EPA's Report on the Environment

Technical Documentation

Identification

1. Indicator Title

Toxic Chemical Wastes Released, Treated, Combusted for Energy Recovery, or Recycled

2. ROE Question(s) This Indicator Helps to Answer

What are the trends in wastes and their effects on human health and the environment?

3. Indicator Abstract

This indicator describes trends in the quantities of TRI chemicals reported as released to the environment or otherwise managed as waste by facilities across the United States from 2003 to 2022. Release and waste management quantities reported by the metal mining sector (NAICS 2122) are presented separately from all other sectors because metal mining represents the largest single industry sector, accounting for about one-third of all releases reported to TRI over the 2003 to 2022 time period.

4. Revision History

07/2025

Data Sources

5. Data Sources

This indicator is based on data from EPA's Toxics Release Inventory (TRI) from 2003 to 2022, from the TRI National Analysis dataset made available in October of 2023 (U.S. EPA, 2023b).

6. Data Availability

The TRI data used for this indicator are available via the TRI Explorer tool using the "2022 National Analysis Dataset

(released October 2023)" and selecting "2001 core chemicals" for trends analyses at https://enviro.epa.gov/triexplorer/tri_release.chemical. Advanced users can download the annual TRI Basic Plus Data Files which include all data elements reported on Reporting Form R by reporting year at https://www.epa.gov/toxics-release-inventory-tri-program/tri-data-and-tools.

Confidentiality issues do not seriously affect data availability. The TRI program usually receives fewer than 10 trade secret claims among more than 80,000 reporting forms submitted by about 21,000 facilities each year. Trade secret claims allowed by the TRI program do not relieve facilities of their obligation to submit release and other waste management data. Instead, trade secret claims merely allow the submitter to mask the specific identity of a TRI chemical with a generic name that must be structurally descriptive of the chemical claimed a trade secret.

Methodology

7. Data Collection

Each year, facilities in the United States that are subject to the TRI reporting requirements and that meet certain criteria (see http://www.epa.gov/toxics-release-inventory-tri-program/tri-threshold-screening-tool) must report, among other information, the quantities of TRI chemicals they released into the environment or otherwise managed as waste to EPA, and to the relevant state or tribal entity. Each facility submits a TRI reporting form for each TRI-listed chemical (see http://www.epa.gov/toxics-release-inventory-tri-program/tri-listed-chemicals) it has manufactured, processed, or otherwise used during the reporting year in amounts exceeding the reporting thresholds.

Facilities submit their TRI forms electronically using the TRI-MEweb (https://www.epa.gov/toxics-release-inventory-tri-program/electronic-submission-tri-reporting-forms) application via EPA's Central Data Exchange (CDX) (see https://cdx.epa.gov/).

8. Indicator Derivation

The data analysis to support this indicator was conducted using a series of files provided by EPA in October 2023. This dataset was composed of the same data that EPA used to develop the TRI Program's Reporting Year 2022 National Analysis (U.S. EPA, 2023b, 2024). 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 or removed from the TRI list after 2003 (the baseline year for the exhibits) are not included in the analyses. This set of the TRI chemicals consistently included over the time period presented are referred to as "core chemicals."

Exhibit 1

This exhibit uses waste quantity data from Section 8 of the TRI Form R for quantities of TRI chemicals managed as waste on site and off site. Waste quantity data were compiled for all sectors and for TRI core chemicals by year and type of management. The graphic displays the quantity of TRI chemicals, by year and by type of management.

Exhibit 2

This exhibit uses the release data from Sections 5 and 6 of the TRI Form R. Exhibit 2 displays, by year, the specific type and quantities of releases of chemicals from all sectors except the metal mining sector, and from the metal mining sector only. For this exhibit, "on-site land releases" are the sum of the TRI data categories for underground injection, landfills, surface impoundments, land treatment/application farming, and other land disposal. Off-site releases are the net releases associated with:

- Quantities of TRI chemicals that are transferred off site to Publicly-Owned Treatment Works (POTWs) and subsequently released to the environment by the POTW as reported in Section 6.1 of the TRI Form R; and
- Quantities transferred off site as reported in Section 6.2 of the TRI Form R that are disposed of off site as indicated by the following reported M codes: M10, M41, M62, M64, M65, M66, M67, M73, M79, M81, M82, M90, M94, and M99.

Exhibit 3

This exhibit also uses the releases data from Section 5 of the TRI Form R. The data are similar to those for Exhibit 2, except Exhibit 3 provides more detail on the type of land disposal for chemicals released to land on site. Results are shown separately for all sectors except metal mining, and for the metal mining sector only. First, on-site land release

quantities by year, and by land disposal type were compiled for all sectors except metal mining. Then the same data were compiled for the metal mining sector only. On-site land disposal quantities for all sectors except metal mining and for metal mining only were then grouped into the three land disposal categories shown in Exhibit 3 as follows:

Category in Exhibit	Type of Land Disposal	Corresponding TRI Form R Section number
Underground Injection	On-site underground injection	5.4.1 and 5.4.2
RCRA Subtitle C Disposal	On-site RCRA C landfills On-site RCRA C surface impoundments	5.5.1A 5.5.3A
Other	On-site other landfills On-site land treatment/application farming On-site other surface impoundments On-site other disposal	5.5.1B 5.5.2 5.5.3B 5.5.4

9. Quality Assurance and Quality Control

The TRI program has implemented a number of data collection and validation protocols, including sound collection methodologies, data management systems, compliance assistance, and quality assurance procedures to help ensure that the TRI reporting requirements are correctly applied on a consistent basis. A comprehensive description of EPA-provided assistance and data quality checks is available at https://www.epa.gov/toxics-release-inventory-tri-program/tri-data-quality-process.

