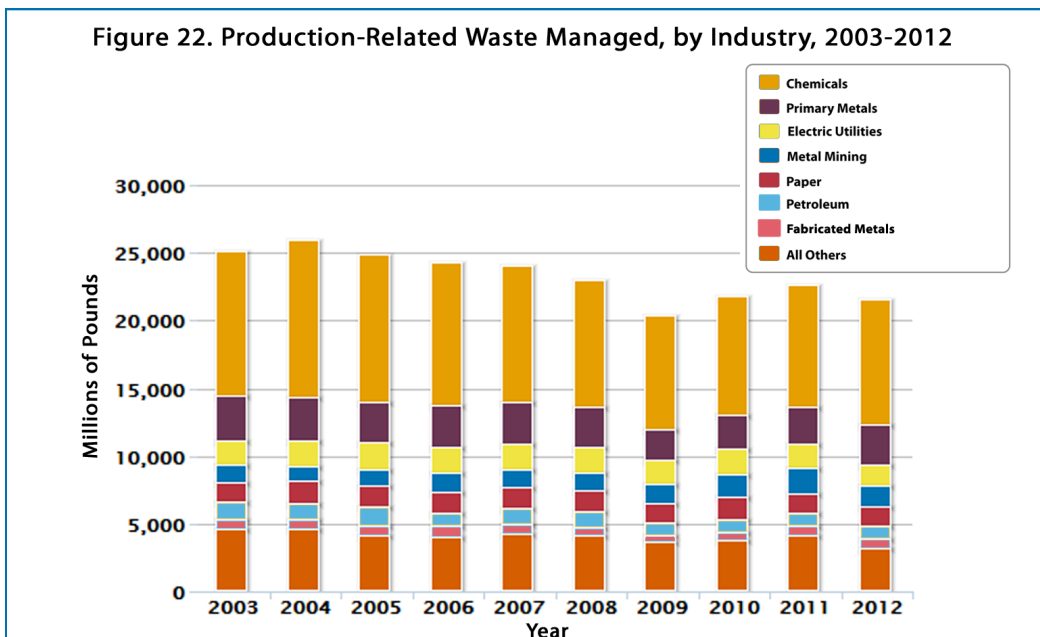


Over time, the amounts and proportions of TRI chemicals' disposal or other releases by each industry sector have varied as shown in Figure 21. All of the seven industry sectors with the largest reported releases in 2012, except metal mining, fell from their 2003 levels. Four of these sectors (metal mining, electric utilities, primary metals, and food) decreased from 2011 to 2012.

The greatest decrease from 2003 to 2012 was observed in the electric utilities sector with a decrease of 554 million pounds (down 52%), including a decrease of 97 million pounds from 2011 to 2012. Among other reasons, these reductions are due to a switch from coal- or oil-based fuels to other fuels, such as natural gas, and improved pollution controls. In recent years, electric utilities have also cited improved estimation methods as another reason for decreases. The metal mining sector reported a 206-million-pound (17%) increase since 2003, due to increases in on-site land disposal.



As shown in Figure 22, the contribution of each of the top seven sectors to the production-related waste managed has not changed considerably between 2003 and 2012. For example, the top three sectors in terms of waste managed in 2003, chemicals, primary metals and electric utilities, reported 63% of waste managed in 2003 and 64% in 2012.



Most industry sectors reported a decline in production-related waste managed from 2003 to 2012 resulting in an overall decrease of 14%. Of the top fifteen industrial sectors in terms of waste managed in 2012, only metal mining increased from 2003 to 2012, with a 16% increase over that time period.

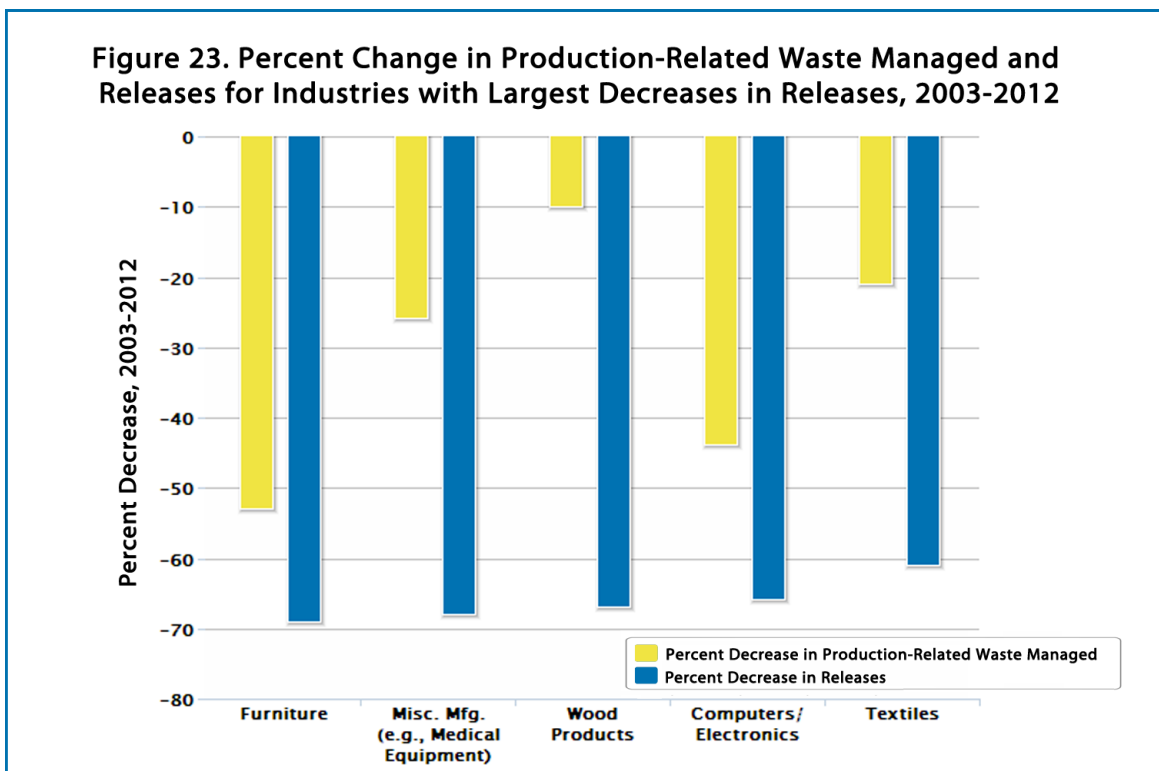
Impacts

Although factors such as production play a role, source reduction appears to have contributed to substantial decreases in the quantities of chemical waste generated in recent years.

Despite long term declines in production-related waste managed, some sectors increased their waste managed in recent years, including:

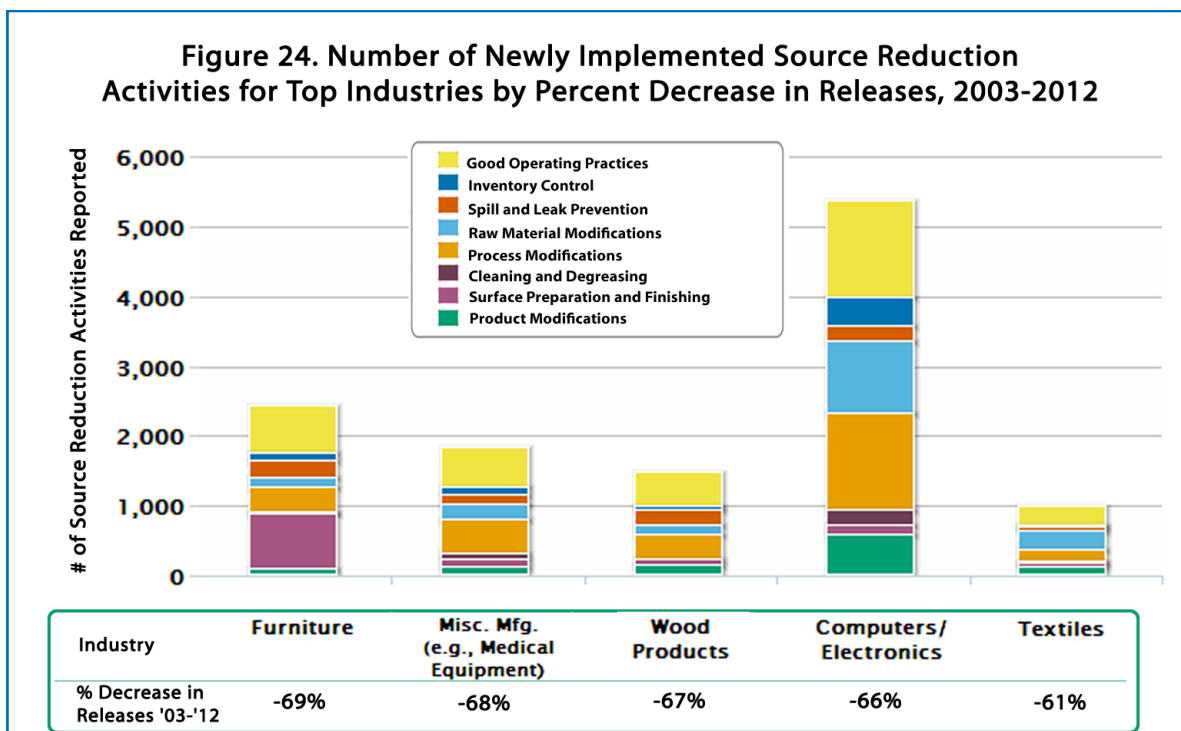
- Chemical manufacturers, which increased 11% from 2009 to 2012, including a 5% increase from 2011 to 2012.
- Primary metals, which increased 31% from 2009 to 2012, including a 4% increase from 2011 to 2012.
- Fabricated metals, which increased 30% from 2009 to 2012, including a 2% increase from 2011 to 2012.

For many industries, source reduction activities appear to have contributed to substantial decreases in waste generation, including releases, in recent years. The five sectors with the greatest percent decrease in releases from 2003 to 2012 are displayed in Figure 23.* Pollution control techniques are often responsible in cases where releases decline at a faster rate than overall waste generation, although other factors, such as reductions in production, can contribute to both trends as well.



