U.S. House Committee on Energy and Commerce
Subcommittee on Environment
"A Decade Later: Assessing the Legacy and Impact of the Frank R. Lautenberg Chemical Safety for the 21st Century Act"
January 22, 2025
Documents for the Record

1. United States Government Accountability Office Report to Congressional Committees entitled, "EPA CHEMICAL REVIEWS: Workforce Planning Gaps Contributed to Missed Deadlines" February 2023, submitted by the Majority.
2. United States Government Accountability Office Report to Congressional Committees entitled, "NEW CHEMICALS PROGRAM: EPA Needs a Systematic Process to Better Manage and Assess Performance" January 2025, submitted by the Majority.
3. Letter from the American Cleaning Institute to Chairman Guthrie, Chairman Griffith, Ranking Member Pallone, and Ranking Member Schakowsky, January 22, 2025, submitted by Rep. Carter (GA).
4. Letter from the U.S. Chamber of Commerce to Chairman Guthrie and Chairman Griffith, January 22, 2025, submitted by the Majority.
5. An article from Iowa Solar entitled, "The Truth about Dangerous Chemicals in Solar Panels" March 7, 2022, submitted by Rep. Palmer.
6. An article from ChemSec entitled, "PFAS waste from solar panels: 'This is something that people in the sector don't like to talk about'" July 3, 2024, submitted by Rep. Palmer.
7. A report from the U.S. Environmental Protection Agency entitled, "2022 TRI National Analysis" submitted by Rep. Palmer.
8. A letter from Microporous, LLC CEO John Reeves to Chairman Guthrie and Ranking Member Pallone, January 22, 2025, submitted by Rep. Harshbarger.

United States Government Accountability Office

Report to Congressional Committees

February 2023

EPA CHEMICAL REVIEWS

Workforce Planning Gaps Contributed to Missed Deadlines

GAO-23-105728

GAO Highlights

Highlights of GAO-23-105728, a report to congressional committees

February 2023

EPA CHEMICAL REVIEWS

Workforce Planning Gaps Contributed to Missed Deadlines

Why GAO Did This Study

Thousands of chemical substances play an important role in modern life and commerce, but can also present serious risks to human health and the environment. In 2016, Congress amended TSCA to establish new deadlines for reviewing chemicals already in commerce, including an initial set of 10 existing chemicals. It also provided that EPA make a formal determination before new chemicals can be manufactured.

GAO was asked to review EPA's implementation of its chemical review responsibilities under TSCA. This report evaluates the extent to which (1) EPA met selected TSCA deadlines for reviewing existing and new chemicals since June 2016, and (2) EPA engaged in workforce planning for implementing its chemical review responsibilities. GAO reviewed relevant laws, regulations, and workforce planning documents, and collected EPA data on new chemical review times and its workforce. GAO also interviewed EPA officials and representatives from industry and environmental health stakeholder organizations.

What GAO Recommends

GAO recommends that EPA develop a process and timeline to fully align its workforce planning efforts for implementing its TSCA chemical review responsibilities with workforce planning principles. EPA agreed with our recommendation but indicated that insufficiency of resources is the primary factor, among others we noted, for missed deadlines.

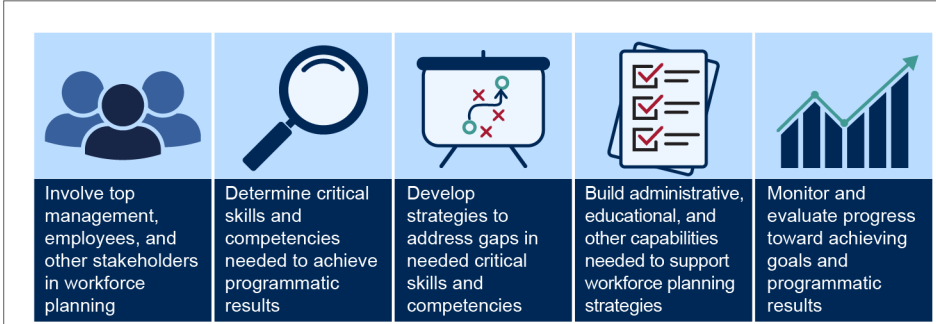
View GAO-23-105728. For more information, contact J. Alfredo Gómez at (202) 512-3841 or gomezj@gao.gov.

What GAO Found

Since 2016, the Environmental Protection Agency (EPA) has missed most deadlines for reviewing existing and new chemicals under the Toxic Substances Control Act (TSCA), as amended. Once prioritized, existing chemicals are reviewed in two main phases —risk evaluation and risk management—and TSCA established specific deadlines for each phase. GAO found that EPA completed the first risk evaluation step (i.e., scoping) for the initial 10 existing chemical reviews on time. However, EPA missed all but one subsequent risk evaluation and risk management deadlines for these chemicals. Additionally, TSCA as amended provides that a person may only manufacture a new chemical if such person submits information to EPA and the agency makes an affirmative determination on the risk of injury to health or the environment. However, GAO found that among those pre-manufacture reviews that EPA completed from 2017 through 2022, the agency typically completed the reviews within the 90-day TSCA review period less than 10 percent of the time. EPA missed the chemical review deadlines due in part to several contributing factors and is implementing some related improvements (e.g., modernizing information systems). However, according to EPA, resource constraints, including insufficient staff capacity, remain the primary reason for missed chemical review deadlines.

EPA has engaged in some initial workforce planning activities for its chemical review responsibilities, but significant workforce planning gaps contribute to missed chemical review deadlines. For example, in March 2021, EPA conducted a skills gap assessment, which included hiring targets for mission-critical occupations. However, EPA officials told GAO the assessment no longer reflects current workforce needs, and that EPA has not created a strategic workforce plan to develop long-term strategies for recruiting, developing, and retaining staff. GAO has identified five principles with which federal agencies' strategic workforce planning efforts should align (see figure). EPA officials told GAO that while they agree that these principles are relevant and reasonable for its TSCA workforce planning efforts, they have not developed a process or timeline to fully align such efforts with these principles. Without doing so, EPA will likely continue to struggle to recruit, develop, and retain the workforce it needs to meet TSCA deadlines for completing existing and new chemical reviews.

Figure: GAO's Five Key Strategic Workforce Planning Principles



Source: GAO. | GAO-23-105728

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Abbreviations

1-BP	1-bromopropane
BBP	butyl benzyl phthalate
D4	octamethylcyclotetrasiloxane
DBP	dibutyl phthalate
DEHP	di-ethylhexyl phthalate
DIBP	diisobutyl phthalate
DIDP	diisodecyl phthalate
DINP	di-isononyl phthalate
EPA	Environmental Protection Agency
FTE	full-time equivalent
FY	fiscal year
HBCD	cyclic aliphatic bromide cluster
HHCB	1,3,4,6,7,8-Hexahydro-4,6,6,7,8,8-hexamethylcyclopenta[g]-2-benzopyran
LoREX	low release and low exposure
LVE	low volume exemption
MCAN	microbial commercial activity notice
NMP	N-Methylpyrrolidone
OCSPP	Office of Chemical Safety and Pollution Prevention
OIG	Office of Inspector General
OPPT	Office of Pollution Prevention and Toxics
OTNE	octahydro-tetramethyl-naphthalenyl-ethanone
PMN	pre-manufacture notice
PPE	personal protective equipment
PV29	C.I. pigment violet 29
SNUN	significant new use notice
TBBPA	4,4'-(1-Methylethylidene)bis[2, 6-dibromophenol]
TCE	trichlorethylene
TCEP	tris(2-chloroethyl) phosphate
TPP	phosphoric acid, triphenyl ester
TSCA	Toxic Substances Control Act

U.S. GOVERNMENT ACCOUNTABILITY OFFICE
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February 17, 2023

The Honorable Thomas R. Carper
Chairman
The Honorable Shelley Moore Capito
Ranking Member
Committee on Environment and Public Works
United States Senate

The Honorable Cathy McMorris Rodgers
Chair
The Honorable Frank Pallone, Jr.
Ranking Member
Committee on Energy and Commerce
House of Representatives

More than 86,000 chemicals are publicly listed for a broad range of potential uses, such as solvents, coatings, electronics, computer chips, fuels, and motor vehicle components.[1] These chemicals play important roles in modern life and commerce, but most have not been evaluated to determine whether they pose serious risks to human health and the environment. Susceptible subpopulations such as workers and communities near industrial facilities—often referred to as "fenceline" communities—may face greater exposure and risk. The Toxic Substances Control Act (TSCA), as amended by the Frank R. Lautenberg Chemical Safety for the 21st Century Act (Lautenberg Act) in 2016, authorizes the Environmental Protection Agency (EPA) to assess and regulate chemical risks for chemicals already in commerce (existing chemicals) and chemicals yet to enter commerce (new chemicals).[2]

[1]EPA maintains an inventory of chemical substances manufactured or processed in the United States for nonexempt commercial purposes under the Toxic Substances Control Act (TSCA) and generally publishes updates to the list about every 6 months. The most recent update, in February 2022, included 86,631 chemicals, of which 42,039 are active substances. According to EPA officials, the February 2022 update was the only posted update in 2022 because of parallel efforts to declassify large numbers of confidential chemicals on the inventory. Officials told us that the next update is expected to be published in spring 2023.

[2]Toxic Substances Control Act, Pub. L. No. 94-469, 90 Stat. 2003 (1976) (codified as amended at 15 U.S.C. § 2601 et seq.). TSCA was substantially amended in 2016 by the Lautenberg Act. Pub. L. No. 114-182, 130 Stat. 448 (2016).

The Lautenberg Act expanded EPA's authority and responsibility to regulate toxic chemicals, in response to concerns about the pace of the agency's work under TSCA and EPA's ability to effectively use its existing authority, according to a committee report accompanying the act.[3] The 2016 amendments established deadlines for conducting risk evaluations and initiating risk management actions for existing chemicals and directed EPA to make formal determinations on all new chemicals before they can be manufactured.

You asked us to review EPA's implementation of its chemical review responsibilities. This report evaluates the extent to which (1) EPA met selected TSCA deadlines for reviewing existing and new chemicals since June 2016, and (2) EPA engaged in workforce planning for implementing its chemical review responsibilities.

To address the first objective, we examined selected provisions of TSCA, as amended by the Lautenberg Act, related to EPA's chemical review responsibilities. Specifically, we reviewed laws and regulations to identify relevant deadlines for EPA's review of existing and new chemicals. We determined EPA's review times for existing chemicals by analyzing relevant EPA documents, such as rules and notices. We collected and assessed New Chemicals Review system data from EPA to determine its review times and determinations for new chemical reviews. We compared EPA's review times to the selected TSCA deadlines to evaluate the extent to which the agency met the deadlines. We reviewed relevant EPA documentation and interviewed knowledgeable EPA officials about the data, and we determined the data were sufficiently reliable for purposes of describing changes from June 22, 2016, through May 16, 2022, the most recent information available for our review.

To corroborate TSCA chemical review implementation progress and identify associated challenges, we interviewed officials from EPA's Office of Chemical Safety and Pollution Prevention (OCSPP) and representatives from two industry and two environmental health stakeholder organizations identified mostly from our prior work, given that work's similar focus on EPA chemical reviews.[4] Our interviews with

[3]H.R. REP. NO. 114-176, at 12-13 (2015).

[4]GAO, *Chemical Assessments: Status of EPA's Efforts to Produce Assessments and Implement the Toxic Substances Control Act*, GAO-19-270 (Washington, D.C.: Mar. 4, 2019).

stakeholder organizations collected illustrative examples that are not generalizable across all stakeholder organizations.

To address the second objective, we identified principles from prior GAO work that federal agencies' strategic workforce planning should address, such as determining critical skills needed to achieve programmatic results and developing strategies to address identified skills gaps.[5] To identify EPA's workforce planning processes, we reviewed relevant EPA planning and budgetary documents. We also interviewed officials from OCSPP's Office of Program Support and representatives from stakeholder organizations. We then compared EPA's workforce planning processes to workforce planning principles.

We collected and analyzed workforce data from EPA on its full-time equivalents (FTEs) for the Office of Pollution Prevention and Toxics (OPPT), which is responsible for TSCA-related activities, for fiscal year 2022.[6] Additionally, we collected TSCA-related workforce counts for onboard staff, hires, and departures from the end of fiscal year 2021 through fiscal year 2022, by mission-critical occupation. EPA could not provide consistent counts for fiscal years prior to 2021 due to a reorganization of OCSPP in October 2020. We interviewed knowledgeable agency officials about the data. We determined that the FTE and workforce count data were sufficiently reliable for purposes of generally understanding EPA's workforce recently available to conduct chemical reviews under TSCA. EPA FTE data do not precisely match activities related solely to EPA's chemical review responsibilities under TSCA.[7] Because they do cover EPA's staff recently available to conduct chemical reviews under TSCA, we determined that the FTE and workforce count data were sufficiently reliable for our purposes.

We conducted this performance audit from January 2022 to February 2023 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for

[5]GAO, *Human Capital: Key Principles for Effective Strategic Workforce Planning*, GAO-04-39 (Washington, D.C.: Dec. 11, 2003).

[6]According to the Office of Management and Budget, FTE employment is the basic measure of the levels of employment used in the budget. It is the total number of hours worked (or to be worked) divided by the number of compensable hours applicable to each fiscal year. See the Office of Management and Budget, *Circular No. A-11: Preparation, Submission, and Execution of the Budget* (Washington, D.C.: Aug. 15, 2022).

[7]Additionally, according to EPA, some of the FTEs supporting TSCA are not in OPPT and therefore are not included in our FTE counts. For example, the Office of Program Support provides information technology system support and related project management.

our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

Within EPA's Office of Chemical Safety and Pollution Prevention (OCSPP), the Office of Pollution Prevention and Toxics (OPPT) manages EPA activities under TSCA. Several divisions within OPPT have chemical review-related responsibilities, notably its Existing Chemicals Risk Assessment Division; Existing Chemicals Risk Management Division; Data Gathering and Analysis Division; and New Chemicals Division. OPPT's Project Management and Operations Division supports the stakeholder transparency and information technology needs of the office's chemical review responsibilities. OCSPP's Office of Program Support is responsible for supporting the office's administrative programs, including workforce planning.[8]

Existing Chemicals

This report discusses three groups of reviews of existing chemicals under TSCA.[9] These are:

- **Initial 10 chemical substances.** As required by TSCA, EPA initiated risk evaluations in December 2016 on an initial set of 10 chemical substances drawn from the 2014 update of the TSCA Work Plan. These included asbestos and methylene chloride.
- **Subsequent 20 high-priority chemical substances.** As required by TSCA, EPA initiated risk evaluations in December 2019 on a subsequent set of 20 high-priority chemical substances.[10]

[8]OCSPP also includes the Office of Pesticide Programs, which does not have TSCA-related responsibilities. In October 2020, EPA reorganized OPPT by creating separate risk evaluation, data gathering, and risk management divisions for existing chemicals and by establishing a single division responsible for risk assessment and risk management of new chemicals.

[9]For purposes of this report, we use the term "existing chemical reviews" to include EPA's risk evaluation and risk management activities for existing chemicals under TSCA. 15 U.S.C. § 2605.

[10]In designating high-priority substances, TSCA requires that EPA select at least half from the chemical substances listed in the 2014 update of the TSCA Work Plan; however, all chemicals in the TSCA inventory are subject to EPA's prioritization screening process. The subsequent 20 high-priority substances designated by EPA on which risk evaluations were initiated include a variety of solvents, phthalates, flame retardants, fragrance additives, and other chemicals.

- **Manufacturer-requested risk evaluations.** At the request of one or more manufacturers as provided under TSCA, EPA initiated risk evaluations of other existing chemical substances.[11]

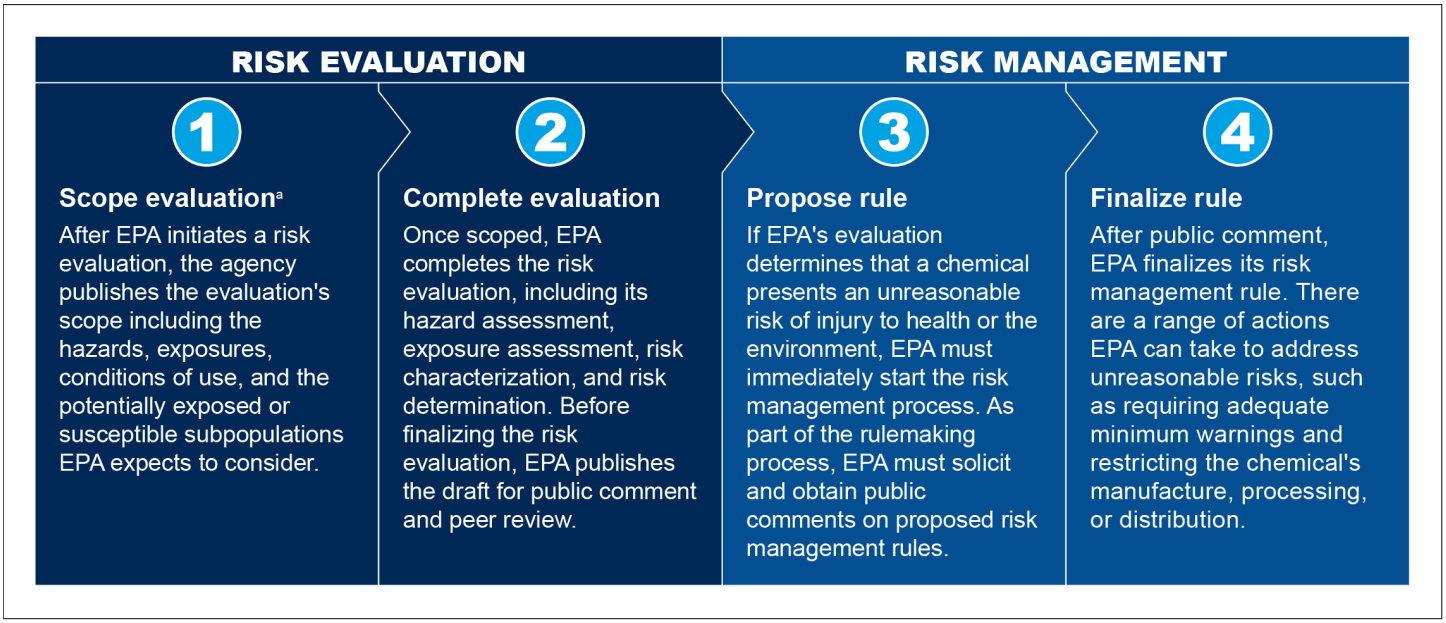
Prioritization is the risk-based screening process for designating existing chemicals for risk evaluation under TSCA. Specifically, EPA uses the prioritization process to designate a chemical substance as either high priority for risk evaluation, or low priority for which risk evaluation is not warranted at the time.[12]

After prioritization, existing chemical reviews involve two main phases: risk evaluation and risk management. Each phase consists of various required steps, including scoping and completing the risk evaluation, as well as proposing and finalizing rules to address unreasonable risks of injury to health or the environment (see fig. 1). For example, scoping is a critical step in EPA's risk evaluation process, since it includes the hazards, exposures, conditions of use, and potentially exposed or susceptible subpopulations that EPA expects to consider. Before publishing the final scope, EPA publishes the draft scope for public comment.

[11]As of September 1, 2022, EPA had initiated manufacturer-requested risk evaluations of three chemical substances: diisodecyl phthalate (DIDP) (1,2-benzene-dicarboxylic acid, 1,2- diisodecyl ester); di-isononyl phthalate (DINP) (1,2-benzenedicarboxylic acid, 1,2-isononyl ester); and octamethylcyclotetrasiloxane (D4). Manufacturers have also requested that EPA conduct a risk evaluation of octahydro-tetramethyl-naphthalenyl-ethanone (OTNE). After finding the request to be "facially complete" under EPA regulations in December 2020, EPA issued a notice of receipt of the request for risk evaluation and solicitation of public comments in Feb. 2021. 86 Fed. Reg. 10,267 (Feb. 19, 2021). The public comment period, which was extended, closed on May 5, 2021. As of December 2022, EPA has not granted the request.

[12]In February 2020, EPA designated 20 chemical substances as "low priority." TSCA requires that upon completion of a risk evaluation (other than those requested by a manufacturer), EPA must designate at least one additional high-priority chemical to take its place, thus ensuring that the EPA's risk evaluation queue always remains full. *See* 15 U.S.C. § 2605(b)(3)(C).

Figure 1: Environmental Protection Agency's (EPA) Risk Evaluation and Risk Management Phases for Existing Chemical Reviews

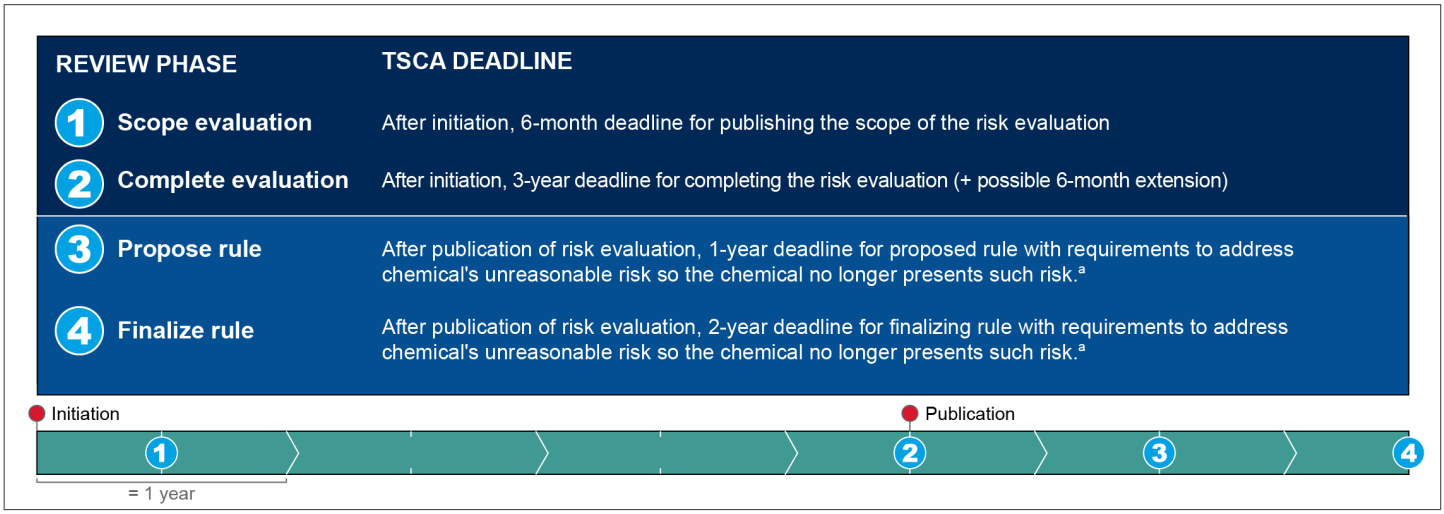


Source: GAO. | GAO-23-105728

[a]Before initiating the formal risk evaluation process, EPA conducts a prioritization process. Prioritization is the risk-based screening process for designated existing chemicals for risk evaluation under TSCA. EPA uses the prioritization process to designate a chemical substance as either high priority for further risk evaluation, or low priority for which risk evaluation is not warranted at the time.

TSCA established specific statutory deadlines for certain steps of EPA's risk evaluation and risk management phases (see fig. 2). For example, after EPA initiates a risk evaluation, it must publish the evaluation's scope within 6 months.

Figure 2: Selected Deadlines for Environmental Protection Agency (EPA) Review of Existing Chemicals under the Toxic Substances Control Act (TSCA)



Source: GAO. | GAO-23-105728

[a]By statute, EPA may extend the deadlines for the publication of a proposed or final rule for not more than 2 years, as long as the aggregate length of such extensions, as well as any extension to the 3-year risk evaluation deadline, does not exceed 2 years, subject to certain additional conditions. 15 U.S.C. § 2605(c)(1)(C). According to EPA officials, the agency has not exercised this extension authority for any existing chemical reviews.

New Chemicals

TSCA generally requires any person who plans to manufacture (including produce and import) or process a new chemical substance for a non-exempt commercial purpose to submit a pre-manufacture notice to EPA for review of potential unreasonable risks to human health and the environment before initiating the activity.[13] Under TSCA prior to the Lautenberg Act amendments, a person could manufacture a new chemical 90 days after submitting a pre-manufacture notice unless EPA made a determination of unreasonable risk and took action to protect against such risk.

