

2011 Toxics Release Inventory National Analysis Overview



What's Inside?

Introduction: What is the TRI National Analysis?	3
Disposal or Other Releases of TRI Chemicals	6
Management of TRI Chemicals	13
Industry Sector Profiles.....	17
• Industry Sector Profile: Chemical Manufacturing.....	23
• Industry Sector Profile: Electric Utilities	25
• Industry Sector Profile: Metal Mining	27
• Industry Sector Profile: Automobile Manufacturing.....	29
Parent Companies	31
Comparing TRI and Greenhouse Gas Reporting.....	34
TRI Tools and Resources.....	36

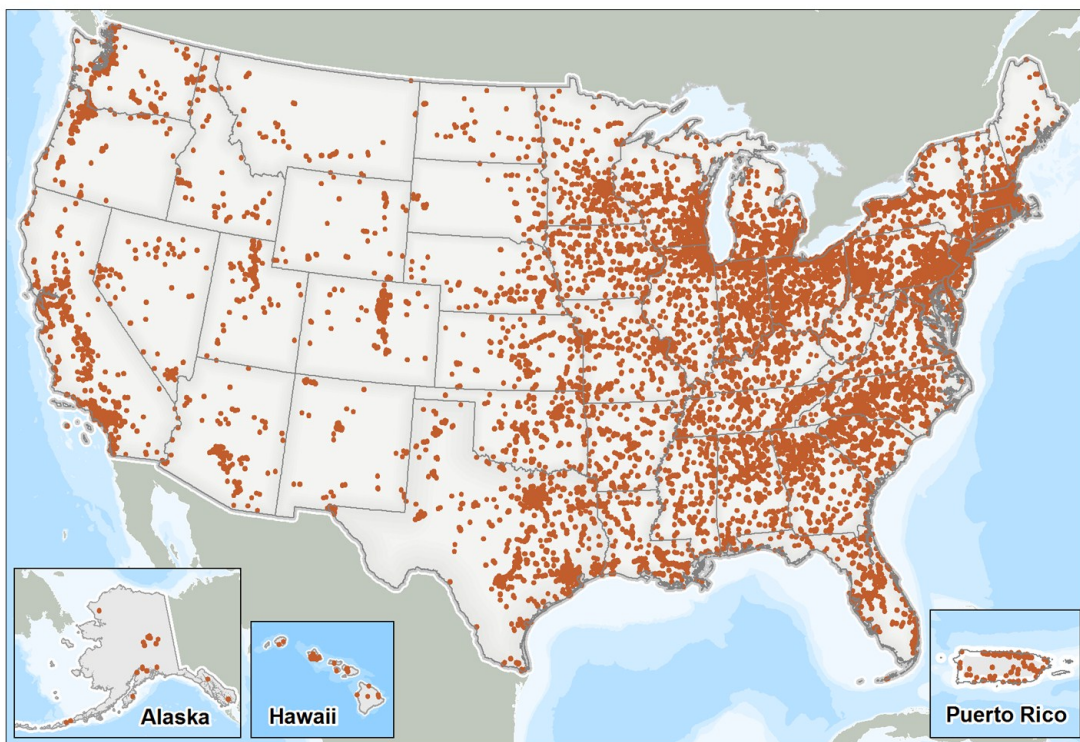


Introduction: What is the TRI National Analysis?

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; therefore, 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 are increasing or decreasing over time. The Toxics Release Inventory (TRI) is a database that contains detailed information on disposal or other releases of over 650 chemicals from thousands of U.S. facilities that report to TRI (see Figure 1). These toxic chemicals can be harmful to either human health or the environment or both.

Figure 1. Geographic Distribution of TRI-Reporting Facilities

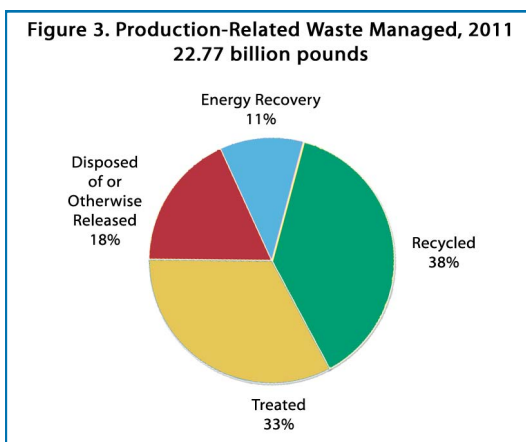
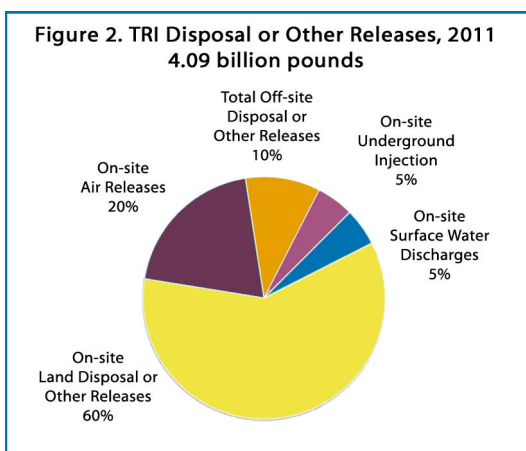


These facilities are typically large and are involved in manufacturing, metal mining, electric power generation, and hazardous waste treatment. Federal facilities are also required to report to TRI by Executive Order.

The 2011 TRI National Analysis is EPA's annual interpretation of TRI data, and it provides the public with valuable information on how toxic chemicals were managed, where toxic chemicals ended up, and how 2011 compares to 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 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 exposed to toxic chemicals.

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



Quick Facts for 2011

Number of TRI Facilities: 20,927

On-site and Off-site Disposal or Other Releases: 4.09 billion lbs

On-site: 3.67 billion lbs

- Air: 0.80 billion lbs

- Water: 0.22 billion lbs

- Land: 2.44 billion lbs

- Underground Injection: 0.22 billion lbs

Off-site: 0.41 billion lbs

Production-Related Waste Managed: 22.77 billion lbs

- Recycled: 8.58 billion lbs

- Energy Recovery: 2.46 billion lbs

- Treated: 7.60 billion lbs

- Disposed of or Otherwise Released: 4.13 billion lbs

In 2011, 20,927 facilities reported to TRI. Together they reported total on- and off-site disposal or other releases of 4.09 billion pounds of toxic chemicals. Most were disposed of or released on site to land, air, water, or injected underground, as shown in Figure 2.

Production-related waste includes waste that is recycled, burned for energy recovery, and treated as well as disposed of or otherwise released. In other words, it encompasses all waste generated from facilities' processes and operations. In 2011 more than 22.77 billion pounds of toxic chemicals were reported as generated at TRI facilities in production-related wastes. Of this total, over 18.64 billion pounds were recycled, burned for energy recovery, or treated, and 4.13 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 (4.09 billion pounds and 4.13 billion pounds, respectively), but are not the same. This is because the value reported under disposal or other releases only counts waste once at final deposition. However, the value reported under production-related waste counts the 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, 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 amounts shown in Figure 2.

This National Analysis Overview presents information on the quantities and types of TRI chemicals in waste on a national scale for 2011, and how these quantities compare to previous years. In addition, several of the industry sectors and companies that report the largest quantities of toxic chemicals in waste are highlighted. EPA's TRI Program provides additional detail about the TRI data on its [website](#), and it posts a variety of tools and resources to help you find information specific to your interests and communities. These include geographic profiles that focus on individual communities, tribal lands, and large aquatic ecosystems. Links to all of these resources can be found in the [TRI Tools and Resources section](#) 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, land, or an underground injection well; or they may take place at an off-site location when a facility transfers waste that contains TRI chemicals as an off-site 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.

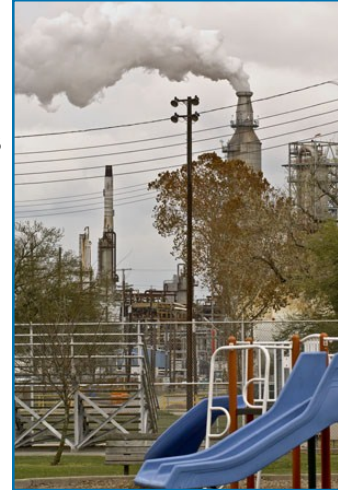
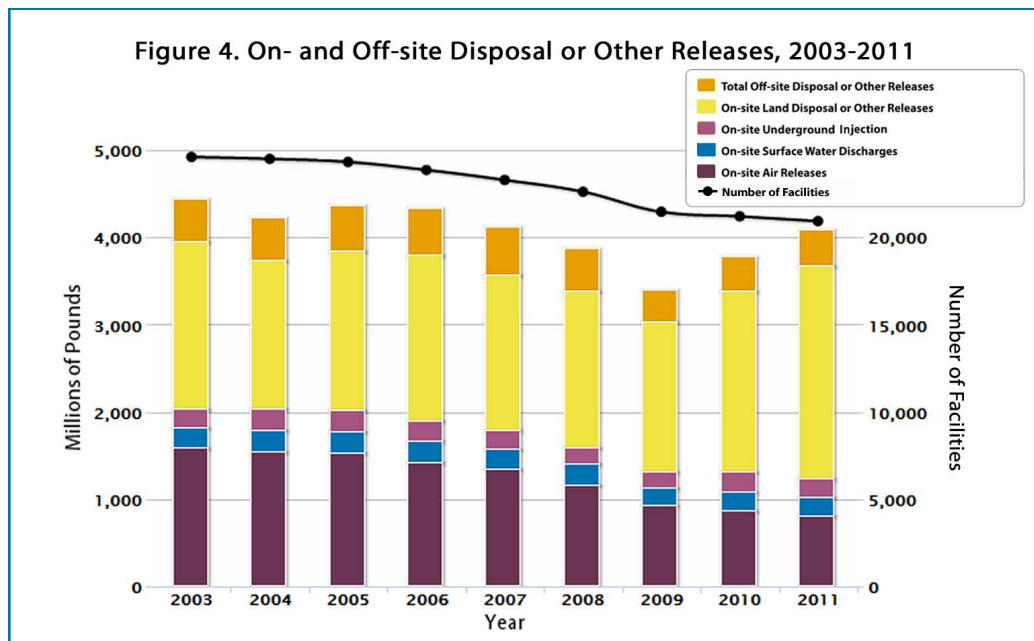


Figure 4 shows that disposal or other releases of TRI chemicals have generally decreased in the long-term: down 8% from 2003 to 2011. This downward trend over the nine-year period was driven by reductions in on-site air emissions. From 2010 to 2011, however, there was an 8% increase in disposal or other releases, mostly due to increases from the metal mining sector. The number of facilities reporting to TRI remained relatively steady from 2010 to 2011, decreasing by 1%.



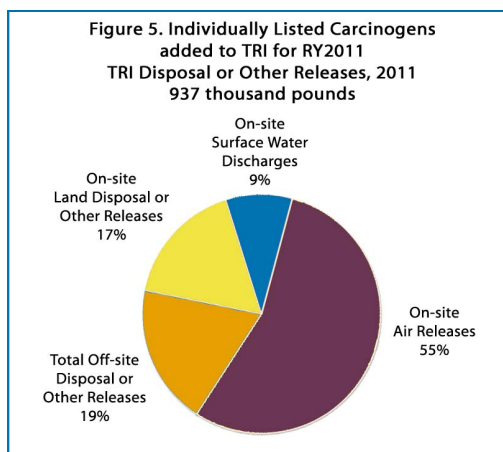
Many factors can affect trends in disposal or other releases, including changes in production, changes in management practices at facilities, changes in the composition in raw materials used at facilities and installation of control technologies. However, in the last few years increases in disposal or other releases have been driven mainly by increases in land disposal at metal mines, which typically handle large volumes of material. In this sector, even a small change in the chemical composition of the ore being mined can lead to big changes in the amount of toxic chemicals reported nationally. In recent years mines have cited increased production, waste rock disposal, and changes in the composition of waste rock as reasons for increased land disposal of TRI chemicals.

Decreases over time in disposal or other releases have been driven mainly by declining air releases, down 788 million pounds since 2003. Most of this decline was due to decreases in hazardous air pollutant (HAP) emissions, such as hydrochloric acid, at electric utilities. Likely reasons for the decreases include a shift from coal to other fuel sources and installation of control technologies at coal-fired power plants.

Newly Reported Chemicals for 2011

2011 is the first year that facilities are required to report on 16 new chemicals that have been classified as “reasonably anticipated to be a human carcinogen” by the [National Toxicology Program](#) (NTP). Twelve of these chemicals are individually-listed and four were added to the existing polycyclic aromatic compounds (PACs) category.

Reports were received for nine of the 12 new individually-listed chemicals. Tetrafluoroethylene comprised more than 50% of the total on-site and off-site disposal and other releases, while the most reports were received for isoprene. The majority of releases were on-site releases to air, as shown in Figure 5.



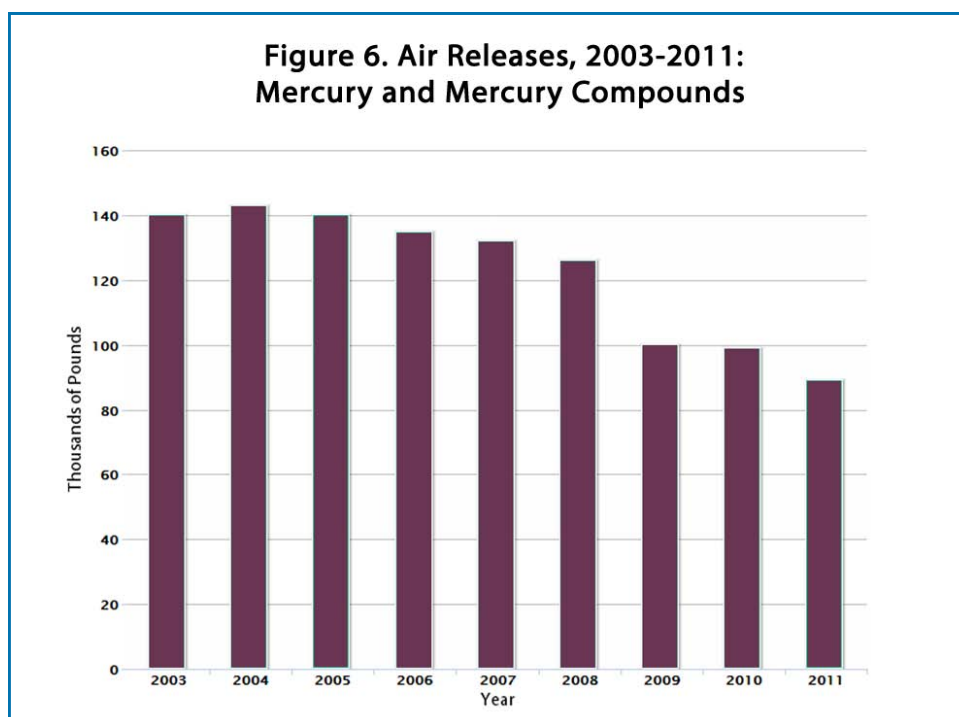
To learn more about these new chemicals added to TRI, go to www.epa.gov/tri/lawsandregs/ntp_chemicals/final.html.