* Limited to sectors with at least 100 forms submitted in 2012.

Figure 24 shows the newly implemented source reduction activities reported from 2003 to 2012 for the five industries with the greatest percent decrease in releases over this time period. As shown in the figure, the types of source reduction activities varies by industry—for example, many furniture manufacturers reported changes to surface preparation and finishing operations (e.g., improved application techniques), while computer and electronics manufacturers frequently reported modifications to their raw materials, processes and products, often associated with the elimination of lead solder.



While sector-specific waste management trends can be used as indicators of environmental performance, it is important to consider the influence that production and the economy have on chemical waste generation.

To get an idea of how changes in production levels at TRI facilities may influence total disposal or other releases, EPA uses “value added” from the Bureau of Economic Analysis to estimate production for the manufacturing sector (www.bea.gov/industry/gdpbyind_data.htm). Value added is a measure of the contribution of each sector to the nation's Gross Domestic Product (GDP), which represents the total value of goods produced and services produced annually in the U.S. While not all of the facilities that report to TRI are in the manufacturing sector, most (89% in 2012) are in this sector. The solid line in Figure 25 shows manufacturing value added (adjusted for inflation), representing production, decreased by 5% from 2003 to 2012. For the same time period, there was a 23% decrease in releases. This decrease occurred even though production decreased by only 5%. Because one would expect releases to decrease proportionally to decreases in production, the graph demonstrates that other factors were also contributing to the reductions in releases.

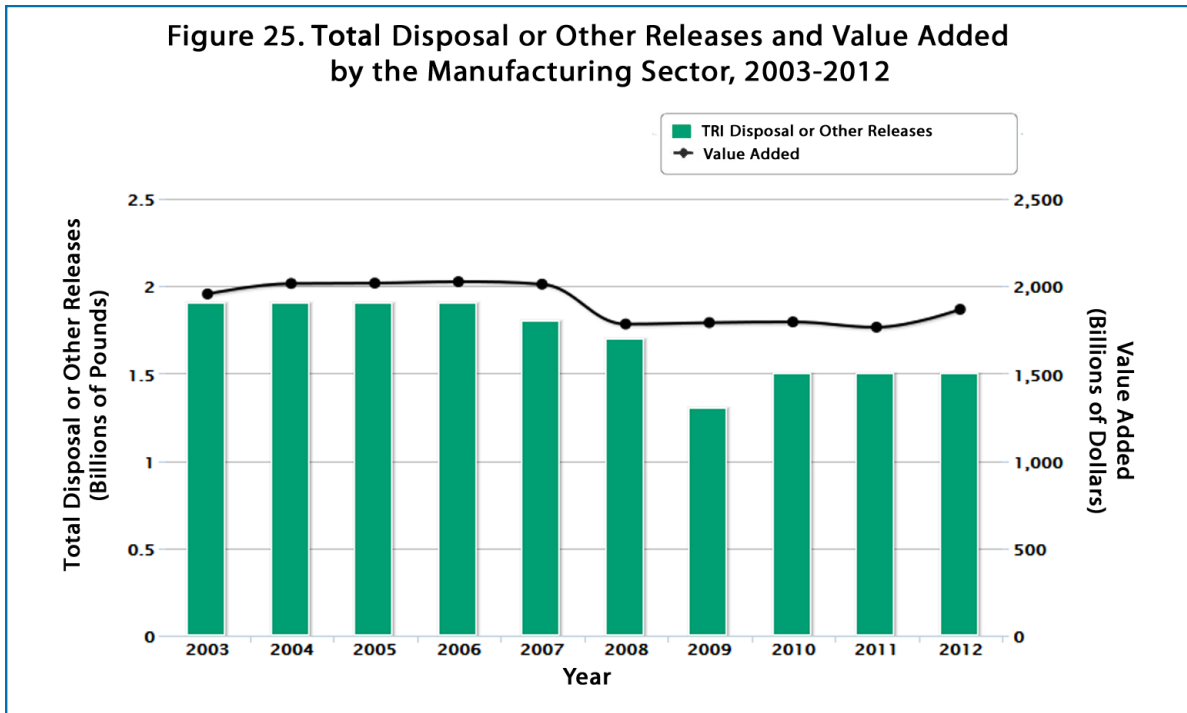
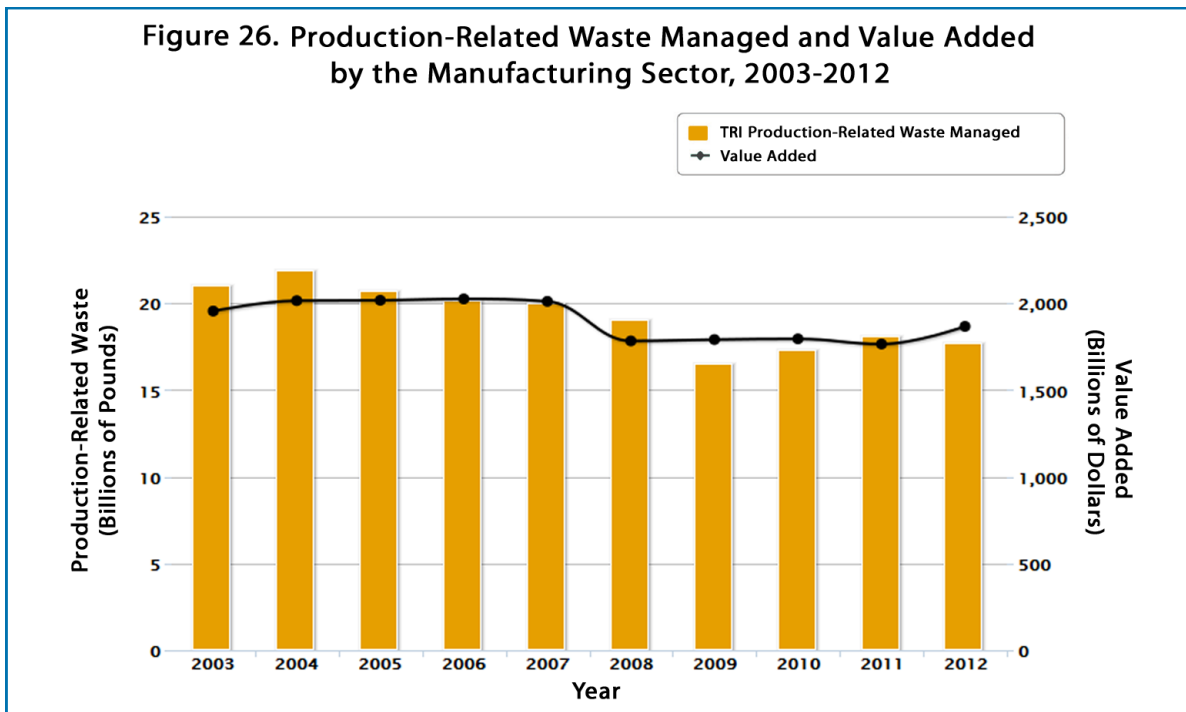


Figure 26 presents the trend in production-related waste managed by the manufacturing sector and the trend in the manufacturing sector's value added (as shown by the solid line). The manufacturing sector's production-related waste decreased by 16% from 2003 to 2012, while manufacturing value added decreased by only 5%. More information on production trends for individual sectors can be found in the sector profiles.



The TRI National Analysis highlights four sectors: chemical manufacturing, electric utilities, metal mining, and computers/electronics. EPA uses the best available data to present these sectors' economic trends. The sources of the data vary by sector. For the electric utilities sector, electricity generation data from the U.S. Department of Energy were used

(www.eia.gov/electricity/data.cfm#generation).

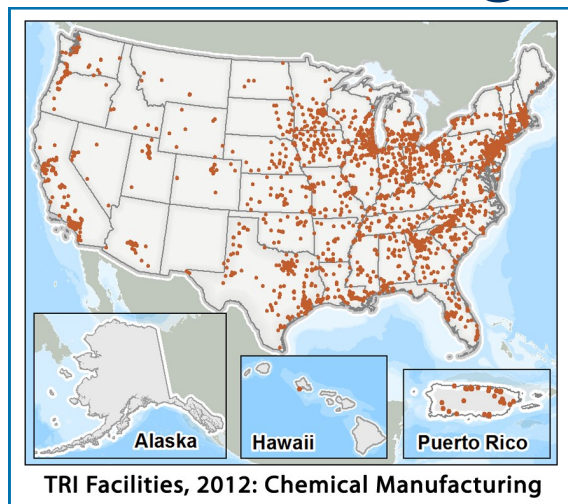
Mine production data are from the U.S. Geological Survey

(minerals.usgs.gov/minerals/pubs/mcs).

The production index from the Federal Reserve was used as an estimate of business activity for the chemical and the computers/electronic sectors (www.federalreserve.gov/datadownload/default.htm).



Chemical Manufacturing



Chemical manufacturers produce a variety of products, such as basic chemicals, products used by other manufacturers (such as synthetic fibers, plastics, and pigments) and consumer products (such as paints, fertilizers, drugs, and cosmetics). The sector had the second largest total disposal or other releases for 2012, which increased by 9% from 2011 to 2012 (see Figure 27), driven by numerous factors such as increased off-site transfers. Since 2003, the sector's releases decreased by 5%, mainly due to a reduction in air emissions.