As amended in 2016, TSCA provides that a person may only manufacture new chemicals if, in addition to submitting a pre-manufacture notice, EPA

[13]In addition, if EPA determines that a use of a chemical substance is a significant new use, TSCA requires persons to submit a significant new use notice to EPA at least 90 days before manufacturing or processing the chemical substance for that use. Some new chemical substances are not subject to pre-manufacture notice reporting. These substances are either (1) excluded from TSCA reporting or (2) exempt from all or part of this reporting because EPA has determined that they do not warrant review or require only a short review, such as Low Volume Exemptions and Low Release/Low Exposure Exemptions.

makes an affirmative determination on the risk of injury to health or the environment of the new chemical and takes any subsequent required actions to mitigate the risk after such a determination.[14] EPA's actions may include, for example, limiting the amount of the substance that may be manufactured, processed, or distributed. According to EPA, TSCA's requirement after the 2016 amendments to make a formal determination on each submission before the chemical can be manufactured or processed has significantly increased EPA's new chemical review responsibilities. According to EPA, the agency made formal determinations for about 20 percent of submissions prior to the amendments in 2016.

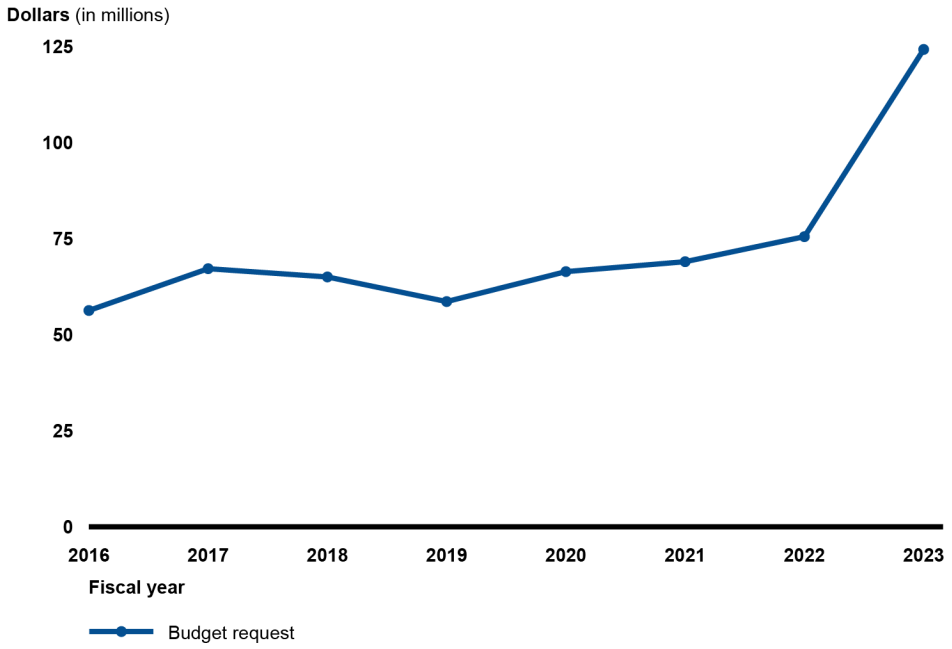
Budget Request

EPA's budget request to implement its TSCA responsibilities remained relatively level from fiscal year 2016 through fiscal year 2022, but notably increased in fiscal year 2023 (see fig. 3). In its request for fiscal year 2023, EPA stated that the agency needs a substantial increase in scientific expertise and financial resources to ensure it can achieve TSCA statutory requirements.[15] EPA noted, however, that appropriations for its TSCA program remained relatively level for the first six years after the 2016 amendments, despite this significant increase in responsibility.

[14]Under TSCA, the applicable review period for EPA's determination and any subsequent required actions is generally 90 days. *See* 15 U.S.C. § 2604(*i*)(3). TSCA further provides that EPA may for good cause extend the review period for additional periods (not to exceed 90 days in the aggregate). 15 U.S.C. § 2604(c). By statute, such an extension and the reasons for it are to be published in the *Federal Register* and constitute a final agency action subject to judicial review. *Id.* According to EPA, the agency has used this extension authority only once since 2016, as a result of the partial government shutdown due to a lapse in funding in February 2019.

[15]TSCA, as amended, requires EPA to publish an annual plan that, among other things, identifies the chemical substances for which risk evaluations are expected to be initiated or completed that year and the resources necessary for their completion. 15 U.S.C. § 2625(n)(2). The 2016 amendments to TSCA also provided EPA with expanded authority to collect fees from chemical manufacturers and importers to help defray up to 25 percent of the costs associated with overall TSCA implementation efforts, and authorized EPA to establish a fee structure by rule. EPA finalized the Fees for the Administration of TSCA rule in October 2018. *See* 83 Fed. Reg. 52,694 (Oct. 17, 2018). However, according to EPA, the rule resulted in the agency collecting only about 13 percent of the "artificially low baseline cost estimate" for the program. EPA issued a proposed rule in January 2021 to revise its 2018 fee rule, and in November 2022, the agency issued a Supplemental Notice of Proposed Rulemaking to modify and supplement the 2021 proposal. *See* 87 Fed. Reg. 68,647 (Nov. 16, 2022) (modifying and supplementing 86 Fed. Reg. 1890 (Jan. 11, 2021)). The 2022 supplemental proposed rule would, among other things, change the TSCA fee amounts and the estimate of EPA's total costs for administering TSCA. 87 Fed. Reg. at 68,647, 68,648.

Figure 3: Budget Request Information for the Environmental Protection Agency's "Toxic Substances: Chemical Risk Review and Reduction" Program Project, Fiscal Years 2016–2023



Source: GAO analysis of EPA annual budget justification documents. | GAO-23-105728

In March 2019, we reported that EPA faced challenges implementing TSCA, such as ensuring that the new chemical review process was efficient and predictable and that EPA had sufficient resources.[16] At the time, EPA officials likened implementing the TSCA amendments to "building an airplane as they fly it," since they had to create guidance and processes while simultaneously applying them to chemical evaluations.

Since 2009, we have also included EPA's processes for assessing and controlling toxic chemicals on our High Risk List as a government program in need of broad-based transformation. In our 2021 update, we reported that EPA neither met initial statutory deadlines for completing chemical risk evaluations nor completed workforce planning to ensure it has the resources and plans in place to implement TSCA.[17]

[16]GAO, *Chemical Assessments: Status of EPA's Efforts to Produce Assessments and Implement the Toxic Substances Control Act*, GAO-19-270 (Washington, D.C.: Mar. 4, 2019).

[17]GAO, *High-Risk Series: Dedicated Leadership Needed to Address Limited Progress in Most High-Risk Areas*, GAO-21-119SP (Washington, D.C.: Mar. 2, 2021).

EPA Missed Most TSCA Deadlines for Reviewing Existing and New Chemicals, but Identified Some Planned Improvement Steps

For existing chemicals, EPA completed the first risk evaluation step (i.e., scoping) for an initial set of 10 chemical reviews on time; however, it missed all but one of the subsequent risk evaluation and risk management deadlines. Among those pre-manufacture reviews that EPA completed from 2017 through 2022, the agency typically completed the reviews within the 90-day TSCA review period less than 10 percent of the time. According to EPA officials, the agency missed these deadlines primarily due to resource constraints, including insufficient capacity in mission-critical occupations needed to complete the reviews, but has taken some steps to improve.

EPA Published Some of the Initial 10 Existing Chemical Review Documents on Time, but Missed Almost All Subsequent Review Deadlines

Missed Deadlines for the Initial 10 Existing Chemical Risk Evaluations

EPA initiated and published the scope of the initial 10 existing chemical risk evaluations on time. However, it missed all but one of the subsequent review deadlines for all three groups of existing chemical evaluations.[18] Specifically, EPA met TSCA's deadline to publish the scope of the initial 10 existing chemical reviews in June 2017. Before publishing the final scope, EPA publishes the draft scope for public comment. However, EPA missed the June 2020 deadline (as extended by 6 months) for completing the risk evaluations of nine of the initial 10 existing chemicals. EPA missed TSCA deadlines for completing the evaluations by time periods ranging from 2 months for 1-bromopropane to 7 months for C.I. pigment violet 29 (PV29) and 1,4-dioxane. We discuss factors that contributed to EPA missing these deadlines below.

Additionally, EPA proposed risk management rules for one existing chemical substance (asbestos, part 1), but did so 4 months after the

[18]The statutory deadline for EPA to publish the scope of the risk evaluations was June 19, 2017. EPA filed the scoping documents in the *Federal Register* on June 20, 2017. Additionally, the statutory deadline for EPA to complete the risk evaluation for methylene chloride was June 19, 2020. EPA filed the completed evaluation in the *Federal Register* on June 23, 2020. Although EPA completed these steps shortly after the TSCA deadlines, for purposes of our analysis, we considered EPA to have "met" these deadlines.

deadline.[19] Moreover, EPA has not yet issued proposed rules for the remaining existing chemical substances.[20] EPA officials noted that they have made progress in identifying and analyzing risk management options and completing other necessary reviews for five additional existing chemical substances in preparation for the development of proposed rules for those chemicals.[21] (See appendix I for more information on EPA's performance in meeting TSCA deadlines for the initial 10 existing chemical reviews.)

Missed Deadlines for the Subsequent 20 and Manufacturer-Requested Existing Chemical Risk Evaluations

EPA also missed the TSCA deadline for publishing the scope of the subsequent 20 high-priority existing chemical substances as well as manufacturer-requested risk evaluations. For example, EPA published the scope of the subsequent 20 high-priority chemical substances in August 2020—two months after the TSCA deadline. Moreover, EPA officials told us that, as a result of insufficient resources provided through the budget process, they do not expect to meet the future deadlines for these evaluations. Representatives from an environmental health stakeholder organization we interviewed told us such delays prolong the potential risk these chemicals pose to human health and the environment by remaining in commerce without risk management rules in place.

Re-opening and Revising Completed Risk Evaluations Contributed to Missed Deadlines

OPPT officials told us that re-opening and revising, as appropriate, completed risk evaluations on the initial 10 chemical substances contributed to missed deadlines for existing chemical risk management rules. They noted that if EPA had not taken these steps, not only would its risk evaluations and associated risk management actions have been less protective, the agency could also have assumed future litigation risk that could have resulted in additional delays. In June 2021, EPA announced the following planned approaches to risk evaluations intended to align more closely with TSCA legal requirements:

[19]Specifically, in April 2022, EPA published a proposed rule to address the unreasonable risk of injury to health it identified from certain asbestos uses (Asbestos, Part 1: Chrysotile Asbestos). 87 Fed. Reg. 21,706 (Apr. 12, 2022). EPA published the final risk evaluation for Asbestos, Part 1, in December 2020, 4 months later than the statutory 1-year deadline for proposed rules.

[20]As noted previously, by statute, EPA is to propose a rule in the *Federal Register* not later than 1 year after, and publish a final rule not later than 2 years after, the publication of the final risk evaluation for a chemical. EPA may extend the deadlines for the publication of a proposed or final rule for not more than 2 years, as long as the aggregate length of such extensions, as well as any extension to the 3-year risk evaluation deadline, does not exceed 2 years, subject to certain limitations. 15 U.S.C. § 2605(c)(1).

[21]In November 2022, EPA submitted to the Office of Management and Budget for interagency review the proposed rule for methylene chloride, and EPA expects to submit additional proposed rules in the coming months, according to EPA officials.

- **Exposure pathways and fenceline community exposure.** In the final risk evaluations for some of the initial 10 chemical substances, EPA noted that it did not assess all air, water, or disposal exposures to the general population because other EPA-administered statutes such as the Clean Air Act already regulated, or could in the future regulate, these exposure pathways. However, according to EPA, excluding these pathways also resulted in a failure to consistently and comprehensively assess risks to both the general population and to potentially exposed or susceptible subpopulations, including communities near industrial facilities (i.e., fenceline communities). Thus, EPA developed a screening-level approach to conduct ambient air and surface water fenceline exposure assessments to understand risks associated with fenceline exposures for certain conditions of use and pathways for some of the first 10 chemicals.[22]
- **Personal protective equipment (PPE).** In its final risk evaluations, EPA generally assumed that workers were always provided, and used, PPE appropriately. However, EPA stated that some workers are not covered by applicable Occupational Safety and Health Administration standards (e.g., self-employed individuals), some employers are out of compliance with the standards, and the standards may be inadequate for ensuring worker protection. EPA is no longer assuming that workers always use PPE in occupational settings, which has resulted in changes to some of the conclusions about unreasonable risk associated with some conditions of use for eight of the initial 10 chemical substances.[23] The statutory definition of "potentially exposed or susceptible subpopulations" specifically identifies workers as an example of such subpopulations, and TSCA requires EPA to develop risk evaluations for conditions of use that include risks to such subpopulations. According to EPA officials, assuming that all workers always have access to and appropriately use PPE not only does not ensure that all workers are protected, but also adds litigation vulnerability for the agency.
- **Whole chemical approach.** In its final risk evaluations, EPA made separate unreasonable risk determinations for every condition of use of a chemical. EPA is withdrawing the previously issued orders for those conditions of use for which no unreasonable risk was found for

[22]According to EPA, the 6 existing chemicals are methylene chloride, trichloroethylene, carbon tetrachloride, perchloroethylene, n-methylpyrrolidone (NMP), and 1-bromopropane.

[23]According to EPA, the eight existing chemicals are methylene chloride, 1-bromopropane, cyclic aliphatic bromide cluster (HBCD), NMP, perchloroethylene, PV29, trichloroethylene (TCE), and carbon tetrachloride.

the risk evaluations for the initial 10 chemical substances. According to EPA, it is also issuing a single revised unreasonable risk determination for each of these chemicals as a "whole chemical substance."

According to EPA, these changes are intended to help the agency fully uphold its mission to protect human health and the environment, follow the statutory requirements to determine whether a chemical substance poses an unreasonable risk, and potentially limit future timely and costly litigation.

Industry and environmental health stakeholder organizations we interviewed shared differing perspectives on the merits of EPA's announced policy changes for existing chemical reviews. Representatives from an industry stakeholder organization we met with reported that the policy changes fail to adequately consider the existence, applicability, and jurisdiction of other federal laws and make incorrect assumptions about worker protections and workplace environments. They also reported that the changes were developed without sufficient on-staff expertise or interagency consultation in relevant scientific and technical fields, particularly with respect to industrial hygiene.[24] They noted that the changes sidestep the best available science requirements of the statute, and risk misleading and confusing the regulated community and the public.[25]

However, representatives from an environmental health stakeholder organization we interviewed told us that unlike most other environmental laws, TSCA obligates EPA to evaluate a chemical's risk throughout its life cycle—from manufacturing through disposal. They noted that TSCA also requires EPA to determine whether a chemical presents an unreasonable risk, without consideration of costs or other nonrisk factors, and to regulate the chemical to the extent necessary so that it no longer presents an unreasonable risk. They supported EPA's decision to revisit the assumption that workers always use appropriate PPE for the specific occupational setting, because the assumption represented a broad generalization based on limited data. Moreover, they noted that the

[24]According to EPA, OPPT currently has a small number of industrial hygienists on staff and is recruiting and hiring new employees into critical science and regulatory positions, including for industrial hygienists.

[25]EPA is required to meet the scientific standards in TSCA for best available science, utilizing a weight-of-scientific-evidence approach when conducting risk evaluations.15 U.S.C. § 2625(h), (i).

Occupational Safety and Health Administration's Permissible Exposure Limit worker safety standards are outdated and not protective.[26]

Court Orders and Other Review Requirements Also Contributed to Missed Deadlines

OPPT officials told us that other factors contributed to missing TSCA deadlines for existing chemicals, such as:

- **Supplemental evaluation after court decision.** As noted previously, EPA designated asbestos as one of the initial 10 chemicals to undergo risk evaluations after the 2016 amendments to TSCA. EPA initially focused the risk evaluation for asbestos on chrysotile asbestos, the only asbestos fiber type that is currently imported, processed, or distributed in the U.S. During the development of the draft risk evaluation, a November 2019 court decision held that EPA's risk evaluation procedural rule should not have excluded legacy uses or associated disposals from the definition of conditions of use.[27] Following the 2019 decision, EPA determined that it would issue the risk evaluation for asbestos in two parts. EPA continued development of the risk evaluation for chrysotile asbestos, the "part 1" risk evaluation, in order to move more expeditiously into risk management, while also initiating a "part 2" risk evaluation for asbestos to address legacy uses and associated disposals.[28] According to EPA, because of the timing of the court decision, the agency did not initiate the part 2

[26]The Occupational Safety and Health Administration recognizes that many of its permissible exposure limits are outdated and inadequate for ensuring protection of worker health. Most of its permissible exposure limits were issued shortly after adoption of the Occupational Safety and Health Act in 1970, and have not been updated since that time. See www.osha.gov/annotated-pels.

[27]*Safer Chemicals, Healthy Families v. EPA*, 943 F.3d 397 (9th Cir. 2019). With regard to risk evaluations, TSCA, as amended, provides that EPA is to conduct risk evaluations "to determine whether a chemical substance presents an unreasonable risk of injury to health or the environment, without consideration of costs or other nonrisk factors, including an unreasonable risk to a potentially exposed or susceptible subpopulation identified as relevant to the risk evaluation by the Administrator, *under the conditions of use*" (emphasis added). 15 U.S.C. § 2605(b)(4)(A). TSCA defines "conditions of use" as the circumstances, as determined by EPA, under which a chemical substance is intended, known, or reasonably foreseen to be manufactured, processed, distributed in commerce, used, or disposed of. 15 U.S.C. § 2602(4). While EPA's risk evaluation procedural rule used the same definition of "conditions of use" as the statute, in the preamble to the final rule, EPA stated that several categories of uses and activities were excluded from the definition of "conditions of use." 82 Fed. Reg. 33,726, 33,729 (July 20, 2017). The court in *Safer Chemicals, Healthy Families* found that EPA's exclusion of two of those categories, legacy uses and associated disposals, was contrary to TSCA's definition of "conditions of use," although EPA's exclusion of legacy disposals was not contrary to TSCA's definition of "conditions of use." *See* 943 F.3d at 421.

[28]EPA issued the final part 1 risk evaluation for asbestos in January 2021. *See* 86 Fed. Reg. 89 (Jan. 4, 2021).

risk evaluation with sufficient time to meet the TSCA risk evaluation deadline for asbestos as one of the initial 10 chemicals. Nevertheless, under a consent decree in a separate case, EPA is required to publish the final part 2 risk evaluation for asbestos by December 1, 2024.[29]

- **Other review requirements.** OPPT officials told us that other laws (e.g., the Regulatory Flexibility Act as amended by the Small Business Regulatory Enforcement Fairness Act) and executive orders (e.g., E.O. 12866) require EPA to conduct additional analyses and consultations that are incompatible, absent significant additional resources, with meeting TSCA risk management deadlines. In addition, they noted that without sufficient resources it can be challenging to fully conform to the practices described in EPA's Action Development Process—a series of steps the agency follows when it develops actions such as regulations and policy statements—and comply with statutory deadlines for rulemaking.[30]

Process and Policy Improvements to Address Missed Deadlines

OPPT officials told us they plan to identify and implement process and policy improvements to help the agency meet future TSCA statutory deadlines for existing chemical reviews. Specifically, based on an ongoing and iterative review of lessons learned from the initial 10 existing chemical reviews, OPPT officials told us they plan to begin the internal agency rulemaking process earlier and develop templates that enable staff to conduct existing chemical evaluations more consistently. In addition, EPA plans to improve some chemical risk evaluation processes. For example, OCSPP officials told us they are developing approaches to help ensure objectivity in the review and selection of scientific studies used to inform chemical risk evaluations. In April 2022, OPPT obtained external peer review of a draft TSCA Systematic Review Protocol intended to strengthen its approach and help ensure that the agency has the best tools under TSCA to protect human health and the environment. EPA officials noted that even if the agency implements these improvements, without additional resources, EPA will not meet its statutory obligations for existing chemical reviews.

[29]EPA finalized the scope for the part 2 risk evaluation for asbestos in June 2022. *See* 87 Fed. Reg. 38,746 (June 29, 2022).

[30]Officials noted they have sought to take advantage of flexibilities afforded under the Action Development Process by seeking expedited review times where possible and identifying steps which can be waived or modified (e.g., streamlining the Early Guidance process). For additional information about EPA's Action Development Process, see GAO, *Environmental Regulation: EPA Should Improve Adherence to Guidance for Selected Elements of Regulatory Impact Analyses*, GAO-14-519 (Washington, D.C.: July 18, 2014).

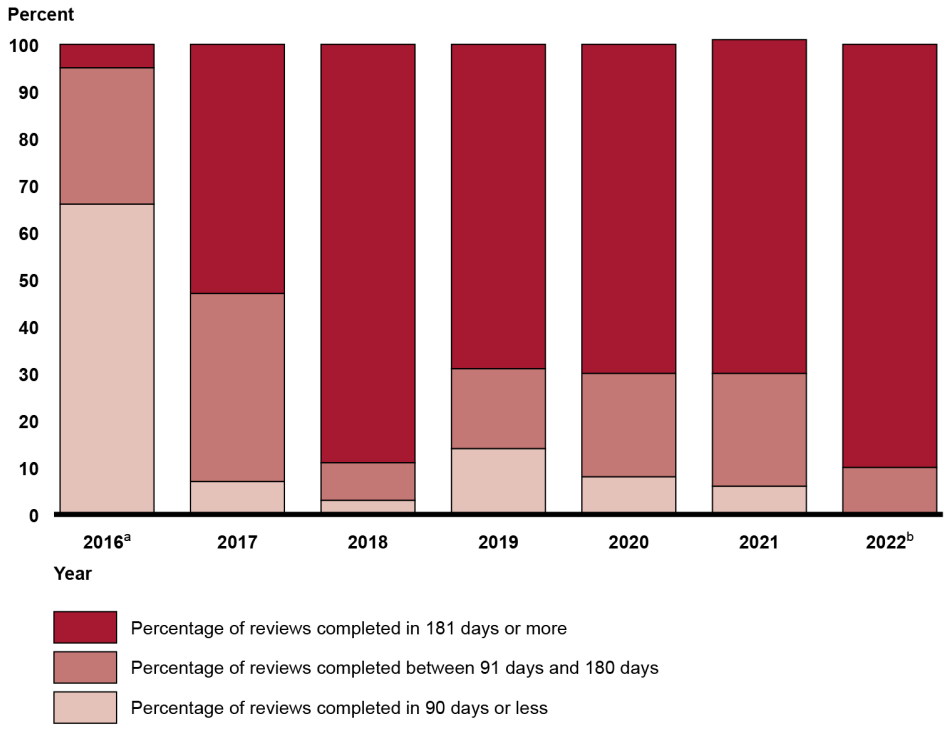
EPA Rarely Completed New Chemical Reviews by the TSCA Deadline, but Identified Some Steps to Improve Its Performance

Among those pre-manufacture reviews that EPA completed from 2017 through 2022, the agency typically completed the reviews within the 90-day TSCA review period less than 10 percent of the time.[31] (See fig. 4.) During that same time period, from 53 to 90 percent of such reviews were completed in 181 days or more. Moreover, some reviews remained under EPA review years after the agency received the submissions.[32] For example, 10 percent of new chemical pre-manufacture notice reviews of submissions EPA received in 2018 remained under EPA review in May 2022, according to the most recent information available for our review. As amended in 2016, TSCA provides that a person may only manufacture new chemicals if, in addition to submitting a pre-manufacture notice, EPA makes an affirmative determination on the risk of injury to health or the environment of the new chemical and takes any subsequent required actions to mitigate the risk after such a determination. Appendix II includes additional information about EPA's review times for new chemical reviews.

[31]According to OPPT officials, EPA's performance in completing pre-manufacture notice reviews within the TSCA 90-day review period appears better in 2016, because review times (as we report in figure 4) for that year reflect a limited period—June 22, 2016, through December 31, 2016 (192 days). Consequently, most review times we report will indicate that EPA completed reviews "in 90 days or less" or "between 91 days and 180 days" during that period. For EPA statistics prior to June 22, 2016, see "New Chemical Program Statistics Prior to June 22, 2016", https://www.epa.gov/reviewing-new-chemicals-under-toxic-substances-control-act-tsca/new-chemical-program-statistics. EPA also provides a general overview of its new chemicals workload, tracks the status of active cases currently under review, and illustrates general statistics for all new chemical submissions received since TSCA was amended in 2016. See "Statistics for the New Chemicals Review Program under TSCA", https://www.epa.gov/reviewing-new-chemicals-under-toxic-substances-control-act-tsca/statistics-new-chemicals-review.

