

Report on the Environment

<https://www.epa.gov/report-environment>

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; and 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 hundreds of 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 or process more than 25,000 pounds, or otherwise use more than 10,000 pounds of a TRI-listed chemical during a calendar year. Much lower reporting thresholds apply for certain chemicals, such as PFAS and those chemicals that are classified as Chemicals of Special Concern.

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 2021, more than 21,000 facilities reported to TRI (U.S. EPA, 2023). 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, the exhibits only include those chemicals that were reportable to TRI for the full 2003 – 2021 time period presented. Metal mining sector ¹ releases are analyzed separately because they represent the largest single industry sector, accounting for over one-third of all releases over the 2003-2021 period.

¹ The 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 practices.²

The quantities of TRI chemicals associated with production-related wastes (Exhibit 1) have

fluctuated year-to-year, with a slight downward trend from 2003 to 2012 and a sustained increase since then. Some of the year-to-year fluctuations over this period may reflect changes in aggregate production levels in the national economy. From 2013 through 2021, a few facilities have reported large increases in recycling, driving the national increase in production-related waste managed.

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. In 2021, 3.2 billion pounds of chemicals were reported to TRI as released. The metal mining sector accounted for 44 percent of all releases reported in 2021, therefore, Exhibit 2 presents releases from the metal mining sector and all other sectors separately.

Releases for all sectors except metal mining: When excluding the metal mining sector, 2021 releases totaled 1.8 billion pounds, a decline of 44 percent since 2003. This downward trend was driven by reductions in air releases which dropped by 1.0 billion pounds (a 65 percent reduction) from 2003 to 2021. 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 2021 were: ammonia and methanol released to air; nitrate compounds released to water; and barium and manganese released to land.

Releases for the metal mining sector: The metal mining sector accounted for 44 percent (1.4 billion pounds) of the total releases reported to TRI in 2021 (Exhibit 2). More than 99% of the releases reported by metal mining facilities were on-site releases to land, primarily consisting of metals contained in the ore and waste rock. 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 releases 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, 2023).

Exhibit 3

Exhibit 3 provides more detail on the trend in on-site disposal to land than was included in the Exhibit 2 trends. The metal mining sector accounted for 68 percent of on-site land disposal reported to TRI in 2021, 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 229 million pounds (25 percent) from 2003 to 2021 (Exhibit 3). Chemicals disposed of to land in the greatest quantities for the 2021 reporting year include metals and their compounds such as barium (e.g., from the electric utilities sector), manganese (from a variety of sectors including chemical manufacturing), and zinc (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 2021. 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 and their compounds. For example, in 2021, zinc and lead each accounted for over a quarter of on-site land disposal (28 percent and 27 percent, respectively), followed by arsenic (22 percent).

2 Over the 2003-2021 period, non-production-related waste represented 0.1 percent of the total quantity of waste managed.

Limitations

- While TRI covers an important subset of chemicals used in commerce, TRI data reflect only listed 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 have not been on the list of chemicals and chemical categories for every year since 2003 or have never been on the list; (2) wastes from facilities within sectors 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, 2022a).
- 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. The TRI Program recognizes that this is the same quantity of the chemical and includes it only once in the total disposal or other releases metric. The production-related waste managed metric, however, considers all instances where the TRI chemical in waste is managed (first as a quantity sent off site for disposal and next as a quantity disposed of on site), and reflects both the off-site transfer and the on-site disposal.

Data Sources

This indicator is based on data from EPA's TRI from 2003 to 2021, based on data files provided by EPA (U.S. EPA, 2022b). The data are also available via the TRI Explorer tool using the "2021 National Analysis Dataset (released October 2022)" and selecting "2001 core chemicals" at https://enviro.epa.gov/triexplorer/tri_release.chemical.