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; dioxin and dioxin-like compounds; and PCBs.

Lead and lead compounds accounted for the vast majority (98%) of the disposal or other releases of PBT chemicals in 2011 and tend to drive trends over time for PBTs. The quantities of lead and lead compounds disposed of or otherwise released rose and fell between 2003 and 2011, with a substantial increase occurring from 2009 to 2011 (102%); trends were primarily driven by changes in on-site land disposal or other releases from the metal mining sector.

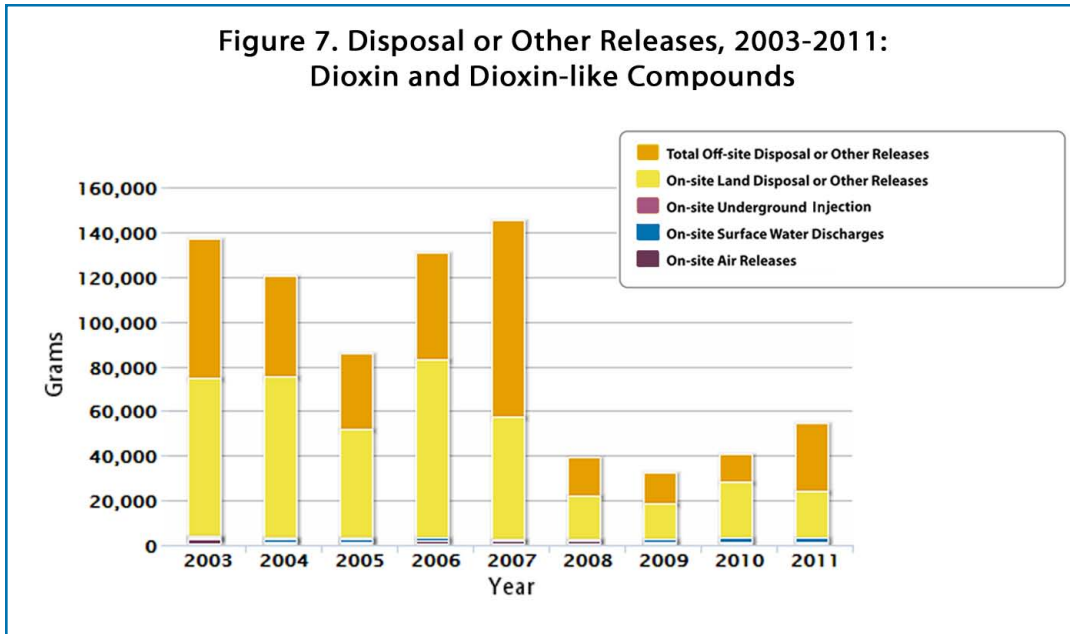
Mercury, another PBT chemical of concern, has traditionally been used to make products such as thermometers, switches, and some light bulbs. It is also found in many naturally occurring ores and minerals, including coal. The overall trend in disposal or other releases of mercury and mercury compounds is driven by metal mines, which accounted

for 97% of on-site land disposal of mercury in 2011. In the United States, coal-burning power plants are the largest source of mercury emissions to the air. Electric utilities, which include coal- and oil-fired power plants, accounted for 65% of the mercury and mercury compounds air emissions reported to TRI in 2011. Since 2003, air releases of mercury and mercury compounds decreased by 36%, including a 10% decrease from 2010 to 2011, as shown in Figure 6. Likely reasons for the decreases include a shift from coal to other fuel sources, and installation of control technologies at coal-fired power plants.

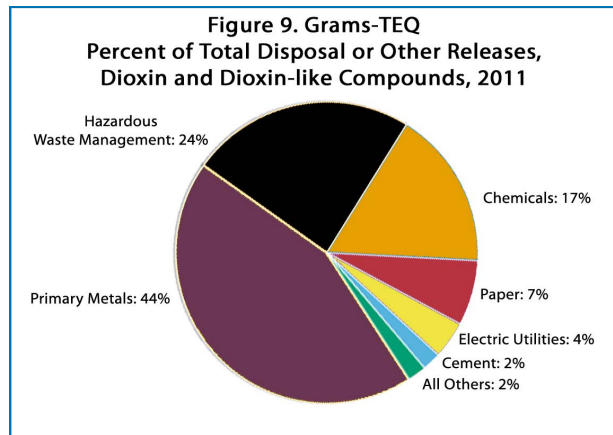
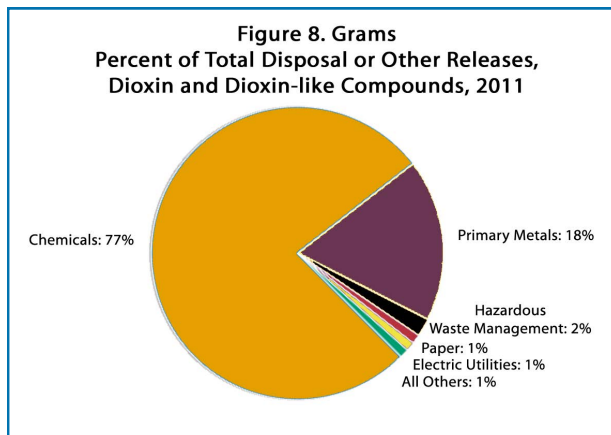


Dioxin and dioxin-like compounds (dioxins) are not only PBTs but are also characterized by EPA as probable human carcinogens. Dioxins are the unintentional by-products of most forms of combustion and several industrial chemical processes. Figure 7 shows the amount of dioxins disposed of or otherwise released in total grams. Disposal or other releases of dioxins increased 35% from 2010 to 2011 but decreased by 60% from 2003 to 2011. In 2011, most (80%) of this quantity was disposed of in on- and off-site RCRA subtitle C or other landfills. The figure also shows increased off-site transfers to disposal from 2010 to 2011, which are primarily due to transfers from one chemical manufacturing facility.

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 with Toxic Equivalency Factors (TEFs), which are based on each congener's toxicity data. 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 (TEQ).

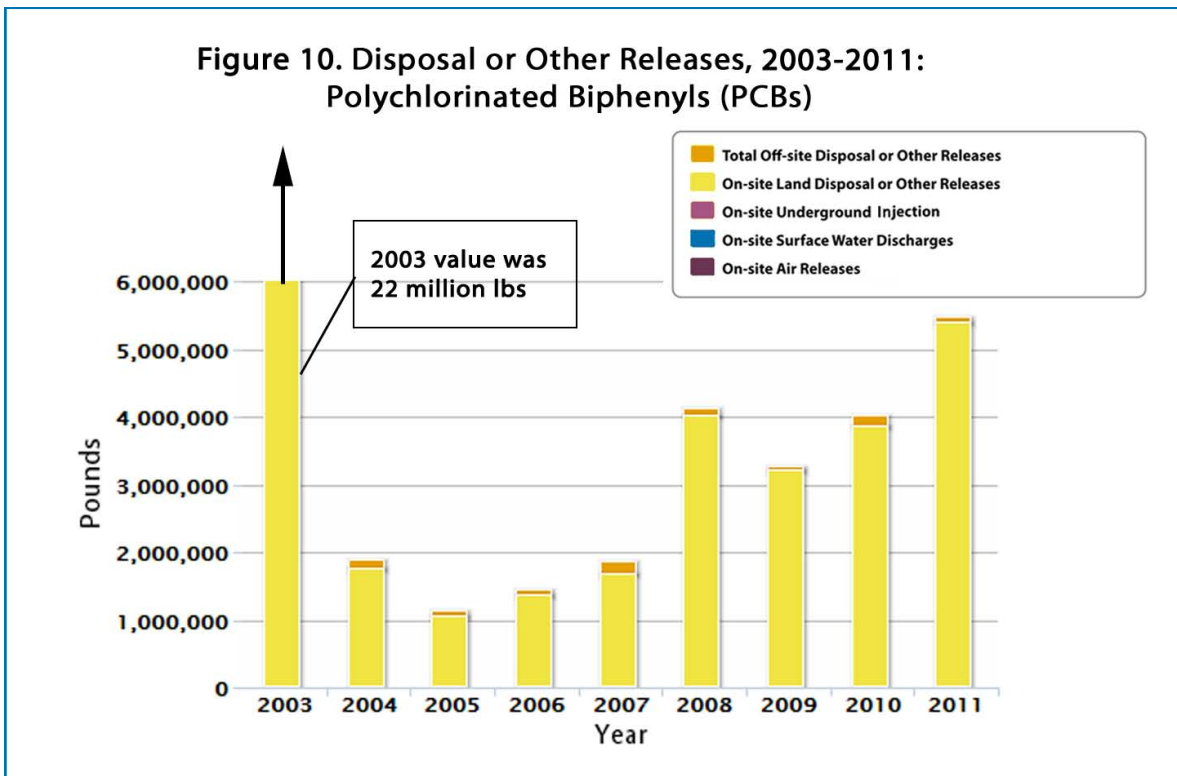


Analyzing dioxins in grams-TEQ is useful when comparing disposal or other releases of dioxin from different sources, or different time periods, where the mix of congeners may vary. EPA only recently began collecting comprehensive data on the individual dioxin congeners, so trends of TRI dioxin data in grams-TEQ are not possible at this time. Various industry sectors may dispose of or otherwise release very different mixes of dioxin congeners. Eight industry sectors accounted for most of both the grams and grams-TEQ of dioxin disposed of or otherwise released in 2011; however, their ranking in terms of percentage of the total is quite different for grams and grams-TEQ, as shown in Figures 8 and 9.

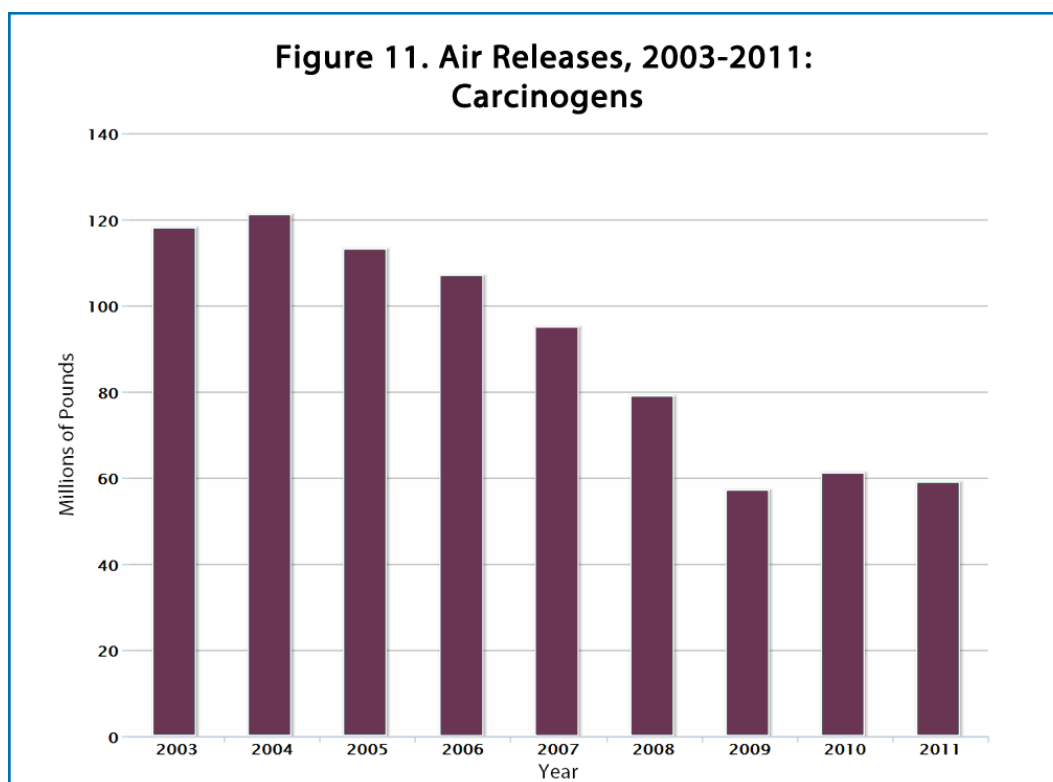


In 2011, the chemical manufacturing industry accounted for 77% of the total grams of dioxin and dioxin-like compounds disposed of or otherwise released, while the primary metals sector accounted for 18% of the total grams. However, when TEFs are applied, the primary metals sector accounted for 44% of the total grams-TEQ and the chemical manufacturing industry for 17% of the total grams-TEQ.

Polychlorinated biphenyls (PCBs), another PBT chemical category, are no longer manufactured or used in new products. Therefore, the disposal or other releases of PCBs are usually a result of cleanup efforts or capacitors and transformers being taken out of service and properly disposed of in facilities that minimize risk to human health and the environment. PCB disposal or other releases typically fluctuate from year to year, as shown in Figure 10, based on how many significant cleanup activities are underway or how many PCB transformers are removed from service. Almost 99% of disposal or other releases of PCBs are disposed of in RCRA (Resource Conservation and Recovery Act) Subtitle C landfills at hazardous waste management facilities. Note that in 2003, almost 22 million pounds of PCBs were disposed of in landfills, as shown in Figure 10 by the black arrow indicating the pounds reported that year exceed the scale of the figure. This 2003 spike in the trend was primarily due to one hazardous waste management facility disposing of PCBs in a RCRA subtitle C landfill.



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 11 shows that the air releases of these carcinogens decreased by 50% between 2003 and 2011, with a 3% (1.9 million pounds) decrease from 2010 to 2011.