[32]EPA regulations provide that a person who submits a pre-manufacture notice may voluntarily suspend the running of the 90-day review period for a specified period of time. *See* 40 C.F.R. § 720.75(b). According to EPA officials, the agency does not consider itself to have missed the deadline for new chemical reviews within the statutory review period because it obtained voluntary suspensions in almost all cases. EPA analyzed its new chemical review data from June 22, 2016, to July 19, 2022, to determine any instances when it did not obtain voluntary suspensions. The agency found 22 instances where data entry errors likely resulted in final determination dates after the 90-day review period. For 20 of these instances, the difference was seven days or less. The greatest difference was 45 days.

Figure 4: Environmental Protection Agency (EPA) Review Times for New Chemical Pre-Manufacture Notices, June 2016 through May 2022



Source: EPA. | GAO-23-105728

Note: Counts are based on the calendar year in which EPA completed the review and reflect the calendar days between the date of receipt and the date of completion.

[a]Counts for 2016 include reviews from June 22, 2016, through December 31, 2016.

[b]Counts for 2022 include reviews from January 1, 2022, through May 16, 2022, which was the most recent information available for our review.

EPA Plans to Address Factors that Contribute to Missed Review Deadlines

OPPT officials told us the primary reason EPA missed new chemical review deadlines was the agency's lack of sufficient resources and expertise. According to EPA's October 2022 report to Congress on its capacity to implement TSCA, the agency continues to operate with significantly fewer resources than it needs to review new chemicals in the way Congress intended and will continue to struggle to quickly review the safety of new chemicals.[33] OPPT officials also identified factors that

[33]Environmental Protection Agency, *Report to Congress on the EPA's Capacity to Implement Certain Provisions of the Frank R. Lautenberg Chemical Safety for the 21st Century Act* (Washington, D.C.: Oct. 2022). OCSPP estimates that the new chemicals program operates with 50 percent of the resources it needs to implement the program.

contribute to missed deadlines for new chemical reviews, along with planned or ongoing efforts to address them. These include the following:

- **Risk assessment revisions.** According to OPPT, when submissions involve the receipt of missing or late information, EPA commonly has to re-run new chemical review risk assessments. OPPT analyzed 94 reviews from 2019 to 2022 to identify the most common causes of this rework and found that an individual review may be reworked multiple times, adding months to the review period.[34] According to OPPT, when such delays are multiplied across hundreds of submissions each year, it compounds new chemical review delays and uses additional resources. In July 2022, EPA conducted an initial webinar for submitters to provide an in-depth look at common issues that cause rework. In October 2022, EPA hosted a subsequent webinar that provided examples of quantitative and qualitative data needed for an appropriate engineering assessment, clarifying common misconceptions and considerations EPA makes when evaluating data.
- **Guidance gaps.** OPPT officials told us that they lack sufficient financial and human resources to simultaneously complete new chemical reviews and develop comprehensive scientific and other guidance, which has contributed to delays and inconsistencies across reviews. For example, due to limited financial and human resources, EPA told us the agency has not updated its new chemicals procedural regulations to align with new requirements under TSCA, as amended, such as clarifying what data persons should include with their submissions. To clarify new chemicals notice requirements, in June 2018, OPPT updated its "Points to Consider" document to assist submitters in preparing pre-manufacture and other notices. According to EPA, it is developing a proposed rule, which it plans to publish in spring 2023, that seeks to increase the quality of information initially submitted in new chemicals notices and improve the agency's processes for the timely and effective completion of new chemical reviews.
- **Information technology challenges.** According to OPPT, the information technology system it uses to support its new chemical review program is unreliable, because it uses older security processes and technology. In September 2022, EPA awarded a new contract to modernize the system. Once modernized, new chemical review staff will be able to integrate data from different databases (e.g., historical

[34]According to EPA, the analysis included 94 unique cases originally submitted from fiscal year 2019 to fiscal year 2022 that required revisions to EPA's engineering assessment due to submission of additional information.

data sources, scientific literature, and public information) and better document the results of their analysis and decisions.

Additionally, OPPT officials told us they are exploring other ways to streamline the new chemical review process. For example, in January 2022, EPA announced its biofuels initiative intended to standardize OPPT's review of new chemicals that could be used instead of other transportation fuels with higher emissions.[35] To streamline the process, OPPT formed a dedicated collaboration team that identified potential improvements, such as generating one report for biofuels pre-manufacture notices that combines the six different risk assessments that OPPT typically conducts. OPPT is expanding this approach to other chemical groups, and in October 2022 announced a new approach for mixed metal oxides, including Cathode Active Materials—a key component of electric vehicle batteries.

Industry and Environmental Health Stakeholder Organizations Offer Varying Views on EPA Missed Deadlines

Representatives from both industry stakeholder organizations we met with told us EPA delays in completing new chemical reviews hampered innovation. For example, they noted that EPA delays adversely impact research and development expenditures and prevent the availability of new and innovative chemistries to support important climate, sustainability, and infrastructure goals. Additionally, they stated that new chemicals are typically safer than the existing chemicals they will replace, so EPA review delays may prolong human health and environmental risk exposure to those existing chemicals.

Representatives from an environmental health stakeholder organization told us EPA could address delays if industry submitted more complete information with the initial new chemical review submission. They also stated that because the statute's intended purpose is to ensure a thorough risk evaluation before new chemicals enter commerce, EPA's performance should not be measured by the speed of these reviews.

EPA's Current Workforce Shortage Hinders Timely Completion of Existing and New Chemical Reviews

According to EPA officials, the agency missed TSCA deadlines primarily due to significant increases in its workload and resource constraints, particularly a workforce shortage within OPPT that continues to hinder timely completion of existing and new chemical reviews. In March 2019, we reported that OPPT faced challenges ensuring it had the appropriate

[35]See "EPA Announces Effort to Help Bring Climate-Friendly New Chemicals to Market to Reduce Greenhouse Gas Emissions", https://www.epa.gov/newsreleases/epa-announces-effort-help-bring-climate-friendly-new-chemicals-market-reduce.

FTE levels for reviewing existing and new chemicals.[36] Specifically, officials told us that in July 2018 OPPT had about 300 FTEs—a staffing level they described as insufficient for conducting existing and new chemical reviews by TSCA deadlines. EPA reported that, for fiscal year 2022, OPPT's workforce had increased to 305 FTEs—lower than the 374 FTEs EPA told us they estimated they would need in fiscal year 2022 to manage their TSCA workload.[37]

Moreover, EPA continues to have difficulty retaining and recruiting staff to conduct chemical reviews. According to OPPT officials, staff leaving OCSPP or the agency has contributed to delays in chemical reviews, and according to representatives from stakeholder organizations we met with, contributes to the loss of institutional knowledge that is important to completing timely and quality reviews. For example, representatives from industry stakeholder organizations told us the loss of expertise through staff attrition or reassignments delayed the processing of new chemical reviews and made review determinations less consistent. Appendix III provides further information on the number of staff in mission-critical and other occupations for reviewing new and existing chemicals since the end of fiscal year 2021.

OPPT's workforce challenges are particularly acute in its New Chemicals Division. In October 2021 and June 2022, OCSPP's Assistant Administrator testified that the lack of sufficient resources had an outsized impact on the new chemical program's ability to meet review deadlines under TSCA and, at the time of her 2022 testimony, the New Chemicals Division had two human health assessors, who are critical to completing

[36]GAO-19-270. According to the Office of Management and Budget, FTE employment is the basic measure of the levels of employment used in the Budget. It is the total number of hours worked (or to be worked) divided by the number of compensable hours applicable to each fiscal year.

[37]According to OPPT, contractors conduct some TSCA responsibilities for new and existing chemical reviews. For existing chemicals, contractor responsibilities include the initial review, summary, and integration of toxicity and other health data, according to OPPT. For new chemicals, according to OPPT, these responsibilities include drafting hazard identification, environmental fate, environmental release and exposure reports; calculating risk; and integrating information and data into the draft risk assessment reports. Officials noted that drafting rules, guidance documents, and policy development are examples of inherently governmental functions, which contractors cannot perform.

new chemical reviews.[38] Further, the Assistant Administrator stated that rebuilding the program's staff capacity was the office's highest personnel priority. For example, according to EPA, they are working to address staff shortages for new chemical reviews caused, in part, from a reorganization in October 2020, which resulted in approximately 15 percent of new chemical review staff permanently moving to work on existing chemical risk reviews. OPPT officials told us they had shifted several existing managers and staff with toxicology and other relevant experience to support new chemical reviews. In addition, the office anticipated hiring additional human health assessors to support new chemical risk assessments awaiting review, to a total of about 11 assessors.

Moreover, according to OPPT officials, these newly hired staff need substantial training and time to learn how to conduct new chemical reviews thoroughly and consistently which contributes to increased review times. OPPT officials told us that new hires may have to work with senior staff for a substantial amount of time before they are prepared to conduct reviews of chemicals on their own, and may continue to face challenges in understanding some aspects of the review process.

OPPT officials also told us the office faces challenges filling some mission-critical occupations in its divisions that review chemicals.[39] We asked OPPT to provide a list of vacant positions in August 2022. At that time, OPPT's list included several management positions (e.g., division director and deputy division director) and 20 staff positions in mission-critical occupations, such as toxicologists and biologists. EPA noted that some of these vacancies were new positions made possible by the spring 2022 enactment of the budget.

Over time, vacant positions have contributed to EPA relying on a limited number of staff to implement EPA's growing responsibilities under TSCA. Moreover, OPPT officials told us that the same limited staff work on multiple other tasks with competing priorities and deadlines. For example, scientists that conduct new chemical reviews are also responsible for

[38]For further information about the June 2022 testimony, see "Toxic Substances Control Act Amendments Implementation" at https://www.epw.senate.gov/public/index.cfm/2022/6/toxic-substances-control-act-amendments-implementation. For information about the October 2021 testimony, see "TSCA and Public Health: Fulfilling the Promise of the Lautenberg Act" at https://docs.house.gov/Committee/Calendar/ByEvent.aspx?EventID=114176.

[39]The Office of Personnel Management defines mission-critical occupations as occupations agencies consider core to carrying out their missions. Such occupations usually reflect the primary mission of the organization without which mission-critical work cannot be completed, the Office of Personnel Management's definition notes further.

reviewing scientific studies as well as developing relevant testing protocols, guidance documents, and training materials. OPPT officials told us they are working to address this challenge and have hired 26 new employees since May 2022. Appendix III provides hire and departure information for staff conducting new and existing chemical reviews since the end of fiscal year 2021.

EPA Engaged in Initial Workforce Planning, but Significant Gaps Contributed to Missed Deadlines for Chemical Reviews

EPA Has Conducted Some Initial Workforce Planning for TSCA Chemical Reviews

EPA has engaged in some initial planning activities to help align its workforce with EPA's TSCA chemical review responsibilities. We have reported that strategic workforce planning is an essential tool to help agencies align their workforce with their current and emerging missions and develop long-term strategies for recruiting, developing, and retaining staff.[40] When agencies engage in strategic workforce planning, they are able to identify and focus investments on long-term human capital issues that most affect their ability to attain their mission. We have identified five key principles with which federal agencies' strategic workforce planning efforts should align (see fig. 5). EPA officials agreed that these principles are relevant and reasonable for its TSCA workforce planning efforts.

[40]GAO-04-39. See also GAO, *FDA Workforce: Agency-Wide Workforce Planning Needed to Ensure Medical Product Staff Meet Current and Future Needs*, GAO-22-104791 (Washington, D.C.: Jan. 14, 2022); *Automated Technologies: DOT Should Take Steps to Ensure Its Workforce Has Skills Needed to Oversee Safety*, GAO-21-197 (Washington, D.C.: Dec 18, 2020); and *Food Safety: Additional Actions Needed to Help FDA's Foreign Offices Ensure Safety of Imported Food*, GAO-15-183 (Washington, D.C.: Jan. 30, 2015).

Figure 5: GAO's Five Key Strategic Workforce Planning Principles

Source: GAO. | GAO-23-105728

EPA's initial planning activities include the following:

- **Completed workforce analysis.** For example, as recommended by EPA's Office of Inspector General (OIG), senior management directed OPPT to conduct a workforce analysis.[41] In December 2020, the office completed its analysis, which provided a "general overview" of the office's then-current workforce structure and identified mission-critical occupations for its risk assessment and risk management programs.[42] According to the document, the analysis was intended to help OPPT retool its workforce and help the office create action plans that focus on specific gaps.
- **Identified planning and monitoring improvements.** OPPT also identified some workforce planning and monitoring improvements in its Strategic Plan FY 2021 – FY 2023. For example, according to the plan, OPPT's New Chemicals Division aims to improve how it allocates resources and develops its human capital assets, among other improvements. The plan also identifies some performance indicators associated with these improvements, such as updating

[41]In August 2020, EPA's OIG recommended that OSCPP conduct a workforce analysis to assess OPPT's capability to implement TSCA and specify what skill gaps must be filled in fiscal year 2021 to meet TSCA requirements. See EPA OIG, *Lack of Planning Risks EPA's Ability to Meet Toxic Substances Control Act Deadlines*, Report No. 20-P-0247 (Aug. 17, 2020).

[42]See OPPT, *Workforce Analysis Fiscal Year 2015 - Fiscal Year 2020*.

human health training materials and developing standard operating procedures. According to OPPT, the division is engaged in a comprehensive effort to update these materials and procedures. For example, OPPT officials told us that the New Chemicals Division developed new procedures for assessing chemicals in certain sectors, such as biofuels, as described previously. Additionally, OPPT officials told us they plan to update the office's human health risk assessment template to provide more detailed instructions for assessors.

- **Conducted skills gap assessment.** Additionally, in March 2021, OPPT completed a skills gap assessment, which includes hiring targets and anticipated attrition counts for fiscal years 2021, 2022, and 2025. The assessment projected workforce needs by occupation, including mission-critical occupations, within OPPT as a whole, as well as within OPPT's underlying divisions based on a reorganization that occurred in October 2020. The assessment was intended to give OPPT a better understanding of its future workforce needs by occupation and, according to OCSPP officials, helped to inform EPA's budget request for fiscal year 2023.
- **Improved strategies to fill critical skills gaps.** OCSPP provided us with an April 2020 document that summarized the office's strategy to fill mission-critical occupations in OPPT's chemical risk assessment and risk management programs, among other objectives. For example, OCSPP officials stated they standardized vacancy announcements and augmented the office's hiring strategy by using existing human capital flexibilities, such as fellowships and student intern positions, to recruit scientists with specialized experience in the areas of toxicology, biological sciences, and chemistry. According to OPPT, the office's recruitment outreach also targeted academic institutions, scientific societies, and special interest groups representing underrepresented communities to ensure an inclusive and diverse workplace. OPPT plans to share the lessons learned from this expanded recruitment outreach with other divisions and use it for recruiting scientists in other disciplinary teams that support the new chemical review process. OCSPP officials told us that EPA's Office of Human Resources also provides tools to help OCSPP monitor hiring actions. For example, EPA provides a report that communicates the office's monthly performance in meeting EPA's 90-day time-to-hire goal.

Significant Workforce Planning Gaps Contribute to Missed Deadlines for Chemical Reviews

Although EPA has engaged in initial workforce planning, significant planning gaps remain that impede the agency's ability to effectively implement its TSCA chemical review responsibilities. These planning gaps include:

- **Limited employee involvement.** Office of Program Support officials told us that OCSPP's strategic workforce planning process only involved management officials. The office typically included non-management staff in general discussions, such as during staff retreats. According to these officials, involving top management in workforce planning activities is most important because they plan OCSPP's chemical review work and have the vision to fully understand what is needed to accomplish all the organization's work. However, workforce planning principles state that involving employees in strategic workforce planning can help agencies identify ways to streamline processes and improve human capital strategies.[43]
- **Outdated skills gap assessment.** According to OCSPP officials, OPPT's 2021 skills gap assessment reflected the best available information that the office had at the time, but no longer reflects current workforce needs. According to estimates in the assessment, OPPT would need 374 employees in fiscal years 2022 and 2025.[44] OCSPP officials told us they plan to hire a contractor to help the office update its assessment to reflect current workforce needs. Workforce planning principles state that agencies should determine the critical skills and competencies needed to achieve current and future programmatic results.
- **Incomplete workforce planning.** As we discussed earlier in this report, EPA's recruitment and training challenges are particularly acute in OPPT's New Chemicals Division. As we noted, OPPT's Strategic Plan FY 2021 – FY 2023 addressed some of these challenges by including some performance indicators related to workforce planning. However, the plan does not address other key planning challenges, such as recruitment targets specifically for filling

[43]GAO-04-39.

[44]EPA's budget request for its TSCA activities (i.e., the Toxic Substances: Chemical Risk Review and Reduction program project) increased from $75.5 million in fiscal year 2022 to $124.2 million in fiscal year 2023, a total that included 532 FTEs. EPA also provided estimates for the fiscal year 2022 and 2023 resources necessary to complete risk evaluations according to the schedule set in the statute in its 2021 annual plan for chemical risk evaluations under TSCA. Appendix III provides further information on the number of staff in mission-critical and other occupations for reviewing new and existing chemicals since the end of fiscal year 2021.

mission-critical occupations. Without developing strategies tailored to address gaps in needed critical skills, skill gaps will continue to hinder existing and new chemical reviews. Moreover, OCSPP has not developed a strategic workforce plan for implementing its TSCA responsibilities. Strategic workforce planning could help the office develop long-term strategies for recruiting, developing, and retaining staff.[45] OCSPP officials told us they have begun to develop a comprehensive plan to ensure employees have the training they need to complete new chemical reviews consistently. For example, OPPT has developed a training framework for new employees to the New Chemicals Division. The framework provides an overview of risk assessment and risk management under TSCA as well as discipline-specific training associated with the new chemicals review process.

- **Unused hiring authority.** Although Congress provided EPA with Title 42 hiring authority for OCSPP for fiscal years 2022 through 2025, OCSPP officials told us the office did not employ any staff under this authority during fiscal year 2022 because it was still in the process of completing required administrative steps.[46] Workforce planning principles state that it is important for agencies to consider the full range of flexibilities available under current authorities and to ensure stakeholder input in developing flexibilities-related policies and procedures by, for example, educating managers and employees on the availability and use of flexibilities.

OCSPP officials stated they have not developed a process to fully align the office's workforce planning efforts for implementing EPA's chemical review responsibilities with relevant workforce planning principles. Officials noted they currently lack the resources and expertise needed to

[45]We have reported that agency approaches to such planning can vary with each agency's particular needs and mission. The success of the workforce planning process can be judged by its results—how well it helps the agency attain its mission and strategic goals—not by the type of process used. See GAO-04-39.

[46]Under this special hiring authority, EPA can fill certain mission-critical positions, generally scientists, without regard to the civil service laws. *See* 42 U.S.C. § 209(f), (g). EPA asked Congress to consider extending this authority to OCSPP in its budget justification for FY 2022. The Consolidated Appropriations Act, 2022 authorized the EPA Administrator, after consultation with the Office of Personnel Management, to employ up to 25 persons at any one time in OCSPP under this authority during each of fiscal years 2022 through 2025. Pub. L. No. 117-103, div. G, tit. II, 136 Stat. 49, 389. According to OCSPP officials, the office developed a new handbook and amended EPA's Title 42 delegation—two steps they told us were necessary to complete before using the authority. Officials noted OCSPP is consulting with the Office of Personnel Management and expects to begin using its authority when the consultation process is complete.

conduct more sophisticated workforce planning activities, including those needed to close the gaps we identified.

However, without developing a process and timeline to ensure its workforce planning efforts fully align with strategic workforce planning principles, EPA will likely continue to struggle to recruit, develop, and retain the workforce it needs to meet TSCA-required deadlines for completing existing and new chemical reviews. Moreover, it may prolong any unmanaged risks to human health and the environment of high-priority existing chemicals currently under review and delay the introduction of new chemicals that could replace existing chemicals that currently may pose more risk of injury to human health and the environment.[47]

Conclusions

The Lautenberg Act, enacted in 2016, expanded EPA's authority and responsibility to regulate toxic chemicals. As a result, EPA's responsibilities and workload expanded and the agency struggled to implement TSCA's chemical review requirements and meet deadlines. However, we found that EPA missed most TSCA deadlines for reviewing existing chemicals and rarely completed new chemical reviews by TSCA deadlines. According to EPA officials, the agency missed these deadlines primarily due to resource constraints, particularly insufficient staff capacity, including in mission-critical occupations.

Although EPA has engaged in some initial workforce planning activities for its amended chemical review responsibilities, significant workforce planning gaps have contributed to missed deadlines for chemical reviews. For example, OCSPP has not developed a strategic workforce plan for implementing its TSCA responsibilities, which could help the office develop long-term strategies for recruiting, developing, and retaining staff. In its 2021 annual plan for chemical risk evaluations under TSCA, EPA provided estimates for the resources necessary to complete risk evaluations according to the schedule set in the statute.

Moreover, OCSPP officials told us they have not developed a process to ensure its workforce planning efforts fully align with relevant workforce planning principles. Key workforce planning principles can help agencies ensure that their workforce supports their current and emerging missions.

[47]During a June 2022 congressional committee hearing, OCSPP's Assistant Administrator agreed that delays in the TSCA new chemicals review process have delayed the introduction of new chemicals into commerce and noted that new chemicals are sometimes designed to replace older and riskier existing chemicals. *See* "Toxic Substances Control Act Amendments Implementation", https://www.epw.senate.gov/public/index.cfm/2022/6/toxic-substances-control-act-amendments-implementation

They can also help agencies develop long-term strategies for recruiting, developing, and retaining staff. Without ensuring its efforts fully align with these principles, EPA will likely continue to struggle to recruit, develop, and retain the workforce it needs to meet TSCA deadlines for completing existing and new chemical reviews. Moreover, continuing to miss deadlines for chemical reviews may slow the introduction of new chemicals, which could replace existing chemicals that currently may pose more risk of injury to human health and the environment.

Recommendation for Executive Action

The Administrator of EPA should direct the Assistant Administrator of OCSPP to develop a process and timeline to fully align its workforce planning efforts for implementing EPA's TSCA chemical review responsibilities with workforce planning principles and incorporate the results, as appropriate, into EPA's annual plan for chemical risk evaluations under TSCA. (Recommendation 1)

Agency Comments and Our Evaluation

We provided a draft of this report to EPA for review and comment. In written comments provided by OCSPP (reproduced in appendix IV), EPA agreed with our recommendation. EPA also provided technical comments, which we incorporated as appropriate. In its comments, EPA indicated that we overstated the extent to which workforce planning affected EPA's progress in implementing TSCA. However, as we noted in the report, strategic workforce planning is an essential tool to help agencies align their workforce with their current and emerging missions and develop long-term strategies for recruiting, developing, and retaining staff. As the report states, workforce planning gaps were one among several factors that contributed to missed TSCA deadlines. We therefore do not believe our findings overstate the importance of workforce planning in EPA's ability to implement TSCA more effectively.

In addition, EPA stated that the draft report lacked context and did not fairly convey the circumstances in the first years following the TSCA amendments in 2016. The agency stated that other factors played a more significant role in missing TSCA deadlines—notably that EPA did not receive appropriations that were commensurate with the significant increase in its responsibilities as a result of the TSCA amendments. Recognizing this concern, our report repeatedly communicates EPA's position about such resource shortages. Moreover, the contributing factors discussed in our report reflect those identified by EPA officials during interviews and through our information requests. We therefore believe the report provides sufficient context for our reporting objectives.

We further acknowledge that EPA is now taking steps to implement process and policy improvements intended to improve its performance in meeting TSCA chemical review deadlines. Similarly, as EPA stated in its

comments, the agency has planned and ongoing efforts to improve its workforce planning, such as augmenting its workforce analysis and developing a hiring plan for fiscal year 2023.

As agreed with your offices, unless you publicly announce the contents of this report earlier, we plan no further distribution until six days from the report date. At that time, we will send copies to the appropriate congressional committees and the Administrator of EPA. In addition, the report is available at no charge on the GAO website at https://www.gao.gov.

If you or your staff have any questions about this report, please contact me at (202) 512-3841 or gomezj@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix IV.