Quick Facts for 2012

Number of TRI Facilities: 3,451
 Facilities Reporting Newly Implemented Source Reduction in 2012: 710

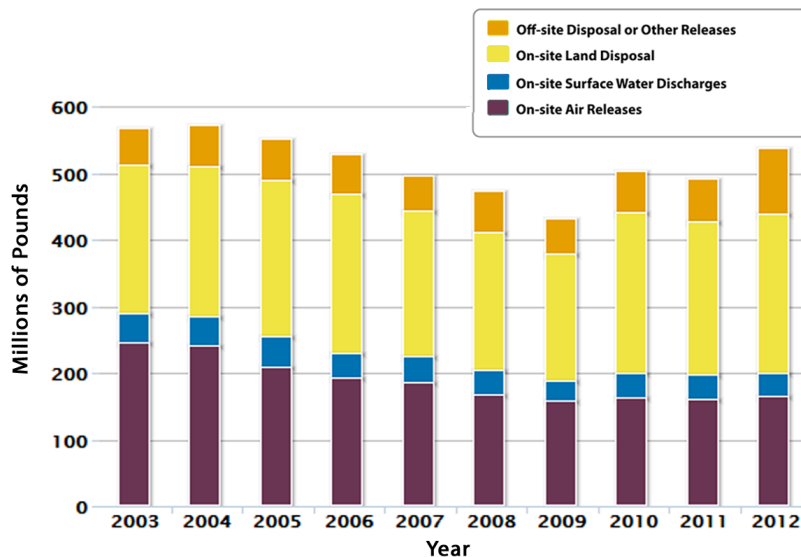
Total Disposal or Other Releases: 544.6 million lb

- On-site: 444.6 million lb
 - Air: 167.6 million lb
 - Water: 34.7 million lb
 - Land: 242.3 million lb
- Off-site: 100.0 million lb

Production-Related Waste Managed: 9,791.9 million lb

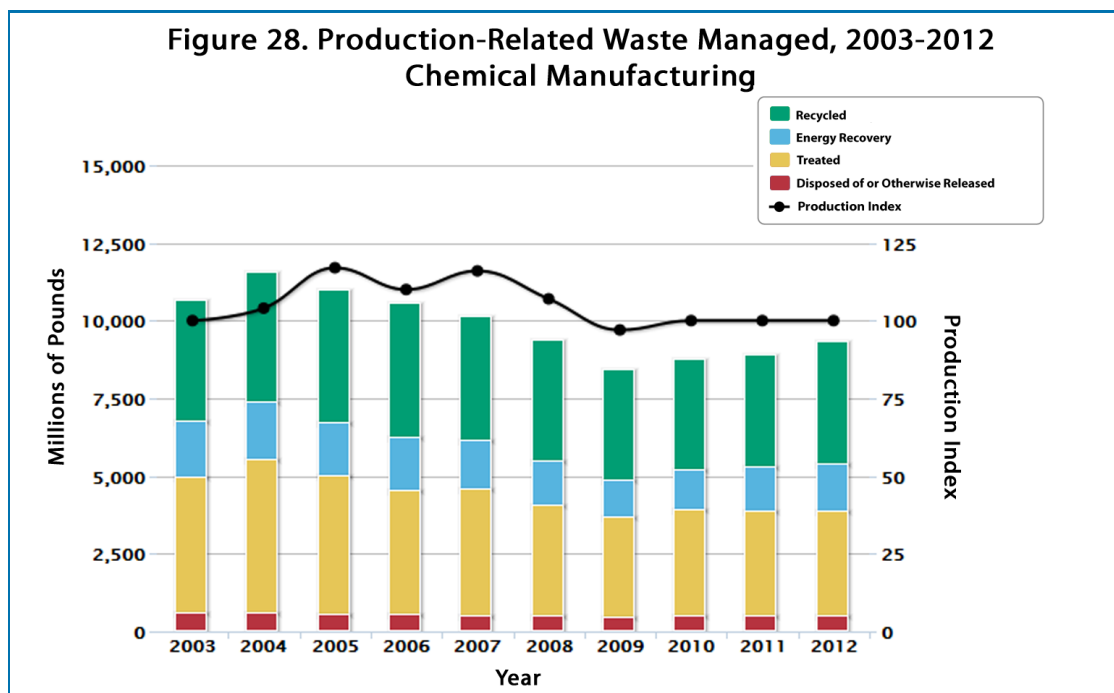
- Recycled: 4,025.0 million lb
- Energy Recovery: 1,695.9 million lb
- Treated: 3,549.3 million lb
- Disposed of or Otherwise Released: 521.7 million lb

Figure 27. Total Disposal or Other Releases, 2003-2012
 Chemical Manufacturing



More chemical manufacturing facilities report to TRI than facilities in any other sector. Due in part to its scope and size, the sector has had the largest production-related waste managed every year since 2003, representing 42% of the total for all industries in 2012. Total disposal or other releases represent a small portion of total waste managed (5%) relative to all sectors (15%), indicating facilities in this sector are implementing other waste management methods to limit the release of toxic chemicals.

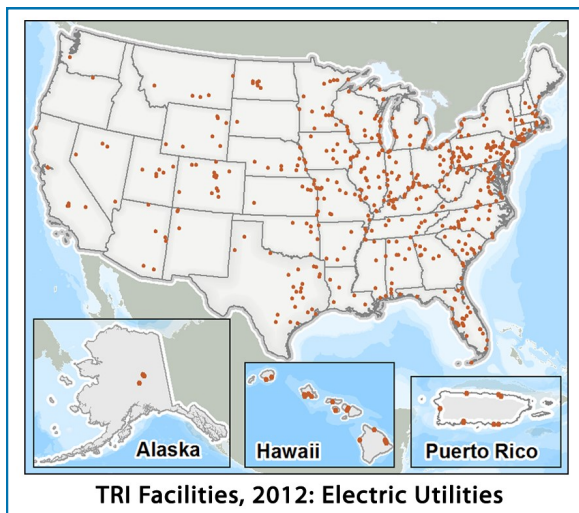
As shown in Figure 28, the sector's production-related waste managed decreased by 12% from 2003 to 2012. Compare this to the black solid line in the figure, which shows this sector's production (represented by the Federal Reserve Board Industrial Production Index) fluctuating over the time period but changing little overall. Production-related waste managed decreased despite the sector's relatively consistent production, demonstrating that the decrease in waste managed by the sector was due to factors other than production.



Although the chemical manufacturing sector has consistently had the largest production-related waste managed, 21% of facilities in the sector reported having initiated practices to reduce their toxic chemical use and waste generation through source reduction activities in 2012. The most commonly reported type of source reduction activity for the sector was good operating practices. In one case, [a facility](#) reported that it increased planned maintenance with a focus on replacing packing and gasket materials that has resulted in a significant reduction in the facility's ammonia releases. Process modifications and spill and leak prevention were also commonly reported by this sector.

TRI's Pollution Prevention Search Tool can help you learn more about [pollution prevention opportunities in this sector](#). And for more information about how this industry and others can choose safer chemicals, visit EPA's Design for the Environment Program pages for [Alternatives Assessments](#) and the [Safer Chemical Ingredients List](#).

Electric Utilities



The electric utilities sector consists of establishments primarily engaged in generating, transmitting, and/or distributing electric power. Electric generating facilities use a variety of fuels to generate electricity; however, only those that combust coal and/or oil to generate power for distribution in commerce must report to TRI. This sector reported the third largest total disposal or other releases of any industry sector in TRI for 2012 (see Figure 29), including the largest on-site air emissions, which represented over 25% of air emissions from all industries.

Quick Facts for 2012

Number of TRI Facilities: 582
 Facilities Reporting Newly Implemented Source Reduction Activities in 2012: 23

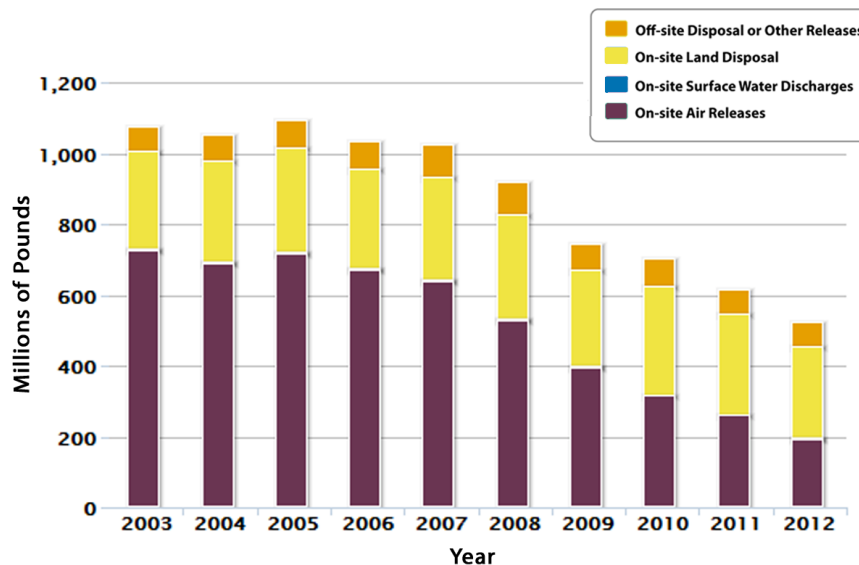
Total Disposal or Other Releases: 519.3 million lb

- **On-site:** 454.4 million lb
 - Air: 192.8 million lb
 - Water: 3.0 million lb
 - Land : 258.6 million lb
- **Off-site:** 64.9 million lb