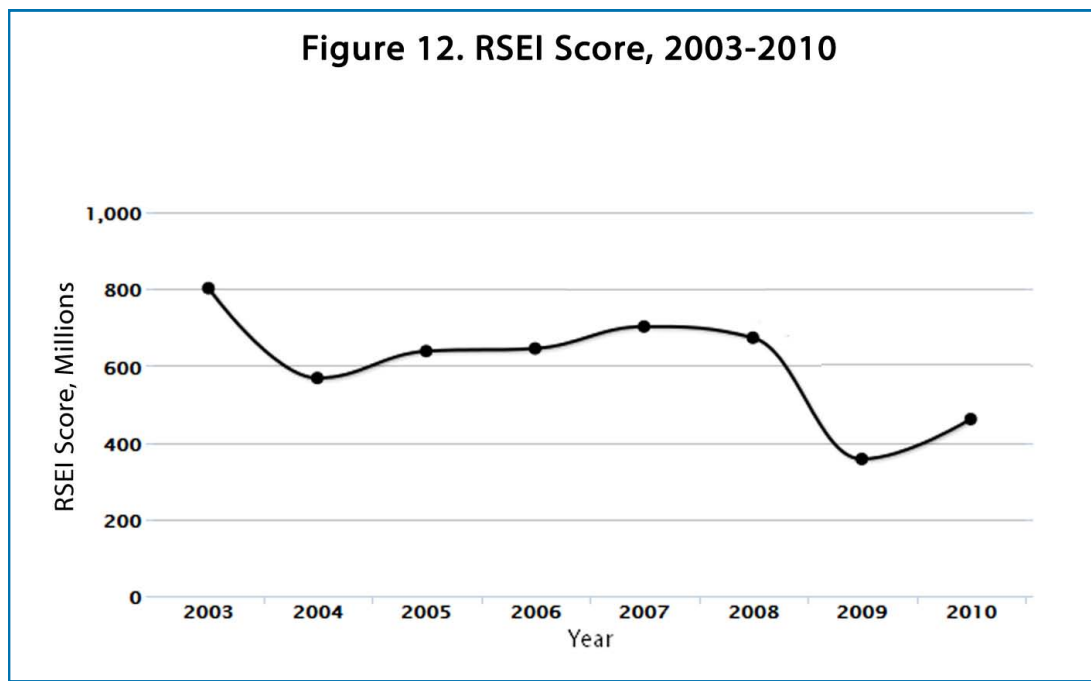


Trends in pounds of disposal or other releases do not account for potential risk of chemical releases. Risk can vary depending on chemical toxicity, how chemicals are released (e.g., to the air or water), where chemicals travel, and where human populations are located.

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 2010 are currently available, and updates through 2011 are scheduled to be available in the near future.

Figure 12 shows the trend in the RSEI score from 2003 to 2010. Over this time period, the RSEI score decreased by 43%, indicating that the relative risk of the TRI releases modeled through RSEI has declined considerably since 2003.



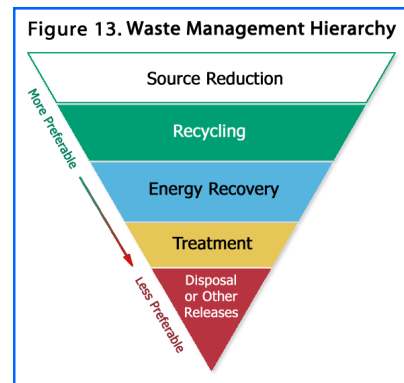
Note that RSEI is a screening-level model that uses simplifying assumptions to fill data gaps and reduce the complexity of calculations in order to quickly evaluate large amounts of data and produce a simple score. The model focuses on chronic human toxicity. It should be used for screening-level activities such as trend analyses that compare relative risk from year to year, or ranking and prioritizing chemicals and 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 Envirofacts 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 www.epa.gov/lawsregs/.

Management of TRI Chemicals

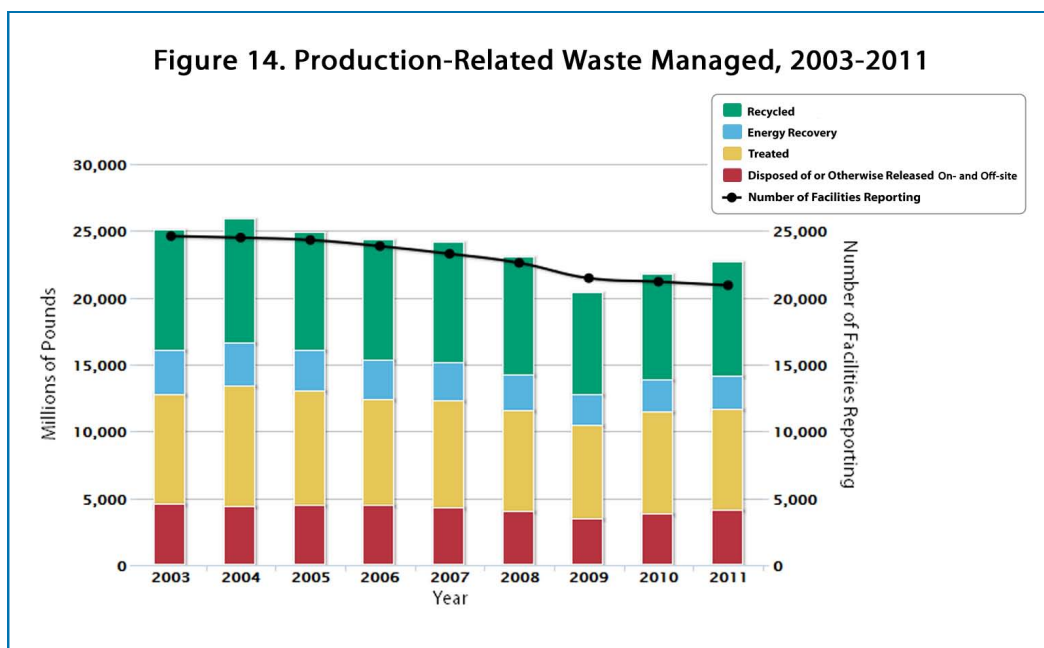
In addition to collecting information on the disposal or other releases of chemicals to the environment, TRI collects information on the quantities of toxic chemicals recycled, combusted for energy recovery, and treated both on- and off-site. This production-related waste includes the total amounts of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

Looking at production-related waste 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 but, 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 13) established by the Pollution Prevention Act of 1990.



As shown in Figure 14, from 2003 to 2011, total production-related waste managed by TRI facilities declined by 9% (more than 2 billion pounds). However, from 2010 to 2011, the total production-related waste managed increased 4%. The quantities of TRI chemicals in waste that were recycled, combusted for energy recovery, and disposed of or otherwise released increased from 2010 to 2011, while the amount treated decreased:

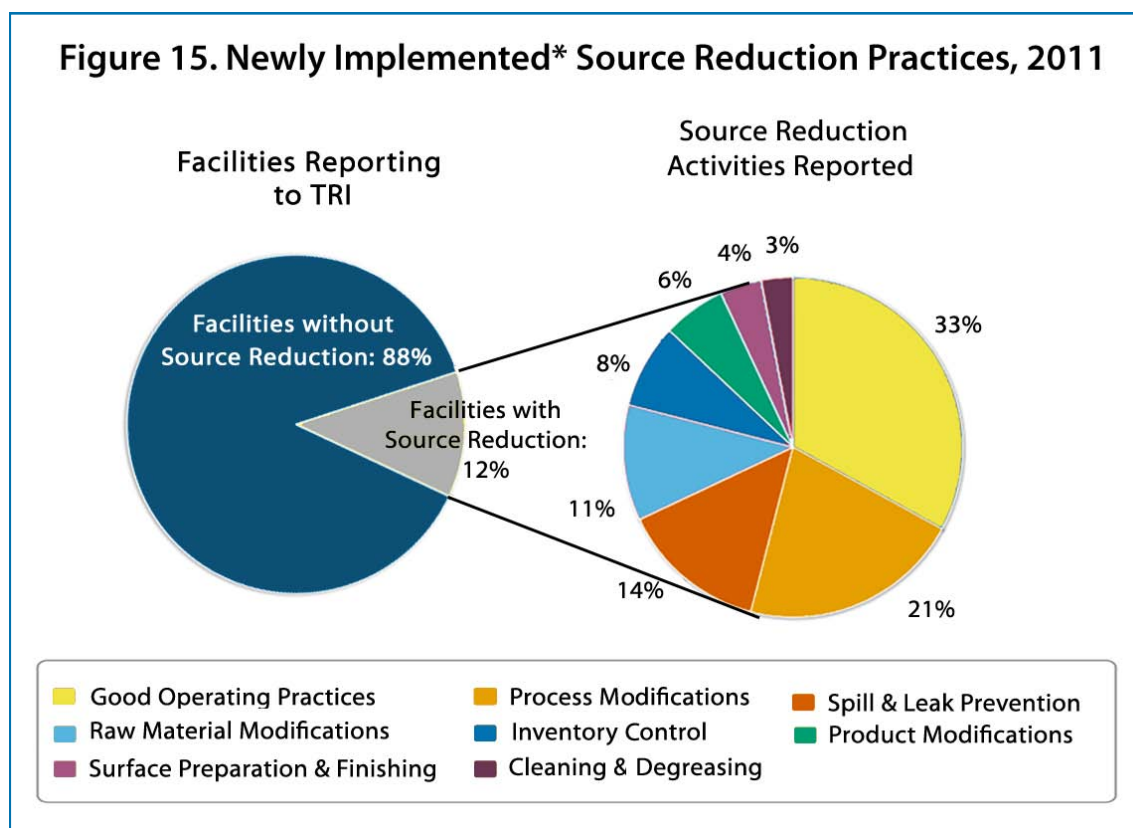
- recycling increased by 8%
- combustion for energy recovery increased by 2%
- treatment decreased by 1% and
- disposal and other releases increased by 8%.



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.

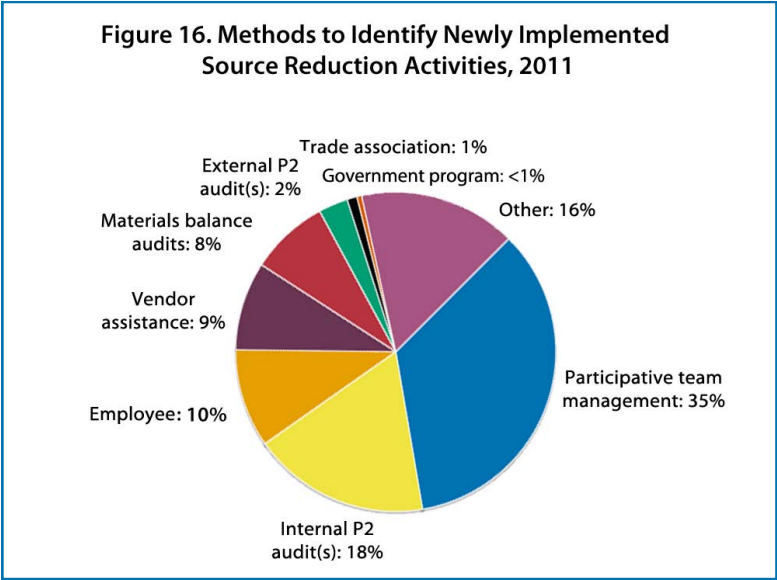
The adoption of pollution prevention activities can help eliminate waste at the source. Progress in implementing these activities can be tracked, in part, through the source reduction practices that are reported to TRI. The term “source reduction” generally refers to any practice that reduces the total 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., improved maintenance scheduling); process modifications (e.g., instituted re-circulation within a process); raw materials modifications (e.g., increased purity of raw materials); and numerous others.

In 2011, a total of 2,509 facilities (12% of all TRI facilities) reported initiating 8,430 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 15.



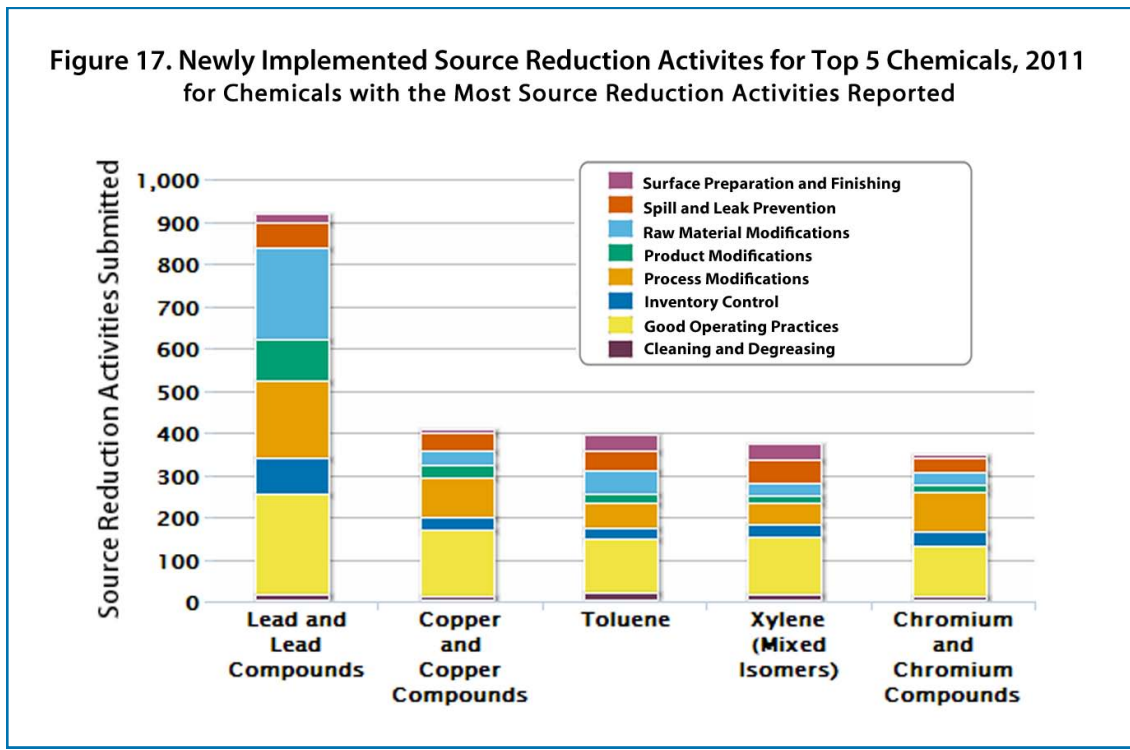
* Facilities may have ongoing source reduction activities initiated in previous years that are not captured in the graphs in this document. To find data on previously implemented source reduction activities see the TRI Pollution Prevention Website (www.epa.gov/tri/p2).

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 16).



In 2011, newly implemented source reduction activities were most frequently reported for the chemicals shown in Figure 17. The figure also shows the

distribution of types of source reduction activities initiated for these chemicals. The type of source reduction implemented varies depending on a chemical's use in industrial operations and the chemical's characteristics. It should be noted that these five chemicals are among the most commonly reported TRI chemicals by number of reports.



Facilities may also report additional information to EPA on their source reduction, recycling, or pollution control activities. For the top chemicals with source reduction reporting, examples of additional information reported are shown in Table 1 with the sector of the facility that submitted each example indicated in brackets.