J. Alfredo Gómez
Director, Natural Resources and Environment

Appendix I: EPA's Performance in Meeting TSCA Deadlines for Reviewing the Initial 10 Existing Chemicals

Table 1: Environmental Protection Agency's (EPA) Performance in Meeting Toxic Substances Control Act (TSCA) Deadlines for Reviewing the Initial 10 Existing Chemicals

Chemical substance	After initiation, TSCA 6-month deadline for publishing scope of the risk evaluation[a]		After initiation, TSCA 3-year deadline for completing the risk evaluation (plus possible 6-month extension)[b]		After publication of risk evaluation, TSCA 1-year deadline for proposed rule to no longer present unreasonable risk, if determined[c]		After publication of risk evaluation, TSCA 2-year deadline for finalizing rule to no longer present unreasonable risk, if determined[c]	
	Deadline	Month completed	Deadline, if extended	Month completed	Deadline	Month completed	Deadline	Month completed
Asbestos (part 1: chrysotile asbestos)[d]	June 2017	June 2017	June 2020	Dec. 2020	Dec. 2021	Apr. 2022	Dec. 2022	[e]
1-Bromopropane (1-BP)	June 2017	June 2017	June 2020	Aug. 2020	Aug. 2021	[e]	Aug. 2022	[e]
Carbon tetrachloride	June 2017	June 2017	June 2020	Nov. 2020	Nov. 2021	[e]	Nov. 2022	[e]
C.I. pigment violet 29 (PV29)	June 2017	June 2017	June 2020	Jan. 2021	Jan. 2022	[e]	Jan. 2023	[e]
Cyclic aliphatic bromide cluster (HBCD)	June 2017	June 2017	June 2020	Sept. 2020	Sept. 2021	[e]	Sept. 2022	[e]
1,4-Dioxane	June 2017	June 2017	June 2020	Jan. 2021[f]	Jan. 2022	[e]	Jan. 2023	[e]
Methylene chloride	June 2017	June 2017	June 2020	June 2020[g]	June 2021	[e]	June 2022	[e]
N-Methylpyrrolidone (NMP)	June 2017	June 2017	June 2020	Dec. 2020	Dec. 2021	[e]	Dec. 2022	[e]
Perchloroethylene	June 2017	June 2017	June 2020	Dec. 2020	Dec. 2021	[e]	Dec. 2022	[e]
Trichlorethylene (TCE)	June 2017	June 2017	June 2020	Nov. 2020	Nov. 2021	[e]	Nov. 2022	[e]

Source: GAO analysis of EPA notices and rules. | GAO-23-105728

Note: As required by TSCA, in December 2019, EPA initiated risk evaluations on a subsequent set of 20 high-priority chemical substances. Those substances included: p-dichlorobenzene; 1,2-dichloroethane; trans-1,2- dichloroethylene; o-dichlorobenzene; 1,1,2-trichloroethane; 1,2-dichloropropane; 1,1-dichloroethane; dibutyl phthalate (DBP) (1,2-benzene-dicarboxylic acid, 1,2-dibutyl ester); butyl benzyl phthalate (BBP) - 1,2-benzene- dicarboxylic acid, 1- butyl 2(phenylmethyl) ester; di-ethylhexyl phthalate (DEHP) - (1,2-benzene-dicarboxylic acid, 1,2- bis(2-ethylhexyl) ester); diisobutyl phthalate (DIBP) - (1,2-benzene-dicarboxylic acid, 1,2- bis-(2methylpropyl) ester); dicyclohexyl phthalate; 4,4'-(1-methylethylidene)bis[2, 6-dibromophenol] (TBBPA); tris(2-chloroethyl) phosphate (TCEP); phosphoric acid, triphenyl ester (TPP); ethylene dibromide; 1,3-butadiene; 1,3,4,6,7,8-hexahydro-4,6,6,7,8,8-hexamethylcyclopenta[g]-2-benzopyran (HHCB); formaldehyde; and phthalic anhydride.

[a]The statutory deadline for EPA to publish the scope of the risk evaluations was June 19, 2017. EPA filed the scoping documents in the *Federal Register* on June 20, 2017.

[b]In June 2021, EPA announced policy changes that affected completed risk evaluations on the initial 10 existing chemicals. For example, EPA will make risk determinations just once for the whole chemical, when warranted, rather than for each condition of use.

[c]EPA's completed evaluation determined that each of the initial 10 existing chemicals presented an unreasonable risk to human health or the environment. By statute, EPA may extend the deadlines for the publication of a proposed or final rule for not more than two years, as long as the aggregate length of such extensions, as well as any extension to the 3-year risk evaluation deadline, does not exceed two years, subject to certain additional conditions. Specifically, such extensions are also subject to the limitation that the Administrator may not extend a deadline for the publication of a proposed or final rule regarding a chemical substance drawn from the 2014 update of the TSCA Work Plan for Chemical Assessments or a chemical substance that, with respect to persistence and bioaccumulation, scores high for one and either high or moderate for the other, pursuant to the TSCA Work Plan Chemicals Methods Document published by the Administrator in February 2012 (or a successor scoring system), without adequate public justification that demonstrates, following a review of the information reasonably available to the Administrator, that the Administrator cannot complete the proposed or final rule without additional information regarding the chemical substance. 15 U.S.C. § 2605(c)(1)(C).

[d]EPA initially focused the risk evaluation for asbestos on chrysotile asbestos (i.e., part 1), the only asbestos fiber type that is currently imported, processed, or distributed in the U.S. However, as a result of a November 2019 court decision, EPA is also evaluating legacy uses and associated disposals of asbestos—conditions of use that EPA excluded from the initial evaluation. EPA finalized the scope for this supplemental effort (i.e., part 2) in June 2022 and expects to publish the final risk evaluation by December 1, 2024, as required by court order.

[e]EPA has not yet completed this review step.

[f]EPA has re-opened and will update the 1,4-dioxane risk evaluation to consider whether to include additional exposure pathways, like drinking water and ambient air, and conditions of use where 1,4-dioxane is generated as a byproduct that were excluded from the supplemental and final risk evaluations. EPA plans to finalize the supplemental risk evaluation by December 2024.

[g]EPA was required to complete the risk evaluation for methylene chloride on June 19, 2020. The EPA Administrator filed the completed evaluation in the Federal Register on June 23, 2020.

Appendix II: EPA Review Times, Determinations, and Completion Rates for New Chemical Reviews

Table 2: Environmental Protection Agency (EPA) Review Times and Determinations for Completed New Chemical Reviews, June 2016 through May 2022

New chemical review type	2016[a]	2017	2018	2019	2020	2021	2022[a]
Pre-manufacture notices (PMN)							
EPA determination for completed reviews							
Allowed to commercialize without restrictions	29	39	56	239	130	36	4
Allowed to commercialize with restrictions pending information development, if applicable	9	277	149	53	103	48	16
Not allowed to commercialize pending development of information	0	6	2	0	4	1	0
Prohibited from commercializing	0	0	0	0	0	0	0
EPA review time[b]							
Percentage of reviews completed in 90 days or less	66%	7%	3%	14%	8%	6%	0%
Percentage of reviews completed between 91 days and 180 days	29%	40%	8%	17%	22%	24%	10%
Percentage of reviews completed in 181 days or more	5%	53%	89%	69%	70%	71%	90%
Significant new use notices (SNUN)							
EPA determination for completed reviews							
Allowed to commercialize without restrictions	0	0	1	3	3	0	0
Allowed to commercialize with restrictions pending information development, if applicable	1	6	3	8	3	0	1
Not allowed to commercialize pending development of information	0	0	0	0	0	0	0
Prohibited from commercializing	0	0	0	0	0	0	0
EPA review time[b]							
Percentage of reviews completed in 90 days or less	0%	0%	0%	9%	0%	0%	0%
Percentage of reviews completed between 91 days and 180 days	100%	50%	0%	18%	33%	0%	100%
Percentage of reviews completed in 181 days or more	0%	50%	100%	72%	67%	0%	0%
Microbial commercial activity notices (MCAN)							
EPA determination for completed reviews							
Allowed to commercialize without restrictions	26	14	40	16	13	32	17

Allowed to commercialize with restrictions pending information development, if applicable	0	1	0	0	0	0	0
Not allowed to commercialize pending development of information	0	0	0	0	0	0	0
Prohibited from commercializing	0	0	0	0	0	0	0
EPA review time[b]							
Percentage of reviews completed in 90 days or less	62%	93%	73%	75%	92%	97%	65%
Percentage of reviews completed between 91 days and 180 days	38%	7%	25%	25%	8%	3%	35%
Percentage of reviews completed in 181 days or more	0%	0%	2%	0%	0%	0%	0%
Low Volume Exemption (LVE)/Low Release and Low Exposure (LoREX) Exemption							
Exemptions Granted	232	302	272	257	202	152	57
Exemptions Denied	68	60	1	1	2	64	65

Source: EPA. | GAO-23-105728

Note: Counts exclude new chemical submissions that (a) EPA determined to be invalid or incomplete, which includes 153 submissions from June 22, 2016, through May 16, 2022; or (b) submitters withdrew during the review process, which includes 380 PMNs, SNUNs, or MCANs and 145 LVEs or LoREX during the same period. Review time percentages may not add to 100 due to rounding. According to EPA, some new chemical review data fields are entered manually, which could result in data errors. EPA officials told us they conduct a monthly quality control process to help ensure manually entered data fields are accurate.

"Allowed to commercialize without restrictions" determinations include reviews for which EPA made not likely to present unreasonable risk determinations including reviews with associated SNURs. "Allowed to commercialize with restrictions pending information development, if applicable" determinations include reviews with associated section 5 orders that allow commercialization with restrictions (and may require testing of the substance). "Not allowed to commercialize pending development of information" determinations include reviews with associated section 5 orders requiring testing prior to commercialization of the substance. "Prohibited from commercializing" determinations represent a "will present unreasonable risk" finding and ban on commercialization.

[a]Counts for 2016 and 2022 are incomplete. Specifically, counts for 2016 include reviews from June 22, 2016, through December 31, 2016. Counts for 2022 include reviews from January 1, 2022, through May 16, 2022, the most recent information available for our review.

[b]Counts are based on the calendar year in which EPA completed the review. "EPA review time" reflects the calendar days between the date of receipt and the date of completion.

Table 3: Environmental Protection Agency (EPA) Percentage of New Chemical Reviews Not Completed, June 2016–May 2022

New chemical review type	2016[a]	2017	2018	2019	2020	2021	2022[a]
Pre-manufacture notices (PMN)	3%	5%	10%	10%	27%	79%	100%
Significant new use notices (SNUN)	16%	0%	0%	0%	33%	91%	100%
Microbial commercial activity notices (MCAN)	0%	0%	0%	0%	0%	0%	67%

Source: EPA. | GAO-23-105728

Note: Counts are based on the calendar year in which EPA received the notice. Counts exclude notices that (a) EPA determined to be invalid or incomplete, which includes 153 notices from June 22, 2016, through May 16, 2022; or (b) submitters withdrew during the review process, which includes 380 PMNs, SNUNs, or MCANs. According to EPA, some new chemical review data fields are entered manually, which could result in data errors. EPA officials told us they conduct a monthly quality control process to help ensure manually entered data fields are accurate.

[a]Counts for 2016 and 2022 are incomplete. Specifically, counts for 2016 include reviews from June 22, 2016, through December 31, 2016. Counts for 2022 include reviews from January 1, 2022, through May 16, 2022, the most recent information available for our review.

Appendix III: EPA Staff for Conducting New and Existing Chemical Reviews

Table 4: Environmental Protection Agency (EPA) Staff for Conducting New and Existing Chemical Reviews, by Mission-Critical Occupations, Fiscal Years (FY) 2021 and 2022

	FY 2021			FY 2022
	Workforce on 9/30/21	10/1/21–9/30/22		Workforce on 9/30/22
Occupations	**Onboards[a]**	**Hires[a]**	**Departures[a]**	**Onboards**
Mission-critical occupations				
Economist	13	2	2	13
Biologist	62	8	8	62
Toxicologist	18	1	0	19
Chemical engineer	14	0	0	14
Physical scientist	18	2	2	18
Chemist	14	4	0	18
Information technology specialist	5	2	0	7
Subtotal	**144**	**19**	**12**	**151**
Other occupations[b]	115	7	11	111
Total	**259**	**26**	**23**	**262**

Source: EPA. | GAO-23-105728

[a]In addition to reporting full-time equivalent (FTE) employment information for budgetary purposes, EPA also reports other workforce information, including onboard, hire, and departure information. EPA defines “onboards” as employees with a “position of record” within the Office of Chemical Safety and Pollution Prevention (OCSPP). Some onboards may be on a temporary detail to a different position inside or outside of OCSPP. EPA defines “hires” as the employees selected to fill a position within OCSPP, whether external or internal hires. EPA defines “departures” as employees who leave OCSPP for any reason (voluntary or involuntary), including resignation, termination, death, or retirement.

[b]Other occupations” include job series not represented in the list of “mission-critical occupations.” The vast majority of these are environmental protection specialists.

Appendix IV: Comments and our evaluation from the United States Environmental Protection Agency

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF CHEMICAL SAFETY
AND POLLUTION PREVENTION

Mr. Alfredo Gomez
Director
Natural Resources and Environment
U.S. Government Accountability Office
Washington, DC 20548

Dear Mr. Gomez:

Thank you for the opportunity to review and comment on GAO's December 7, 2022, Draft Report titled "EPA Chemical Reviews Workforce Planning Gaps Contributed to Missed Deadlines," GAO Project Number 105728.

The purpose of this letter is to provide EPA's response to the Draft Report. For your convenience, EPA has also prepared detailed technical comments transmitted with this response, but which EPA expects will remain internal to GAO.

As explained below, although the Office of Chemical Safety and Pollution Prevention (OCSPP) agrees with GAO's recommendation to improve workforce planning for EPA's Toxic Substances Control Act (TSCA) program, we have significant concerns that the Draft Report lacks context for GAO's findings and therefore conveys an inaccurate picture of EPA's recent efforts to address these problems. The Draft Report does not fairly convey the circumstances in the first years following enactment of the reformed law that created challenges the TSCA program continues to face. Most notably, by focusing on workforce planning in its sole recommendation and in the Draft Report's title, GAO overstates the extent to which workforce planning affected the Agency's progress in implementing TSCA.

OCSPP believes a host of other factors, including several discussed in GAO's Draft Report, played a much more significant role in missed TSCA deadlines. Examples of such factors include the primary factor of insufficient resources largely caused by the previous Administration's failure to request additional funding from Congress and the failure to fully meet budget requests in recent years, insufficient focus in the early years of TSCA implementation on building the scientific, information technology and related infrastructure of the new law, and court challenges related to past policy decisions that necessitated re-work and policy shifts.

Fundamentally, while OCSPP agrees that additional workforce planning could benefit its TSCA implementation efforts, we also believe that even the most robust and strategic workforce planning effort will be all but useless if the program does not receive the sustained levels of resources needed to implement it.

Background:

GAO's objective was to evaluate EPA's implementation of its TSCA chemical review responsibilities. The Draft Report reviewed the extent to which: (1) EPA met selected TSCA deadlines for reviewing existing and new chemicals since June 2016; and (2) EPA engaged in workforce planning for implementing its chemical review responsibilities. The discussion below includes some notable examples of challenges and/or OCSPP efforts we believe GAO should more fully consider in its evaluation:

- Resource shortages: The Lautenberg Act provided EPA with a great deal of new authority and responsibility. For existing chemicals, the law was changed from a discretionary statute, the power of which had been rendered largely ineffective due to litigation on EPA's 1989 ban on asbestos, to a requirement that EPA systematically and comprehensively prioritize and evaluate at least 20 existing chemicals at once and provide protections against the identified unreasonable risks through regulations. Under the amended law, EPA is also required to complete formal risk determinations for 100% of all new chemical submissions, as compared to the pre-2016 practice of completing formal risk determinations on about 20% of such submissions. The new law also provided new responsibility for increasing transparency and new data-gathering authority. Despite this significant increase in responsibility, appropriations for EPA's TSCA program remained relatively level for the first 6 and a half years of the new law, in no small part because the previous Administration did not once request any additional funding from Congress. President Biden asked for an increase for TSCA in the FY 2022 budget request with an additional $15 million and 88 FTE to help sustain the TSCA program, but EPA did not receive all it requested. In the FY 2023 budget request, using TSCA workforce and resource needs analyses conducted in late 2020 and early 2021, the President asked for an increase of $59.2 million and 175 FTE to support the TSCA program, but EPA received only $19.7 million.

  EPA faced an additional challenge with collecting fees, which Congress expected would defray up to 25% of authorized TSCA implementation costs. Although the law was enacted in 2016, EPA's first fees rule was not finalized until 2018, and no fees were collected until FY 2019. Under the 2018 rule, the costs of the first 10 risk evaluations (the costliest TSCA implementation activity at the time) were exempted from being subject to fees, and no budget analysis to calculate the costs of implementing the new law to use as its baseline was conducted. As a result, the 2018 fees rule resulted in the collection of only about 13% of the artificially low baseline cost estimate for the program. In November 2022, EPA issued a Supplemental Notice of Proposed Rulemaking that would change the fees associated with TSCA to reflect an estimate of the full costs of implementing the program.

- IT challenges: A critical need for improving EPA's performance on TSCA implementation is modernizing the outdated IT systems necessary for chemical data collation, storage, and curation and to make the data received under TSCA readily available in structured and consistent formats. The current legacy infrastructure (hardware and systems software) and application software systems are prone to problems such as latency, screen freezes, Virtual Desktop Interface (VDI) connectivity outages, disruptions in workflow application and related tools, drive mapping volatility, and wholesale downtime. These problems have resulted in productivity losses across OPPT. For example, the IT system used to house the work done by OCSPP's New Chemicals Division frequently crashes. In one notable instance in late 2021, the system remained unusable for about two weeks, bringing the program's work to a halt. Making the major investments required to modernize IT systems supporting TSCA implementation is impossible without sustained increased appropriations in the annual budget.

- Legal Challenges: OCSPP's efforts to implement TSCA have also been hampered by legal challenges, including challenges to policies adopted by the previous administration. EPA was sued on three of four TSCA procedural framework rules, various specific chemical actions, TSCA section 21 petition responses, transparency in the new chemicals program, and other issues. As an example, in late 2019, the court in *Safer Chemicals, Healthy Families v. EPA*, 943 F.3d 397 (9th Cir. 2019) held that EPA's Risk Evaluation Rule, 82 FR 33726 (July 20, 2017) should not have excluded "legacy uses" (*i.e.,* uses without ongoing or prospective manufacturing, processing, or distribution for use) or "associated disposals" (*i.e.,* future disposal of legacy uses) from the definition of conditions of use. Following this ruling, EPA determined that the complete Risk Evaluation for Asbestos would have to be issued in two parts. Further, the Agency also determined that the risk evaluation framework rule had to be revised to reflect the court's findings and that it had to consider other policy changes that may anticipate future analogous challenges. EPA has considered these policy changes and reflected some of them in Agency actions (e.g., revised unreasonable risk determinations, fenceline screening methodology).

- Unused hiring authority and other personnel actions: GAO found that although Congress provided Title 42 hiring authority to OCSPP for fiscal years 2022 through 2025, OCSPP did not employ any staff under this authority during fiscal year 2022. GAO failed to note, however, that OCSPP is actively building the infrastructure and taking steps to use its new Title 42 hiring authority, which was provided in the FY 2022 federal budget enacted in mid-March 2022. Before OCSPP could use this authority, it was required to develop a new Title 42 handbook, which was completed on December 15, 2022. OCSPP also had to seek an amendment to EPA's Title 42 delegation, which was approved by the EPA Administrator on October 17, 2022. OCSPP must also consult with the U.S. Office of Personnel Management (OPM) on its prospective use of Title 42 authority, which it is currently doing. OCSPP expects to begin to use its Title 42 hiring authority when the consultation process is complete. Rather than acknowledge the expeditious manner in which OCSPP has taken the steps required before utilizing Title 42 hiring authority, GAO merely observes that it had yet to be used.

  Similarly, GAO uses a point-in-time August 2022 estimate of OPPT vacancies to exemplify personnel recruitment and retention challenges experienced by OPPT. Some of these vacancies, however, were new positions made possible by the spring 2022 enactment of the budget. Through the development of an innovative and aggressive recruitment strategy, OPPT hired 26 new employees since May 1, 2022, to work in priority TSCA implementation areas that have been most challenged by insufficient resources. OCSPP's efforts to support its staff have also resulted in year-over-year increases in positive responses to key questions in the Federal Employee Viewpoint Survey. Broadly, for the second year in a row, the OCSPP scores are among our highest ever. EPA looks forward to taking further steps that improve OCSPP's culture and satisfaction levels.

GAO Recommendation:

Recommendation 1: The Administrator of EPA should direct the Assistant Administrator of OCSPP to develop a process and timeline to fully align its workforce planning efforts for implementing EPA's TSCA chemical review responsibilities with workforce planning principles and incorporate the results, as appropriate, into EPA's annual plan for chemical risk evaluations under TSCA.

EPA Response:

EPA agrees with Recommendation 1. EPA has taken action to improve its workforce planning efforts for TSCA chemical review responsibilities.

- EPA has developed a task order to engage contractor support for additional workforce planning and technical support across OCSPP to augment the analysis OCSPP conducted in 2020. This effort is expected to get underway in January 2023.
- Since May 1, 2022, OPPT has hired 26 new employees across the office using the resources provided in the FY 2022 budget.
- EPA has developed a detailed plan for hiring actions under the enacted FY 2023 budget. This plan identifies at least 52 new hiring actions within OCSPP's Office of Pollution Prevention and Toxics, most of which are intended to strengthen the office's capacity in a range of key disciplines for TSCA implementation.

Thank you for the opportunity to review the Draft Report. If you have questions or need further information, please reach out to Janet L. Weiner, OCSPP's Senior Audit Liaison at weiner.janet@epa.gov.

Sincerely,

MICHAL FREEDHOFF Digitally signed by MICHAL FREEDHOFF Date: 2023.01.20 08:41:39 -05'00'

Michal I. Freedhoff, Ph.D.
Assistant Administrator

cc: EPA GAO Liaison Team
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Appendix V: GAO Contact and Staff Acknowledgments

GAO Contact

J. Alfredo Gómez, (202) 512-3841 or gomezj@gao.gov

Staff Acknowledgments

In addition to the contact named above, the following staff members made key contributions to this report: Diane Raynes (Assistant Director), William Colwell (Analyst-in-Charge), Adrian Apodaca, Alisa Carrigan, Virginia Chanley, Jennifer Gould, Nacole King, Summer Lingard-Smith, Steven Lozano, Patricia Moye, Corinna Nicolaou, and Monica Scott.

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United States Government Accountability Office

Report to Congressional Requesters

January 2025

NEW CHEMICALS PROGRAM

EPA Needs a Systematic Process to Better Manage and Assess Performance

GAO-25-106839

January 2025

NEW CHEMICALS PROGRAM

EPA Needs a Systematic Process to Better Manage and Assess Performance

GAO Highlights

Highlights of GAO-25-106839, a report to congressional requesters

Why GAO Did This Study

The Toxic Substances Control Act (TSCA), as amended, directs EPA to make a formal determination on the risk of injury to health or the environment on each new chemical before it can be manufactured. However, GAO reported in February 2023 (GAO-23-105728) that EPA typically made its determination within the 90-day TSCA review period less than 10 percent of the time.

GAO was asked to review EPA's implementation of its TSCA New Chemicals Program. This report (1) summarizes the perspectives of selected manufacturers on EPA's review process and (2) evaluates the extent to which EPA follows key practices for managing and assessing the program. GAO identified a random, nongeneralizable sample of notices submitted to EPA from October 2021 to April 2024 and interviewed 19 manufacturers that submitted these notices. GAO also compared EPA's management and assessment activities to key practices it developed based on federal laws, federal guidance, and prior GAO work.

What GAO Recommends

GAO is making two recommendations, including that EPA's NCD address, as it finalizes its strategic plan, relevant key management and assessment practices; and implement a systematic performance management process that aligns with the key practices. EPA agreed with both recommendations.

View GAO-25-106839. For more information, contact J. Alfredo Gómez at (202) 512-3841 or gomezj@gao.gov.

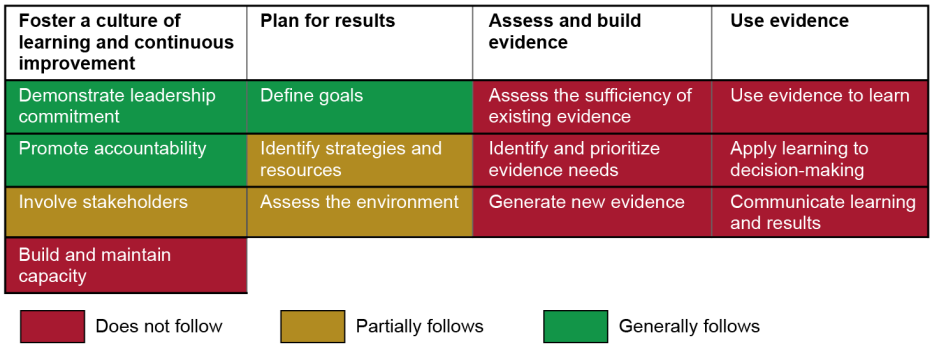
What GAO Found

Representatives from 19 manufacturers GAO interviewed identified a range of challenges, strengths, and potential improvements for the U.S. Environmental Protection Agency's (EPA) new chemicals review process. For example, most (16 of 19) representatives told GAO they experienced review delays and described effects of these delays on their businesses. Effects manufacturers cited included harming customer relations, creating a competitive advantage for existing chemical alternatives at the expense of new chemicals, and hindering market participation.