Production-Related Waste Managed: 1,594.1 million lb

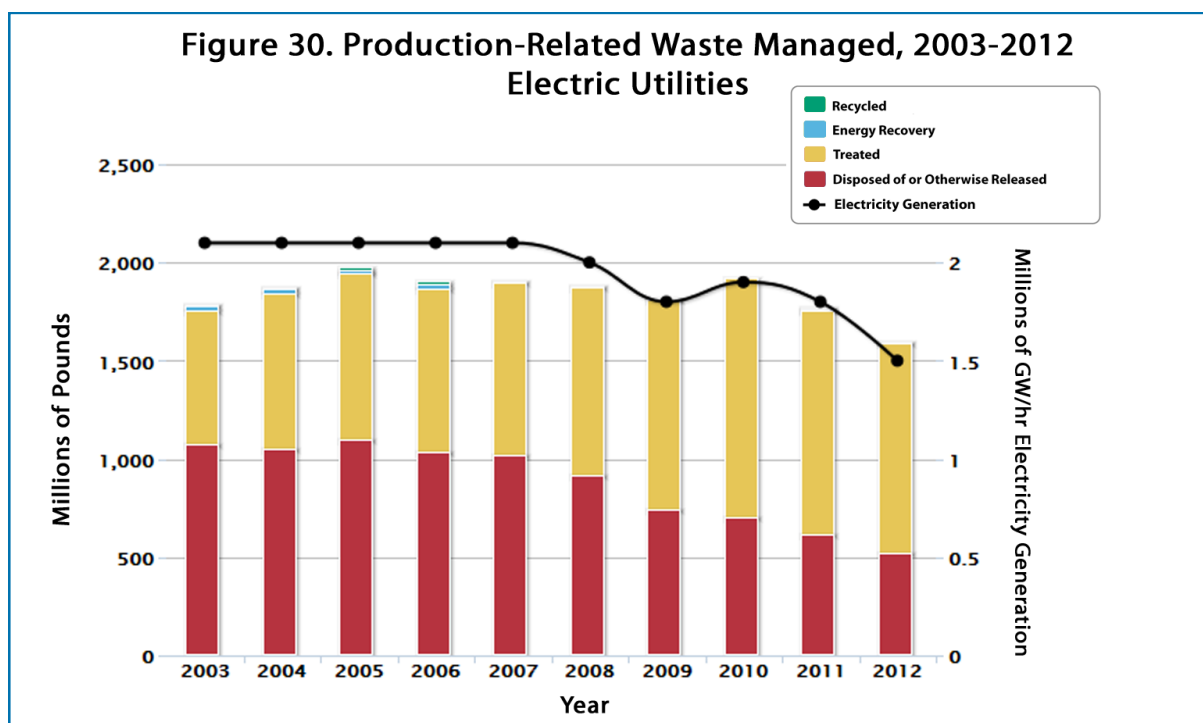
- Recycled: 7.9 million lb
- Energy Recovery: 3.1 million lb
- Treated: 1,064.1 million lb
- Disposed of or Otherwise Released: 519.1 million lb

Figure 29. Total Disposal or Other Releases, 2003-2012
 Electric Utilities



The electric utilities sector's releases decreased by 52% from 2003 to 2012, including a 16% decrease from 2011 to 2012. This decrease is driven by a 73% decrease in on-site air releases from 2003 to 2012, including a 65-million-pound decrease from 2011 to 2012.

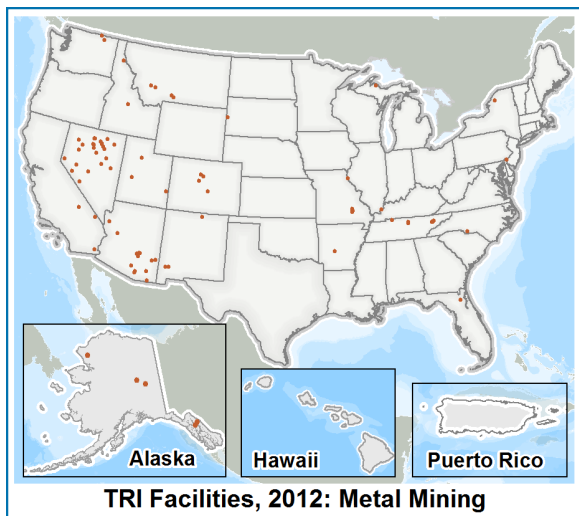
Production-related waste managed has decreased 19% from peak levels in 2005, coinciding with a 28% reduction from peak 2005 levels in net production (in terms of electricity generated using coal and oil fuels), represented by the black solid line in Figure 30. The recent production decrease is driven by the industry's transition to natural gas, which exempts many electric utilities from TRI reporting. While the overall ratio of production-related waste managed per gigawatt-hour produced has not significantly changed, the ways in which the sector manages this waste have changed considerably.



In 2012, two-thirds of production-related waste managed was treated, while slightly less than one-third was released. This is in contrast to 2003, when the opposite was the case—almost two-thirds of the waste was released and one-third was treated. This trend is in large part due to an increase in the number of scrubbers at electric utilities that treat (or destroy) acid gases that would otherwise be on-site air releases. The releases per gigawatt-hour produced have dramatically decreased, offset by an increase in quantities treated per gigawatt-hour produced.

In the electric utilities sector, 4% of facilities reported having initiated practices in 2012 to reduce their toxic chemical use and waste generation through source reduction activities. The most commonly reported types of source reduction activities for the sector were good operating practices and process modifications. For example, [one electric generating facility](#) reported reducing ammonia used in its selective catalytic reactor to control nitrogen oxides (NOx) emissions by optimizing reaction conditions and replacing ammonia injection control valves. TRI's Pollution Prevention Search Tool can help you learn more about [pollution prevention opportunities in this sector](#).

Metal Mining



The portion of the metal mining sector covered by TRI includes facilities mining for copper, lead, zinc, silver, gold, and several other metals. These facilities tend to be in Western states where most of the copper, silver and gold mining occurs; however, zinc and lead mining tend to occur in Missouri, Tennessee, and Alaska. Metals generated from U.S. mining operations are used in a wide range of products, including automobiles and electrical and industrial equipment. The extraction and beneficiation of these minerals generate large amounts of waste.

Quick Facts for 2012

Number of TRI Facilities: 88
 Facilities Reporting Newly Implemented Source Reduction Activities: 6

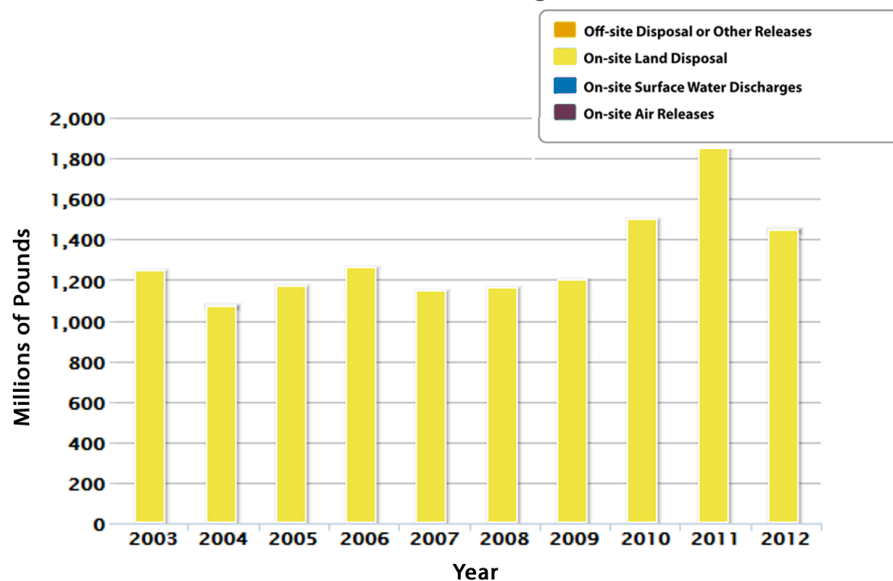
Total Disposal or Other Releases: 1,448.8 million lb

- **On-site:** 1,445.7 million lb
 - Air: 2.6 million lb
 - Water: 2.0 million lb
 - Land: 1,441.1 million lb
- **Off-site:** 3.1 million lb

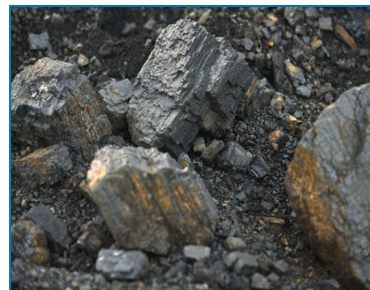
Production-Related Waste Managed: 1,532.2 million lb

- Recycled: 61.1 million lb
- Energy Recovery: 20 lb
- Treated: 22.8 million lb
- Disposed of or Otherwise Released: 1,448.2 million lb

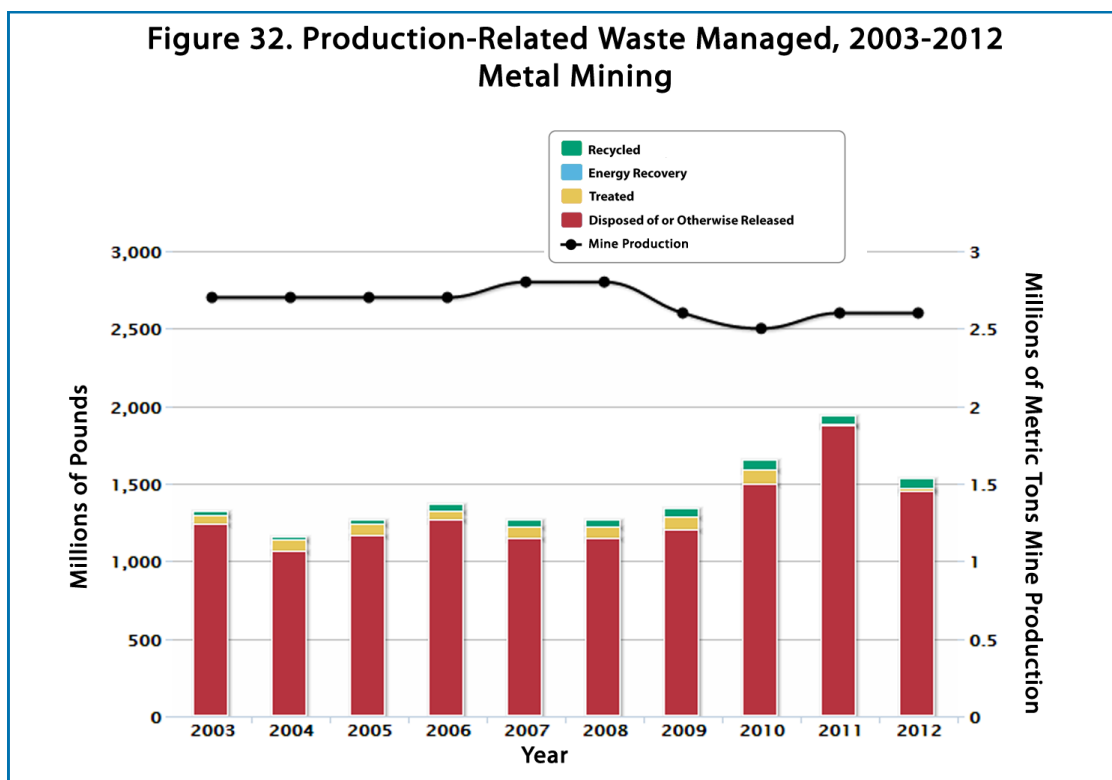
**Figure 31. Total Disposal or Other Releases, 2003-2012
 Metal Mining**



The metal mining industry's total disposal or other releases reflect the high volume of materials managed on-site at metal mines. As shown in Figure 31, more than 99% of its releases are on-site land disposals resulting from very small concentrations of metals naturally present in the ore body. In 2012, the metal mining sector reported the largest disposal or other releases representing 40% of the releases for all industries. It also reported nearly two-thirds (65%) of the on-site land disposal reported for 2012 for all industries.