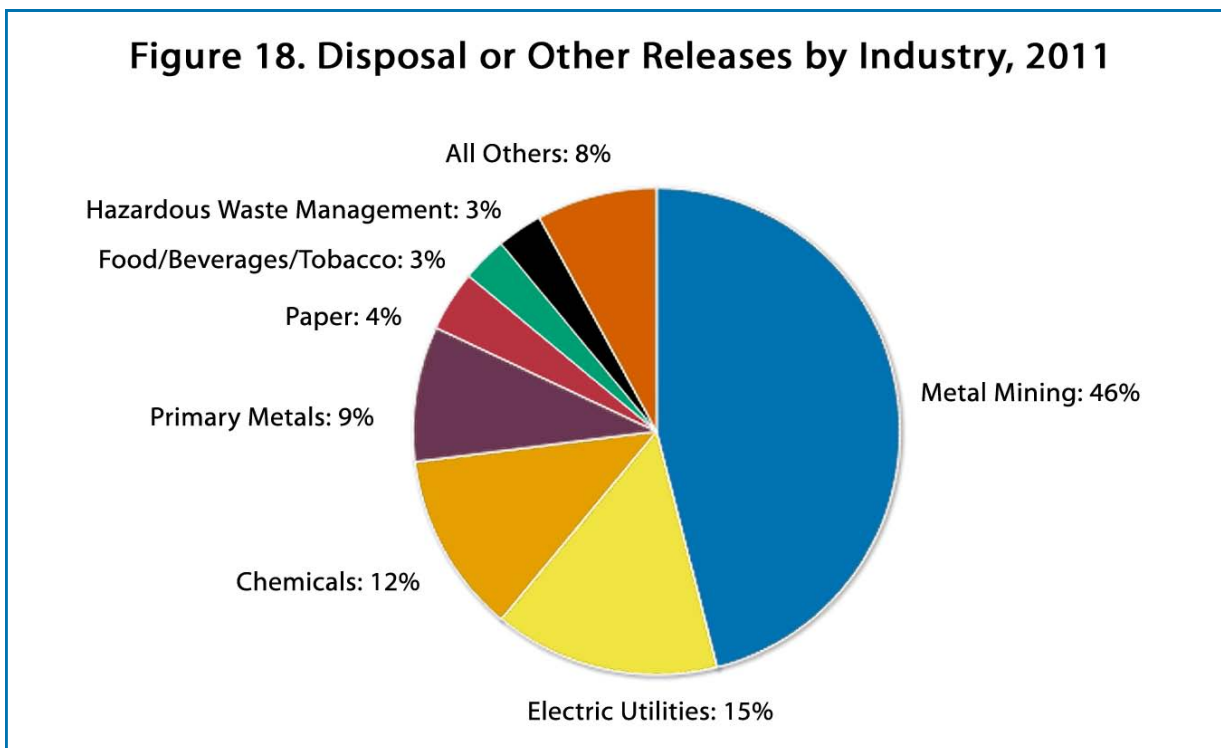
Table 1: Selected Source Reduction Activity Descriptions, by Chemical (2011)
(from Section 8.11 of the Form R)

Chemical	Source Reduction Activity Descriptions
Lead and Lead Compounds	<ul style="list-style-type: none"> • During reporting year 2011 an alternative product surface finishing line was implemented as an alternative to the lead process. The new process was installed for a customer that desired the surface finish. The new process is not limited to only that customer. Several customers have utilized the lead-free process and we expect continued growth of this process. [Computers/Electronic Products sector] • Our agency/institution has implemented an aggressive environmental management system (EMS) program based on the ISO 14001 standard. We are moving to purchase "lead" free ammunition (green ammunition) and instituted better tracking procedures/operational controls that add accuracy in regard to our release calculations. [Federal Facility] • Changed frequency of solder plating bath replacement from once every 18 months, to once every 24 months. [Computers/Electronic Products sector]
Copper and Copper Compounds	<ul style="list-style-type: none"> • A filter system was added to a process that generated copper fines. The fines had the opportunity to dissolve and reach the wastewater ion exchange system. The filter system was installed to remove the copper fines at the source. Filter system was designed during new equipment design review. Reuse of rinsewater containing copper fines was implemented to conserve water with a side benefit of less copper discharge. [Computers/Electronic Products sector] • When ordering copper wire and designing units, we had previously ordered and cut 10% longer pieces than necessary to allow for error. Reducing the extra amount from 10% to 7% will save a bit on excess material. [Electrical Equipment sector] • The site has implemented a 'zero leak' policy. Shift supervisor make rounds every 4 hours to look for signs of leaks or releases. Any leak or release is stopped and work orders are written to make repairs. [Chemicals sector]
Toluene	<ul style="list-style-type: none"> • Used toluene for cleaning parts. At the suggestion of an employee, a water based green cleaner has been used to replace the toluene. The future use of toluene has been eliminated. Used a local vendor to identify an adequate water based cleaner to replace the toluene. [Fabricated Metal Products sector] • We are retrofitting our sand mills one-by-one to be fully enclosed, preventing evaporative loss during milling, and saving time and solvent during cleaning. Internal EHS reviews determined that yields will improve and the work environment would be cleaner if we could prevent the loss of volatile components. For a given batch using solvent carrier, we expect 0.75% to 1.5% of the solvent used will be eliminated as fugitive/stack emissions. There were many ways to update or upgrade the mills including full replacement and assorted methods to capture and control emissions. Working with the vendor, total enclosure was selected as the most efficient method for reducing emissions. [Chemicals sector] • Preventive maintenance scheduling and records will be transitioned to digital documentation, to make that data more easily accessed, and to further be able to quantify quality record keeping. Increased use of inventory and production control systems through digitization will further benefit closer accounting of on-hand stocks. Corporate planning to increase cooperation between production facilities. [Textiles sector]
Xylene (mixed isomers)	<ul style="list-style-type: none"> • Implementing kanban inventory control systems that should help reduce inventory. New equipment and procedures that will help reduce waste. [Furniture sector] • Finished coatings product that contained xylene has been eliminated and replaced with a low VOC product. This elimination has resulted in a significant reduction of the use of a xylene containing raw material. [Chemicals sector] • Installed blowdown lines to capture all cleaning materials and paint related products throughout facility; Process improvements made with process engineer/maintenance manager. [Chemicals sector]
Chromium and Chromium Compounds	<ul style="list-style-type: none"> • Installed a new piece of equipment (Salvagnini punching / shearing system) to better utilize the raw material resulting in less waste. [Machinery sector] • [The facility] continues to reduce hex chrome contained in primers. This year a new primer was introduced containing half the chromium the previous primer contained. The long range plan is to reduce all chromium contained in the primary primer used on aircraft parts and assemblies to 0. [Transportation Equipment sector] • Trials underway with trivalent vs hex chromate conversion coating for corrosion resistance on zinc plated copper parts used in electrical applications. [Fabricated Metal Products sector]

Industry Sector Profiles

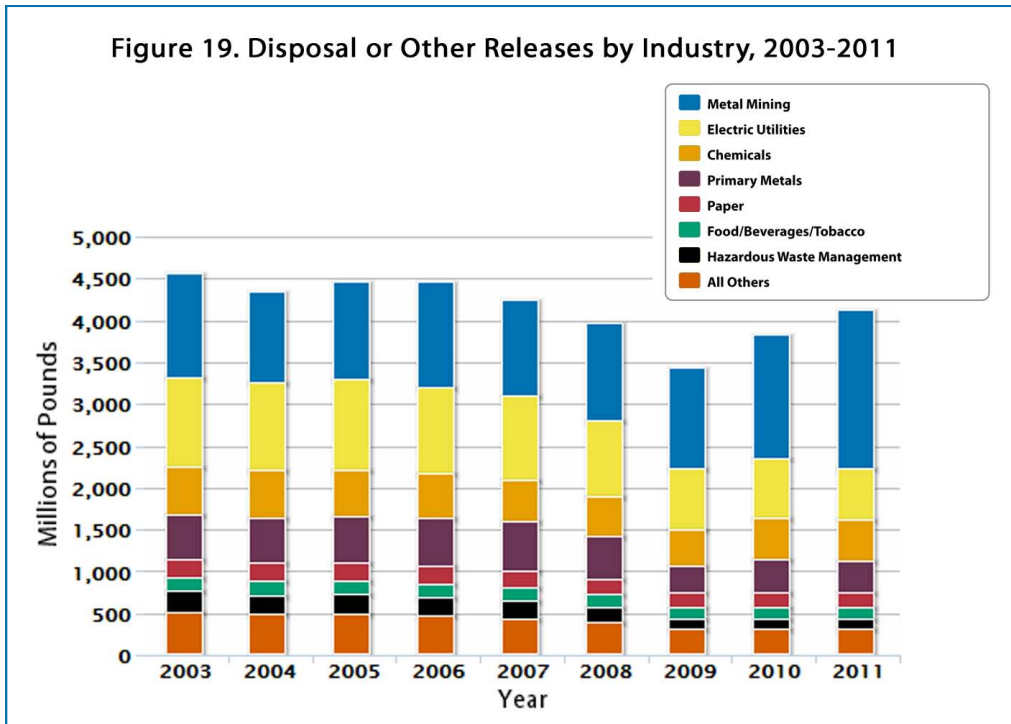
Individual industry sectors reporting to TRI can vary substantially in size, scope, and makeup, therefore, the amounts and types of toxic chemicals generated and managed by each differs greatly. Within a sector, however, the industrial processes, products, and regulatory requirements are often similar, 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.

To take a closer look at the individual sectors, Figure 18 shows that in 2011, 92% of all disposal or other releases of TRI chemicals originated from just seven of the 26 TRI industry sectors. More than half originated from just two industry sectors: metal mining (46%) and electric utilities (15%).

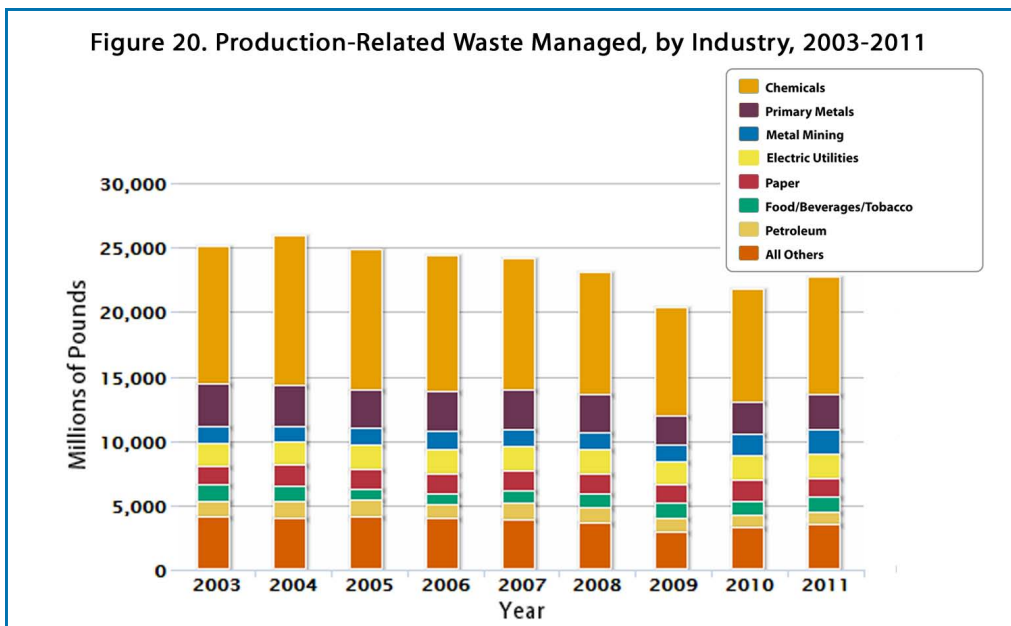


Over time, the amounts and proportions of TRI chemicals disposed of or otherwise released by each industry sector have varied as shown in Figure 19. All of the seven industry sectors with the largest reported total disposal or other releases, except metal mining, fell from their 2003 levels. Five of them (electric utilities, chemicals, primary metals, paper and food) also decreased from 2010 to 2011.

The greatest decrease from 2003 to 2011 was observed in the electric utilities sector with a decrease of 457 million pounds (43%) from 2003, including an 87 million pound decrease from 2010 to 2011. Among other reasons, these reductions may be due to a switch from coal to other fuels 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 652 million pound (52%) increase since 2003, mostly due to increases in on-site land disposal.



As shown in Figure 20, the contribution of each of the top seven sectors to the total production-related waste managed has not changed considerably between 2003 and 2011.

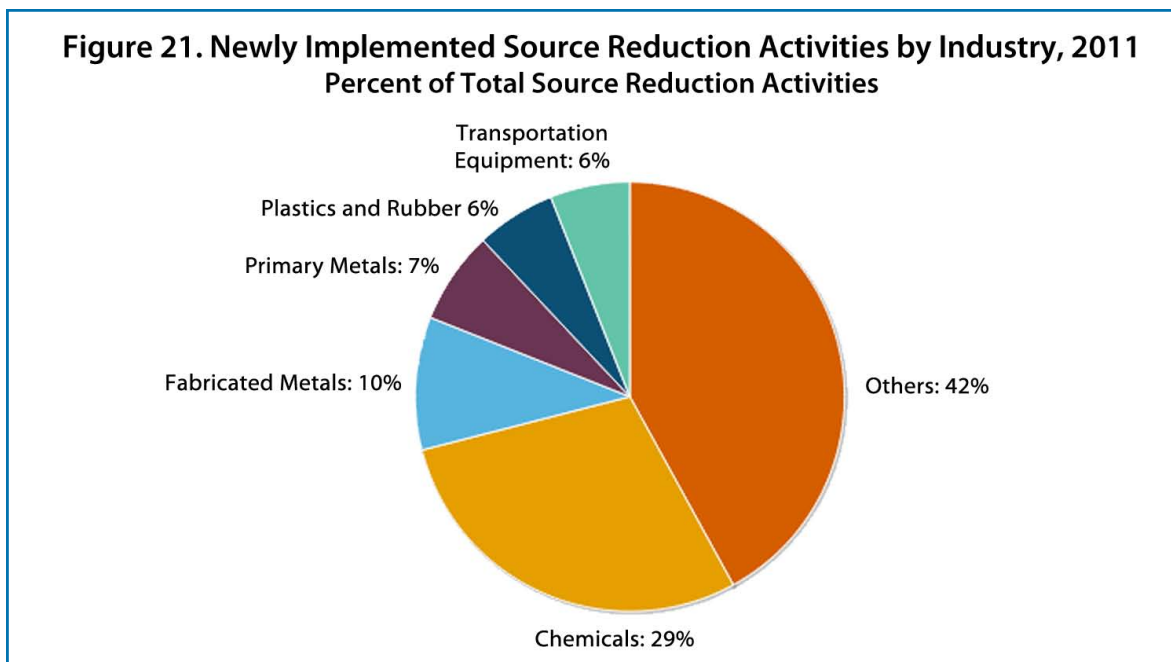


Each year, the chemical manufacturing sector reported more production-related waste managed than any other sector. It now accounts for 40% of the total, down from 43% in 2003. Conversely, the metal mining sector's production-related waste managed accounted for 5% of the total reported across all sectors in 2003 and increased to 9% by 2011.