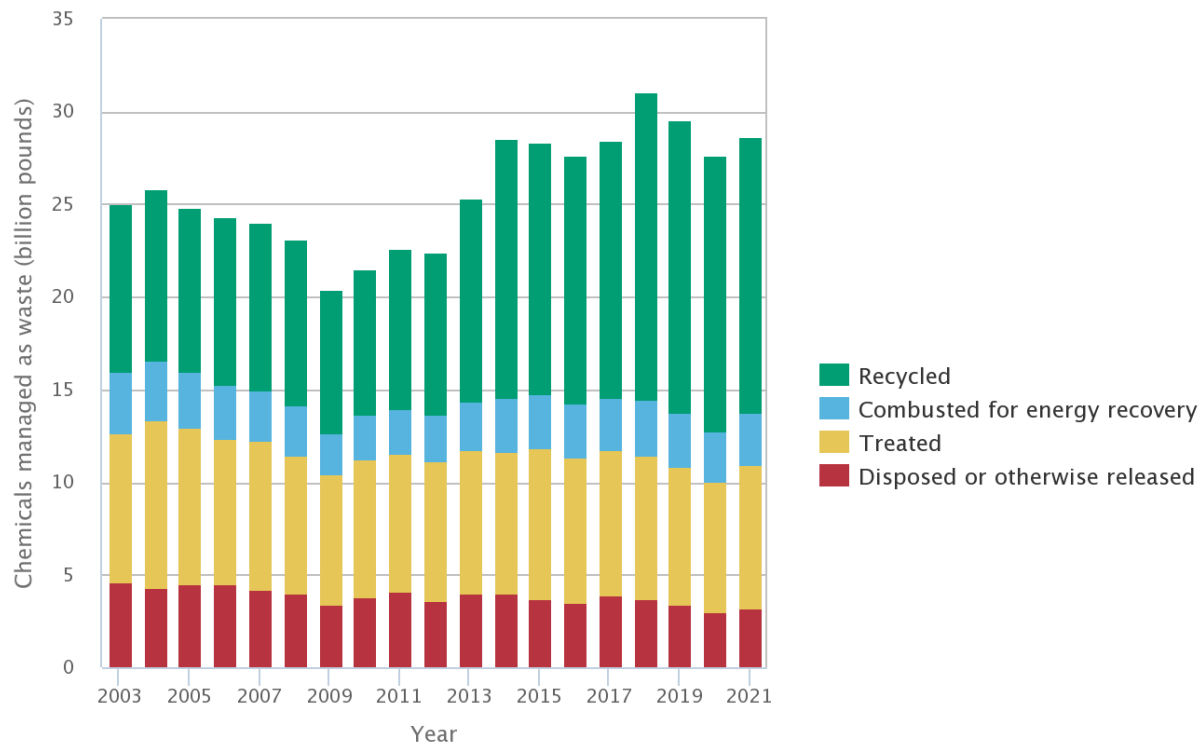
References

U.S. EPA (United States Environmental Protection Agency). 2023. 2021 Toxics Release Inventory National Analysis. <https://www.epa.gov/trinationalanalysis>.

U.S. EPA. 2022a. Toxic Chemical Release Inventory Reporting Forms and Instructions: Revised 2021 version. EPA 740-B-22-002. https://guideme.epa.gov/ords/guideme_ext/guideme_ext/guideme/file/ry_2021_rfi.pdf (pdf) (7.3 MB).