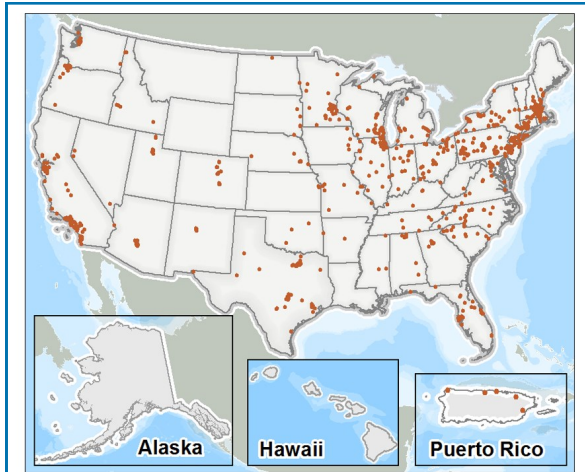
As shown in Figure 32, the metal mining sector's production-related waste managed is primarily disposed of or otherwise released. The quantity of waste managed changed little from 2003 to 2009, and then it increased in 2010 and 2011 prior to a decline in 2012. Metal mine production, represented by the black solid line in Figure 32, remained relatively steady from 2003 to 2012. This indicates that factors other than production have contributed to the recent changes in quantities of waste managed. One factor frequently cited by facilities is the composition of the extracted ore and waste rock, which can vary substantially from year to year. In some cases, large quantities of toxic chemicals in waste rock may qualify for a concentration-based exemption and not need to be reported in one year but not qualify for the exemption the next year or vice versa due to very small changes in the chemical's concentration.



In the metal mining sector, 6 of the 88 facilities initiated practices in 2012 to reduce their toxic chemical use and waste generation through source reduction. Toxic chemical quantities reported by this sector are not especially amenable to source reduction, since they primarily reflect the natural composition of the waste rock.

To learn more about this sector, visit EPA's Minerals/Mining/Processing Compliance Assistance website at www.epa.gov/compliance/assistance/sectors/mineralsmining.html.

Computers/ Electronics



TRI Facilities, 2012: Computers and Electronics

This sector includes facilities that manufacture computers and electronic products such as semiconductors, communications equipment, and industrial controls. Compared to the other industry sectors profiled, quantities of toxic chemicals released or managed as waste are relatively low. However, this sector's high rate of reporting source reduction activities and efforts to remove lead from products is notable, so the sector is included as one of the Industry Sector Profiles.

Quick Facts for 2012

Number of TRI Facilities: 875
Facilities Reporting Newly Implemented Source Reduction Activities: 233

Total Disposal or Other Releases: 4.2 million lb

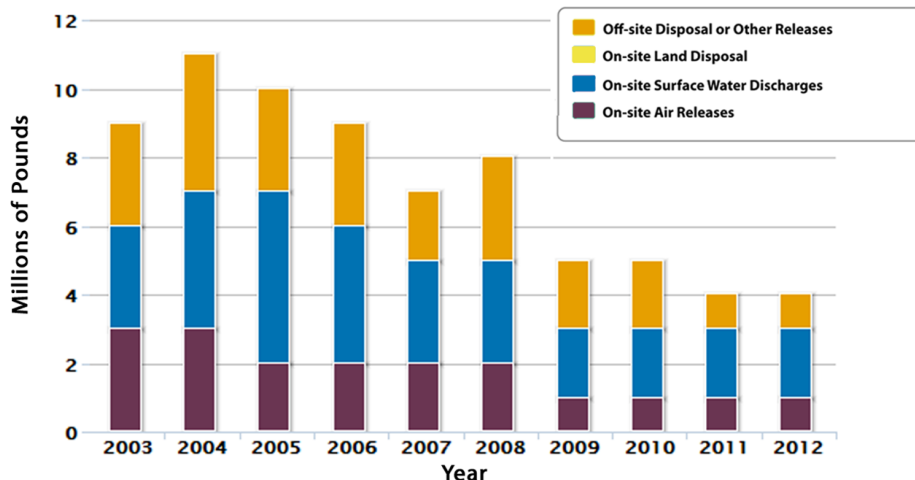
- On-site: 2.8 million lb
 - Air: 1.3 million lb
 - Water: 1.6 million lb
 - Land: 14 thousand lb

- Off-site: 1.4 million lb

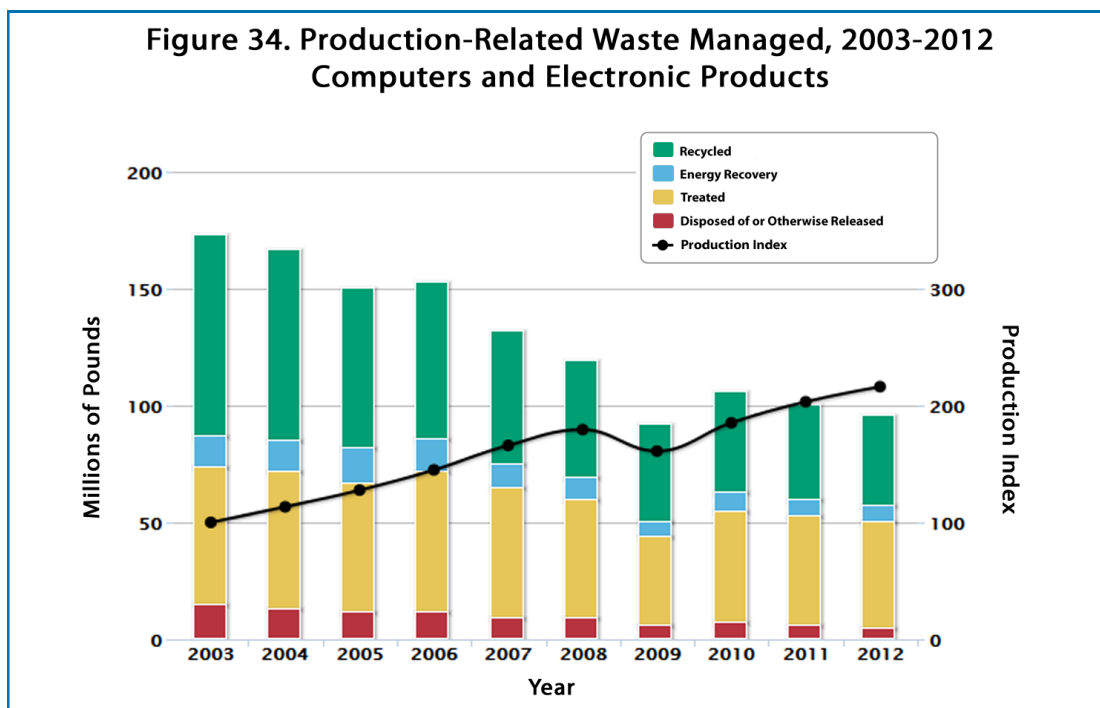
Production-Related Waste Managed: 96.5 million lb

- Recycled: 38.9 million lb
- Energy Recovery: 7.2 million lb
- Treated: 45.1 million lb
- Disposed of or Otherwise Released: 5.3 million lb

Figure 33. Total Disposal or Other Releases, 2003-2012
Computers and Electronic Products



As shown in Figure 34 by the solid black line, the computer and electronics sector’s production (represented by the Federal Reserve Board Industrial Production Index) more than doubled between 2003 and 2012. The sector’s production-related waste managed followed an opposite trend, decreasing by 44% over the same time period (including large decreases in waste recycled) indicating that this sector has decreased its waste per unit of production dramatically over this time period. Likewise, the sector’s total disposal or other release quantities have decreased 57% from 2003 to 2012, with decreased on-site air and water releases and quantities transferred off-site for disposal or other releases.



This sector has one of the highest rates for reporting on newly implemented source reduction activities. In 2012, 27% of facilities reported having initiated practices to reduce their toxic chemical use and waste generation through source reduction activities. Process modifications were commonly reported, which include activities such as modifying equipment or instituting recirculation within processes.

This sector has significantly reduced its lead waste in recent years driven by a shift to lead-free solder in its products, which resulted in part from the 2003 Restriction of Hazardous Substances (RoHS) Directive in the European Union. This shift to lead-free solder is evident in the sector’s TRI reporting—production-related waste of lead and lead compounds in this sector decreased by 79% from 2003 to 2012. Many facilities substituted raw materials to reduce or eliminate lead and reported the change was made to comply with RoHS. [One such facility](#) reduced its lead waste by 88% from 2005 to 2012.

TRI’s Pollution Prevention Search Tool can help you learn more about [pollution prevention opportunities in this sector](#). And for more information about how this industry and others can choose safer chemicals visit EPA’s Design for the Environment Program pages for [Alternatives Assessments](#) and the [Safer Chemical Ingredients List](#).