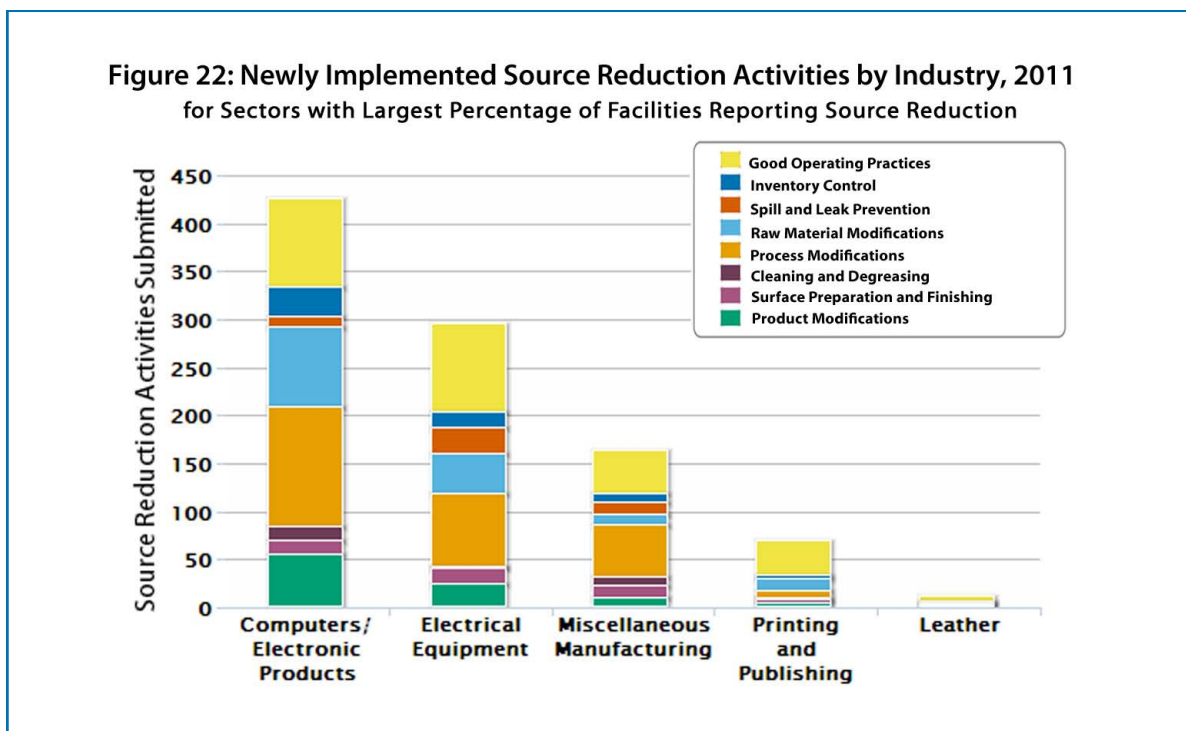
Most industry sectors reported a decline in total production-related waste from 2003 to 2011 resulting in the overall decrease of 9%; however some sectors increased from 2010 to 2011. In particular:

- Chemical manufacturers increased over 3% each year from 2009 to 2011, bringing production-related waste managed back close to 2008 levels. From 2003 to 2011, they reported an overall decrease of 15% (1.6 billion pounds).
- Metal mining production-related waste managed remained relatively steady from 2003 to 2009, and then increased by 46% from 2009 to 2011.

Reductions in production-related waste managed can be a result of various factors, including implementing practices that reduce chemical waste at the source, referred to as source reduction. Among the industry sectors reporting to TRI, facilities in the chemical manufacturing sector reported more newly implemented source reduction activities (2,422) in 2011 than facilities in any other sector. It should be noted that, in part, this reflects the fact that the chemical manufacturing sector submits more reports to TRI than any other sector. Together, the top five sectors reporting newly implemented source reduction activities accounted for more than half of the source reduction reported to TRI, as shown in Figure 21.



There were several sectors where more than 20% of the TRI facilities reported source reduction activities in 2011. These sectors are shown in Figure 22. The figure also shows what types of source reduction activities were reported. Miscellaneous manufacturing, which had the third highest percentage of source reduction activities reported, includes facilities that manufacture products as diverse as medical equipment and supplies, jewelry, sporting goods, toys, and office supplies.



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 generation.

To get an idea of how changes in production levels at TRI facilities may influence 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). While the manufacturing sector does not include all TRI facilities, it does make up 88% of facilities reporting to TRI in 2011. The solid line in Figure 23 shows manufacturing value added (adjusted for inflation) decreased by 4% from 2003 to 2011. For the same time period, the figure shows a 26% decrease in disposal or other releases. This decrease occurs even though production decreased by only 4%. Because one would expect disposal or other releases to decrease proportionally to decreases in production, the graph suggests that other factors were also contributing to the reductions in disposal and other releases.

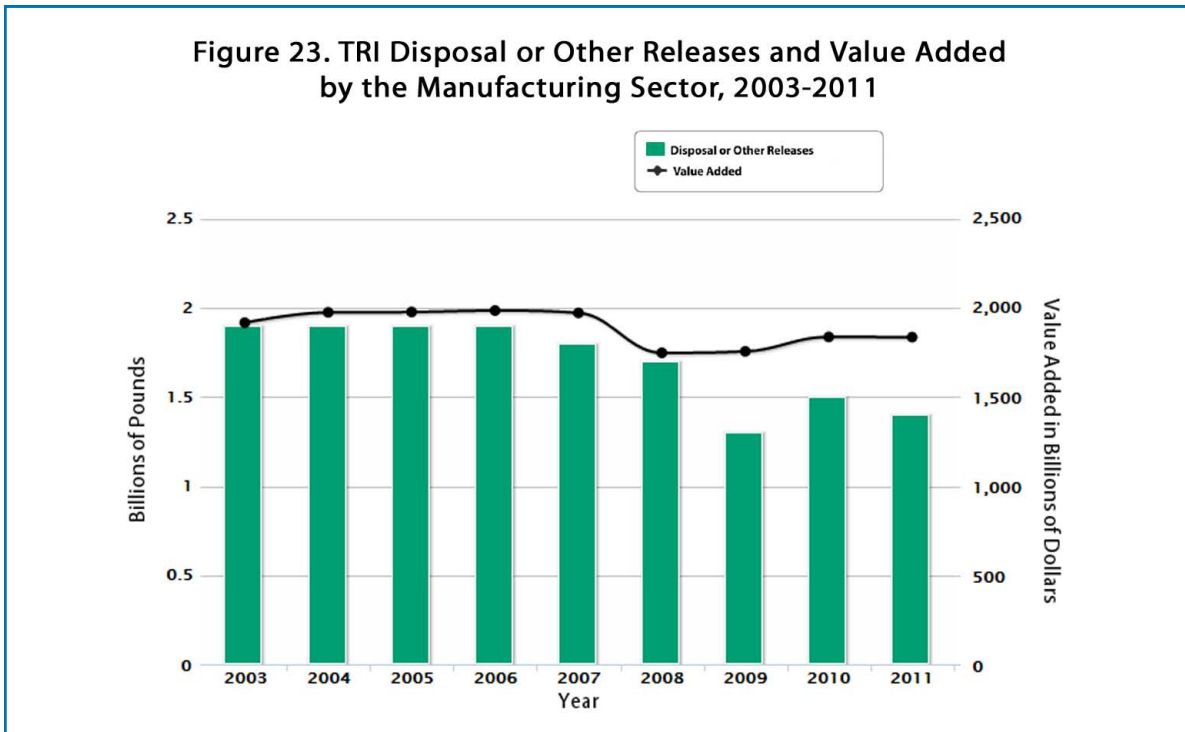
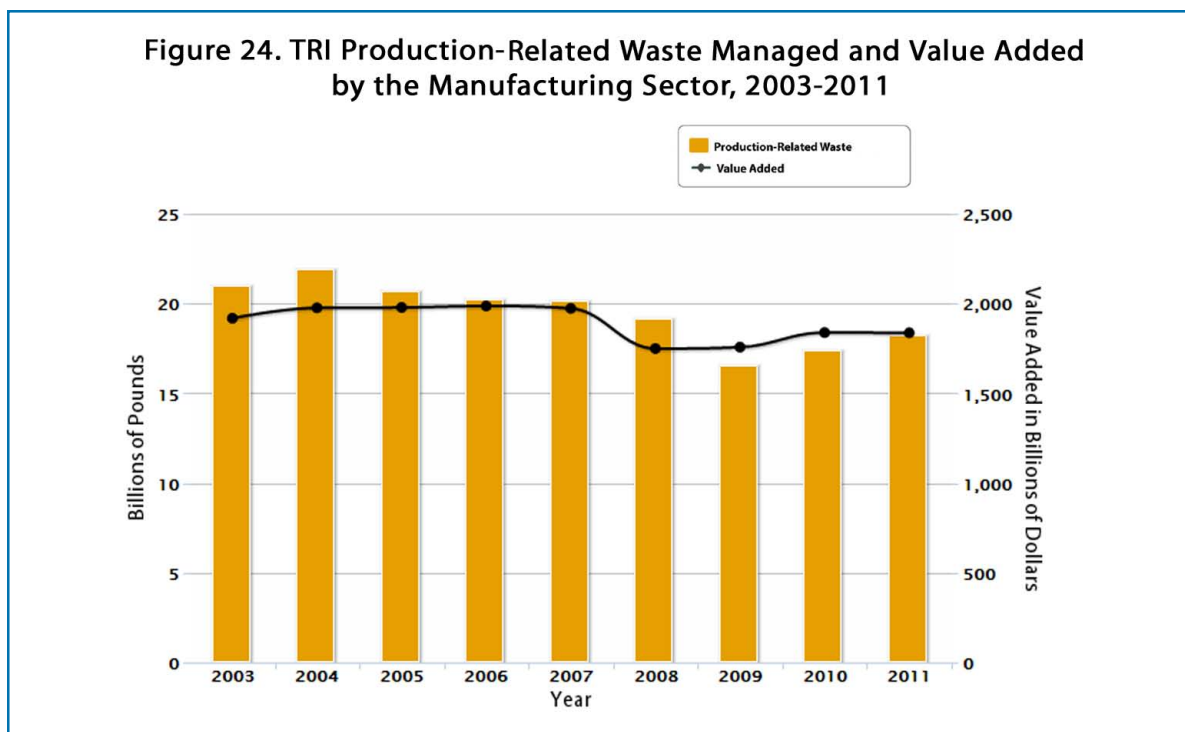


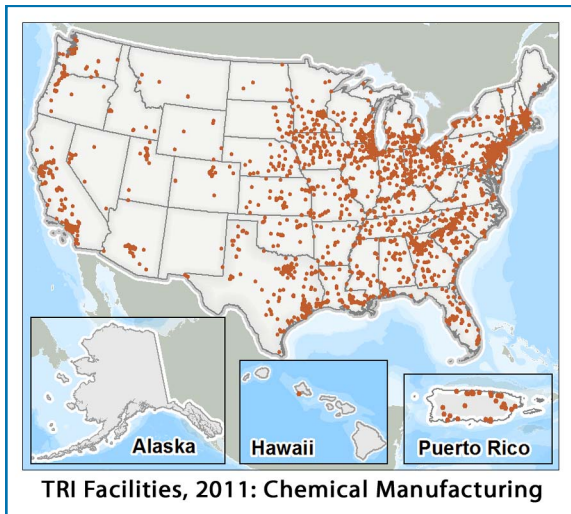
Figure 24 presents the trend in production-related waste managed by the manufacturing sector and the trend in the manufacturing sector's value added (as shown by the solid line). The manufacturing sector's production-related waste decreased by 13% from 2003 to 2011, while manufacturing value added decreased by only 4%. More information on the production trends for individual sectors can be found in the sector profiles in this section.



In this section, EPA uses the best available data to present select 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 (<http://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 automotive manufacturing 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, cosmetics, and soaps). The sector had the third largest total disposal or other releases for 2011 with a decrease of 3% from 2010 to 2011. Since 2003, the sector's disposal or other releases decreased by 13%, mainly due to a reduction in air emissions.

Quick Facts for 2011

Number of TRI Facilities: 3,472
 Facilities Reporting Newly Implemented Source Reduction in 2011: 545

On-site and Off-site Disposal or Other Releases: 491.1 million lbs

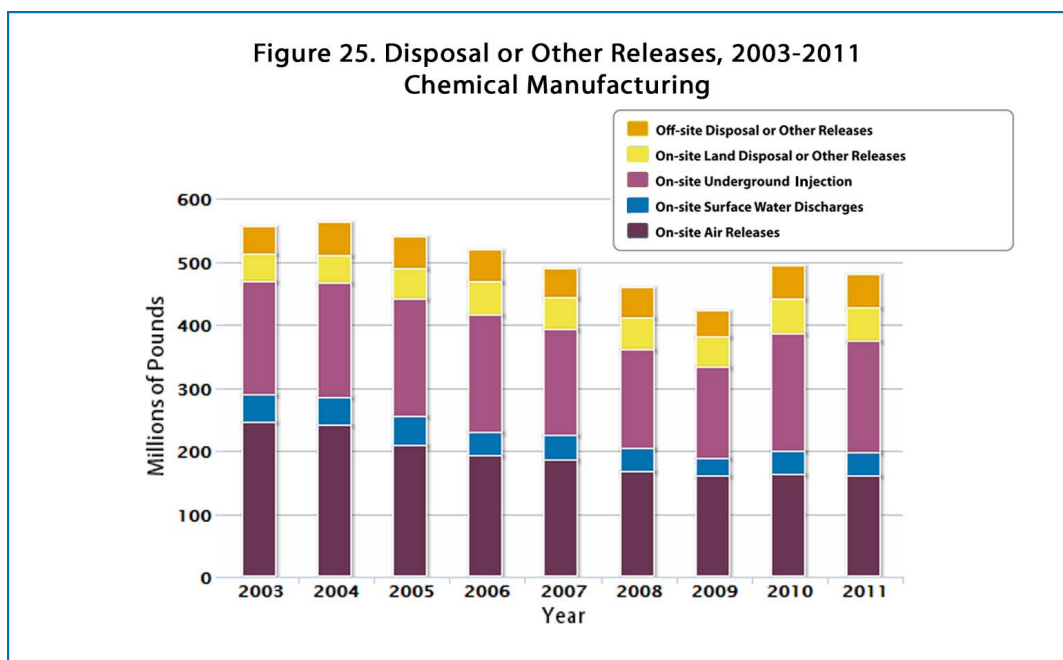
On-site: 427.3 million lbs

- Air: 160.1 million lbs
- Water: 36.3 million lbs
- Land: 53.4 million lbs
- Underground Injection: 177.5 million lbs

