

Toxic Chemicals in Wastes

The Toxics Release Inventory (TRI) is a publicly available database on the quantities of certain chemicals released to the environment or managed as waste. The data are submitted annually to EPA by facilities in industry sectors such as manufacturing, metal mining, electric utilities, and commercial hazardous waste management. Facilities report the quantities of TRI chemicals released on-site and off-site to air, water, or land, treated, combusted for energy recovery, or recycled. Reducing the quantities of TRI chemical wastes is desirable for both environmental and economic reasons. TRI chemicals have known toxic properties, rendering them potentially hazardous to workers in both production and waste management facilities, and more generally to ecosystems and to the general human population. As elements of overall business strategies, companies target waste reduction as a means to improve their environmental performance and reduce costs associated with managing toxic chemical wastes.

TRI collects information on the release and other waste management quantities of more than 650 chemicals and chemical categories. Facilities are required to report to TRI if they employ the equivalent of 10 or more employees; are in a TRI-covered sector, including manufacturing, mining, electric utilities, and federal facilities; and manufacture and/or process more than 25,000 pounds, and/or otherwise use more than 10,000 pounds of a TRI-listed chemical during a calendar year. Much lower reporting thresholds exist for TRI chemicals that are classified as persistent, bioaccumulative and toxic (PBT). The TRI reporting threshold for PBT chemicals is either 100 pounds or 10 pounds, except for the dioxin and dioxin-like compounds category, which has a threshold of 0.1 gram. 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, are not readily destroyed, and build up or accumulate in body tissue (U.S. EPA, 2007). For 2016, EPA required reporting of 16 PBT chemicals and four PBT chemical compound categories (U.S. EPA, 2016).

TRI is national and multimedia in coverage, encompassing all U.S. states and territories, and releases of TRI chemicals to air, water, and land. For reporting year 2016, more than 21,000 facilities reported to TRI (U.S. EPA, 2018). Reporting requirements for TRI began with the first forms due in 1988 and have varied somewhat over the years. For year-to-year comparability of the release and waste management trends presented for this indicator, chemicals that were added to the TRI list after 2003 (the baseline year for the exhibits) are not included in the analyses. Metal mining sector¹ releases are analyzed separately because they represent the largest single industry sector, accounting for about one-third of all releases and 87 percent of PBT releases over the 2003-2016 period.

¹The metal mining sector consists of facilities in NAICS code 2122.

What the Data Show

Exhibit 1

Exhibit 1 displays trends in the amounts of TRI chemicals that are released to the environment, treated, combusted for energy recovery, or recycled. These quantities result from activities related to production and are referred to as production-related wastes. Non-production-related wastes, which are associated with catastrophic events and remedial actions (cleanup), are not included in this indicator because they are not directly related to routine production practices²

Waste managed for all industry sectors, non-PBT chemicals: In 2016, the quantities of TRI non-PBT chemicals associated with production-related wastes totaled 25.1 billion pounds (Exhibit 1). Although there have been year-to-year fluctuations in the amount of non-PBTs managed as waste, there was a slight downward trend from 2003 to 2013. Some of the year-to-year fluctuations over this period may reflect changes in aggregate production levels in the national economy. The 2014 to 2016 increase in production-related waste was driven by increased recycling, primarily by one facility reporting over 3.4 billion pounds of cumene recycled per year over this period.

Waste managed for all industry sectors, PBT chemicals: Reported PBT chemicals in production-related wastes totaled 1.4 billion pounds in 2016, continuing the year-to-year fluctuations (Exhibit 1). This trend is dominated by lead and lead compounds which accounted for 97% of the PBT chemicals in production-related waste for 2003 to 2016. The metal mining sector accounts for most of the releases of lead and lead compounds and annual variations in mine production and ore quality contribute to the annual fluctuations in the quantity of lead and lead compound releases reported. The electrical equipment and primary metals sectors account for most of the lead and lead compounds recycled; these quantities have also fluctuated over the time period shown in Exhibit 1.