Parent Companies

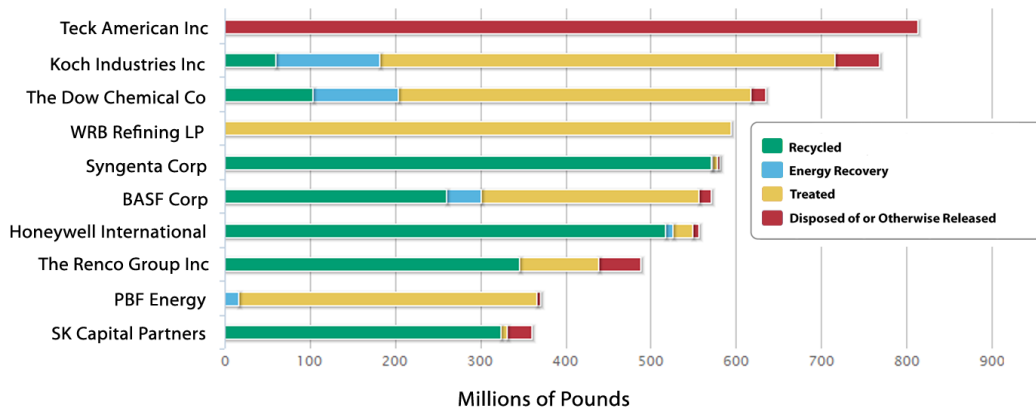
Many of the facilities reporting to TRI are owned by parent companies that also own other facilities reporting to TRI. Facilities reporting to TRI are asked to provide the name of their highest level parent company in the United States, if they have one.

The parent companies and single facilities with no parent company that reported the largest quantity of chemicals in production-related waste managed are shown in Figure 35. As stated earlier in this document, production-related waste managed includes the total amounts of toxic chemicals in waste managed by facilities, which helps track industry progress in reducing waste generation and in moving toward safer waste management alternatives. It includes quantities of chemicals recycled, used for energy recovery, treated, and disposed of or otherwise released, whether on- or off-site.

What is a Parent Company?

Generally in TRI, a parent company is a facility's highest level U.S. corporation or other business entity.

Figure 35. Production-Related Waste Managed by Top 10 TRI Parent Companies*, 2012



* EPA has placed an added emphasis on the importance of improved data quality for parent company names. These rankings have not been independently verified but reflect the parent company information provided by TRI facilities in 2012.

These companies vary in size and the sectors in which they operate. The number of TRI reporting facilities owned by these companies ranges from 1 to 105. For five of the top ten companies, the waste managed is primarily from their facilities in the chemical manufacturing sector (Dow Chemical, Honeywell, Syngenta, BASF, and SK Capital). Other parent companies in Figure 35 are in the petroleum sector (PBF Energy and WRB Refining), metal mining (Teck American), and metal smelting (The Renco Group). Koch Industries operates in a variety of industry sectors including pulp and paper, petroleum refining, and chemicals.

As stated earlier, the waste management hierarchy, established by the 1990 Pollution Prevention Act, guides and encourages waste generators toward the best options for managing their wastes. At the top of the hierarchy is the most preferable option: the prevention of toxic waste generation through pollution prevention or source reduction activities. Pollution prevention practices can include modifications to equipment, processes, and procedures, as well as reformulation or redesign of products, substitution of raw materials, and improvement in maintenance and inventory controls.

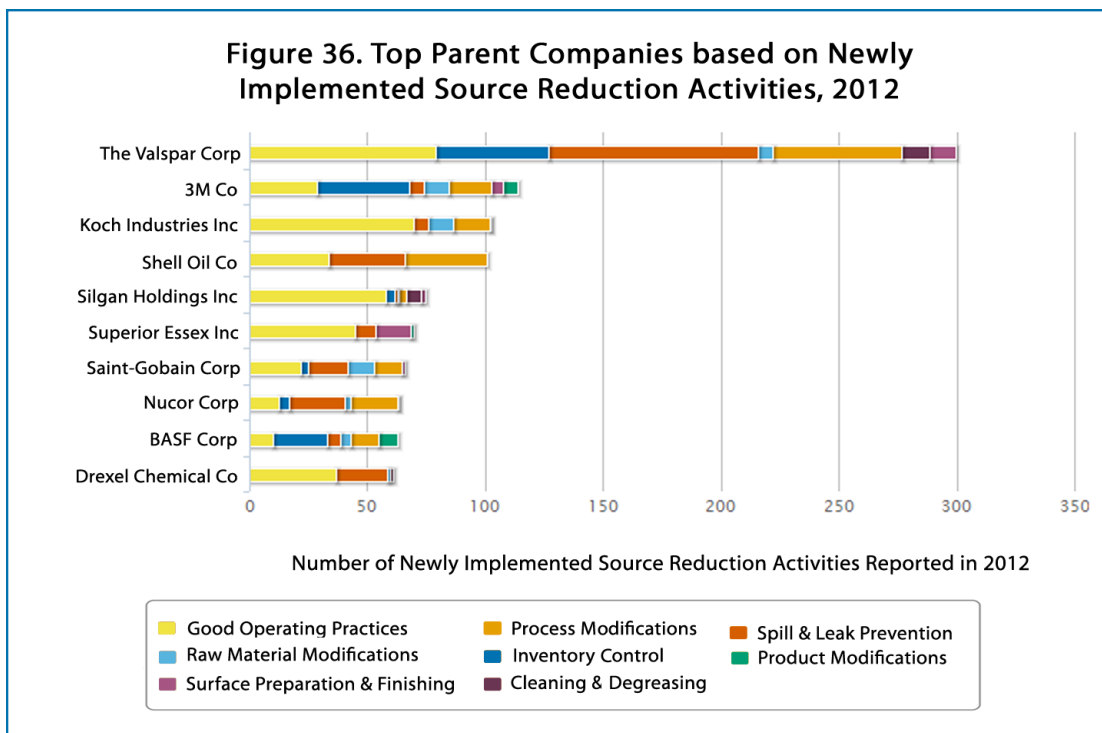
Facilities are asked to report on the source reduction activities they initiate each year. In 2012, 15% of all facilities reporting to TRI indicated that they initiated source reduction activities. In the past 5 years, over 22% of facilities reporting to TRI indicated that they initiated source reduction activities in at least one year since 2008. Table 2 shows the percent of current reporting facilities of the top parent companies that have reported source reduction for 2012, and in the recent past (2008 to 2012).

Table 2. Newly Implemented Source Reduction Activities at the Top Parent Companies for Production-Related Waste Managed, 2012			
Parent Company	Facilities Reporting for 2012	Percent of Facilities Reporting Source Reduction Activities for 2012	Percent of Facilities Reporting Source Reduction Activities at Least One Year, 2008-2012
TECK AMERICAN INC	1	100%	33%
KOCH INDUSTRIES INC	105	28%	31%
THE DOW CHEMICAL CO	49	12%	32%
WRB REFINING LP	1	100%	100%
SYNGENTA CORP	1	100%	100%
BASF CORP	56	28%	35%
HONEYWELL INTERNATIONAL INC	61	31%	36%
THE RENCO GROUP INC	10	10%	10%
PBF ENERGY	2	0%	0%
SK CAPITAL PARTNERS	5	20%	40%

Some companies report additional (optional) information to TRI about their pollution prevention or waste management activities. For example, among the top 10 parent companies, additional information reported included:

- A facility owned by The Renco Group is largely eliminating the use of a high xylene content material, except for minor use in service parts manufacturing. Two key technology changes that enabled this change are the use of flame and plasma surface treatments, and better formulations of water-based painting technologies. Total disposal or other releases of xylene at this facility fell by 32% between 2011 and 2012, and reductions are expected to continue in 2013. [\[facility details\]](#)
- By improving inventory scheduling, one Honeywell International facility reduced the quantity of expired products of which it must dispose. This facility also reclaims lead off-site from solder dross and uses on-site administrative controls to maximize the usage of lead solder. The quantity of lead managed as waste fell by about 5% between 2011 and 2012. [\[facility details\]](#)
- A Syngenta facility instituted a practice of using process material for process flush rather than consuming additional fresh n-methyl-2-pyrrolidone. [\[facility details\]](#)

To take a closer look at parent companies reporting source reduction activities, Figure 36 presents the parent companies that reported the most newly implemented source reduction activities in 2012.



Four of these top companies' TRI facilities operate primarily in the chemical manufacturing sector (Valspar, 3M, BASF, and Drexel Chemical). Superior Essex makes wire and cable. Nucor is a major steel producer in the United States. Koch Industries' TRI facilities operate in a variety of industry sectors including pulp and paper, petroleum refining, and chemicals. Saint-Gobain Corp facilities manufacture building products and refractories. Shell Oil facilities are in the chemical manufacturing and petroleum refining sectors, and Silgan Holdings produces metal containers. Some of these companies submitted additional text to EPA with their TRI reports describing their pollution prevention activities. Examples include:

- Based on an employee recommendation, one BASF facility implemented a new policy to reduce spills due to hose failure, which requires the electronic identification and annual testing of all hoses that are used to transfer chemicals. [\[facility details\]](#)
- A facility owned by Koch Industries installed a new power boiler to generate steam from natural gas rather than coal. Total disposal or other releases of barium compounds from this facility fell by over 40% between 2011 and 2012, even though production associated with barium compounds rose slightly in the same time frame. [\[facility details\]](#)
- Recent process piping improvements at a Saint-Gobain facility are expected to reduce or eliminate the solids collecting in process water tanks, which account for the majority of its waste disposed of in landfills. [\[facility details\]](#)

These and other submissions related to pollution prevention can be accessed on TRI's Pollution Prevention Website (www2.epa.gov/toxics-release-inventory-tri-program/pollution-prevention-p2-and-tri).

Comparing TRI and Chemical Data Reporting

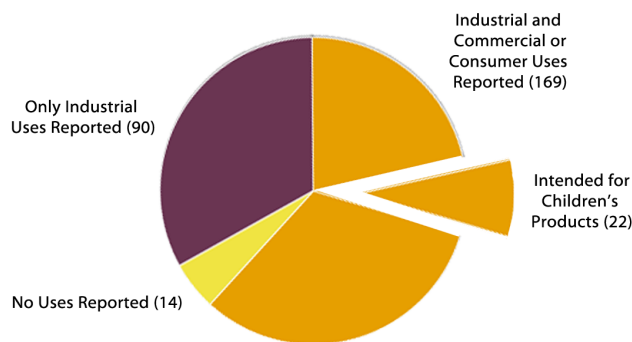
In addition to toxic chemical release and management data collected through the TRI Program, EPA collects information about the manufacture (including import) and use of chemicals in U.S. commerce through the Chemical Data Reporting (CDR) rule under the authority of the Toxic Substances Control Act (TSCA). Combining the chemical information reported to both TRI and CDR provides a more complete picture of a chemical's lifecycle from sources of import and domestic manufacture to means of final deposition in the environment or products.