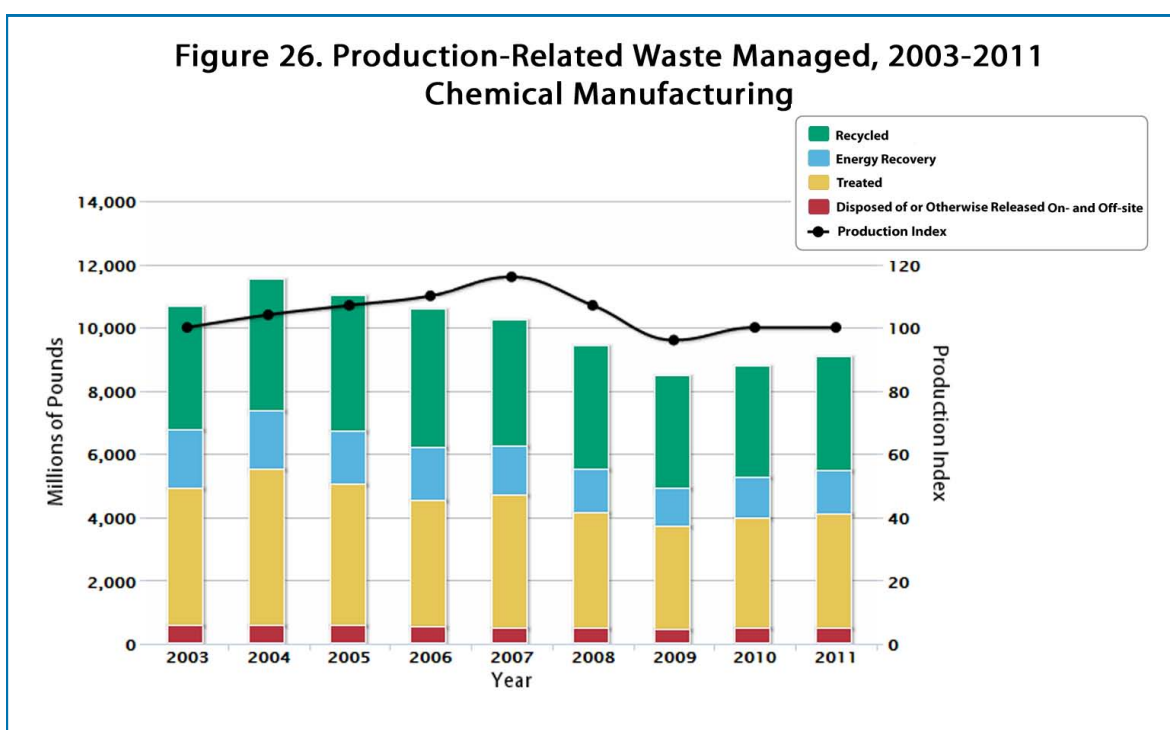
Off-site: 63.8 million lbs

Production-Related Waste Managed: 9,119.7 million lbs

- Recycled: 3,610.1 million lbs
- Energy Recovery: 1,399.1 million lbs
- Treated: 3,614.9 million lbs
- Disposed of or Otherwise Released: 495.6 million lbs



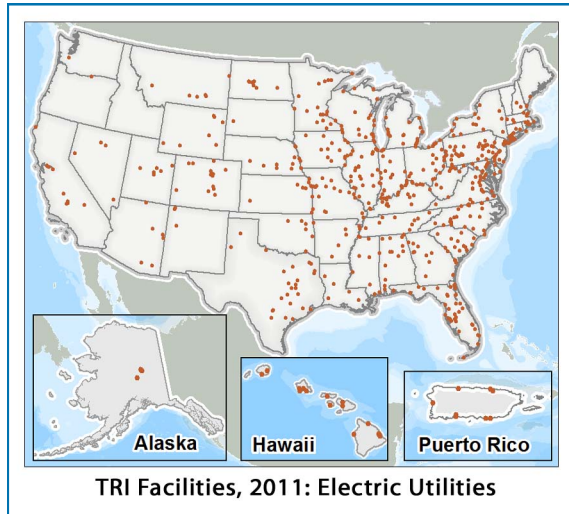
Partly due to the size and scope of the chemical manufacturing sector, it has consistently had the largest production-related waste managed every year since 2003, representing 40% of the total for all industries in 2011. As shown in Figure 26, the sector's total production-related waste managed decreased by 15% from 2003 to 2011. Compare this to the black solid line in the figure, which shows this sector's production fluctuating over the time period but changing little overall. Production-related waste managed decreased despite the sector's constant production, suggesting that the decrease in production-related 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, 16% of facilities in the sector reported having initiated practices to reduce their toxic chemical use and waste generation through source reduction activities in 2011. The most commonly reported source reduction activity for the sector was good operating practices, which includes activities such as improved maintenance procedures or production schedules. In one case, a facility reported that “better process control and operator training have contributed to the decrease in ammonia emissions in liquid effluents.” Process modifications and spill and leak prevention were also commonly reported.

To learn more about this sector, visit EPA’s Chemical Compliance Assistance website at www.epa.gov/compliance/assistance/sectors/chemical.html.

Electric Utilities



The electric utilities sector consists of establishments primarily engaged in generating, transmitting, and/or distributing electric power. Electric utilities may use a variety of fuels to generate electricity; however, only facilities that combust coal and/or oil to generate power for distribution in commerce must report to TRI. These electric utilities reported the second largest disposal or other releases of any industry sector for 2011, including the largest on-site air emissions, which represented over 32% of air emissions from all industries.

Quick Facts for 2011

Number of TRI Facilities: 618
 Facilities Reporting Newly Implemented Source Reduction Activities: 26

On-site and Off-site Disposal or Other Releases: 616.6 million lbs

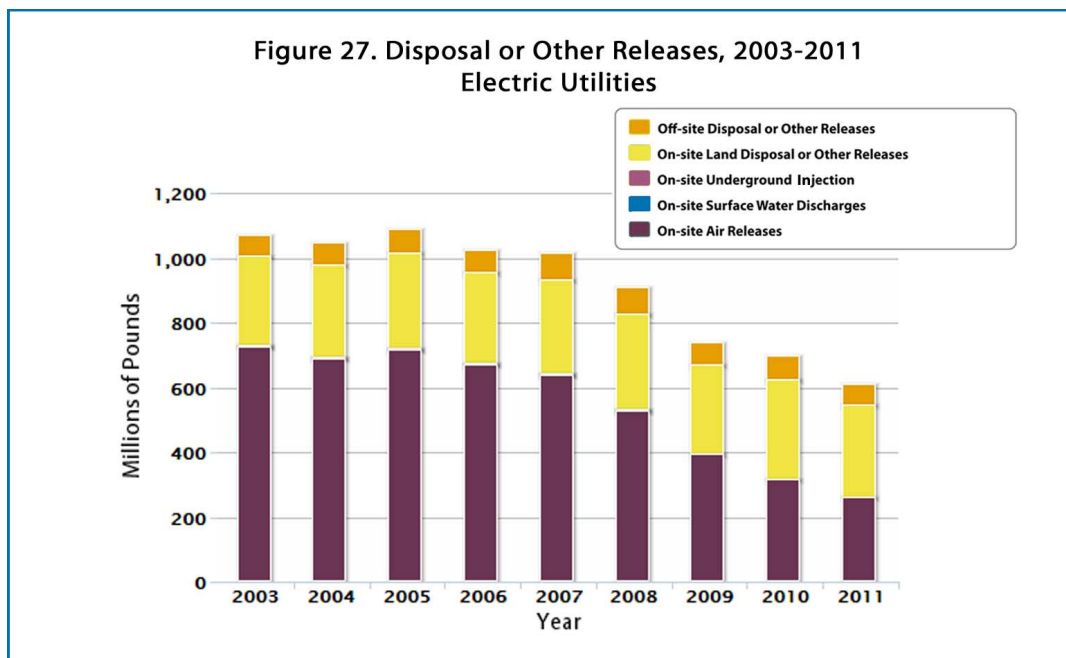
On-site: 544.8 million lbs

- Air: 257.8 million lbs
- Water: 2.8 million lbs
- Land: 284.2 million lbs
- Underground Injection: 8 thousand lbs

Off-site: 71.8 million lbs

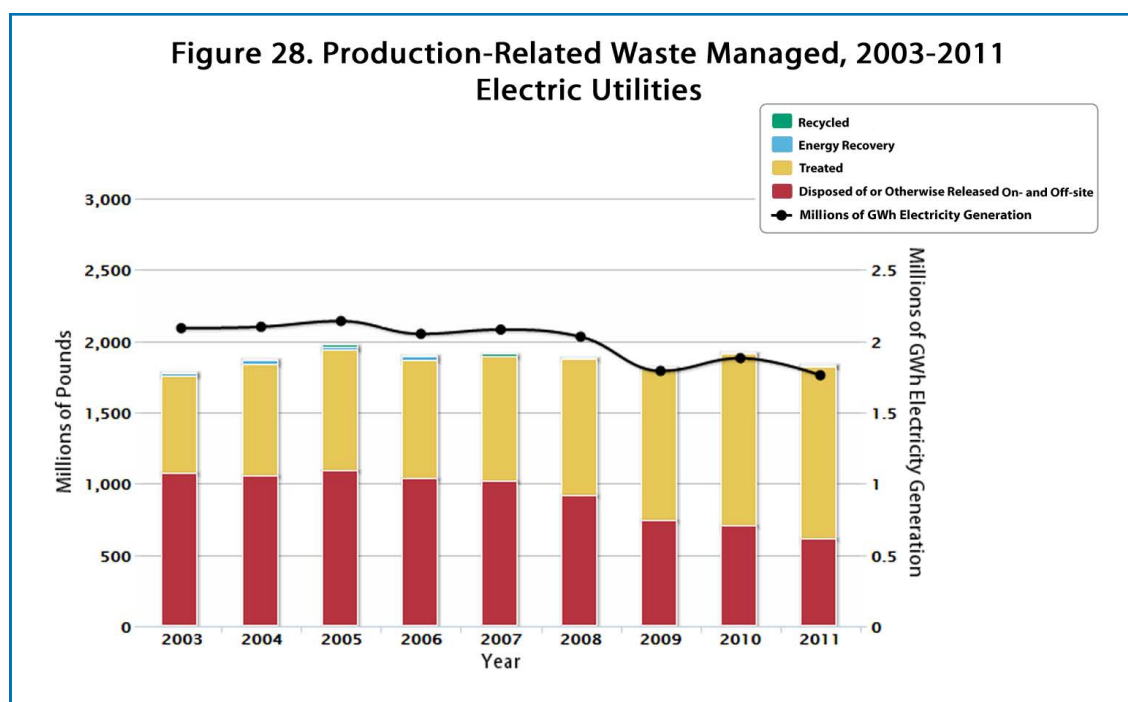
Production-Related Waste Managed: 1,834.8 million lbs

- Recycled: 6.1 million lbs
- Energy Recovery: 7.0 million lbs
- Treated: 1,205.4 million lbs
- Disposed of or Otherwise Released: 616.4 million lbs



The sector's total disposal or other releases decreased by 43% from 2003 to 2011, including a 12% decrease from 2010 to 2011. Air emissions, which accounted for 42% of this sector's disposal or other releases, decreased by 65% from 2003 to 2011, including a 55 million pound (18%) decrease from 2010 to 2011.

The sector's production-related waste managed fluctuated somewhat from 2003 to 2011, but overall has remained relatively constant over this time period, as shown in Figure 28. While the overall quantity of waste generated has changed little, how the sector manages this waste has changed considerably. In 2011, almost two-thirds of production-related waste managed was treated while approximately one-third was disposed of or otherwise released. This is in contrast to 2003, when the opposite was the case – almost two-thirds of the waste was disposed of otherwise 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 in air emissions. Therefore, instead of being reported to TRI as air emissions, these chemicals are reported as treated.

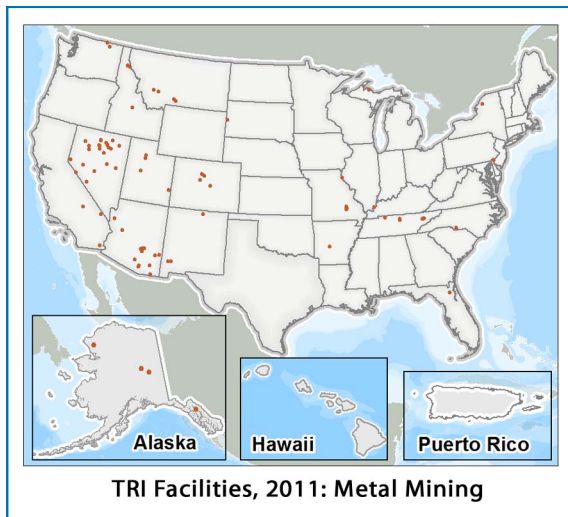


While production-related waste managed remained relatively steady overall from 2003 to 2011, production (in terms of electricity generated), represented by the black solid line in Figure 28, decreased by 16%. The constant production-related waste managed despite a downward trend in production suggests that waste generated per gigawatt-hour produced has increased, indicating that factors other than production are influencing the quantity of production-related waste generated.

In the electric utilities sector, 4% of facilities reported having initiated practices to reduce their toxic chemical use and waste generation through source reduction activities in 2011. The most commonly reported source reduction activities for the sector were good operating practices and process modifications. For example, one facility in the sector reported that it “installed and operated pulse jet fabric filters which reduced the mercury air emissions.”

To learn more about this sector, visit EPA's Power Generators Compliance Assistance website at www.epa.gov/compliance/assistance/sectors/power.html.