Exhibit 2

Exhibit 2 displays trends in the TRI chemicals disposed of or otherwise released to the environment, including on-site and off-site releases to air, water, and land. The metal mining sector accounted for more than 40 percent of all releases reported in 2016, therefore, Exhibit 2 presents releases from the metal mining sector and all other sectors separately.

Releases for all sectors except metal mining: In 2016, 3.4 billion pounds of chemicals were reported to TRI as released, including on-site releases to air, water, or land, and off-site transfers that are released. When metal mining is excluded, 2016 releases totaled

1.9 billion pounds—a decline of 41 percent since 2003. This downward trend was driven by reductions in air releases which dropped by 996 million pounds (a 63 percent reduction) from 2003 to 2016. On-site releases to water and land, and off-site releases also declined over this time period (Exhibit 2). The chemicals reported as released in the greatest quantities to each medium in 2016 were: ammonia and methanol released to air; nitrate compounds released to water; and barium and manganese and their compounds released to land. PBT chemicals accounted for a small portion of the quantity of chemicals released, averaging of 3 percent during the time period presented in Exhibit 2. Of these PBT quantities released, 90% was lead and lead compounds, which were primarily disposed of to land on-site. Note that in the 2016 dataset used for this analysis, one facility erroneously reported the pounds of lead compounds they had recycled as released to water for 2016. This error results in the appearance of a substantial increase in PBTs released to water for 2016. This error will be corrected in subsequent data updates. Once this error is corrected, releases of PBTs to water show a 13% decrease from 2015 to 2016.

Releases for the metal mining sector: The metal mining sector accounted for 44 percent (1.5 billion pounds) of the total releases reported to TRI (3.4 billion pounds) in 2016 (Exhibit 2). Nearly all of the releases reported by metal mining facilities were on-site releases to land. On-site land disposal by metal mines has fluctuated from year-to-year. Mines have reported that changes in production and changes in the chemical composition of the deposit being mined are the primary causes of fluctuations in the amount of chemicals reported. Metal mining facilities typically handle large volumes of material, and even a small change in the chemical composition of the deposit being mined can lead to big changes in the amount of TRI chemicals reported (U.S. EPA, 2018).

Exhibit 3

Exhibit 3 provides more detail on the trend in on-site disposal to land that was included in the Exhibit 2 trends. The metal mining sector accounted for 67 percent of on-site land disposal reported to TRI in 2016, therefore, Exhibit 3 presents land disposal from the metal mining sector and all other sectors separately.

On-site land disposal for all sectors except metal mining: When considering all sectors other than metal mining, quantities of chemicals disposed of to land on-site declined by 146 million pounds (16 percent) from 2003 to 2016 (Exhibit 3). Chemicals disposed of to land for the 2016 reporting year include metal and metal compounds such as barium and manganese (e.g., from the electric utilities and chemical manufacturing sectors), and zinc and copper (e.g., from the primary metals sector such as smelting and steel manufacturing).

On-site land disposal for the metal mining sector: For the releases reported to TRI by facilities in the metal mining sector, land disposal accounted for more than 99% of total releases each year from 2003 to 2016. Therefore, the trend in on-site land releases for the metal mining sector in Exhibit 3 is almost identical to the trend for the sector's releases to all media shown in Exhibit 2. The chemicals disposed of on-site to land by the sector are mostly metals. For example, in 2016, lead and lead compounds accounted for 39 percent of on-site land disposal, followed by zinc and zinc compounds (35 percent), with arsenic and copper and their compounds accounting for another 16 percent.

2Over the 2003-2016 period, non-production-related waste represented 0.4 percent of the total quantity of waste released.

Limitations

- TRI data reflect only “reported” chemicals, not all chemicals with the potential to affect human health and the environment. The TRI chemical list does not include all toxic chemicals, nor do the sectors that are subject to TRI reporting include all industry sectors. The following are not included in this indicator: (1) chemicals that are not on the list of approximately 650 chemicals and chemical categories; (2) wastes from facilities within industrial categories that are not required to report to TRI; (3) wastes from facilities with fewer than 10 full-time employee equivalents; and (4) chemical waste managed at facilities where the quantity manufactured, processed, or otherwise used was less than a threshold amount for the chemical and year in question (U.S. EPA, 2016).
- TRI chemicals vary widely in toxicity, meaning that some low-volume releases of highly toxic chemicals might pose higher risks than high-volume releases of less toxic chemicals. The release or disposal of chemicals also does not necessarily result in the exposure of people or ecosystems.
- Some facilities report off-site transfers for release to other TRI-covered facilities that report these quantities as on-site releases. This double-counting of release quantities is taken into account in the case of releases for all sectors in total, but not for releases within individual sectors. This may cause some discrepancy in certain release numbers for specific sectors when compared with release data on all sectors.