U.S. EPA. 2022b. 2021 National Analysis data files provided by EPA. The data are also available via the TRI Explorer tool using the "2021 National Analysis Dataset (released October 2022)" and selecting "2001 core chemicals" for trends analyses at

Exhibit 1. Quantities of toxic chemicals released, treated, combusted for energy recovery, or recycled, in the U.S., as reported to EPA's Toxics Release Inventory, 2003–2021



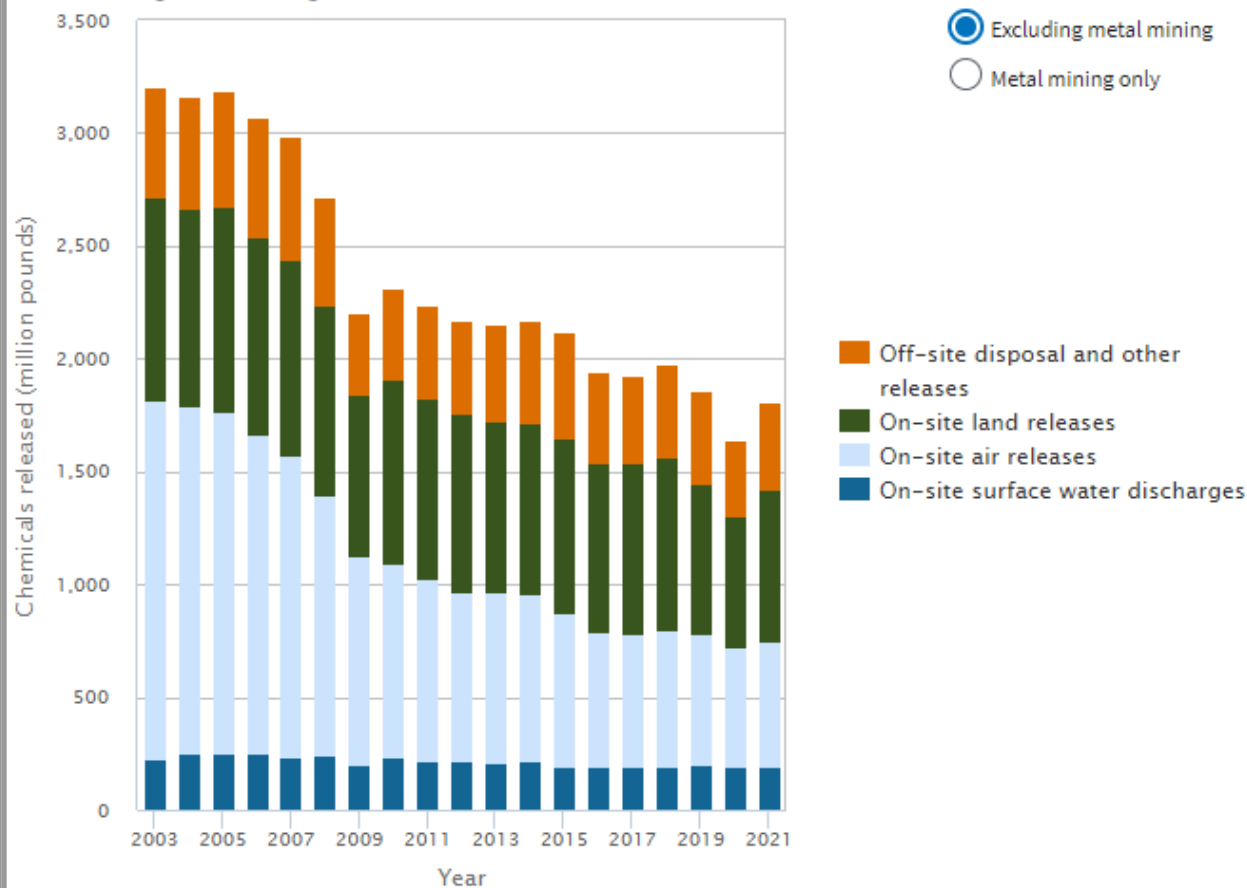
Coverage: Production-related waste from facilities as reported to TRI.

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, 2022b

Exhibit 2. Quantities of toxic chemicals released in the U.S., by type of release, as reported to EPA's Toxics Release Inventory, 2003–2021

Excluding metal mining



Coverage: Disposal or other releases from facilities as reported to TRI.