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 tends 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 2011

Number of TRI Facilities: 87
 Facilities Reporting Newly Implemented Source Reduction Activities: 6

On-site and Off-site Disposal or Other Releases: 1,894.8 million lbs

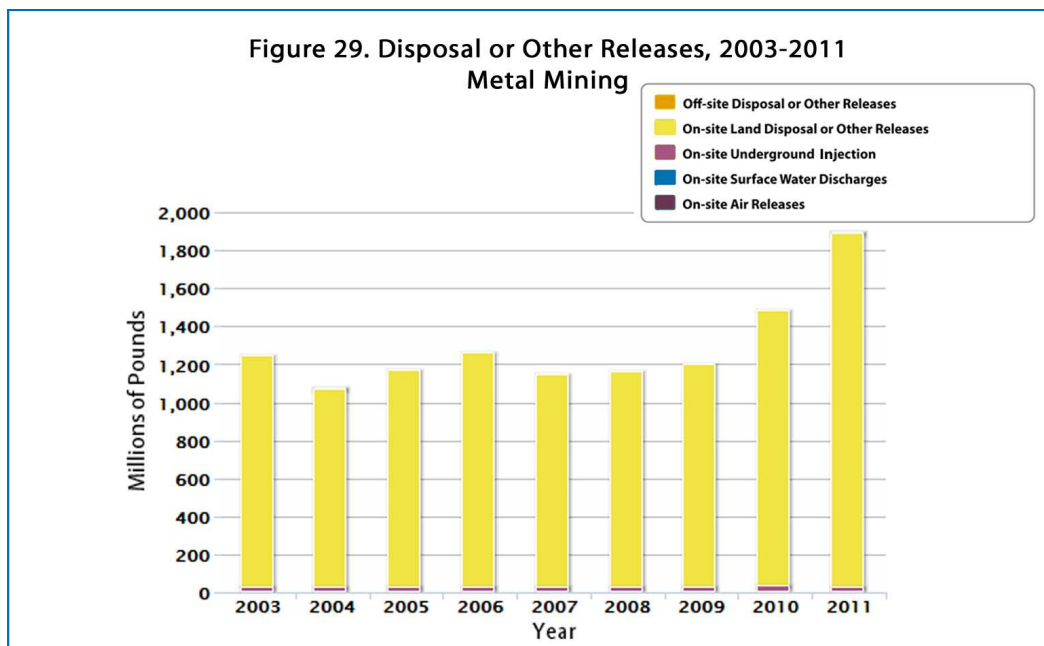
On-site: 1,892 million lbs

- Air: 3.1 million lbs
- Water: 1.9 million lbs
- Land: 1,862.4 million lbs
- Underground Injection: 24.6 million lbs

Off-site: 2.8 million lbs

Production-Related Waste Managed: 1,956.1 million lbs

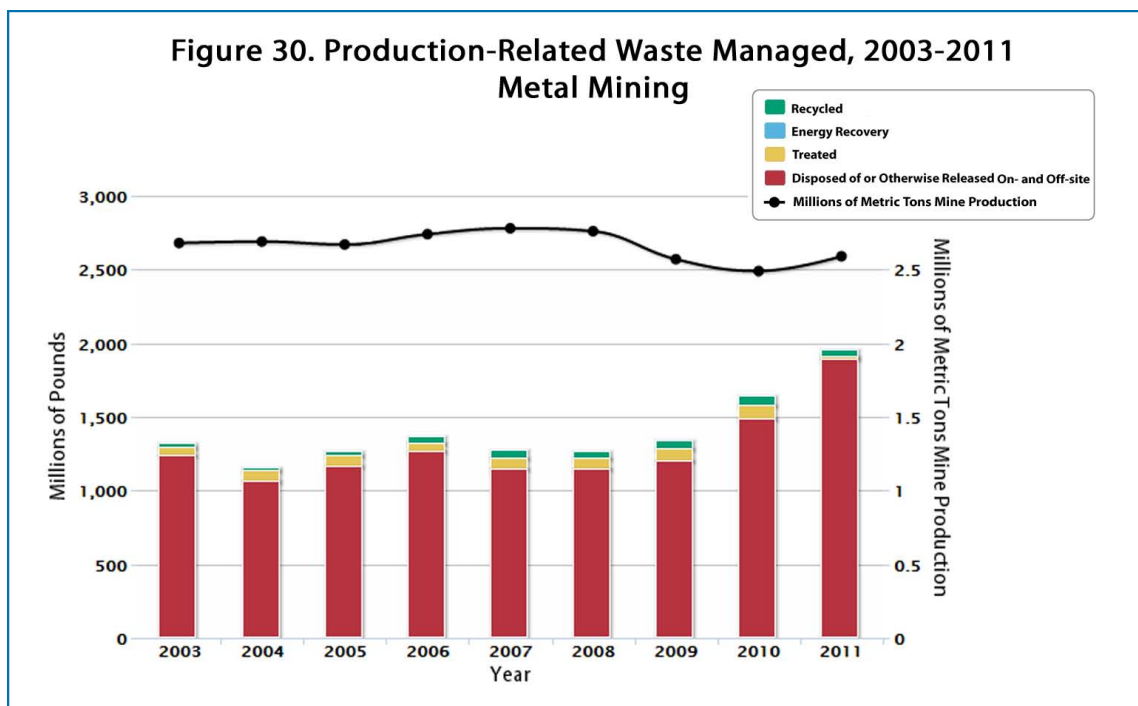
- Recycled: 49.0 million lbs
- Energy Recovery: 14 lbs
- Treated: 12.9 million lbs
- Disposed of or Otherwise Released: 1,894.2 million lbs



The metal mining industry's total disposal or other releases reflect the high volume of materials managed on site at metal mines. The vast majority of its total disposal or other releases are on-site land disposals and are a result of very small concentrations of metals naturally present in the ore body. In 2011, the metal mining sector reported the largest disposal or other releases representing 46% of the total disposal or other releases for all industries. It also reported more than three-quarters (76%) of the on-site land disposal reported for 2011 for all industries.



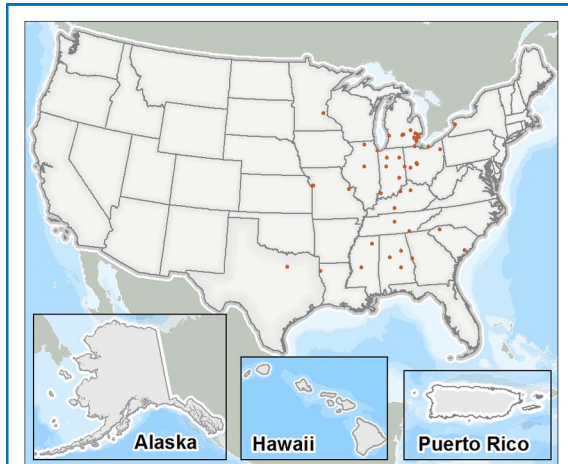
The metal mining sector had the third largest total production-related waste managed in 2011. As shown in Figure 30, total production-related waste changed little from 2003 to 2009, and then increased by 46% from 2009 to 2011. Mine production, represented by the black solid line in Figure 30, remained relatively steady from 2003 to 2011. This suggests that factors other than production, such as changes in the composition of the ore body and waste rock, have contributed to the recent upward trend. Such factors are particularly significant in cases where large quantities that qualify for a concentration-based exemption in one year may become reportable in their entirety the next year due to very small increases in the concentration of a toxic chemical in waste rock.



In the metal mining sector, 7% of facilities reported having initiated practices to reduce their toxic chemical use and waste generation through source reduction activities in 2011. The most commonly reported source reduction activity for the sector was good operating practices, such as improved maintenance scheduling.

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

Automobile Manufacturing



TRI Facilities, 2011: Automobile Manufacturing

This sector includes facilities that assemble automobiles, light trucks, and utility vehicles to produce finished vehicles, and facilities that manufacture automotive vehicle bodies. Compared to the other industry sectors profiled, this sector is small in terms of both number of facilities reporting and in total quantities released or managed as waste. However, given this sector's high percentage of air releases and the attention on the automobile sector's production levels in recent years, the sector is included as one of the Industry Sector Profiles.

Quick Facts for 2011

Number of TRI Facilities: 49
 Facilities Reporting Newly Implemented Source Reduction Activities: 4

On-site and Off-site Disposal or Other Releases: 11.2 million lbs

On-site: 10.5 million lbs

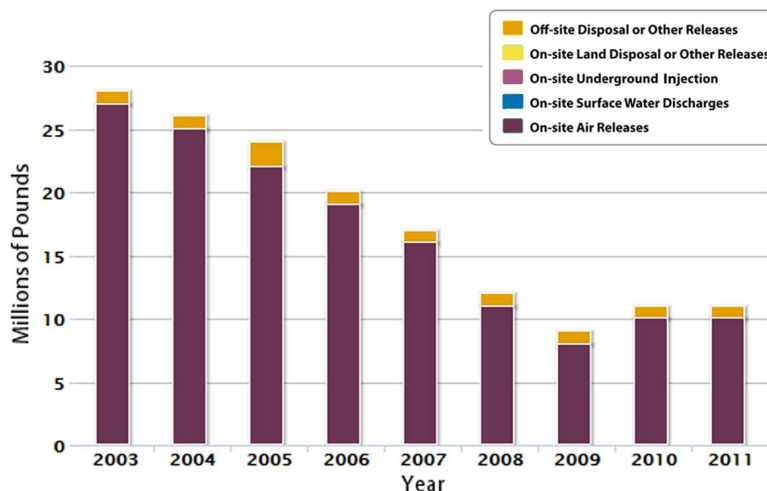
- Air: 10.4 million lbs
- Water: 4,953 lbs
- Land: 29 thousand lbs
- Underground Injection: None

Off-site: 730 thousand lbs

Production-Related Waste Managed: 44.3 million lbs

- Recycled: 21.9 million lbs
- Energy Recovery: 876 thousand lbs
- Treated: 10.4 million lbs
- Disposed of or Otherwise Released: 11.2 million lbs

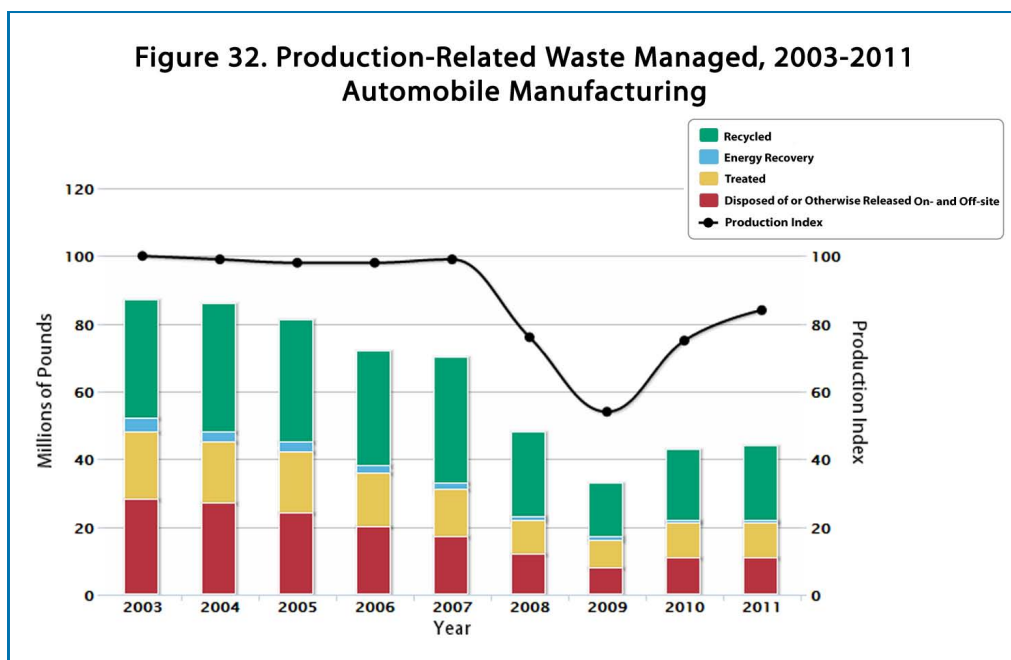
Figure 31. Disposal or Other Releases, 2003-2011
 Automobile Manufacturing



The sector's disposal or other release quantities are dominated by air emissions (93% in 2011), with the remaining 7% largely reported as transferred off site, as shown in Figure 31. Since 2003, the sector's total disposal or other released decreased by 60%, driven by a 16-million-pound reduction in air releases.

As shown in Figure 32 by the solid black line, the sector's production has fluctuated considerably in recent years. Most notably, it dropped by 46% from 2007 to 2009, and then increased in 2010 and 2011 to a level exceeding 2008 production, but not as high as the 2007 level. The sector's production-related waste managed followed a trend similar to production. Overall, production-related waste managed decreased by almost 50% from 2003 to 2011 while production declined by 16%. Because the production-related waste managed decreased more than the sector's production, this indicates that waste per unit of product has decreased over this time period.

When considering total production-related waste, the sector has also shifted how their waste is managed. The proportion recycled has increased from 2003, when 40% of total production-related waste was recycled, to 2011 when 49% was recycled. During the same time period, quantities disposed or otherwise released declined from 33% of total production-related waste in 2003 to 25% in 2011.



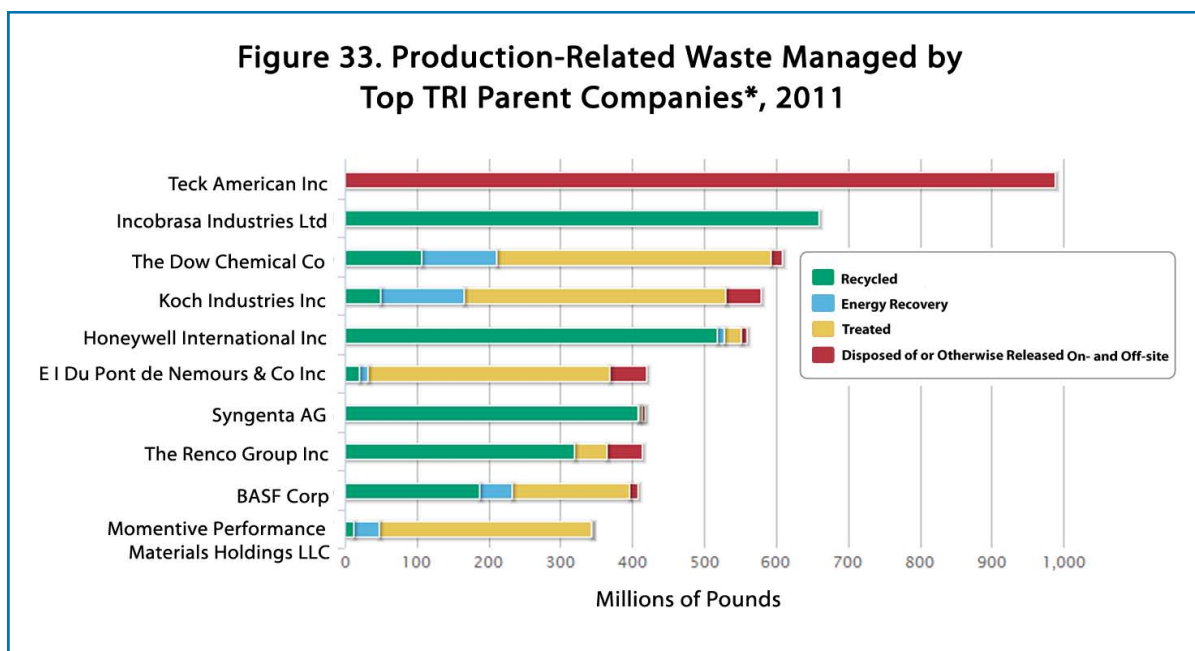
In the automobile manufacturing sector, 9% of facilities reported having initiated practices to reduce their toxic chemical use and waste generation through source reduction activities in 2011. The most commonly reported source reduction activity for the sector was good operating practices, which includes activities such as improved maintenance procedures or production schedules. For example, one facility “implemented a reliability centered maintenance (RCM) program which identified the need for redundant pollution controls associated with the nitride coating process” for ammonia.