For calendar year 2011 activities (the most recent common reporting year), 7,674 individual chemicals were reported to CDR and 514 individual chemicals and chemical categories were reported to TRI. Of the chemicals reported to TRI, 273 (53%) matched one or more CDR chemicals while the remaining 241 were not reported to CDR. Most of these 241 chemicals are not regulated by TSCA (such as pesticides, pharmaceuticals and polymers), and thus are not required to be reported to CDR. In some cases CDR data, including chemical identity, are withheld as confidential business information and, therefore, this analysis may underestimate the actual overlap between the two programs.

CDR complements TRI information, tracking the quantity of chemicals domestically manufactured and imported, and the known uses of chemicals in industrial processing and in consumer and commercial products. CDR reporters indicate if the product is "intended for use by children," which means the reported chemical or mixture is used in or on a product that is specifically intended for use by children age 14 or younger. Figure 37 shows how reported TRI chemicals correlate with CDR

reported uses. Nearly all chemicals (259) had industrial uses and 169 also had commercial or consumer uses.* Of the chemicals with commercial or consumer uses reported, 22 were in products intended for use by children.

Figure 37. Uses of CDR Matched TRI Chemicals and Chemical Categories



Example: TRI and CDR Data for Ethylbenzene

Ethylbenzene (CAS #100-41-4) is used as an example of how TRI and CDR data for 2011 may be combined for a more complete picture of the chemical's lifecycle. Ethylbenzene is reportable under both programs and used in consumer and commercial products intended for use by children. Exposure to ethylbenzene is associated with health effects including irritation of eyes, skin and respiratory track while chronic exposure may be associated with renal cancer or other cancers, as well as damage to hearing or the inner ear.

Ethylbenzene is a natural constituent of crude oil and is present in many petrochemical products and fuels; however, most industrial grade ethylbenzene is produced by the

* Industrial uses are reported for chemicals meeting the more than 100,000 lb CDR manufacturing threshold. Therefore, if a chemical is manufactured in small amounts it would not be reported.

reaction of benzene and ethylene. In 2011, 31 facilities reported to CDR a total production volume of 9.66 billion pounds of ethylbenzene manufactured (which includes quantities imported). For activities during the same timeframe, 1,315 facilities filed a TRI form for ethylbenzene.

Figure 38 combines 2011 CDR and TRI data for ethylbenzene to show its production, uses and waste management. The 31 CDR filers reported downstream industrial uses and consumer and commercial uses, including five products intended for children's use. The CDR filers also indicated the industrial sectors that use ethylbenzene, including:

- Paint and Coating Manufacturing
- Basic Organic Chemical Manufacturing
- Plastics Material and Resin Manufacturing
- Petroleum Refineries
- Petrochemical Manufacturing

Many of the 1,315 TRI facilities reporting ethylbenzene were also in these sectors.

The TRI facilities reported managing 78.4 million pounds of ethylbenzene as waste, which represents less than 1% of the total production volume reported to CDR, indicating that the chemical was largely consumed in a process or is in a product, rather than ending up as a waste. This is further supported by the CDR data that show the two top industrial functions for this chemical are intermediates and solvents.

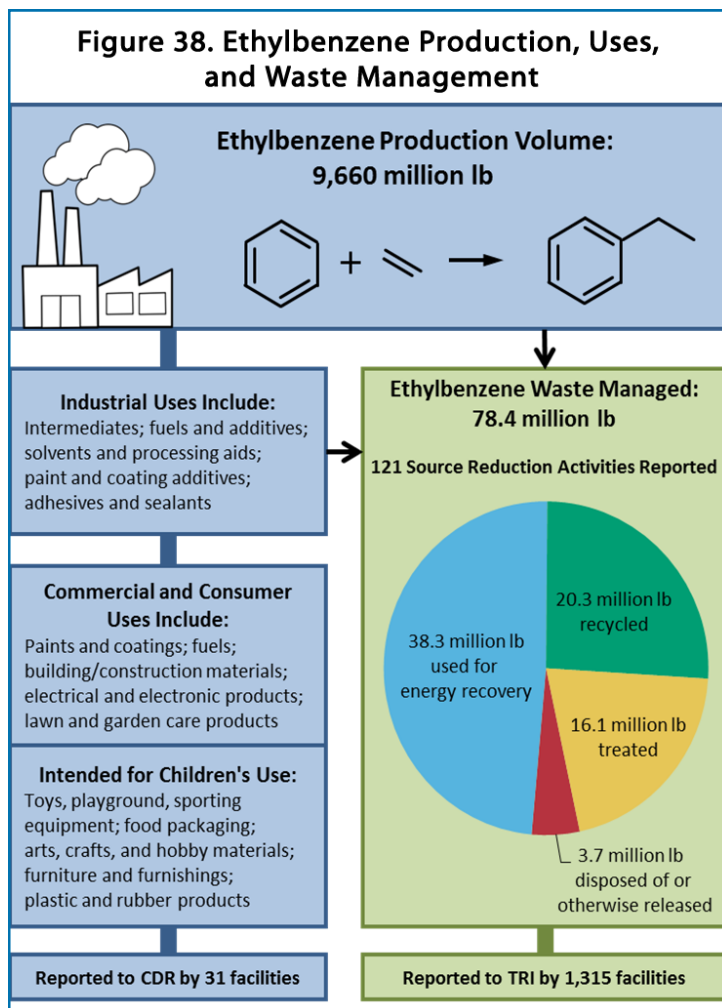
Almost half of the ethylbenzene waste was used for energy recovery, and 5% (3.7 million pounds) was disposed of or otherwise released primarily as air emissions or through underground injection.

TRI reporters also provide information on source reduction activities implemented to generate less waste. Of the 1,315 TRI facilities reporting for ethylbenzene, 121 (9%) reported a source reduction activity; among the most common are:

- Improved maintenance scheduling, recordkeeping, or procedures;
- Changed production schedule to minimize equipment and feedstock changeovers; and
- Substituted raw materials.

[One facility](#) with large reductions in ethylbenzene air emissions from 2010 to 2011 reported installing a thermal oxidizer to destroy emissions from their coating line.

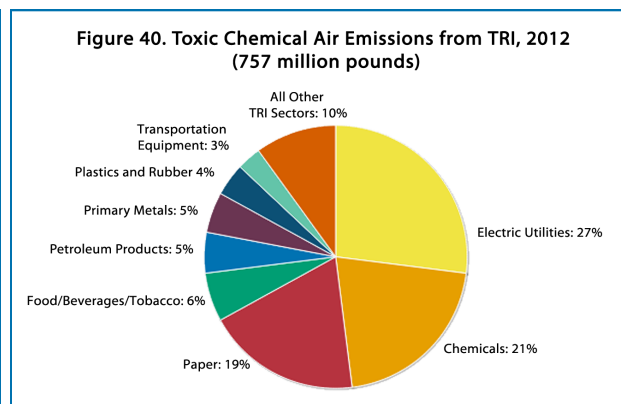
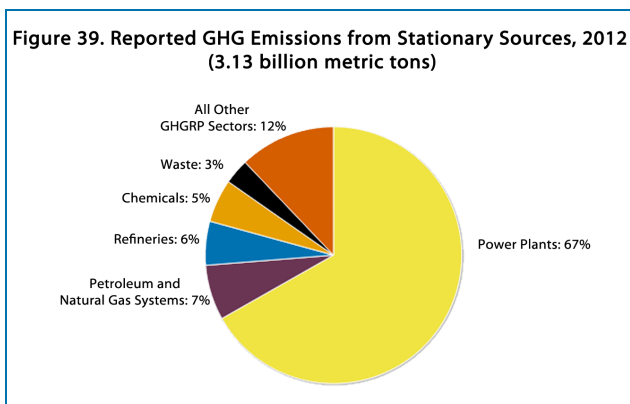
For more information on the CDR program, see www.epa.gov/cdr/.



Comparing TRI and Greenhouse Gas Reporting

Under the authority of the Clean Air Act, EPA's Greenhouse Gas Reporting Program (GHGRP) requires large emitters of greenhouse gases and suppliers of certain products to submit annual greenhouse gas reports to EPA. Emissions of greenhouse gases lead to elevated concentrations of these gases in the atmosphere, leading to a change in Earth's radiative balance that contributes to climate change. These elevated concentrations are reasonably anticipated to endanger both the public health and the public welfare of current and future generations. The purpose of the GHGRP is to collect timely, industry-specific data to help us better understand the source of greenhouse gas emissions and to inform climate policy.

While facilities report a variety of greenhouse gases to EPA, the predominant gas is carbon dioxide (CO₂), which is released during fossil fuel combustion and various industrial processes. TRI reporting covers different chemicals, some of which are byproducts of energy production, but TRI chemicals are also used in and released from additional processes ranging from metal mining to surface cleaning. Therefore, the top air emitting sectors in TRI are similar, but not identical to, the top emitting sectors covered by the GHGRP. Analyzing toxic chemical releases reported to TRI and greenhouse gas emissions reported to the GHGRP together creates a more complete picture of emissions at the facility and sector levels. Figures 39 and 40 reflect the most recent data from the GHGRP and TRI.