Representatives also identified strengths in how EPA implements the program and potential process improvements. For example, almost all (18 of 19) representatives found EPA's public information sources somewhat or very helpful. Representatives suggested that EPA improve the new chemicals review process by clarifying review requirements, providing realistic time frames for completing reviews, and improving communication, among other improvements.

EPA's New Chemicals Division (NCD) has taken some important initial planning steps, but NCD does not follow most key practices for managing and assessing the results of its New Chemicals Program.

Extent to Which the U.S. Environmental Protection Agency (EPA) Follows Key Management and Assessment Practices for Its New Chemicals Program



Source: GAO analysis of EPA performance planning and monitoring documents. | GAO-25-106839

For example, in August 2024, NCD drafted a strategic plan that identifies five strategic goals and how to achieve them. However, NCD did not follow some relevant key practices in developing the plan, including involving external stakeholders and identifying resources needed to achieve each draft goal. Moreover, NCD officials told GAO that they had not developed a systematic process to ensure that it consistently follows all key practices. Addressing relevant key practices—including involving stakeholders and identifying resources—as NCD finalizes its strategic plan could position the division to better manage and assess the program. Further, implementing a systematic performance process could better position NCD to ensure that it achieves program goals, such as improving the timeliness of reviews.

Contents

Figures

Abbreviations

CBI	confidential business information
CDX	Central Data Exchange
EPA	U.S. Environmental Protection Agency
FY	fiscal year
GPRA	Government Performance and Results Act of 1993
LVE	low volume exemption
NCD	New Chemicals Division
OPPT	Office of Pollution Prevention and Toxics
PMN	pre-manufacture notice
TSCA	Toxic Substances Control Act

U.S. GOVERNMENT ACCOUNTABILITY OFFICE
441 G St. N.W.
Washington, DC 20548

January 22, 2025

The Honorable Shelley Moore Capito
Chairman
Committee on Environment and Public Works
United States Senate

The Honorable Brett Guthrie
Chairman
Committee on Energy and Commerce
House of Representatives

The Toxic Substances Control Act (TSCA), as amended, authorizes the U.S. Environmental Protection Agency (EPA) to assess and regulate risks from chemical substances already in commerce (existing chemicals) and chemical substances yet to enter commerce (new chemicals).[1] The 2016 Frank R. Lautenberg Chemical Safety for the 21st Century Act, which amended TSCA, substantially expanded EPA's responsibility to regulate new chemicals, among other amendments.[2] For example, the law began requiring EPA to make a formal determination on the risk of injury to health or the environment on each new chemical before it can be manufactured.[3] According to EPA officials, this requirement significantly increased its review responsibilities.

As of November 2024, EPA reports that it has received 2,623 new chemical notices—which initiate EPA's risk review—since TSCA was

[1]Toxic Substances Control Act, Pub. L. No. 94-469, 90 Stat. 2003 (1976) (codified as amended at 15 U.S.C. § 2601 et seq.). TSCA defines "chemical substance" as any organic or inorganic substance of a particular molecular identity, including any combination of such substances resulting from a chemical reaction or occurring in nature, and any element or uncombined radical. 15 U.S.C. § 2602(2).

[2]Pub. L. No. 114-182, 130 Stat. 448 (2016).

[3]TSCA provides that a person may only manufacture a new chemical or manufacture or process for a significant new use of an existing chemical if, in addition to submitting a pre-manufacture notice (PMN), EPA makes an affirmative determination on the risk of injury to health or the environment of the new chemical and takes any subsequent required actions to mitigate the risk after such a determination. 15 U.S.C. § 2604(a); 40 C.F.R. pts. 720, 721, 725. The applicable review period for EPA's determination and any subsequent required actions is 90 days with certain exceptions. *See* 15 U.S.C. § 2604(i)(3).

amended in 2016, including 192 in fiscal year 2024.[4] In addition, EPA reports that it has received 2,573 requests for exemption from certain notice requirements (e.g., low volume exemption [LVE] requests) during the same period, including 242 in fiscal year 2024. However, some external stakeholders have expressed concerns about, for example, the efficiency and transparency of EPA's process for reviewing new chemicals.[5] Moreover, since 2009, we have included EPA's processes for assessing and controlling toxic chemicals on our High-Risk List as a government program in need of broad-based transformation. In our 2023 update of our High-Risk List, we reported that, although EPA has taken some steps toward completing new chemical reviews on time, it has missed most statutory deadlines.[6] Specifically, in February 2023, we reported that, among those pre-manufacture reviews that EPA completed from 2017 through 2022, the agency typically made its determination within the initial 90-day review period less than 10 percent of the time.[7]

You asked us to review issues related to EPA's implementation of its TSCA New Chemicals Program. This report (1) summarizes the perspectives of selected manufacturers on EPA's implementation of its review process for new chemicals and (2) evaluates the extent to which EPA follows key practices for managing and assessing the results of the program.

To address our first objective, we interviewed a nongeneralizable group of 19 manufacturers about their perspectives on EPA's implementation of its

[4]For additional information, *see* U.S. Environmental Protection Agency, *Statistics for the New Chemicals Program under TSCA* (Washington D.C.: Nov. 5, 2024), accessed November 13, 2024, https://www.epa.gov/reviewing-new-chemicals-under-toxic-substances-control-act-tsca/statistics-new-chemicals-program. Counts are as of November 1, 2024, and include valid PMNs, significant new use notices, and microbial commercial activity notices. TSCA requires any person who plans to manufacture or process a new chemical, a significant new use of an existing chemical, or microorganisms for commercial purposes to submit a PMN at least 90 days prior to the manufacture of the chemical. *See* 15 U.S.C. § 2604(a); 40 C.F.R. pts. 720, 721, 725.

[5]For some of the 53 comments that EPA received on its 2024 amendments to the new chemical procedural regulations to improve the efficiency of its new chemicals review processes, among other things, *see* U.S. Environmental Protection Agency, Updates to New Chemicals Regulations Under the Toxic Substances Control Act (TSCA), 89 Fed. Reg. 102773 (Dec. 18, 2024).

[6]GAO, *High-Risk Series: Efforts Made to Achieve Progress Need to Be Maintained and Expanded to Fully Address All Areas*, GAO-23-106203 (Washington, D.C.: Apr. 20, 2023).

[7]GAO, *EPA Chemical Reviews: Workforce Planning Gaps Contributed to Missed Deadlines*, GAO-23-105728 (Washington, D.C.: Feb. 17, 2023).

new chemicals review process. To select the manufacturers, we first analyzed EPA's New Chemicals Review and Chemical Information System data to identify notices that manufacturers submitted from October 1, 2021, through April 20, 2024 (519 total notices). We selected these dates to reflect EPA's current review process and align with its fiscal year performance assessment schedule.[8] We then randomly selected a nongeneralizable sample of notices reflecting the distribution of all notices across our selection criteria to serve as illustrative examples. These criteria included

- review duration (90 days or less, more than 90 days, and still under review);
- review type (pre-manufacture notices [PMN], significant new use notices, and microbial commercial activity notices);[9]
- EPA determination for completed reviews (e.g., not likely to present an unreasonable risk of injury to health or the environment);
- participation in EPA improvement efforts (e.g., mixed metal oxides reviews);[10] and
- manufacturer size (small business concern or person other than a small business concern).

To assess the reliability of these data, we reviewed EPA documentation (e.g., entity relationship diagrams) related to these system data and discussed the data sources with knowledgeable EPA officials. Based on

[8]Specifically, we analyzed (1) a weekly New Chemicals Review data report that included information on review duration, review type, EPA's determination for completed reviews, and participation in EPA improvement efforts; and (2) a Chemical Information System data extract that included information on manufacturer size and contact information. For purposes of this report, we use the term "manufacturer" to also include other submitters, such as importers or processors.

[9]Microbial commercial activity refers to the manufacturing, importing, or processing of microorganisms, such as yeast or bacteria, for commercial purposes, such as biofuel. EPA requires that a person who manufactures, imports, or processes new or significant new uses of microorganisms for commercial purposes submit a microbial commercial activity notice to EPA. *See* 15 U.S.C. § 2604(a); 40 C.F.R. pt. 725 subpt. D.

[10]We previously reported that EPA was exploring ways to streamline the new chemicals review process. *See* GAO-23-105728, 19. For example, in January 2022, EPA announced its biofuels initiative intended to standardize reviews of new chemicals that could be used instead of other transportation fuels with higher emissions. Similarly, in October 2022, it announced a new approach for reviewing mixed metal oxides, including cathode active materials, a key component of electric vehicle batteries.

this information, we determined that the data were sufficiently reliable for selecting our sample.

After we selected our sample, we conducted semi-structured interviews with representatives of 19 manufacturers that submitted the associated notices and completed a systematic content analysis of our interview records.[11] We used a semi-structured interview approach because it allowed us to elicit rich responses about the range of manufacturers' experiences. In addition, this approach allowed for a more robust methodology. By using consistently worded questions about manufacturers' experiences, we were able to quantify and aggregate responses, as well as allow unscripted clarification and in-depth discussion.

Our content analysis approach involved five general steps: identify data sources, develop categories, code data, assess reliability, and analyze results. Identified data sources included records of the semi-structured interviews we conducted with each manufacturer. Since our questions were exploratory, we used an inductive approach to develop preliminary coding categories and subsequently tested them. Once we developed these categories, two analysts independently coded each record, then met to assess intercoder reliability and reconcile any coding differences. Although the results of our analysis are not generalizable, they reflect a range of manufacturers' perspectives on EPA's new chemicals review process. Our review did not include independently corroborating all statements shared by manufacturer representatives, such as how EPA's implementation of the new chemicals review process financially affected their companies.

To evaluate the extent to which EPA follows key management and assessment practices, we reviewed GAO's guide to evidence-based policymaking, which identifies 13 key practices for managing and assessing the results of federal programs, such as EPA's New Chemicals Program.[12] To understand EPA's current management and assessment activities, we collected and analyzed agency performance planning and monitoring documents. We also interviewed officials from EPA's Office of

[11]Our initial sample included 21 notices. In cases of non-response, we selected replacement notices (10) that still allowed the sample to reflect the distribution of all 519 notices across our selection criteria. We completed interviews with representatives of 19 manufacturers.

[12]GAO, *Evidence-Based Policymaking: Practices to Help Manage and Assess the Results of Federal Efforts*, GAO-23-105460 (Washington, D.C.: July 12, 2023).

Pollution Prevention and Toxics' (OPPT) New Chemicals Division (NCD), which is responsible for implementing the New Chemicals Program. Two analysts then independently compared those management activities to the 13 key practices and associated key actions to determine whether EPA generally follows, partially follows, or does not follow each practice.[13] The analysts then discussed how to reconcile, as appropriate, any differences in their determinations.

We conducted this performance audit from May 2023 to January 2025 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

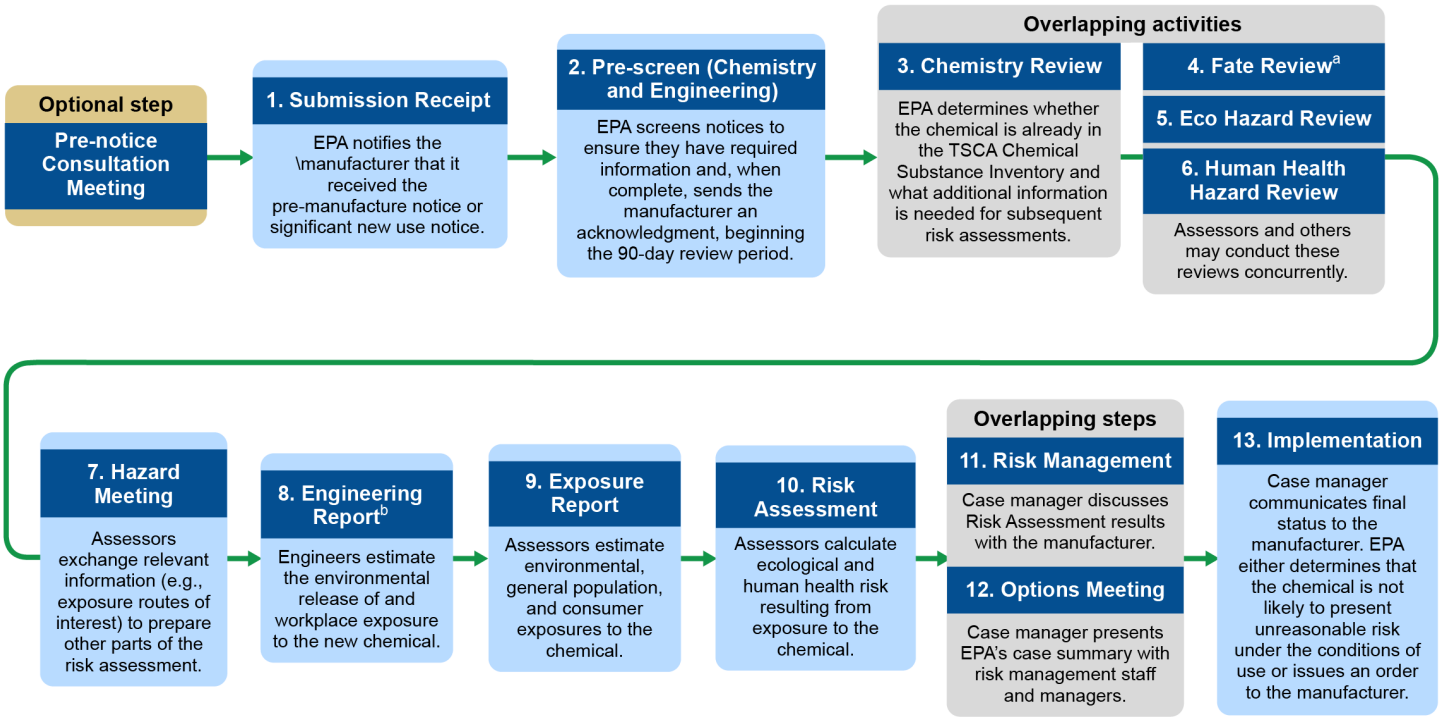
New Chemicals Review Process

EPA's process to review new chemical substances involves 13 steps and includes an optional Pre-notice Consultation Meeting on topics related to the preparation and completeness of the manufacturer's notice as summarized in figure 1.[14]

[13]When we determined that EPA has implemented all key actions associated with the practice, we report that EPA "generally follows" the practice. When we determined that EPA has implemented at least one but not all key actions, we report that the agency "partially follows" the practice. When we determined that EPA has implemented none of the key actions, we report that EPA "does not follow" the practice.

[14]Our review focuses on PMNs, significant new use notices, and microbial commercial activity notices. It does not address exemption notices (e.g., LVEs, low releases and low exposures exemptions, or test marketing exemptions), because such notices have a different review period and regulatory considerations than PMNs.

Figure 1: Summary of the U.S. Environmental Protection Agency (EPA) New Chemicals Review Process



TSCA = Toxic Substances Control Act

Source: GAO analysis of EPA information. | GAO-25-106839

Note: EPA's New Chemicals Division eliminated a separate "Scoping Meeting" to streamline where case discussions occur in the workflow. Division officials noted that those same discussions now occur as part of the Hazard Meeting. This review process is not applicable to microbial commercial activity notices.

[a]During the Fate Review step, EPA evaluates how chemicals released into the environment move, transform, or accumulate in various media.

[b]Engineering assessment begins after Chemistry Review and may overlap with Fate Review, Eco Hazard Review, and Human Health Hazard Review.

We provide additional information in appendix I about key review activities that occur at each step, along with potential EPA interaction with manufacturers during the review. For example, the case manager—who coordinates the review and serves as the official point of contact—may communicate with the manufacturer for clarification about information they provided in their notice or other issues of concern.

EPA posts a range of information sources (e.g., policies and guidance) about the new chemicals review process on its website and conducts

webinars to help manufacturers prepare their notices.[15] For example, EPA recommends that submitters review its June 2018 *Points to Consider When Preparing TSCA New Chemical Notifications* document, which is intended to help submitters prepare notices and meet TSCA requirements, as well as to facilitate EPA's review of notifications.[16] Manufacturers submit information to EPA using the agency's Central Data Exchange (CDX) information system.

At the Pre-screen step, EPA reviews all notices to ensure they are complete, such as ensuring that they include information on environmental releases and worker exposure. Once EPA determines that the notice is complete, it notifies the manufacturer, and the 90-day TSCA applicable review period begins.[17] According to EPA, it uses a standardized approach that draws on knowledge and experience across disciplinary and organizational lines to identify and evaluate concerns regarding health and environmental effects, exposure, and release.[18] It has also developed assessment methods to help evaluate what happens to chemicals when laboratory studies or monitoring data are not available or need to be supplemented. These methods assess a particular aspect

[15]*See*, for example, U.S. Environmental Protection Agency, EPA's Review Process for New Chemicals (Washington, D.C.: Oct. 15, 2024), accessed November 14, 2024, https://www.epa.gov/reviewing-new-chemicals-under-toxic-substances-control-act-tsca/epas-review-process-new-chemicals#policies. EPA also reports information on its new chemicals workload, tracks the status of active cases currently under review, and illustrates general statistics for all new chemical submissions. *See* U.S. Environmental Protection Agency, *Statistics for the New Chemicals Program under TSCA*. According to that page, EPA started reporting the number of rework assessments completed monthly in June 2024, beginning with January 2024. "Rework" is EPA's term for work that supplements completed initial risk assessments, such as evaluation of new information from the submitter and development of new assessment reports or memoranda in response to new information or questions.

[16]U.S. Environmental Protection Agency, *Points to Consider When Preparing TSCA New Chemical Notifications* (Washington D.C.: June 2018), accessed September 11, 2024, https://www.epa.gov/sites/default/files/2018-06/documents/points_to_consider_document_2018-06-19_resp_to_omb.pdf.

[17]EPA regulations provide that a person who submits a PMN may voluntarily suspend the running of the 90-day review period for a specified period of time. *See* 40 C.F.R. § 720.75(b). As we reported in February 2023, according to EPA officials, the agency obtained voluntary suspensions in almost all cases that exceeded the 90-day review period. *See* GAO-23-105728. While EPA's review period is suspended, the new chemical may not be manufactured until EPA makes a formal determination on the risk of injury to health or the environment on the new chemical. *See* 15 U.S.C. § 2604(a).

[18]*See* "EPA's Review Process for New Chemicals," U.S. Environmental Protection Agency, accessed November 14, 2024, https://www.epa.gov/reviewing-new-chemicals-under-toxic-substances-control-act-tsca/epas-review-process-new-chemicals#policies.

of a chemical's possible impact on health or the environment. For example, EPA may use predictive models to assess worker exposure during the manufacturing, processing, and use of a chemical.

Key Practices for Managing and Assessing the Results of Federal Programs

Based on our prior work as well as federal laws and guidance, in July 2023, we developed 13 key practices that can help federal agency leaders develop and use evidence to effectively manage and assess the performance of federal programs.[19]

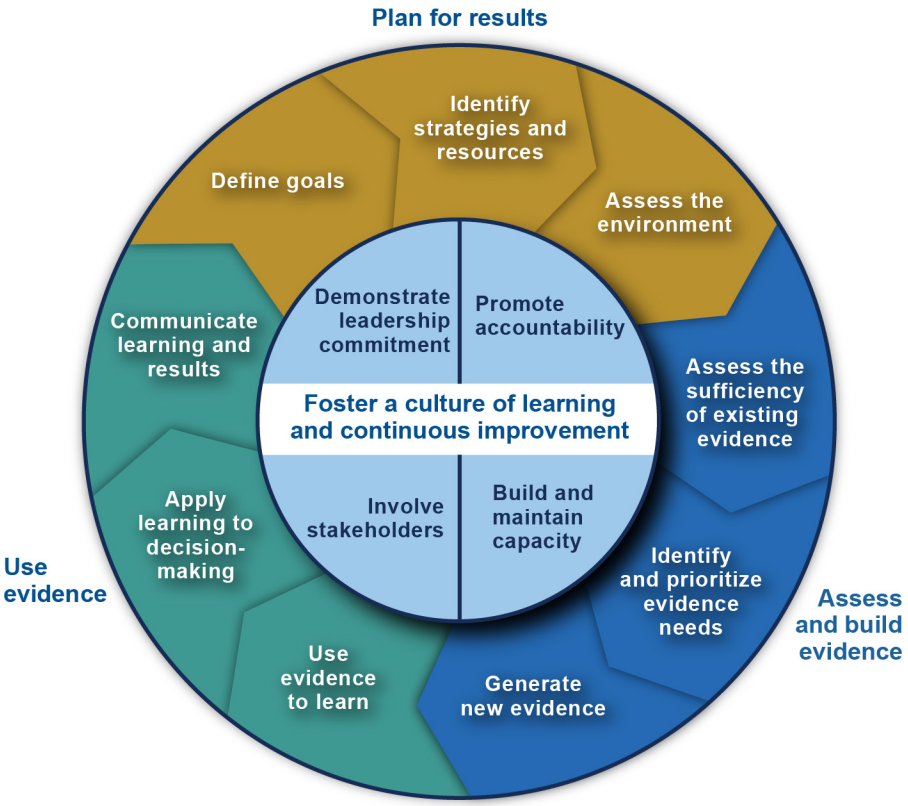
We organize the practices into the following four topic areas, based on their primary focus, as shown in figure 2:

- Foster a culture of learning and continuous improvement
- Plan for results
- Assess and build evidence
- Use evidence

While we present the topic areas and practices in a certain order, they are interconnected. As the figure illustrates, the latter three are part of an iterative cycle. Within that cycle, the practices in the "plan for results" topic area are foundational. For example, until an agency identifies goals for a program, it is not positioned to identify or prioritize its evidence needs or to use evidence in monitoring progress.

[19]GAO-23-105460. Relevant laws and guidance include the Government Performance and Results Act of 1993 (GPRA), as amended (Pub. L. No. 103-62, 107 Stat. 285); the GPRA Modernization Act of 2010, as amended (Pub. L. No. 111-352, 124 Stat. 3866 (2011)); the Foundations for Evidence-Based Policymaking Act of 2018 (Evidence Act) (Pub. L. No. 115-435, 132 Stat. 5529 (2019)); and the Executive Office of the President Office of Management and Budget's guidance (e.g., Circular No. A-11).

Figure 2: Key Practices to Manage and Assess the Results of Federal Programs



Source: GAO analysis. | GAO-25-106839

The four practices in the “foster a culture of learning and continuous improvement” topic area are central to carrying out the nine practices that comprise the iterative cycle covered by the other three topic areas.

One key cultural practice is to involve stakeholders. Stakeholders can include entities both internal and external to the agency, such as manufacturers and organizations that address environmental protection, human health, and occupational safety, as well as other interested parties. We have reported that the involvement of a range of stakeholders is often vital to the success of federal efforts. Stakeholder input can help an organization determine priorities, target resources, and align its goals and strategies with those of others involved in achieving the same or

similar outcomes.[20] Such input can also facilitate understanding among all relevant parties of both competing demands that an organization faces and constraints on its resources.