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

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 total quantity of chemicals in TRI production-related waste managed are shown in Figure 33. As stated earlier in this document, production-related waste 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 on- and off-site.



* 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 Reporting Year 2011. Please note that one facility, Incobrasa Industries Ltd, does not report a parent company, but it is listed in this table because it has a comparable quantity of total production-related waste managed.

These companies vary in size and sector. The number of TRI reporting facilities owned by these companies ranges from 1 to 110. For six of the top ten companies, production related waste is primarily from their facilities in the chemical manufacturing sector (Dow Chemical, Honeywell, DuPont, Syngenta AG, BASF, and Momentive Performance Materials). Other parent companies in Figure 33 are in the food products sector (Incobrasa Industries), metal mining (Teck American), and metal smelting (The Renco Group). Koch Industries' TRI facilities operate 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 pollution prevention activities they initiate each year. In 2011, 12% of all facilities reporting to TRI indicated that they initiated pollution prevention activities. Over 20% of all facilities reporting to TRI for 2011 indicated that they initiated pollution prevention activities in at least one year since 2007. Table 2 shows the percent of current reporting facilities of the top parent companies that have reported source reduction for 2011, and in the recent past (2007 to 2011).

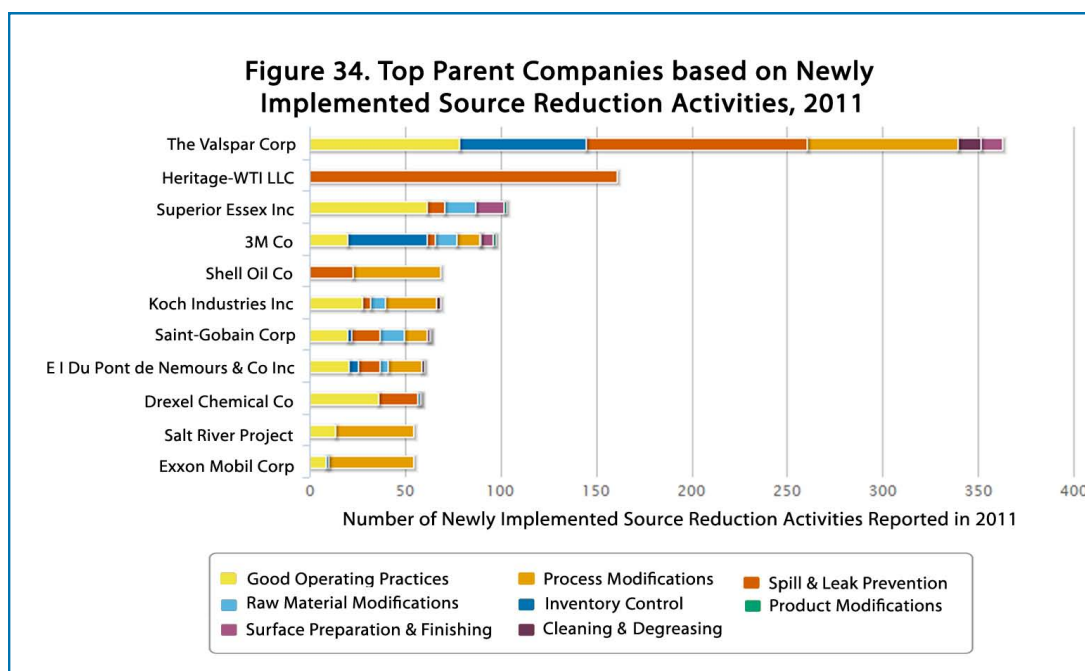
Table 2. Newly Implemented Source Reduction Activities at the Top Parent Companies for Production-Related Waste Managed, 2011

Parent Company	Facilities Reporting for 2011	Percent of Facilities Reporting Source Reduction Activities for 2011	Percent of Facilities Reporting Source Reduction Activities at Least One Year, 2007-2011
TECK AMERICAN INC	1	100%	100%
INCOBRASA INDUSTRIES LTD	1	0%	0%
THE DOW CHEMICAL CO	49	8%	35%
KOCH INDUSTRIES INC	110	19%	22%
HONEYWELL INTERNATIONAL INC	63	19%	29%
E I DU PONT DE NEMOURS & CO	64	25%	38%
SYNGENTA CORP	1	100%	100%
THE RENCO GROUP INC	10	10%	10%
BASF CORP	57	19%	33%
MOMENTIVE PERFORMANCE MATERIALS HOLDINGS LLC	31	19%	32%

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

- A Dow Chemical facility changed its methods of production scheduling to consolidate production runs of a single product, thus reducing startup and cleanout activities and the related wastewater.
- New product development continues to focus on no-lead solders (i.e. high tin solders), resulting in less solder usage at a Honeywell facility. The facility added that Waste Electrical and Electronic Equipment (WEEE) and other toxic chemical initiatives drive the effort to reduce/eliminate lead from their products.
- To redirect landfill leachate from process effluent back to the production process for reuse, a BASF facility installed a French drain recycling system, reducing the ammonia entering the wastewater treatment system.

To take a closer look at parent companies reporting source reduction activities, Figure 34 presents the parent companies that reported the most newly implemented source reduction activities in 2011.



Four of these top companies' TRI facilities primarily operate in the chemical manufacturing sector (Valspar, 3M, DuPont, and Drexel Chemical). The Heritage-WTI site is a waste management facility. Superior Essex makes wire and cable. 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 and Exxon Mobil facilities are in the chemical manufacturing and petroleum refining sectors, and Salt River Project operates electric utilities. Some of these companies submitted additional text to EPA with their TRI reports describing their pollution prevention activities. Examples include:

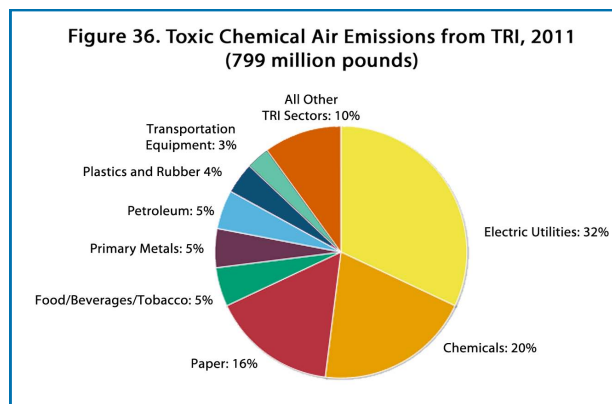
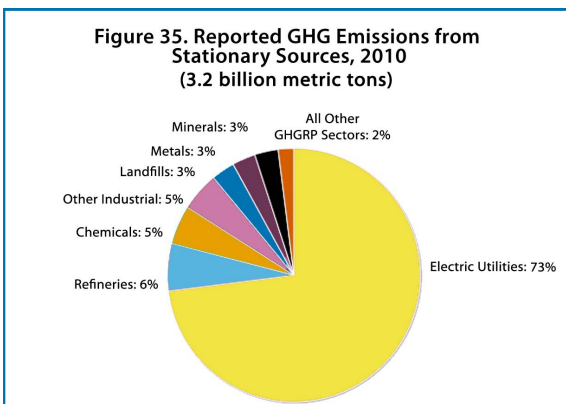
- Through better scheduling of deliveries and raw materials usage, a 3M facility reduced their waste material.
- A Koch facility reported implementing multiple pollution prevention activities for methanol including: evaluating and reformulating raw materials used in the production process, implementing new shift and production planning scheduling system, conducting equipment inspections and audits to minimize excess emissions, and implementing an advanced maintenance planning and scheduling program.
- To improve identification and elimination of increased flaring, an Exxon Mobil facility improved its flare system monitoring.

These and other submissions related to pollution prevention can be accessed on each facility's individual Form Rs (Section 8.11) through Envirofacts (www.epa.gov/tri/tridata/index.html) and TRI's Pollution Prevention Website (www.epa.gov/tri/p2).

Comparing TRI and Greenhouse Gas Reporting

In 2010, under the authority of the Clean Air Act, EPA initiated the Greenhouse Gas Reporting Program (GHGRP), which 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.

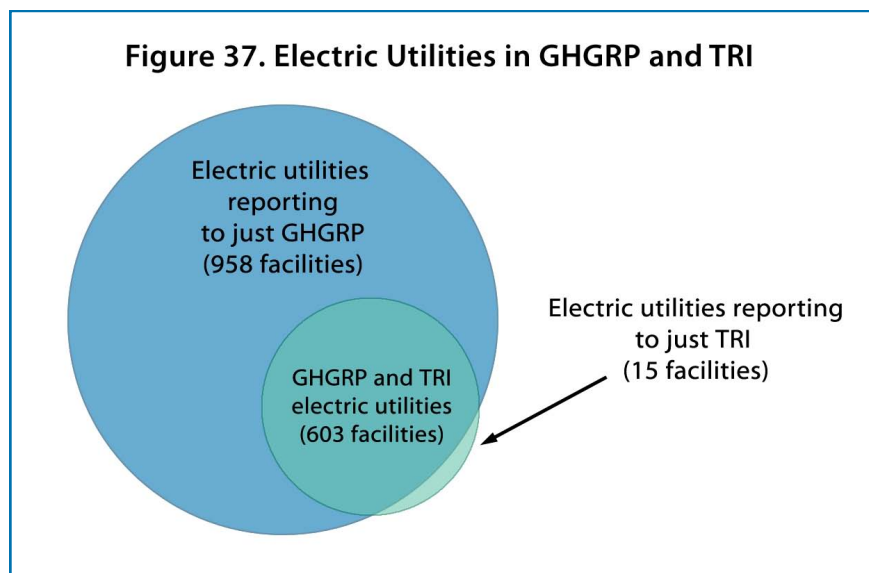
While facilities report a variety of greenhouse gases to EPA, the predominant gas is carbon dioxide (CO₂), which is released during fossil fuel combustion and various industrial processes. TRI reporting covers different chemicals, some of which are byproducts of energy production, but TRI chemicals are 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 35 and 36 reflect the most recent data from TRI (2011) and the GHGRP (2010).



In 2010, over 6,200 facilities reported direct emissions of 3.2 billion metric tons of carbon dioxide equivalent (mt CO₂e), about 7 trillion pounds, to the GHGRP, which represents about half of the 6.8 billion mt CO₂e that EPA estimated was released in the United States from all human-related sources. 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 35. 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 refineries, and chemical manufacturing, which accounted for almost 2.7 billion mt CO₂e.

Among TRI reporters, the electric utility sector is also the largest source of air emissions – primarily because of contaminants present in fossil fuels, such as sulfur, which are released during combustion. Electric utilities account for 32% of the 799 million pounds of air emissions reported to TRI in 2011, as shown in Figure 36. The top air emitting sectors in the TRI program, electric utilities and chemical manufacturing, are large in part because they use or process large volumes of materials, such as fuels and chemicals. The top emitting sectors in the GHGRP, electric utilities and petroleum refineries, are the largest due to the large quantities of fossil fuel that are combusted on site at these facilities. The relative contribution of each sector to the total emissions for each program differs because of the relative magnitude of chemical manufacturing, processing and use among TRI reporters versus fossil fuel combustion among GHG reporters.

When comparing the GHGRP to TRI, users should keep in mind that TRI and GHGRP have different reporting thresholds and define sectors differently. For example, TRI requires only electric utilities that burn coal or oil as fuel to report*, whereas the GHGRP requires electric utilities that emit greater than 25,000 mt CO_{2e} to report regardless of the fuels used. Most of the electric utilities reporting to the GHGRP only are natural gas fired, which emit less greenhouse gas per unit of power generated than coal-fired electric utilities do. Figure 37 shows the overlap between the two programs within the electric utilities sector.



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

*U.S. government owned and operated federal facilities that meet chemical use thresholds must report to TRI regardless of the sector in which they operate. As a result, four government-operated nuclear power plants that do not combust coal or petroleum do report to TRI, but do not report to the GHGRP. The other electric utilities in TRI, but not GHGRP, include nuclear-fueled utilities with small fossil fuel use and others that came on line in 2011.

TRI Tools and Resources

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

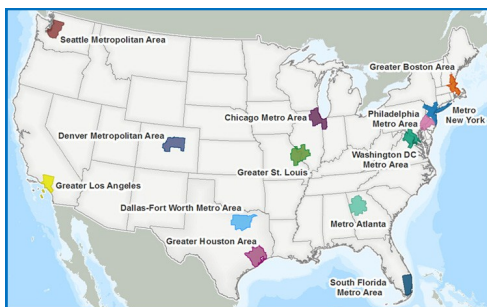
For more information about the Toxics Release Inventory Program and the most recent TRI data, go to:

- EPA's TRI website — www.epa.gov/tri

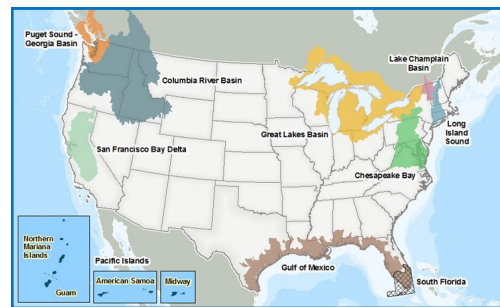
For location-specific analysis of TRI data, go to:

- 2011 TRI National Analysis — www.epa.gov/tri/nationalanalysis

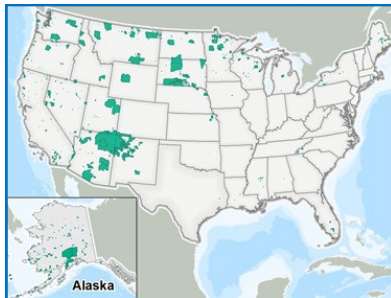
2011 Location-Specific Analyses



Urban Communities



Large Aquatic Ecosystems



Indian Country and Alaska Native Villages



State Fact Sheets



See also

- **Chemical Right 2 Know** (www.chemicalright2know.org) — a site developed by the Environmental Council of the States through a cooperative agreement with EPA.
- **myRight-to-Know TRI mobile application** (www.epa.gov/tri/myrtk/index.htm) — learn about nearby TRI facilities.



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