Data Sources

This indicator is based on data from EPA's TRI from 2003 to 2016, based on data files provided by EPA (U.S. EPA, 2017). The data are also available via the TRI Explorer tool using the “2016 Dataset (released October 2017)” and selecting “2001 core chemicals” at https://iaspub.epa.gov/triexplorer/tri_release.chemical.

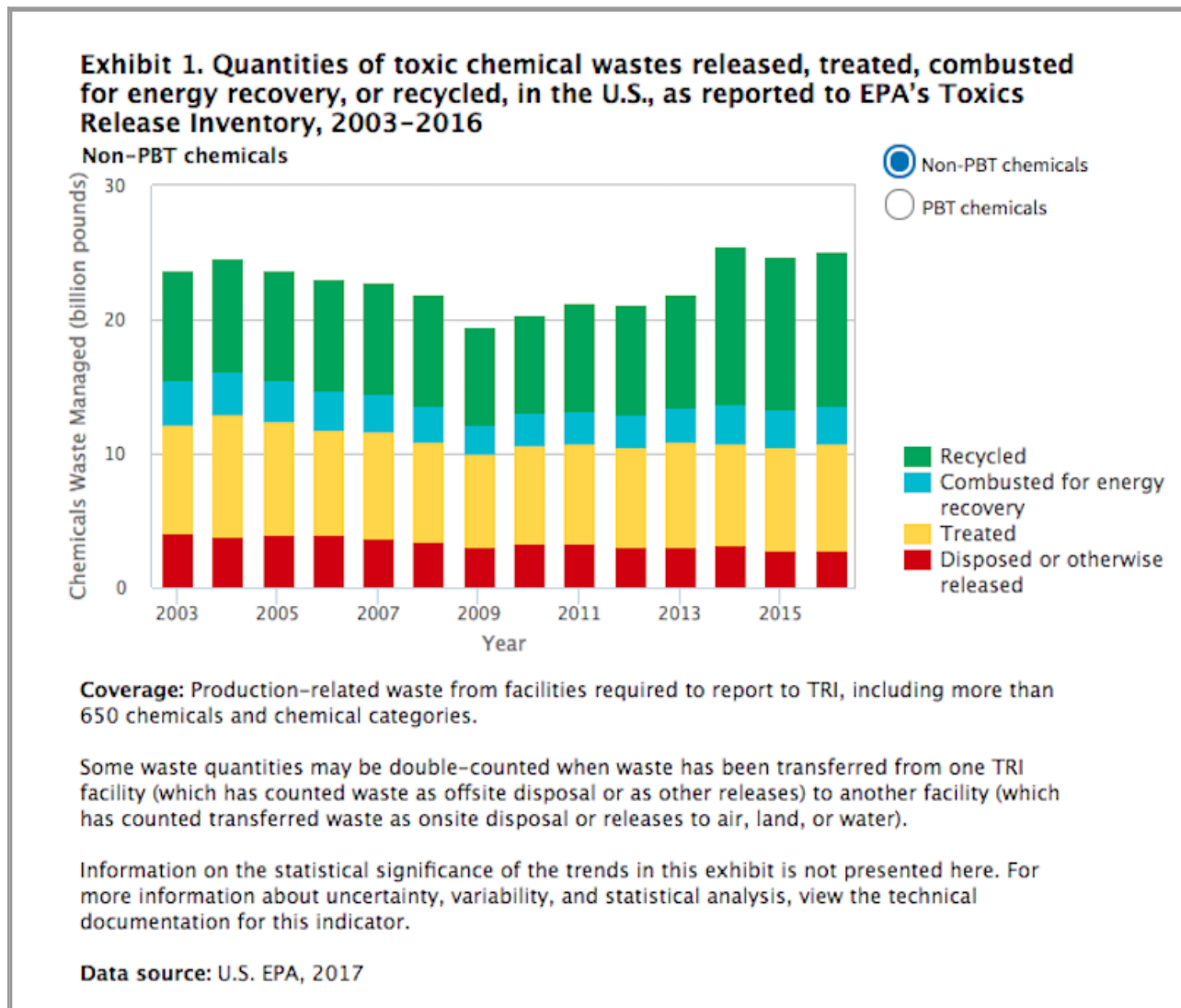
References

U.S. EPA (United States Environmental Protection Agency). 2018. 2016 Toxics Release Inventory National Analysis. <https://www.epa.gov/trinationalanalysis>.

U.S. EPA. 2017. 2016 National Analysis data flat files provided by EPA. The data are also available via the TRI Explorer tool using the “2016 Dataset (released October 2017)” and selecting “2001 core chemicals” for trends analyses at https://iaspub.epa.gov/triexplorer/tri_release.chemical.

U.S. EPA. 2016. Toxic Chemical Release Inventory Reporting Forms and Instructions: Revised 2016 version. EPA 740-B-16-001. https://www.epa.gov/sites/production/files/2018-01/documents/ry_2016_tri_reporting_forms_and_instructions.pdf (186 pp, 3.58MB)

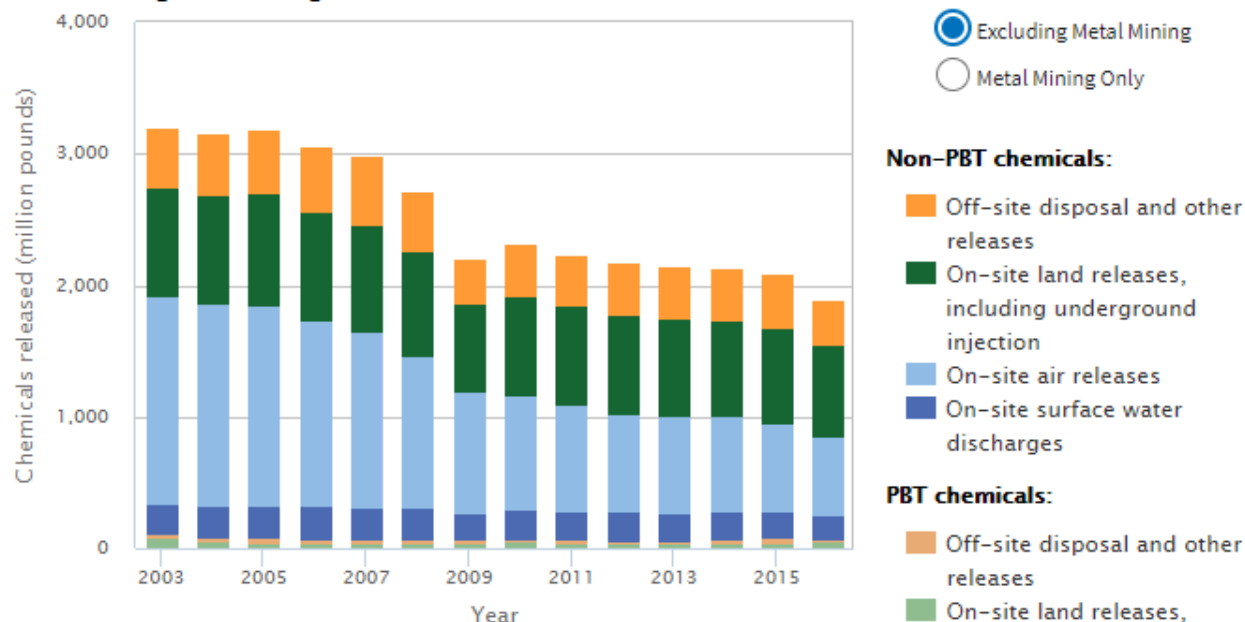
U.S. EPA. 2007. Persistent, bioaccumulative, and toxic (PBT) chemicals rules. <https://www.epa.gov/toxics-release-inventory-tri-program/persistent-bioaccumulative-toxic-pbt-chemicals-rules-under-tri>



Visit <https://www.epa.gov/roe> to see the full exhibit.