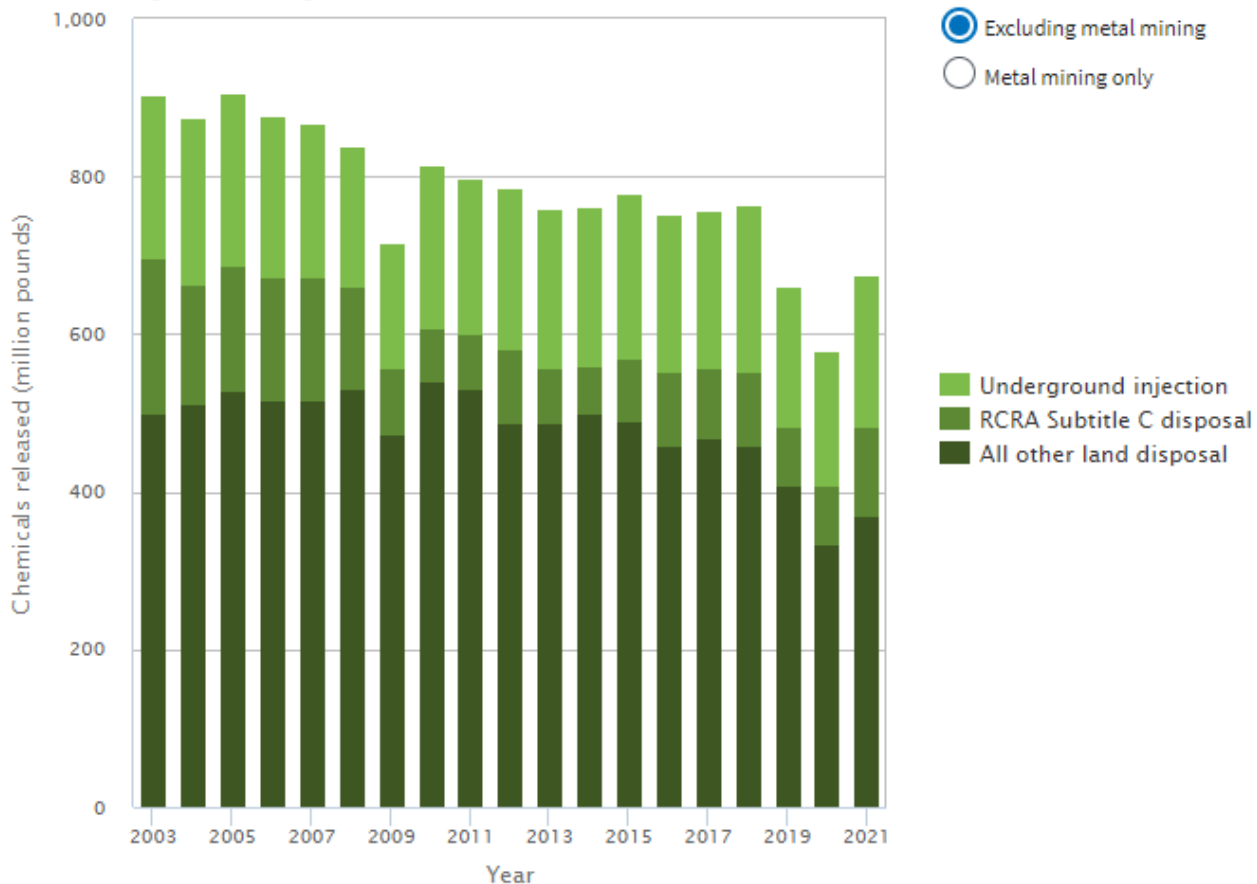
Information on the statistical significance of the trends in this exhibit is not presented here. For more information about uncertainty, variability and statistical analysis, view the technical documentation for this indicator.

Data source: U.S. EPA, 2022b

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

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, 2003–2021

Excluding metal mining



Coverage: Disposal to land on site from facilities as reported to TRI.

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, 2022b

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