In addition, facilities must certify the accuracy and completeness of the information reported on their TRI form by signing and dating the form. The data quality activities EPA performs include:

- The first level of data quality checks on TRI data occurs automatically in the TRI-MEweb reporting system.
- Each year, EPA conducts additional data quality analyses, screening the most recent TRI forms and identifying those with potential errors. Using the list of facilities with potential errors, EPA's headquarters and regional staff contact facilities to discuss submissions. When errors are confirmed, EPA instructs facilities to revise those submissions. The data quality reviews to identify potential errors may include, but are not limited to:
    - Facilities that reported a large change in total disposal or other releases and/or other waste management quantities (with a focus on air and water releases).
    - Facilities that reported a large change in disposal or other releases and/or other waste management quantities for certain chemicals of concern.
    - Facilities that have potential errors in reporting dioxin and dioxin-like compounds.
    - Facilities that reported large (>1 million pounds) quantities of volatile organic chemicals onsite but reported <10 pounds of air releases.
    - Facilities that reported the same quantities on multiple sections of Form R for more than two years.
    - Facilities that reported large changes in media-specific (focus on air and water) disposal or other releases for top toxicity-weighted chemicals from EPA's risk screening tool, the Risk-Screening Environmental Indicators (RSEI) model.

The TRI program continually receives and processes revisions to correct data errors from prior years. Where revisions have been made, the data for prior years may differ from previous data releases. EPA does not make independent corrections to the data, and instead expects facilities to meet their statutory obligation to submit revisions if necessary.

Analysis

10. Reference Points

There are no established reference points, thresholds, or ranges of values for this indicator.

11. Comparability Over Time and Space

Because EPA cannot correct reporting errors in the TRI database until the facility sends a certified revision or withdrawal, at any given time the database may reflect uncorrected facility reporting errors. Where revisions have been made, the data published in prior years may differ from the data in the current dataset.

In addition, when making year-to-year comparisons, it is important to consider changes in reporting requirements that may have taken place for the reporting years for which comparisons of submitted data are being made (U.S., EPA, 2023c, 2023d).

12. Sources of Uncertainty

The main source of uncertainty with TRI data is the selection of the technique used to derive a mass quantity to report. The law that requires certain facilities to report release and other waste management quantities of TRI chemicals does not require that these quantities be measured or otherwise determined experimentally¿although if by coincidence measurement is required under other regulations these "readily available" measured values can also be used for TRI reporting purposes. When measured data are not "readily available," the TRI regulations require that facilities determine their release and other waste management quantities of TRI-listed chemicals by making "reasonable estimates." Implicit in the allowance of reasonable estimates is that the law recognizes that some mass quantities reported to TRI are based on estimates, so there will be some degree of uncertainty in the data submitted.

The quality of TRI data and related information that is submitted to EPA is solely the responsibility of the facilities that are required to submit such data and information. Nonetheless, given the widespread use and importance of the TRI database as an information source and decision-making tool, EPA's TRI Program has for many years been proactive in identifying and implementing activities to assist facilities in submitting TRI data that are of optimal quality. These activities include: development of industry-specific and chemical-specific technical guidance documents; detailed reporting forms and instructions; establishment of the TRI Information Center; TRI-ME online reporting software (which has many built-in data quality checks); and in-house data quality analyses.

13. Sources of Variability

Key sources of variability in TRI data are exogenous economic factors that vary over time. Prices of inputs and products, general expansion or contraction of the economy domestically and globally, and many other factors affect production levels and the mass quantities of TRI chemicals released and otherwise managed as waste. Changes in regulations and implementation of pollution prevention practices may also affect TRI data.

14. Statistical/Trend Analysis

Other than the display of descriptive trend data and calculation of percentages cited in the text of the indicator, no statistical techniques have been used to characterize long-term trends.

Limitations

15. Data Limitations

Limitations to this indicator include the following:

- 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 are not on the TRI list of chemicals and chemical categories; (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 of the chemical for the year in question (U.S. EPA, 2023a).
- 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.

References

U.S. EPA (United States Environmental Protection Agency). 2024. 2022 Toxics Release Inventory National Analysis. https://www.epa.gov/trinationalanalysis.

U.S. EPA. 2023a. Toxic Chemical Release Inventory Reporting Forms and Instructions: Revised 2022 version. EPA 740-B-23-001. https://guideme.epa.gov/ords/guideme_ext/guideme_ext/guideme/file/ry_2022_rfi.pdf (PDF) (180 pp, 7.0 MB).

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U.S. EPA. 2023c. Factors to consider when using Toxics Release Inventory Data. https://www.epa.gov/toxics-release-inventory-tri-program/factors-consider-when-using-toxics-release-inventory-data.

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