In 2012, over 7,500 facilities in nine industry sectors reported direct emissions of greenhouse gases to the atmosphere, totaling over 3.13 billion metric tons of carbon dioxide equivalent (mt CO₂e). This represents about half of the 6.7 billion mt CO₂e that EPA estimated was released in the United States from all human-related sources in 2011. The GHGRP does not require direct emissions reporting from all U.S. sources. For example, the transportation sector is a large source of greenhouse gas emissions in the United States, but is not included in Figure 39. To learn more about human-related greenhouse gas emissions in the U.S., see the latest version of the U.S. Greenhouse Gas Inventory (www.epa.gov/climatechange/ghgemissions/usinventoryreport.html). Sectors with the highest reported greenhouse gas emissions include electric utilities, petroleum and natural gas systems, refineries, and chemical manufacturing, which combined account for almost 2.7 billion mt CO₂e.

What is CO₂e?

Emissions of greenhouse gases are typically expressed in a common metric, so that their impacts can be directly compared, as some gases are more potent than others. The international standard practice is to express GHGs in CO₂e.

In 2012, more than one-third of the facilities reporting to GHGRP also reported to TRI, as shown in Figure 41. However, this subset of GHGRP reporters accounted for almost three-quarters of GHGRP emissions (see Figure 42), indicating that the facilities reporting the greatest GHG emissions also exceed TRI reporting thresholds.

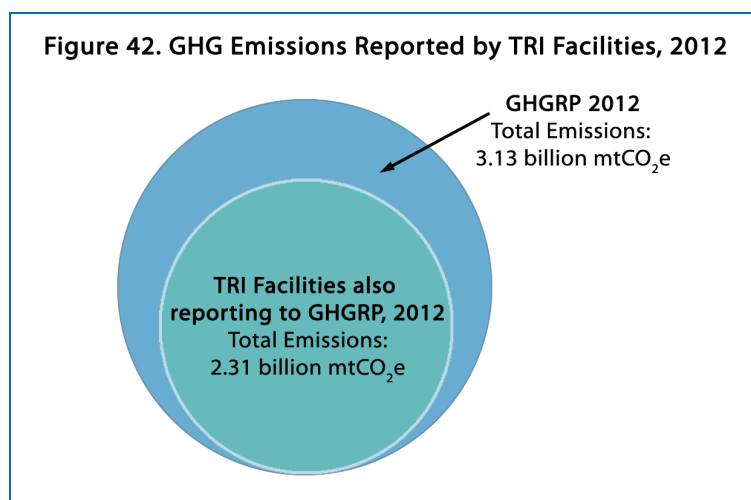
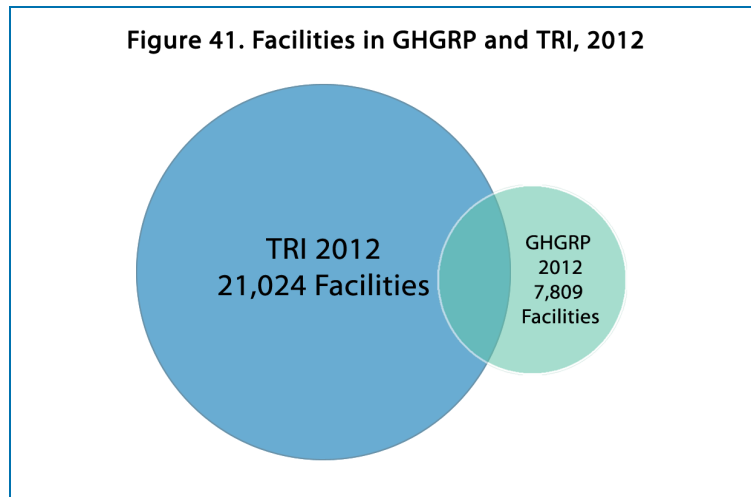
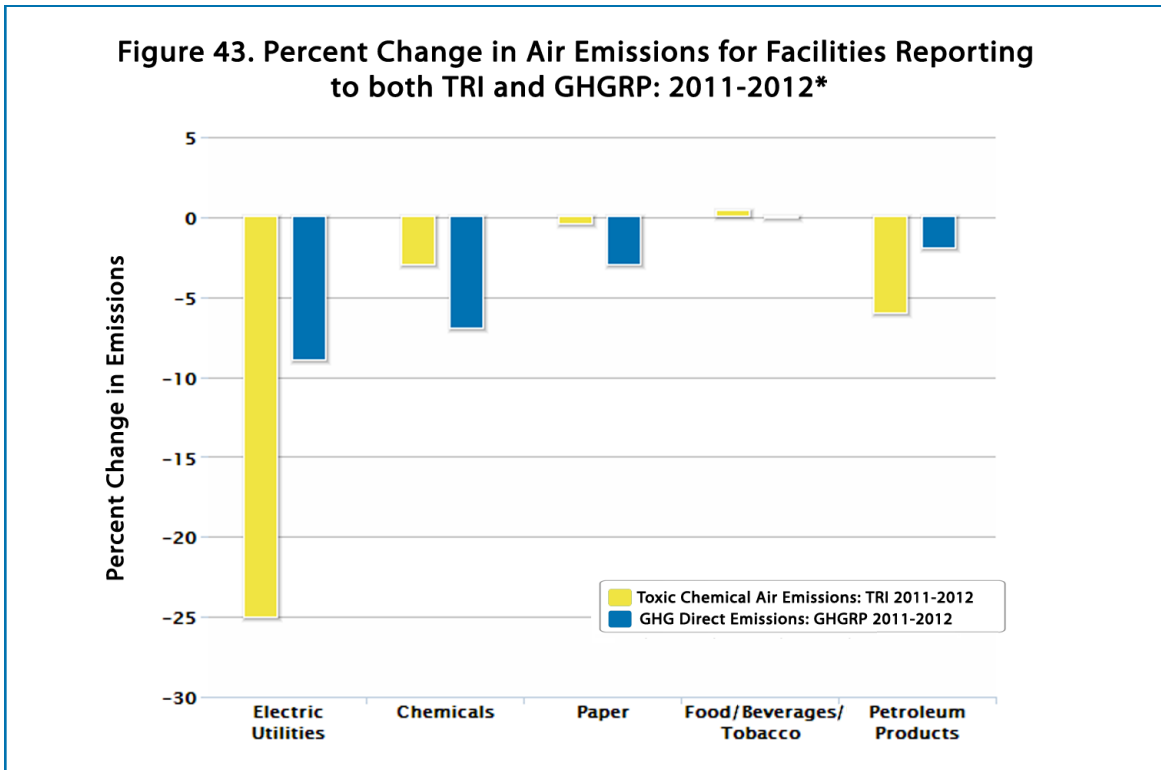


Figure 43 shows the percent change in total air emissions from 2011 to 2012 for the subset of facilities reporting to both TRI and GHGRP. Even though this graph is limited to a single set of facilities, the percent change in emissions for each industry varies between the two programs. The variation in reductions is driven by differences in the types of pollutants reported to TRI and GHGRP and by the impacts of certain source reduction and pollution control activities. Some actions taken by facilities reduce emissions of both greenhouse gases and toxic chemicals that are byproducts of fuel combustion. Other actions, like the installation of new treatment technology, may reduce emissions of a specific TRI chemical but not affect greenhouse gas emissions. Electric utilities, whose TRI and GHGRP emissions are often generated through the same process, reported significant reductions in air emissions for both programs. The reduction in TRI air emissions was driven by decreases in hydrochloric acid, sulfuric acid, and hydrogen fluoride, which combined account for most (94%) of the air emissions reported by electric utilities in 2012.



*Excludes one facility that reported under different TRI industry sector categories in 2011 and 2012.

To learn more about the GHG Reporting Program, visit the program's website at www.epa.gov/ghgreporting/.

TRI Tools and Resources

Tools and resources that can help you find information specific to your concerns and communities:

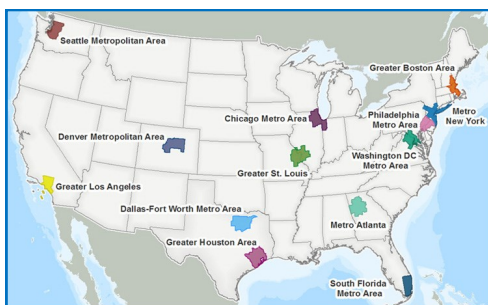
For more information about the Toxics Release Inventory Program and the most recent TRI data, go to:

- EPA's TRI website — www2.epa.gov/tri

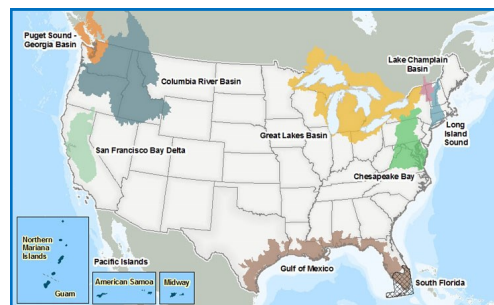
For location-specific analysis of TRI data, go to:

- **2012 TRI National Analysis** — www2.epa.gov/toxics-release-inventory-tri-program/2012-tri-national-analysis

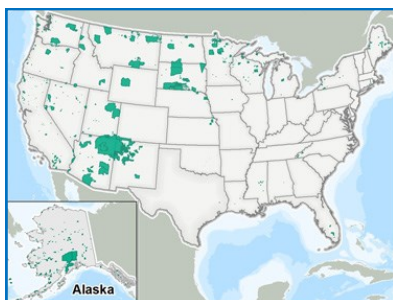
2012 Location-Specific Analyses



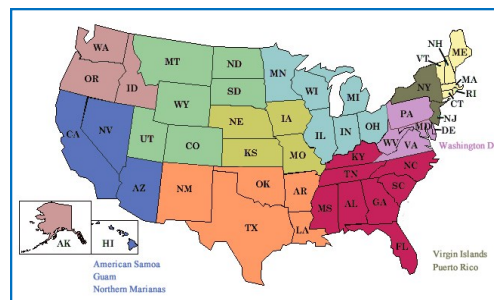
Urban Communities



Large Aquatic Ecosystems



Indian Country and Alaska Native Villages



ZIP code, City, County, or State Fact Sheets



See also:

- **TRI Data and Tools website** (www2.epa.gov/toxics-release-inventory-tri-program/tri-data-and-tools) — learn about nearby TRI facilities and access the pollution prevention information reported to TRI.



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