Selected Manufacturers Identified a Range of Challenges, Strengths, and Potential Improvements for EPA's New Chemicals Review Process

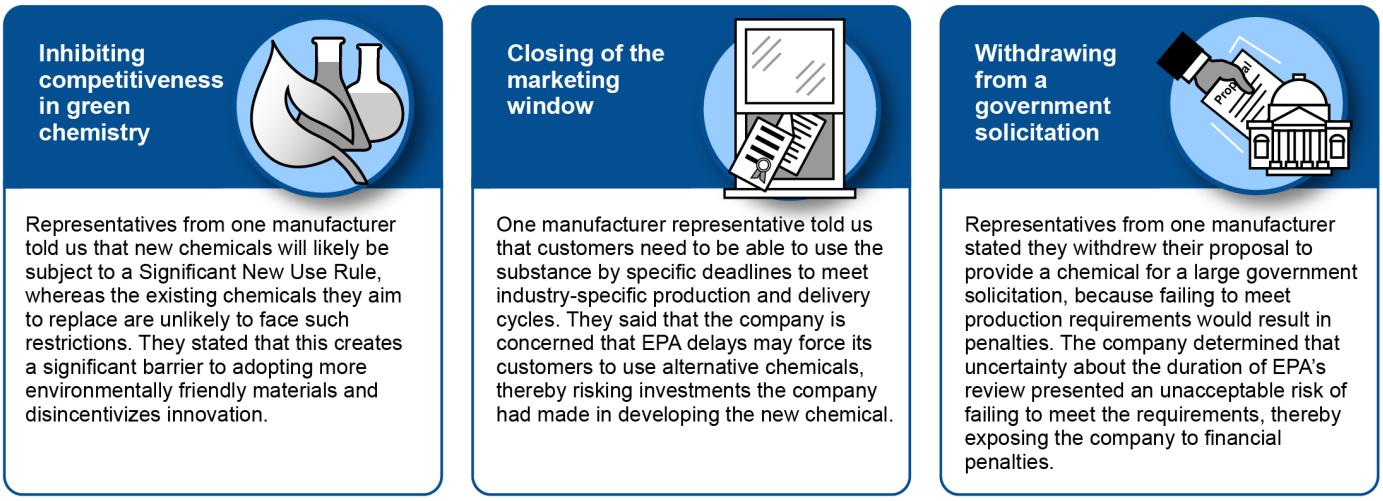
Selected manufacturers shared their perspectives about challenges and strengths related to the review and submission processes, the usability of EPA's CDX information system, and potential process improvements. For example, most manufacturer representatives told us they experienced review delays and described a range of impacts these delays had on their businesses. Almost all manufacturer representatives reported using EPA's publicly available information sources to prepare their submissions, but most told us that additional information would be helpful. While some representatives told us that EPA's CDX information system was easy to learn or use, others described challenges completing or updating their submissions. Finally, representatives cited a range of potential review process improvements such as improving the transparency of review requirements.

New Chemicals Review Process

Most (16 of 19) manufacturer representatives told us they experienced review delays, which they attributed to inadequate EPA staffing, insufficient EPA reviewer expertise, and other factors. Representatives described a range of effects EPA's new chemical review process had on their businesses, such as harming client or customer relations (11), affecting the company financially (10), creating a competitive advantage for existing chemical alternatives at the expense of new chemicals (six), hindering market participation (four), or harming innovation (four). Figure 3 shows examples of how representatives from three manufacturers said EPA's review process affected their companies.

[20]GAO-23-105460.

Figure 3: Reported Examples of How the U.S. Environmental Protection Agency's (EPA) New Chemicals Review Process Affected Selected Manufacturers



Source: GAO illustrations and analysis of interviews with selected manufacturers. | GAO-25-106839

Note: Examples are based on interviews we conducted with 19 manufacturers that submitted new chemical notices to EPA from October 1, 2021, through April 20, 2024. EPA uses Significant New Use Rules in the new chemicals program in two ways. First, EPA generally promulgates a Significant New Use Rule that requires notice to EPA by any person who wishes to manufacture or process a new chemical in a way other than described in the terms and conditions contained in the consent order that binds the original submitter and requires measures to limit exposures or mitigate the potential unreasonable risk for that substance. Second, if EPA determined that the new chemical substance is "not likely to present an unreasonable risk" under its conditions of use, EPA may still issue a Significant New Use Rule that identifies other circumstances that may present risk concerns should they occur in the future.

Representatives also shared varying perspectives about the transparency of EPA's review process. Whereas representatives from nine manufacturers expressed frustration about not knowing where their submission stood in the review process, four told us they appreciated receiving updates from EPA staff—particularly case managers—about the status of their submissions. Representatives from four of 19 manufacturers said that EPA should provide additional information about review timelines, such as realistic time estimates for completing reviews.

Additionally, nine manufacturer representatives shared concerns about the transparency of EPA's review process requirements. For example, one manufacturer said that EPA did not accept the chemical naming in its submission, though the manufacturer said they submitted the chemical naming in accordance with relevant EPA guidance. Another manufacturer told us that EPA would not disclose the chemical identity of analogues it used for risk assessments, which impeded the company's ability to hold

EPA accountable or determine the appropriateness of the agency's risk assessment approach.

Submission Process

Almost all (18 of 19) manufacturer representatives we interviewed reported using publicly available EPA information sources to prepare their submissions and generally found those sources to be somewhat or very helpful. For example, representatives from one manufacturer told us they consulted EPA sources about how the agency handles confidential business information (CBI).[21] Representatives from 11 manufacturers also told us they attended EPA webinars, such as the Engineering Initiative Webinar Series, which is intended to increase the efficiency and transparency of EPA's new chemical determinations.

Although pre-notice consultation is an opportunity for submitters to receive EPA assistance in preparing pre-manufacture and other notices, 14 of 19 manufacturer representatives we interviewed told us they did not request such optional meetings with EPA. Eight of 14 of these representatives told us Pre-notice Consultation Meetings were unnecessary because their companies already had experience with the new chemicals review process or had hired consultants who did.

However, representatives identified additional information that EPA could provide to help manufacturers better prepare future submissions. Twelve of 19 representatives told us that EPA should provide additional information that clarifies its new chemicals review process or submission information requirements.

- For example, representatives from one manufacturer told us that the submission process for microbial commercial activity notices is "a mysterious black box." They said that the company was unsure what information it needed to submit due to decades-old EPA guidance. Specifically, they said that EPA's June 1997 *Points to Consider in the Preparation of TSCA Biotechnology Submissions for Microorganisms* guidance is out of date. They also said it lacked sufficient information about, for example, what to include in the microbial commercial activity notice submission, such as characteristics of the microorganism and how to submit a text file of the genetic

[21]Under TSCA section 14, manufacturers submitting CBI to EPA under TSCA may assert a claim for protection from public disclosure of that information. 15 U.S.C. § 2613. EPA's regulations specify the requirements for submitting and supporting CBI claims under TSCA. *See* 40 C.F.R. pt. 703. For example, the submitter must certify that information provided to substantiate a CBI claim is true and correct.

manipulations done to it. Representatives noted that they appreciated EPA scheduling consultations to prepare the notice, but more comprehensive guidance about what to include in the submission would benefit both the agency and submitters.[22]

- Representatives from another manufacturer stated that EPA should specify how it utilizes chemical distribution, processing, and use information. Representatives told us that making this information available to manufacturers before they submit notices (e.g., by adding it to the June 2018 *Points to Consider When Preparing TSCA New Chemical Notifications* document) could help them better substantiate their submissions.

Usability of EPA's CDX Information System

Five of 19 manufacturer representatives we interviewed told us that EPA's CDX information system was easy to learn or use. However, others described challenges completing or updating their submissions using CDX, such as the following:

- **System errors:** Eight representatives told us they experienced errors when using CDX. For example, one representative described having to manually edit each submission file that contained non-English characters, since CDX would redact those characters during transmission. The representative told us they spent 6 weeks addressing CDX technical errors before EPA considered their submission complete, starting the 90-day TSCA applicable review period.
- **Challenges substantiating CBI claims:** Six representatives discussed challenges using CDX to substantiate their CBI claims. Representatives from one manufacturer told us that EPA previously allowed manufacturers to use a standard Word document template to substantiate CBI claims in CDX, but EPA now requires the submitter to answer six CBI questions for every individual claim. They estimated

[22]EPA provides guidance documents for filing microbial commercial activity notices under TSCA. *See* U.S. Environmental Protection Agency, *Guidance Documents for Filing a Biotechnology Submission under TSCA* (Washington D.C.: Sept. 16, 2024), accessed November 12, 2024, https://www.epa.gov/regulation-biotechnology-under-tsca-and-fifra/guidance-documents-filing-biotechnology-submission. NCD officials told us the division does not currently plan to update the June 1997 *Points to Consider* document, because it regularly conducts Pre-notice Consultation Meetings with these submitters and microbial commercial activity notices represent a small proportion of the submissions that NCD receives. According to information from EPA, as of November 1, 2024, EPA has received 199 valid microbial commercial activity notices out of the 2,623 new chemical notices that EPA has received since TSCA was amended in 2016. *See* U.S. Environmental Protection Agency, *Statistics for the New Chemicals Program under TSCA*.

that manual substantiation in CDX took three times longer than it had using a template.

- **Navigation and learning challenges:** Five representatives stated that CDX was not intuitive or that it took substantial time to learn how to use the system. One manufacturer told us that they would have had difficulty navigating CDX without the assistance of an external consultant, because the system itself did not have instructions for using it.

Nine of 19 representatives told us they appreciated the support they received from the CDX help desk, which helped them manage system errors. For example, representatives from one manufacturer told us the help desk provided them with methods to work around technical errors, such as saving submission forms in a certain way to ensure that authorized users appeared as signatories on the forms.

Potential New Chemicals Review Process Improvements

Among the 19 manufacturers we interviewed, the most-cited potential improvements to the new chemicals review process were primarily related to reducing review times or improving the transparency of process requirements, as summarized below:[23]

- **Clarify new chemicals review process requirements (12):** For example, one manufacturer representative suggested that EPA establish updated, transparent protocols that clearly specify minimum likely testing requirements or guidelines that could be publicly accessed by manufacturers prior to submitting the PMN.[24] Another

[23]Other potential improvements included streamlining the review process for new chemicals with similar characteristics; improving the consistency of risk assessments; duly considering the relative benefits of new chemicals in comparison to existing chemicals; improving transparency about EPA's use of models and analogues when producing risk assessments; using manufacturer test data; and duly considering manufacturer practical experience. Another potential improvement raised in our interviews was to increase consistency between EPA's new chemicals review process and other regulatory approaches. The same chemical substance can be regulated in different ways depending on its use. For example, a manufacturer representative noted that the U.S. Food and Drug Administration may review the chemical substance when used as a produce bag; however, EPA may also review the substance under its new chemicals review process for a different commercial use (e.g., consumer product packaging). We recognize that EPA's ability to increase consistency between its new chemicals review process and other regulatory approaches may depend on changes to existing statutory authorities and requirements, such as TSCA.

[24]According to NCD officials, TSCA, as amended, requires submitters to provide what is "known or reasonably ascertainable," and, consequently, does not establish specific testing "requirements" prior to submitting a PMN. They noted that EPA may include testing requirements in a section 5(e) order if needed to address risk.

representative said that EPA guidance does not sufficiently specify what information manufacturers should provide with their submission. They contrasted EPA's practice with that of Canada, which they said provides a more complete list of requirements to submitters.[25]

- **Increase number of reviewers (9):** Some manufacturers said that additional reviewers may reduce review delays. For example, representatives from one manufacturer told us that staff attrition and retirement, as well as a shortage of human health assessors, contribute to review delays. In February 2023, we reported that EPA's significant workforce planning gaps—including difficulty retaining and recruiting staff—have contributed to missed deadlines for new chemical reviews.[26]
- **Clarify the status of incomplete reviews or time frames for completing them (9):** One manufacturer suggested that EPA provide realistic time frames for completing reviews, particularly when the agency does not meet the applicable 90-day TSCA review period. Representatives from another manufacturer told us that reporting more granular information on EPA's statistics web page, including where specific PMNs stand in the review process, would help the company plan.[27]

[25]In October 2015, we reported on how Canada manages the human health risks of existing chemicals identified as toxic under the Canadian Environmental Protection Act, 1999. Our report did not include a comparison between the Canadian and U.S. new chemical review processes. *See* GAO, *Chemicals Management: Observations on Human Health Risk Assessment and Management by Selected Foreign Programs*, GAO-16-111R (Washington, D.C.: Oct. 9, 2015).

[26]GAO-23-105728. During our review for the 2023 report, EPA officials told us the primary reason the agency missed new chemical review deadlines was because they did not have sufficient resources and expertise. They also identified other factors that contributed to missed deadlines such as guidance gaps, IT challenges, and risk assessment revisions. We recommended EPA develop a process and timeline to fully align its workforce planning efforts for implementing its TSCA chemical review responsibilities with workforce planning principles and incorporate the results, as appropriate, into its annual plan for chemical risk evaluations under TSCA. The agency has partially addressed this recommendation by, for example, developing a Workforce Action Plan with related follow-on goals to address hiring delays and retention challenges.

[27]According to NCD officials, EPA's *Statistics for the New Chemicals Program under TSCA* includes links to all active new chemical cases and exemptions. However, the status information that the web page provides for active new chemical cases may not provide granular information that some manufacturers prefer. For example, when we exported data on all active cases from the website in September 2024, we found that EPA provided the following four status categories: (1) awaiting submitter information/action, (2) awaiting submitter signature on order, (3) risk assessment, and (4) risk management.

- **Reduce review times (8):** Representatives from one manufacturer noted that EPA will likely continue to operate in a resource-constrained environment and must identify innovative ways to complete reviews in a timely manner. Another manufacturer suggested that EPA reduce review times for certain chemicals by creating a "triage program," where the agency groups chemicals by risk profiles and expedites its review of lower-risk chemicals.
- **Improve communication throughout the review process (8):** One manufacturer told us that improved communication may clarify and help address the underlying causes of delays more quickly, such as when EPA needs more information from manufacturers. The manufacturer noted that more timely communication can help "dislodge" cases that are stuck in review.

In June 2024, EPA announced new initiatives intended to increase the transparency of new chemical reviews, among other things. For example, EPA began implementing an internal engineering checklist to systematically review new chemical submissions and identify potential data gaps at the beginning of the review process. Additionally, EPA launched the NCD Reference Library that includes guidance documents, compliance advisories, templates, manuals, and other materials for stakeholders.[28] We discuss NCD's involvement of stakeholders in planning and assessing the program later in this report.

EPA Follows Some but Not All Key Management and Assessment Practices

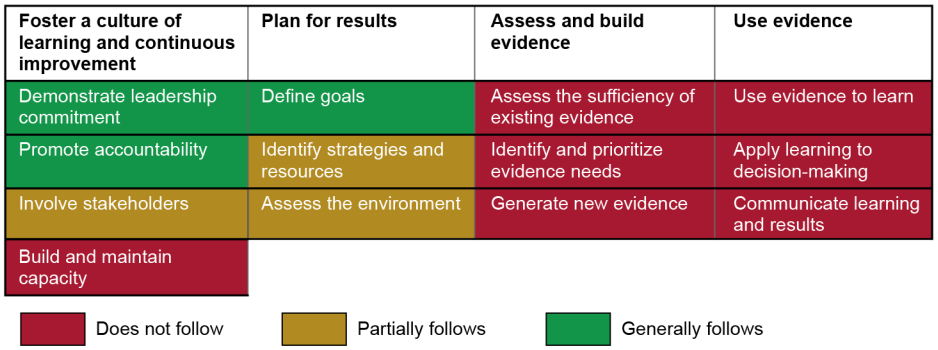
EPA's NCD Generally or Partially Follows Some Key Practices, Including Defining Draft Program Goals

EPA's NCD generally or partially follows six of the 13 key practices for managing and assessing its New Chemicals Program, all of which fall

[28]U.S. Environmental Protection Agency, *EPA Announces Initiatives to Improve Efficiency, Worker Protections and Transparency in New Chemical Reviews* (Washington, D.C.: June 26, 2024), accessed November 12, 2024, https://www.epa.gov/chemicals-under-tsca/epa-announces-initiatives-improve-efficiency-worker-protections-and.

within the first two topic areas (see fig. 4).[29] Appendix II includes additional information about the extent to which EPA follows these practices.

Figure 4: Extent to Which the U.S. Environmental Protection Agency (EPA) Follows Key Management and Assessment Practices for Its New Chemicals Program



Source: GAO analysis of EPA performance planning and monitoring documents. | GAO-25-106839

- **Foster a culture of learning and continuous improvement:** NCD demonstrates leadership commitment by involving senior leaders in performance management and evidence-building activities and those leaders meet regularly to coordinate those activities. Additionally, NCD promotes accountability by assigning responsibility for these activities in performance plans for senior leaders and supervisory scientists. Moreover, division officials told us they consulted with some (i.e., internal) stakeholders such as senior leaders, case managers, and other employees in its strategic planning efforts.
- **Plan for results:** In August 2024, NCD drafted a strategic plan that defines five goals related to the program (see table 1).[30] The draft plan also identifies metrics and strategies for achieving each strategic goal, but does not consistently identify needed resources.[31] In their written responses to us, NCD officials indicated they had addressed

[29]Specifically, we determined that NCD generally follows three practices, partially follows three practices, and does not follow the remaining seven practices.

[30]Additionally, EPA's agency-wide strategic plan includes one goal related to new chemical reviews: by September 30, 2026, review 90 percent of past risk mitigation requirements for TSCA new chemical substances decisions compared to the fiscal year 2021 baseline of none. *See* U.S. Environmental Protection Agency, *FY 2022–2026 EPA Strategic Plan* (Washington D.C.: March 2022), 85.

[31]NCD's draft strategic plan is subject to change upon further deliberations. NCD officials told us that we could include the draft strategic goals in this report.

the "assess the environment" practice by identifying factors that could affect goal achievement, but the plan does not consistently define strategies to mitigate those factors. For example, officials stated that EPA's "unstable" and "antiquated" information technology systems, including CDX, could affect NCD's ability to improve the timeliness of new chemical risk assessments. Officials also stated that high management and staff workload could affect the division's ability to achieve its goal to "support healthy organizational culture." Although NCD is still finalizing how the division will ultimately assess progress in achieving this goal, senior managers told us they currently consider, for example, Federal Employee Viewpoint Survey scores to monitor performance in this area.[32]

Table 1: U.S. Environmental Protection Agency (EPA) New Chemicals Division Draft Strategic Goals, Fiscal Years (FY) 2024–2025

Deliver scientifically sound risk-based assessments for new chemical substances with improved timeliness
Ensure policies and risk management actions are protective and aligned with statutory goals and requirements and stakeholders are aware of requirements
Manage, update, and publish the Toxic Substances Control Act inventory
Reinforce commitment to transparency by providing the public with meaningful information on a consistent and timely basis
Strive for program excellence; support healthy organizational culture

Source: EPA New Chemicals Division's August 2024 draft FY 2024—2025 strategic plan. | GAO-25-106839

EPA's NCD Does Not Follow Most Key Practices and Has Not Developed a Systematic Performance Management Process

While NCD has taken some important initial steps described above, we determined that the division does not follow seven of 13 key management and assessment practices. For example, NCD has not formally assessed the sufficiency of its existing evidence-building capacity or identified actions to maintain or enhance that capacity. Relatedly, the division does not follow any practices for effectively assessing, building, or using evidence because it has not completed foundational planning actions. Such foundational actions include involving stakeholders and identifying

[32]The Federal Employee Viewpoint Survey is an organizational climate survey that assesses how employees jointly experience the policies, practices, and procedures characteristic of their agency and its leadership. According to EPA survey results, NCD employees' positive responses on three key questions related to scientific integrity and trust have improved from 2020 to 2023. For example, positive responses to the survey's "my supervisor treats me with respect" question increased from 76 percent in 2020 to 100 percent in 2023. Positive responses to the survey's "I can disclose a suspected violation of any law, rule, or regulation without fear of reprisal" question increased from 33 percent in 2020 to 63 percent in 2023.

resources needed to achieve goals.[33] Finalizing its strategic plan in a manner that is consistent with such practices could better position NCD to identify and prioritize the evidence it needs and use that evidence to monitor progress toward achieving the plan's strategic goals, such as to "deliver scientifically sound risk-based assessments for new chemical substances with improved timeliness."

Additionally, NCD officials told us that they had not developed a systematic process that ensures the division consistently follows all key practices in implementing the program. Doing so could help the division manage the New Chemicals Program's performance more effectively by, for example, building stakeholder involvement into its strategic management process, as appropriate. We have previously reported that involving of a range of stakeholders early and often is vital to the success of federal efforts.[34] Such stakeholders could include manufacturers and organizations that address environmental protection, human health, and occupational safety, as well as other interested parties. NCD officials routinely engage with external stakeholders through topic-specific workshops, conferences, and other means. However, they did not involve these stakeholders in developing the draft strategic plan. One option is to release an exposure draft to solicit stakeholder comment before finalizing the plan.[35] By involving stakeholders as it finalizes and implements the plan, NCD could better capture a range of perspectives to inform its efforts.

Moreover, involving a range of stakeholders in NCD's performance management process could also help the division better understand how to achieve its stated strategic goals. As discussed earlier in this report, representatives from most manufacturers we interviewed told us that EPA should provide additional information that clarifies its new chemicals review process or submission information requirements. Representatives also raised concerns about EPA guidance being out of date or inconsistent with feedback the company received on its submission. Involving external stakeholders could help NCD understand stakeholders'

[33]As we noted earlier in this report, while we present the topic areas and practices in a certain order, they are interconnected, and two of them—"assess and build evidence" and "use evidence"—are part of an iterative cycle that builds on key actions established in the foundational "plan for results" topic area.

[34]GAO-23-105460.

[35]An exposure draft can solicit public comment on a proposed policy or action. Interested parties are invited to read and discuss a preliminary version of a document and express their opinions on its contents to minimize any unintended consequences.

information needs and priorities, as the division determines how to achieve its draft goals of "ensuring stakeholders are aware of requirements" and "providing the public with meaningful information on a consistent and timely basis."

Conclusions

Under TSCA, EPA is required to make a formal determination on the risk of injury to health or the environment on each new chemical before it can be manufactured and, if appropriate, take subsequent required actions to mitigate the risk. However, EPA continues to face challenges carrying out its responsibility to make such determinations within the applicable 90-day TSCA review period. In this context, manufacturers' representatives whom we interviewed discussed a range of strengths, challenges, and potential improvements to the new chemicals review process.

NCD has taken important initial steps to better manage and assess its New Chemicals Program, such as developing a draft strategic plan that identifies five strategic goals. However, NCD does not follow most key management and assessment practices. For example, the division does not follow any key practices related to assessing, building, or using evidence because it has not completed foundational planning actions. As NCD finalizes the strategic plan, addressing relevant key practices—including involving a range of internal and external stakeholders and identifying resources—will better position NCD to identify and prioritize its evidence needs. This will also enable NCD to use that evidence to monitor progress toward achieving the plan's strategic goals, such as to "deliver scientifically sound risk-based assessments for new chemical substances with improved timeliness."

Additionally, NCD has not developed a systematic process that ensures the division consistently follows all key practices, which could help the division manage the program's performance more effectively. For example, involving a range of external stakeholders early and often in such a process could help NCD understand stakeholders' information needs and priorities. This understanding is important, as the division finalizes its strategic plan and determines how to achieve its draft goals of "ensuring stakeholders are aware of requirements" and "providing the public with meaningful information on a consistent and timely basis."

Recommendations for Executive Action

We are making the following two recommendations to EPA:

The Administrator of EPA should ensure that NCD, as it finalizes its strategic plan, addresses relevant key practices for managing and

assessing the New Chemicals Program, including involving stakeholders and identifying resources. (Recommendation 1)

The Administrator of EPA should ensure NCD implements a systematic process that aligns the division's performance management approach with key management and assessment practices. (Recommendation 2)

Agency Comments

We provided a draft of this report to EPA for review and comment. In its written comments, reproduced in appendix III, EPA agreed with both of our recommendations. Regarding recommendation 1, EPA indicated that NCD aims to finalize the division's draft strategic plan in Spring 2025. EPA stated that the agency is committed to improving the efficiency and transparency of the New Chemicals Program but noted that, without significantly increased resources for the program, its progress toward those ends may be limited. Given this concern, EPA said that NCD is considering different options for engagement with key stakeholders without detracting from completing casework. Regarding recommendation 2, EPA said that, resources permitting, NCD intends to develop a systematic process that aligns the division's performance management approach with key management and assessment practices, such as building and maintaining capacity. EPA also provided technical comments, which we incorporated as appropriate. After we received EPA's written comments, the agency provided supplemental information to highlight recent progress in completing new chemical reviews. Specifically, according to EPA, NCD (a) completed 32 risk assessments in November 2024 and 56 such assessments in December 2024 and (b) reduced the number of cases from fiscal year 2023 that were still under review at the beginning of fiscal year 2024.

We are sending copies of this report to the appropriate congressional committees and the Administrator of EPA. In addition, the report is available at no charge on the GAO website at https://www.gao.gov.

If you or your staff have any questions about this report, please contact me at (202) 512-3841 or gomezj@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last

page of this report. GAO staff who made key contributions to this report are listed in appendix IV.