Exhibit 2. Quantities of toxic chemicals released in the U.S., by type of release, as reported to EPA's Toxics Release Inventory, 2003–2016

Excluding Metal Mining



Coverage: Disposal and other releases from facilities required to report to TRI, including more than 650 chemicals and chemical categories. Includes small quantities of non-production-related, one-time waste.

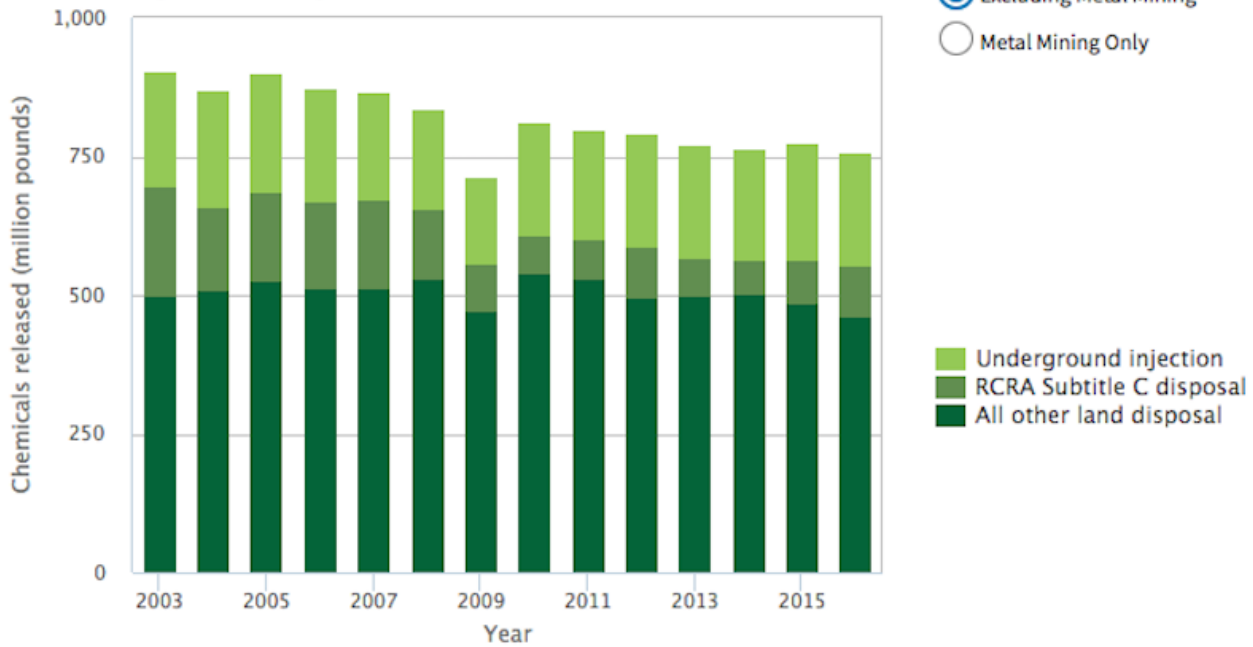
Information on the statistical significance of the trends in this exhibit is not presented here. For more information about uncertainty, variability, and statistical analysis, view the technical documentation for this indicator.

Data source: U.S. EPA, 2017

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Exhibit 3. Quantities of toxic chemicals released on-site to land in the U.S., by type of release, as reported to EPA's Toxics Release Inventory, 2003-2016

Excluding Metal Mining



Coverage: Disposal to land on-site from facilities required to report to TRI, including more than 650 chemicals and chemical categories.

Information on the statistical significance of the trends in this exhibit is not presented here. For more information about uncertainty, variability, and statistical analysis, view the technical documentation for this indicator.

Data source: U.S. EPA, 2017

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