J. Alfredo Gómez
Director
Natural Resources and Environment

Appendix I: U.S. Environmental Protection Agency New Chemicals Review Process

Table 2: U.S. Environmental Protection Agency (EPA) New Chemicals Review Process

Step	What key review activities occur at this step?	Does this step overlap with other steps?	How do EPA and manufacturers interact, if at all, during this step?
1. Submission Receipt	The Office of Pollution Prevention and Toxics (OPPT) confirms receipt of the pre-manufacture notice (PMN), significant new use notice, or microbial commercial activity notice.[a]	No.	Manufacturers receive an auto-generated email from the Central Data Exchange (CDX) information system when the PMN, significant new use notice, or microbial commercial activity notice submission is successfully received. The manufacturer can download a copy of the record of the submission.
2. Pre-screen (Chemistry and Engineering)	OPPT screens all notices within 1–3 days of receipt to ensure the notices have the required information, such as unambiguous chemical identity and complete site identification information, manufacturing process descriptions, and information on environmental releases and worker exposure for each site.[b]	No.	If OPPT finds that a submitted notice does not have all required information, the office notifies the manufacturer and provides next steps for resubmitting the notice. Additionally, when a manufacturer successfully completes the Pre-screen step, OPPT sends an Acknowledgment Letter to the manufacturer.
3. Chemistry Review	The case manager and review chemists conduct inventory checks to determine if the chemical is already in the TSCA Chemical Substance Inventory, generate initial chemistry reports, and conduct a chemistry meeting to discuss what additional information is needed for subsequent risk assessments.[c]	Some Chemistry Review, Fate Review, Eco Hazard Review, and Human Health Hazard Review activities may overlap.	Review chemists may contact manufacturers with questions related to the notice.
4. Fate Review	Fate assessors (consisting of biologists, physical scientists, and environmental engineers) evaluate environmental fate and transport of the new chemical and assign “fate ratings” that score the chemical’s persistence, bioaccumulation, migration to groundwater, etc.[d]	Some Chemistry Review, Fate Review, Eco Hazard Review, and Human Health Hazard Review activities may overlap.	If questions related to the notice arise, assessors may contact manufacturers via the case manager.
5. Eco Hazard Review	Ecological risk assessors (consisting of biologists and toxicologists) evaluate the potential environmental hazard to aquatic organisms. For example, assessors will consider the fate properties of a chemical (e.g., how fast the chemical degrades in a stream) when evaluating the potential harm to fish populations.	Some Chemistry Review, Fate Review, Eco Hazard Review, and Human Health Hazard Review activities may overlap.	If questions arise related to the notice, assessors may contact manufacturers via the case manager.

Step	What key review activities occur at this step?	Does this step overlap with other steps?	How do EPA and manufacturers interact, if at all, during this step?
6. Human Health Hazard Review	Health assessors (consisting of biologists and toxicologists) evaluate the health hazards to people, including consumers, workers, and the general population. For example, EPA considers if a chemical is a possible human carcinogen.	Some Chemistry Review, Fate Review, Eco Hazard Review, and Human Health Hazard Review activities may overlap.	If questions arise related to the notice, assessors may contact manufacturers via the case manager.
7. Hazard Meeting	Fate assessors, ecological risk assessors, human health assessors, and the case manager exchange information relevant to the scope of the chemical's assessment (e.g., exposure routes of interest) to prepare for the next step of Risk Assessment.[e] Chemical-specific information will be shared across disciplines related to topics such as water solubility (chemistry), degradation rates (fate), fish toxicity (eco hazard), and general population hazards (human health hazard).	Some Chemistry Review, Fate Review, Eco Hazard Review, and Human Health Hazard Review activities may overlap with the Hazard Meeting.	The case manager may speak with the manufacturer about hazards identified. For example, if the assessors estimate high eco hazard, the case manager may inform the manufacturer about the hazard assessment and discuss whether the manufacturer can limit release of the substance to water.
8. Engineering Report	Engineers (typically chemical engineers) estimate the environmental release of and workplace exposure to the new chemical. For example, EPA may use manufacturer estimates, models, generic scenarios, or emission scenario documents to estimate environmental release and workplace exposure.	Engineering assessment begins after Chemistry Review and may overlap with Fate Review, Eco Hazard Review, and Human Health Hazard Review.	Chemical engineers contact manufacturers if there are questions.
9. Exposure Report	Exposure assessors (consisting of biologists, physical scientists, toxicologists, chemical engineers, and environmental engineers) estimate environmental, general population, and consumer exposures to the chemical.[f]	Compiling data for the Risk Assessment may begin before completion of the Exposure Report but estimates of the chemical's health and ecological risks occur only after the Exposure Report is complete.	Not applicable.

Step	What key review activities occur at this step?	Does this step overlap with other steps?	How do EPA and manufacturers interact, if at all, during this step?
10. Risk Assessment	Ecological assessors and human health assessors calculate ecological and human health risk resulting from exposure to the chemical. For example, human health assessors calculate if risks for developmental effects will exceed the margin of safety due to the estimated releases to drinking water. Ecological assessors will calculate whether the estimated chemical concentration in a stream exceeds the concentration of concern in the environment.	Compiling data for the Risk Assessment may begin before completion of the Exposure Report, but estimates of the chemical's health and ecological risks occur only after the Exposure Report is complete.	Assessors may contact manufacturers via the case manager if questions arise related to the notice.
11. Risk Management	The case manager reviews the Risk Assessment and discusses results with the manufacturer. The case manager develops risk mitigation options, as necessary.	The Risk Management and Options Meeting steps may overlap.	The case manager discusses Risk Assessment results and risk mitigation options with the manufacturer, as needed.
12. Options Meeting	The case manager presents EPA's summary of the case to risk management staff and managers. The case summary includes discussion of conditions of use, outcomes of the Risk Assessment step, proposed determination, and proposed risk mitigation terms.[g]	The Risk Management and Options Meeting steps may overlap.	The case manager discusses the outcome(s) of the Options Meeting, including recommended consent order terms, as needed, with the manufacturer.
13. Implementation	If EPA determines the chemical is not likely to present unreasonable risk under the conditions of use, the agency will notify the manufacturer, which may commence manufacture of the chemical or manufacture or processing for a significant new use. If EPA makes any of the four other determinations, it must issue an order to the manufacturer, typically a consent order.[g] A consent order may include requirements such as testing; use of worker personal protective equipment; hazard labeling; restrictions on manufacturing, processing, distribution, use, or disposal; recordkeeping requirements; and water release restrictions.	No.	The case manager communicates the status of final document reviews with manufacturers and sends final, signed documents to manufacturers.

Source: GAO analysis of EPA information. | GAO-25-106839

[a]Certain categories of new chemical substances are exempt from PMN requirements under TSCA section 5 (e.g., low volume exemption [LVE], low releases and low exposures exemption, research and development exemption, test marketing exemption) and have a different notification, review period, and requirements than PMNs. *See* 40 C.F.R. §§ 723.50, 720.36, 720.38. For example, LVEs follow the same general risk assessment steps within a shorter time frame and have a different risk management process where they are either granted or denied. Microbial commercial activity notices do not go through each specific step but follow the same general process as PMNs.

[b]After the Pre-screen step, EPA must notify the submitter within 30 days of receipt that the submission is incomplete and that the notice review period will not begin until EPA receives a complete notice. 40 C.F.R. § 720.65(c)(2).

[c]U.S. Environmental Protection Agency, TSCA Chemical Substance Inventory (Washington, D.C.: Oct. 22, 2014), accessed December 17, 2024, https://www.epa.gov/tsca-inventory.

[d]"Environmental fate" refers to what happens to a chemical or a microorganism once it is released into the environment, including any changes due to physical, chemical, and biological processes. "Transport" refers to how chemicals move in the environment.

[e]EPA's "Risk Assessment" includes a "human health risk assessment" and an "ecological risk assessment." A "human health risk assessment" is the process to determine whether a potential hazard exists for a chemical (or its degradants) and to estimate the potential for, and magnitude of, risk to an exposed individual or population. An "ecological risk assessment" evaluates the potential adverse effects of each new chemical substance and compares the effects with predicted environmental exposures to determine risk.

[f]An exposure assessment is the process of identifying the likely duration, intensity, frequency, and number of exposures to a chemical, including the nature and types of individuals or populations that are exposed to the chemical.

[g]"Conditions of use" refers to the intended, known, or reasonably foreseen circumstances, of the manufacture, processing, distribution in commerce, and use and disposal of chemicals. 15 U.S.C. § 2602(4). EPA may make one of five determinations. EPA's determinations include (1) the chemical or significant new use presents an unreasonable risk of injury to health or the environment; (2) available information is insufficient to allow the agency to make a reasoned evaluation of the health and environmental effects associated with the chemical or significant new use; (3) in the absence of sufficient information, the chemical or significant new use may present an unreasonable risk of injury to health or the environment; (4) the chemical is or will be produced in substantial quantities and may either enter the environment in substantial quantities or result in significant or substantial human exposure to the chemical; and (5) the chemical or significant new use is not likely to present an unreasonable risk of injury to health or the environment. 15 U.S.C. § 2604(a)(3).

Appendix II: Extent to Which the U.S. Environmental Protection Agency Follows Key Management and Assessment Practices for Its New Chemicals Program

Table 3: Extent to Which the U.S. Environmental Protection Agency (EPA) Follows Key Management and Assessment Practices for Its New Chemicals Program

Topic area	Key management and assessment practice	Description of EPA activities	GAO determination
Plan for results	Define goals	EPA's New Chemicals Division (NCD) draft strategic plan defines five goals that generally align with EPA's agency-wide strategic plan. The draft plan also includes metrics for each goal.	Generally follows
	Identify strategies and resources	NCD's draft strategic plan identifies strategies for each goal and includes interdependencies where coordination with other organizations, programs, and activities may be needed; however, the plan does not identify the resources needed to achieve each goal.	Partially follows
	Assess the environment	NCD's draft strategic plan identifies internal and external factors that could affect goal achievement but does not consistently define strategies to address or mitigate those factors.	Partially follows
Assess and build evidence	Assess the sufficiency of existing evidence	—[a]	Does not follow
	Identify and prioritize evidence needs	—[a]	Does not follow
	Generate new evidence	—[a]	Does not follow
Use evidence	Use evidence to learn	—[a]	Does not follow
	Apply learning to decision-making	—[a]	Does not follow
	Communicate learning and results	—[a]	Does not follow
Foster a culture of learning and continuous improvement	Demonstrate leadership commitment	NCD involves senior leaders in performance management and evidence-building activities, and those leaders meet regularly to coordinate those activities.	Generally follows
	Promote accountability	NCD assigns responsibility for performance management and evidence-building activities in performance plans for senior leaders and supervisory scientists.	Generally follows
	Involve stakeholders	NCD involved internal stakeholders in developing its draft strategic plan. Although NCD routinely engages with external stakeholders through topic-specific workshops, conferences, and other means, the division did not involve these stakeholders in developing the draft strategic plan specifically.	Partially follows
	Build and maintain capacity	NCD has not formally assessed the sufficiency of its existing evidence-building capacity or identified actions to maintain or enhance that capacity. NCD senior managers told us the division lacks sufficient expertise and resources to do so.[b]	Does not follow

— = No activities

Source: GAO analysis of EPA performance planning and monitoring documents. | GAO-25-106839

[a]While we present the topic areas and practices in a certain order, they are interconnected, and two of them—"assess and build evidence" and "use evidence"—are part of an iterative cycle that builds on key actions established in the foundational "plan for results" topic area. Because EPA has not finalized the division's strategic plan or completed these key actions, we determined that the agency is not positioned to, and thus does not, follow the six practices included in the "assess and build evidence" and "use evidence" topic areas.

[b]Agency performance improvement officers advise and assist agency leaders to ensure that the mission and goals of the agency are achieved. These officers are responsible for leading efforts to set goals; reviewing progress on those goals and identifying course corrections; and promoting a culture of using data and evidence, managing risks, and communicating performance information. This includes advising organizational components, such as NCD, in strategic planning. NCD officials told us that they had not consulted with the performance improvement officer when drafting the division's strategic plan.

Appendix III: Comments from the U.S. Environmental Protection Agency

ASSISTANT ADMINISTRATOR FOR CHEMICAL SAFETY AND POLLUTION PREVENTION
WASHINGTON, D.C. 20460

December 31, 2024

Mr. Alfredo Gomez
Director
Natural Resources and Environment
U.S. Government Accountability Office
Washington, DC 20548

Dear Mr. Gomez:

Thank you for the opportunity to review and comment on GAO's November 26, 2024, Draft Report titled "New Chemicals Program: EPA Needs a Systematic Process to Better Manage and Assess Performance," GAO Project Number 106839.

The purpose of this letter is to provide EPA's response to the Draft Report. For your convenience, EPA has also prepared detailed technical comments transmitted with this response (see Appendix), but which EPA expects will remain internal to GAO.

While the Office of Chemical Safety and Pollution Prevention (OCSPP) acknowledges that improvements to the New Chemicals Division's (NCD's) strategic planning and performance management could benefit the new chemicals review process, we maintain that even the most robust strategic plans will be all but useless if the program does not receive the predictable and sustained levels of resources needed to implement them. OCSPP has significant concerns that without a significant increase in budget, as requested for FY 2025 and prior fiscal years, an increased investment in strategic planning will divert critical resources from EPA's efforts to increase the pace of actual review of new chemical submissions and to implement various process improvements already in progress. Fundamentally, operating without a predictable budget, such as when operating under Continuing Resolutions for extended periods, makes long-term planning and more progress on efficiency improvements exceedingly difficult.

Background and Discussion:

GAO's objective was to evaluate EPA's implementation of its TSCA New Chemicals Program. The Draft Report (1) summarizes the perspectives of selected chemical manufacturers[1] on EPA's review process

[1] GAO identified a random, nongeneralizable sample of notices submitted between October 2021 and April 2024 and interviewed 19 manufacturers that submitted these notices.

and (2) evaluates the extent to which the New Chemicals Division's August 2024 draft strategic plan follows GAO's 13 key practices[2] for managing and assessing the results of federal programs.

In the Draft Report, GAO recommended that addressing some of these key practices could position the New Chemicals Division to better manage and assess the program, and that implementing a systematic performance process could better position NCD to ensure that it achieves program goals, such as improving the timeliness of reviews.

The discussion below describes the significant resource challenges facing NCD and OCSPP, as well as several programmatic, scientific, and transparency-related process improvement efforts we believe GAO should more fully consider in its evaluation.

Resource Shortages:

Amendments to TSCA in 2016 provided EPA with a great deal of new authority and responsibility. Under the amended law, EPA is statutorily required to complete formal risk determinations for 100% of all new chemical submissions, compared to the pre-2016 practice of completing formal risk determinations on only about 20% of such submissions. To accomplish this and other vital additional work required under TSCA, EPA requested $130.7M in the President's Fiscal Year (FY) 2024 Budget. Despite this significant increase in responsibility and our budget request, the budget appropriation OCSPP received has stayed essentially flat. In fact, the program area budget for EPA's TSCA program in the FY 2024 appropriation was reduced by $5 million compared to what was enacted in the FY 2023 budget, with only $78.8M received from Congress in FY 2024. Accordingly, and also because the FY 2024 budget was enacted 6 months into FY 2024, the Agency needed to make difficult choices to ensure that it would be able to continue its work to protect human health and the environment from the risks presented by toxic chemicals. EPA has requested $131.9 million in the President's FY 2025 Budget but will continue to operate at the reduced FY 2024 levels until at least mid-March 2025.[3]

EPA is committed to improving the efficiency and transparency of the TSCA New Chemicals program. However, without significant increased resources for the program, the Agency's progress toward those ends will be limited. Since July 2022, the New Chemicals Program has hired over 20 new staff to fill both new and backfilled roles, however the program continues to have fewer staff to review new chemicals than during the previous Administration. This is because during FY 2020, approximately 16 full time equivalents (FTEs) (-15% of staff working on new chemicals at the time) were diverted to work on overdue existing chemical risk evaluations. In September 2020, OCSPP reorganized and cemented that shift (over the objections of career managers in the Office of Pollution Prevention and Toxics, or OPPT).

Full funding of the President's FY 2025 budget request of $131.9M for the TSCA program would allow for hiring 14 additional new employees to support the new chemicals review process. OCSPP will

[2] GAO, "Evidence-Based Policymaking: Practices to Help Manage and Assess the Results of Federal Efforts," GAO-23-105460 (Washington D.C.: July 12, 2023).
[3] H.R. 10545, the "American Relief Act, 2025" was signed into law by President Biden on December 21, 2024. This Act provides appropriations to Federal agencies through March 14, 2025.

continue to use all available resources and hiring authorities including our Title 42 hiring authority, under which NCD publicly announced a position for an Environmental Health Data Scientist/Engineer in USAJOBS.gov on December 10, 2024.

Full funding would also allow for continued investment in stabilizing and modernizing EPA's information technology (IT) platforms and infrastructure for managing case workflows, reducing or eliminating system downtime. A critical need for improving EPA's performance on TSCA implementation is modernizing the outdated IT systems necessary for chemical data collation, storage, and curation and to make the data received under TSCA readily available in structured and consistent formats. The current legacy infrastructure (hardware and systems software) and application software systems are prone to problems such as latency, screen freezes, virtual desktop interface connectivity outages, disruptions in workflow application and related tools, drive mapping volatility, and wholesale downtime. These problems have resulted in productivity losses across OPPT, where NCD resides. For example, the IT system housing the work done by NCD frequently crashes. In one notable instance in late 2021, the system remained unusable for about two weeks, bringing the program's work to a halt. Making the major investments required to modernize the IT systems supporting TSCA implementation is impossible without sustained increased appropriations in the annual budget.

Full funding would allow more focused review and development of standard operating procedures and science policies to support consistency and efficiency in program implementation. It would mean more time for staff training. It would result in the development of new science through a fully funded collaborative research program with EPA's Office of Research and Development. It would enable staff to increase engagement with stakeholders to improve models and assumptions that feed into our risk assessments. It would enable quicker progress towards the elimination of the backlog and review of new submissions within 90 days.

These resource shortages notwithstanding, under the Biden-Harris Administration, EPA has made real progress, including in timeliness and transparency. In FY 2023, EPA completed 70% more new chemical risk assessments than in FY 2022, and in FY 2024, EPA maintained this increased pace. In FY 2024, EPA completed 501 risk assessments, while there were 434 new chemical submittals that came into EPA. Of particular note, the program completed 49 risk assessments in September 2024 and 42 in October 2024, significantly up from 22 assessments in July 2024 and 32 in August 2024. The program also increased completion of backlogged cases. For example, the FY 2022 static backlog[4] has decreased by 69% since October 1, 2022, and the FY 2023 static backlog[5] has decreased by 64% since October 1, 2023.

Data on the total number of new chemical submissions under EPA review demonstrate meaningful process improvement gains. For the first time in several years, the number of new chemical submissions under EPA review has decreased for each of the last four months (August through November, 2024). To continue to improve upon the efficiencies described above, EPA has already launched programmatic, scientific, transparency-related process, and work culture improvement plans,

[4] The number of FY 2022 and older cases still under review at the beginning of FY 2023.
[5] The number of FY 2023 cases still under review at the beginning of FY 2024.

and has planned additional actions to continue moving cases through the review process efficiently, including:

Programmatic Process Improvements:

- In December 2024, EPA finalized updates to the regulations that govern new chemical reviews to align them with amended TSCA and both increase transparency and speed up reviews. This rule should help prevent delays caused by submitters not understanding the information or level of detail needed by EPA.
- Since July 2022, the New Chemicals Program developed and implemented comprehensive, discipline-specific training plans and mentoring for new staff.
- In June 2023, the New Chemicals Program developed and is now implementing a framework for reviewing and managing new chemical reviews for PFAS. This framework standardizes notice reviews and ensures consistency and quality of assessments. Using the framework, EPA has completed risk assessments for 19 cases.
- While EPA's efficiency focus is not solely limited to specific chemical sectors, the program has achieved demonstratable results with a sector-focused approach. The New Chemicals Program is currently prioritizing review of new chemicals in sectors that support the manufacturing goals of the Inflation Reduction Act (IRA). These notice reviews are completed in about a third of the time of other cases. Prioritized sectors include semiconductors, electric vehicle batteries, and bio-based products including biofuels.
- The New Chemicals Program is revising and refining the methodology for new chemical program risk estimates for petroleum alternative fuels, and will continue use of the streamlined process for petroleum alternative fuels.
- The New Chemicals Program is continuing to use EPA's standardized approach for reviewing mixed metal oxides, which are used for batteries, electric vehicles, semiconductors, and renewable energy generation. Since the launch of the effort in November 2022, EPA has completed 15 risk assessments using the approach.
- The New Chemicals Program is working collaboratively with the semiconductor sector to ensure a predictable regulatory approach for chemistries that rely on photo-acid generators (PAGs) while additional testing is ongoing. Using this approach, EPA has completed reviews for more than six dozen PAGs, some of which were completed in less than 90 days.
- In 2022-2023, the New Chemicals Program conducted a broad industry outreach campaign to reduce late submission of key engineering-related information, which often results in the need for EPA to re-work its assessments and longer review times.
    - Building on this effort, in May 2024, the New Chemicals Program began implementing the use of a checklist for EPA's engineering contractors to proactively reach out to submitters when information needs clarification or supplementation. As a direct result of this outreach, the program has seen improved submissions, benefiting both the Agency and the submitter.
- In 2024, EPA revamped the Significant New Use Rule (SNUR) development process, enabling the New Chemicals Program to issue proposed SNURs for 158 chemicals and final SNURs for 25 chemicals in FY 2024. The program is continuing to implement efficiencies, and in FY 2025 has already issued 74 proposed SNURs and 31 final SNURs.

Scientific and Administrative Activities and Improvements:

- The New Chemicals Program continues to update EPA's standard operating procedures and policies.
    - In January 2024, the New Chemicals Program issued a decision framework related to identifying eye irritation or corrosion hazards, which will help ensure a consistent and transparent approach to this issue and reduce animal testing.
- The New Chemicals Program is collaborating with the Office of Research and Development (ORD) to develop new science to improve new chemical review quality, consistency, and speed and expects to be able to increase the pace of this work.
- The New Chemicals Program established "Tiger Teams" to tackle long-standing science and policy issues that can hold up the finalization of assessments.
- In January 2024, the program led a 2-day workshop and several follow-up meetings with the fragrance sector to resolve scientific issues.

Outreach and Transparency Improvements:

While the New Chemicals Division did not obtain formal input on its strategic plan from external stakeholders, its strategic plan was largely informed by the numerous regular meetings NCD engages in with stakeholders, including industry and industry trade groups, labor unions, non-governmental associations, and law firms. The following are examples of these additional NCD outreach and transparency activities:

- The New Chemicals Program continues to engage with submitters first through pre-notice meetings to ensure accurate initial submissions. NCD received over 500 pre-notice inquiries in FY 2024.
- At the start of the notice review period, companies are assigned a program manager to serve as the primary liaison between the submitter and EPA. The program manager's role includes providing regular, detailed updates to the submitter.
- The New Chemicals Program continues to increase outreach efforts with sectors such as Electric Vehicle Batteries, Semiconductors, and the Fragrance industry to discuss approaches for estimating exposure and releases. In FY 2024, the program participated in dozens of meetings with representatives from these industry sectors -- in addition to the meetings case managers held with individual company submitters on a regular basis. The program also participates in regular meetings with external stakeholders such as industry trade groups, non-governmental organizations, and labor unions to listen to concerns and ideas and answer questions.
- In June 2024, the New Chemicals Program began including completed "rework" risk assessments when reporting monthly statistics on new chemical reviews, so that stakeholders have increased transparency of EPA's workload.
- In June 2024, EPA created the New Chemicals Division Reference Library, an index of EPA documents related to the new chemicals program to make it easier for the public to find documents all in one place online. This material is available at https://www.epa.gov/reviewing-new-chemicals-under-toxic-substances-control-act-tsca/new-chemicals-division-reference.

Work Culture Improvements:

As you may be aware, on September 17, 2024, EPA's Office of Inspector General (OIG) released five reports about whistleblower complaints[6] related to events in the new chemicals program that began a couple of years after the 2016 TSCA amendments were enacted. These events stemmed from the intense pressure that the previous administration's political leadership placed on both career managers and scientists in EPA's new chemicals program to more quickly review and approve new chemicals. The OIG's independent reports also cite the failure to provide additional resources for the increased workload in the new chemicals program that resulted when TSCA was amended, and cite career staff and managers' descriptions of meeting the statutory deadlines as "ridiculous" and "somewhat impossible" in the absence of additional resources. The career staff and managers also described the pressure to speed reviews that was imposed by the previous political leadership as "intense," "pushing us like animals on a farm," and saying that career managers needed to "have a "firm hand" [on career staff] and push timelines."

Since the beginning of the Biden-Harris Administration, when the current leadership of OCSPP was first made aware of these issues, OCSPP has worked to restore scientific integrity to the core of our mission to protect the environment and public health. In doing so, OCSPP also committed to protecting employees' rights to make whistleblower disclosures, while fostering an environment where people are empowered to share differing scientific opinions. OCSPP now conducts annual refresher training on both scientific integrity and the Whistleblower Protection Act for all OCSPP managers. OCSPP leadership has also actively cooperated with and aided the OIG efforts to resolve allegations raised about past events that occurred within the new chemicals program.

As a result, OCSPP's work environment has been transformed in recent years, including in the new chemicals program. As noted in the Draft Report, OCSPP's efforts to support its staff have resulted in year-over-year increases in positive responses to key questions in the Federal Employee Viewpoint Survey (EVS). Broadly, for the third year in a row, the OCSPP scores are among the highest ever. This is in sharp contrast to the EVS results in 2020, when only 33% of employees who worked in the predecessor division to the New Chemicals Division said they could disclose a suspected violation of any law, rule, or regulation without fear of reprisal. In 2023, that number jumped to 63% of New Chemicals Division employees, while 100% of respondents in NCD also indicated that their supervisor treated them with respect. In 2022, 2023 and 2024, the 10 highest percent positive results for NCD included: "My supervisor treats me with respect" and "My supervisor holds me accountable for achieving results."

Conclusion:

As has been outlined above, EPA has taken numerous actions to try to meet its New Chemical review deadlines and has seen demonstrable improvement within the limits of the resources that have been provided within the last 4 years. However, the historic underfunding of the program -- coupled with the recent budget cuts that have been put in place -- will limit OCSPP's ability to make further

[6] See https://www.epaoig.gov/reports/administrative-investigation/report-investigation-whistleblower-reprisal-investigation

improvements. That means EPA can, at best, only maintain the current pace of reviews and other activities and cannot fully achieve Congress' intent under the revised law.

While there is always more EPA can do to improve our effectiveness and work environment, including improvements to strategic planning, I am incredibly proud of the important progress that OCSPP has already made to make the New Chemicals Division a more effective and efficient organization with a collaborative and supportive environment for career staff.

GAO Recommendations:

Recommendation 1:

- The Administrator of EPA should direct the Assistant Administrator of OCSPP to ensure that NCD, as it finalizes its strategic plan, addresses relevant key practices for managing and assessing the New Chemicals Program including involving stakeholders and identifying resources.

Recommendation 2:

- The Administrator of EPA should direct the Assistant Administrator of OCSPP to ensure that NCD implements a systematic process that aligns the division's performance management approach with key management and assessment practices.

EPA Response:

EPA agrees with Recommendation 1.

- OCSPP appreciates that GAO's Draft Report, specifically Figure 2, provides a structural framework for constructing the NCD strategic plan to demonstrate how our operations conform to the 13 key management practices identified by GAO. NCD is targeting Spring 2025 to finalize its strategic plan. As OCSPP finalizes the plan, NCD will utilize GAO's framework to address relevant key practices, including involving a range of internal and external stakeholders and identifying resources to assist NCD in identifying and prioritizing the program's evidence needs. NCD is considering different options for engagement with key stakeholders without detracting from completing casework.

EPA agrees with Recommendation 2.

- OCSPP appreciates GAO's recognition in Figure 4 of the Draft Report, that NCD "generally follows" or "partially follows" several critical key management practices, notably: demonstrating leadership commitment, promoting accountability, defining goals, identifying strategies and resources, involving stakeholders and assessing the environment. Resources permitting, NCD will build upon this progress and develop a systematic process that aligns the division's performance management approach with GAO's other key management and assessment practices, such as assessing and building evidence, using evidence, and building and maintaining capacity.

Thank you for the opportunity to review the Draft Report. If you have questions or need further information, please reach out to Janet L. Weiner, OCSPP's Senior Audit Liaison at weiner.janet@epa.gov.

Sincerely,

MICHAL FREEDHOFF Digitally signed by MICHAL FREEDHOFF Date: 2024.12.31 10:04:29 -05'00'

Michal I. Freedhoff, Ph.D.
Assistant Administrator

cc: EPA GAO Liaison Team
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Appendix IV: GAO Contact and Staff Acknowledgments

GAO Contact

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Staff Acknowledgments

In addition to the contact named above, the following staff members made key contributions to this report: Diane Raynes (Assistant Director), William Colwell (Analyst in Charge), Mark Braza, Steven Flint, Frank Garro, Cory Gerlach, Michael Hoffman, Erik Kjeldgaard, Barbara Lancaster, Benjamin Licht, Matt McLaughlin, Amanda Miller, Abinash Mohanty, Dan Royer, Robbie Skinner, and Linda Tsang.

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american cleaning institute®

January 22, 2025

The Honorable Brett Guthrie
U.S. House of Representatives
2161 Rayburn House Office Building
Washington, D.C. 20515

The Honorable Frank Pallone
U.S. House of Representatives
2107 Rayburn House Office Building
Washington, D.C. 20515

The Honorable Morgan Griffith
U.S. House of Representatives
2209 Rayburn House Office Building
Washington, D.C. 20515

The Honorable Jan Schakowsky
U.S. House of Representatives
2508 Rayburn House Office Building
Washington, D.C. 20515

Dear Chairman and Ranking Member,

The American Cleaning Institute (ACI)[i] appreciates the opportunity to provide this letter for the record for the House Energy and Commerce Committee hearing titled *A Decade Later: Assessing the Legacy and Impact of the Frank R. Lautenberg Chemical Safety for the 21st Century Act*.

ACI is excited to be a partner and a resource to the Committee, the US Environmental Protection Agency (EPA), and other stakeholders as we collectively work to implement and enhance the Toxic Substances Control Act (TSCA). We have long advocated for a regulatory framework, which the Lautenberg Act provides, that is balanced and science-based in order to promote innovation and ensure chemical safety while maintaining a competitive and sustainable industry.

It is critical for the EPA to provide predictability, consistency and transparency in determining new chemical reviews. ACI member companies have experienced significant delays and restrictions with the EPA's Pre-manufacture Notice (PMN) and Significant New Use Notice (SNUN) review process. This has caused a bottleneck in innovation, hindering advancements in public safety and environmental protection; new chemistries could replace existing chemicals by using improved manufacturing and processing techniques that reduce risk, exposure, and energy use.

On behalf of the entire cleaning product industry, we thank you for your leadership on chemical safety. Chemical innovation forms the foundation of most products in society and is key to a growing, vibrant, and sustainable economy, including job creation. ACI stands ready to work with the Committee and EPA staff to implement a chemical management process that supports American innovation and benefits U.S. consumers and international business competitiveness.

Sincerely,

Blake Nanney
Director, Government Affairs
BNanney@cleaninginstitute.org

[i] ACI represents the approximately $60 billion U.S. cleaning product supply chain. ACI members include the manufacturers and formulators of soaps, detergents, and general cleaning products used in household, commercial, industrial and institutional settings; companies that supply ingredients and finished packaging for these products; and chemical distributors. ACI serves the growth and innovation of the U.S. cleaning products industry by advancing people's health and quality of life and protecting our planet. ACI achieves this through a continuous commitment to sound science and being a credible voice for the cleaning products industry.

U.S. Chamber of Commerce

1615 H Street, NW
Washington, DC 20062-2000
uschamber.com

January 22, 2025

The Honorable Brett Guthrie
Chairman, Committee on Energy and Commerce
U.S. House of Representatives

The Honorable Morgan Griffith
Chairman, Subcommittee on Environment
U.S. House of Representatives

Subject: Addressing Delays and Inefficiencies in the EPA's New Chemicals Program under TSCA

Dear Chairman Guthrie and Chairman Griffith:

The domestic production of chemicals is critical to U.S. economic growth, global competitiveness, and the development and advancement of transformative technologies. The business of chemistry drives the innovation that Americans depend on every day, from computer chips and medicines to infrastructure and energy. That is why the Frank R. Lautenberg Chemical Safety for the 21st Century Act was intended to modernize TSCA by ensuring timely and science-based decisions. We believe the USEPA's current approach to implementing the law, however, has led to significant delays, inefficiencies, and regulatory uncertainty that undermine both congressional intent and American innovation.

As the Subcommittee on Environment convenes to assess the legacy and impact of the Act, the U.S. Chamber of Commerce offers the following observations of how the EPA's inability to meet its statutory obligations under TSCA Section 5 threatens the chemical sector's ability to deliver innovative solutions .

Challenges

1. **Missed Statutory Deadlines**:
    - As of October 2024, more than 94% of the 415 chemicals under review have exceeded the 90-day deadline, with many pending review for more than a year.
    - EPA circumvents deadlines by pressuring manufacturers to agree to "voluntary" clock suspensions, effectively making the process unpredictable and non-compliant with TSCA's requirements.
2. **Inefficiencies and Resource Mismanagement**:
    - Despite increased appropriations and fees, EPA has reduced determinations, eliminated beneficial programs like Sustainable Futures, and expanded the scope of reviews beyond "reasonably foreseen conditions of use."

- Submitters report that EPA disregards industry-provided data, relying instead on internal models that are neither transparent nor available for industry review.

3. **Overly Conservative Assessments and Overuse of Restrictions**:
    - EPA frequently imposes excessive restrictions, including consent orders and significant new use rules (SNURs), deterring downstream users and hindering commercialization.
    - One concerning example is the exclusion of submitter-provided data on Personal Protective Equipment (PPE) in risk evaluations, despite its importance in real-world safety measures.

Broader Impacts on Innovation and Economic Competitiveness

These challenges extend beyond regulatory inefficiency to broader economic and innovation concerns. The chemical sector is at the heart of transformative innovations that drive the U.S. economy and address global challenges. Examples include advanced materials for renewable energy, lightweight composites for transportation, and development of ever-more efficient and sustainable chemical processes. Recent analyses highlight the critical role of innovation in enhancing the chemical industry's resilience and securing its position as a leader in global markets. Delayed reviews and regulatory uncertainty erode these opportunities, forcing businesses to shift resources abroad or abandon projects altogether.

Additionally, the U.S. chemical industry benefits from a unique energy advantage that supports domestic production and global competitiveness. Regulatory inefficiencies risk undermining this advantage, making it more difficult for companies to capitalize on favorable energy costs and driving investment toward regions with more predictable regulatory frameworks.

Proposed Solutions

To address these challenges, we respectfully request that the Committee:

1. **Hold EPA Accountable to Statutory Deadlines**:
    - Reinforce the importance of adhering to the 90-day determination period mandated by TSCA Section 5, providing manufacturers with the certainty needed for innovation and investment.
2. **Improve Program Efficiency**:
    - Direct EPA to streamline the PMN process by:
        - Evaluating only "reasonably foreseen conditions of use" as required by statute.
        - Using submitter-provided data as the primary basis for evaluations and allowing submitters to respond to EPA data.

    - Restore programs like Sustainable Futures that support small and medium-sized businesses in compliance efforts.
3. **Limit Overreach in Risk Evaluations**:
    - Ensure EPA evaluates chemicals based on realistic marketplace use, limiting the overuse of consent orders and SNURs to only necessary cases.
    - Reintegrate the consideration of PPE data in risk evaluations to ensure regulatory decisions are grounded in science and practicality.
4. **Allocate Resources with Conditions**:
    - Provide additional funding for the New Chemicals Program, contingent on EPA implementing process improvements, enhancing transparency, and meeting performance metrics.

Call to Action

EPA's current practices are restricting innovation, deterring investment, and forcing businesses to explore more predictable regulatory environments. This is not only a loss for the chemical sector but for the broader economy, as innovation in this industry underpins advancements in countless others, from energy and housing to healthcare and transportation. To maintain U.S. leadership in chemical innovation and ensure a sustainable, competitive future, it is imperative that EPA fulfill its obligations under TSCA in a timely, efficient, and transparent manner.

We appreciate your leadership in addressing these critical issues. Please let us know if additional information or testimony would be helpful.

Sincerely,

U.S. Chamber of Commerce

March 7, 2022

The Truth About Dangerous Chemicals In Solar Panels

By admin | Solar Maintenance, Technology

In 1839, a French physicist, Edmond Becquerel, discovered the photovoltaic effect, which produces a voltage or electric current when exposed to light or radiant energy. Since then, he has inspired other scientists and mathematicians to continue his work.

Notably, a French mathematician, Augustin Mochot, began registering patents for solar-powered engines in 1860. American innovators started filing for patents for solar-powered devices in 1888.

Fast-forward to 2022, and solar-powered devices are more popular than ever with environmentalists and clean energy activist groups all over social media. Utilizing the mighty sun's power to harness clean and free energy while alleviating the effects of climate change – sounds great, doesn't it?

Solar Panels: Are They A Health And Environmental Hazard

With all the seemingly amazing things that solar power offers, why hasn't solar energy replaced the current energy status quo? Here's why.

Current Global Solar Energy Situation

At the end of 2021, the top three countries that use solar power are China, with 35.6 % of the world's total solar energy, the U.S. with 10.6%, and Japan with 9.4%. Coincidentally, these three are also in the world's top 5 largest electricity consumers.

China is the undisputed leader in solar installations, with over 35% of global capacity. What's more, the country is showing no signs of slowing down. It has the highest number of wind and solar projects pending, which are expected to add another 400,000MW to its clean energy capacity.

Following China from a distance is the U.S., which recently surpassed 100,000MW of solar power capacity after installing another 50,000MW in the first three months of 2021. Annual solar growth in the U.S. has averaged an impressive 42% over the last decade.

Policies like the Federal solar investment tax credit, which offers a 26% tax credit on residential and commercial solar systems, have helped propel the industry forward.

Germany, India, and Italy are next with 7.5%, 5.5%, and 3% respectively.

These six countries saw solar power as the best alternative to reduce their conventional electricity use. Consequently, this makes them the world's largest contributors to solar power-related waste.

There are factors limiting solar installations.

> Limitations of production. Nearly all solar panels being made are being sold before they are even manufactured. Manufacturing companies are producing solar panels almost as fast as they can be installed.
> Lobbying by energy companies. Power companies that own coal, oil, and natural gas power plants stand to lose money if consumers install solar and thus generate their own power, so they have organized extensive lobbying against solar. They suggest solar panels contain dangerous chemicals and that solar panels cause pollution.

What Are Solar Panels Actually Made Of?

In 2018, Michael Shellenberger wrote an article for Forbes Magazine with the question: "If Solar Panels Are So Clean, Why Do They Produce So Much Toxic Waste?" Which immediately begged the question: What are solar panels made of? Note that the author of that article is a nuclear power lobbyist.

Solar panels are made with PV (photovoltaic) cells of silicon semiconductors that absorb sunlight and create an electric current. 95% of all photovoltaic cells are made entirely of Silicon, an element so common that it makes up 27.7% of the entire Earth's crust and is the second-most abundant element we have (second only to Oxygen).

Aside from regular PV cells, PV thin films are also used in solar panel manufacturing. These films are made of the following:

- Copper Indium Gallium Diselenide (CIS/CIGS)
- Cadmium Telluride (CdTe)
- Amorphous Silicon (a-Si)
- Cadmium Hallium (di)Selenide
- Hexafluoroethane
- Lead
- Polyvinyl Fluoride

The materials used in making thin film solar panels can be toxic. These toxic chemicals are introduced into the environment in two stages of a solar panel's lifespan – production and disposal. During production, these chemicals are gathered, manipulated, heated, cooled, and a plethora of other processes which involve human beings in every step. Not to mention the exhaust gasses that factories spew into the atmosphere.

However, all residential and commercial solar installations happening today are done with silicon cells, which contain no toxins.

At the end of a solar panel's life-cycle, solar panels are taken to recycling plants to be broken down and scrapped for recyclable materials. The aluminum frames and trace elements of silver are the most valuable components. When standard silicon-photovoltaic-cell solar panels are broken apart there are no major toxic chemicals released into the environment.

According to solar power experts, solar panel recycling efforts are dramatically increasing and will explode with full force in two or three decades and improve the ease of recycling solar panels. The reality is that there are now many companies who understand how to recycle solar panels, and this number will get larger, expanding as rapidly as the PV industry grew ten years ago.

One nuclear power proponent, Jack Dini, argued that solar power creates more toxic waste and pollution per unit of energy than nuclear power plants. His book, "Challenging Environmental Mythology", argues for nuclear power, but fails to emphasize that all 3 new-age energy sources: solar, wind, and nuclear all produce dramatically less pollution than coal and oil energy.

Experimental thin-film solar substrates are still considered by many to be dangerous. “Contrary to previous assumptions, pollutants such as lead or carcinogenic cadmium can be almost completely washed out of the fragments of solar modules over several months, for example, by rainwater, making it possible for different bodies of water to be contaminated.”

These chemicals don’t appear in modern aluminum-frame solar panels.

Recycling has begun to solve this problem, with more and more companies offering recycling.

ROSI Solar, a French startup founded in 2017, recently announced plans to build a new recycling plant in Grenoble, France. Yun Luo, ROSI’s CEO, says the company has developed a process to extract the silver, silicon, and other high-value materials from used panels. The plant should open before the end of 2022 with a contract from Soren, a French trade association.

The International Renewable Energy Agency (IRENA) in 2016 estimated there were about 250,000 metric tonnes of solar panel waste to be recycled at the end of that year. IRENA projected that this amount could reach 78 million metric tonnes by 2050.

Where Do We Go From Here?

To start powering your home with solar (in the US), an average residential 5kW size system costs between $3 and $5 per watt, according to the CSE (Centre for Sustainable Energy), which results in the $15,000 to $25,000 range. That’s just for installation. Solar energy is cheaper in the long run, but many people are apprehensive about the initial investment.

A solar panel is a sandwich of thin silicon solar cells insulated on one side by plastic and the other side by glass, all held together by a sturdy aluminum frame. The back of the solar panel contains a junction box with wiring that channels the electricity into a positive and negative output.

When being recycled, the solar panels aluminum frame is easiest to recycle. Recycling companies take off the panel frame and the junction box to recover the aluminum and copper, which are some of the most commonly recycled materials in the world. The rest of the module can then either be re-tested and re-used in other solar panels, or crushed to make an impure crushed glass powder.

Recycling has also become mandatory in some areas.

“If we don’t mandate recycling, many of the modules will go to landfills,” said Arizona State University solar researcher Meng Tao, who authored a paper reviewing the recycling of silicon solar panels.

In addition to developing better recycling methods, the solar industry has started repurposing solar panels and reusing them in areas where available space is less at a premium.

One company called Recycle PV Solar recertifies and then resells the recycled solar panels it receives after testing them to ensure they are in good condition. Sam Vanderhoof, its CEO, says this helps to offset the cost of recycling. Some solar panels are also making their way overseas to poorer countries to generate electricity where any amount of electricity can be an improvement over current access.

It is estimated that taking apart your average 72-cell silicon solar panel can get $5-$10 for the aluminum, copper, and glass alone. They can fetch more if they are simply reused elsewhere.

Solar panels can fail over time, typically as a result of the silicon cells breaking down or the wiring connections inside breaking down after decades of exposure to the elements. But most manufacturers offer warranties on the output of their solar panels for as long as 25 years.

The solar recycling industry is growing and is being supported by policies and regulations. In the EU producers of solar panels also finance the recycling of solar panels. Lawmakers and solar manufacturers have recognized that recycling benefits the solar industry and the ecosystem.

Other Alternative Energy Sources

Aside from solar, other methods of generating alternative energy have been around for years. These methods include wind turbines, hydroelectric plants, geothermal energy, biofuel, and biomass. Each alternative power source finds it opponents.

Wind power takes up large amounts of skyline, and some people find them ugly to look at. Biomass and biofuels typically use corn crops that could otherwise be used as food. Nearly 50% of our corn crops go to produce corn ethanol.

Wind turbines are spun by the wind to generate power, hydroelectric plants are powered by water, biomass use existing organic waste to create thermal energy which is then converted to power. These alternatives are still being developed and have their own side effects.

Takeaway

Manufacturers making new Tier 1 solar panels use almost entirely non-toxic chemicals, meaning that you don’t need to search for non-toxic solar panels to expect them to be used in your project. Even factoring in emissions caused during the manufacture of solar panels, solar is still about 100 times less polluting than coal and 50 times less polluting than natural gas.

Solar power is now the most ecologically friendly option when it comes to generating energy, second only to wind power. But solar doesn't require huge swaths of land and can be installed to be nearly invisible on open land. By switching to solar today all of us can contribute to making the world a healthier place to live.

TAGS Solar Maintenance, Technology

PFAS

PFAS waste from solar panels: ‘This is something that people in the sector don’t like to talk about’

Solar panels may very well save the planet. But the way they’re being produced and disposed of right now is seriously hurting the environment. Thousands of tons of PFAS waste are put in landfills each year — and the sector has no idea how to deal with it.

Published on 03 Jul 2024

Harnessing the sun's energy will be one of the most important measures to save our planet — and solar panels have a key role to play. But as we turn to solar power to combat the climate crisis, a troubling issue emerges.

The vast majority of solar panels currently use toxic and highly persistent PFAS chemicals in the outer layer to ensure durability. In 2022, the market share for PFAS materials in these outer layers was close to 80%, while PFAS-free alternatives accounted for only one-fifth.

> "Most of these products have no characteristic for recycling"
>
> *Huib van den Heuvel, Chief Commercial Officer at Solarge*

But the real problem of PFAS in solar panels is yet to be seen.

"Most of these products have no characteristic for recycling or other circular use of the materials", says Huib van den Heuvel, Chief Commercial Officer at Solarge, a Dutch solar energy company.

PFAS in solar panels is a waste issue

This means that old solar panels become waste that needs to be dealt with. In Europe, they are incinerated when they reach end-of-life after 25–30 years, which is not ideal since it releases harmful chemicals like PFAS into the atmosphere.

However, the European market for solar panels is tiny, accounting for only 2% of the total share. In the rest of the world, old solar panels instead end up in landfills, where toxic PFAS are allowed to leach into soil and groundwater, posing significant risks to human health and wildlife.

“This is something that people in the sector do not like to talk about. There is a kind of system for collecting all this waste, but we’re not really re-using the material; we’re basically just getting rid of it. This is something not many end users know. Those who have been in the business for a long time find ways to deal with it by managing the risks, but it is not really taking care of the problem; it’s more taking care of one’s own interests”, continues Huib van den Heuvel.

Dr. Jonatan Kleimark, Head of Market Transition at ChemSec, comments:

> “PFAS contamination is a serious issue that needs immediate attention”
>
> *Dr. Jonatan Kleimark, Head of Market Transition at ChemSec*

“The focus has been on promoting solar energy as a clean alternative, but we can’t ignore the environmental impact of the materials used to make the solar panels. PFAS contamination is a serious issue that needs immediate attention”.

Safer alternatives are available

But despite these challenges, there is hope on the horizon.

There are safer PFAS-free alternatives on the market that fulfil all the necessary criteria. Traditional PET-based outer layers have been used for more than 15 years and are readily available from the main suppliers. New innovations are also constantly being developed, many of which are designed to be recycled.

These safer alternatives represent a way for the solar industry to keep its green reputation. Only by facing the PFAS problem directly can solar energy fully benefit the planet without contributing to the chemical pollution crisis.

Related news

2022 TRI National Analysis

Introduction to the 2022 TRI National Analysis

Industries and businesses in the U.S. use many chemicals to make the products we depend on, such as pharmaceuticals, computers, paints, clothing, and automobiles. While most chemicals on the Toxics Release Inventory (TRI) chemical list are managed by facilities in ways that minimize releases into the environment, releases still occur as part of normal business operations.

It is your right to know what TRI chemicals are being used in your community, how the chemical waste is managed—including through environmental releases—and whether these quantities have changed over time.

The TRI tracks how industries manage certain toxic chemicals. Information facilities report each year to EPA provides insights into how chemicals are managed by facilities conducting industrial activities such as manufacturing, metal mining, generation of electric power, and hazardous waste management. TRI data are publicly available. For calendar year 2022, more than 21,000 facilities reported to the TRI Program.

Each year, in support of its mission to protect human health and the environment, EPA analyzes the most recent TRI data, conducts comparative analyses with TRI data for previous years, and publishes its findings in the TRI National Analysis. Check out the Catalog of Applied TRI Data Uses to learn more about how EPA and others have used TRI data.

TRI Reporting

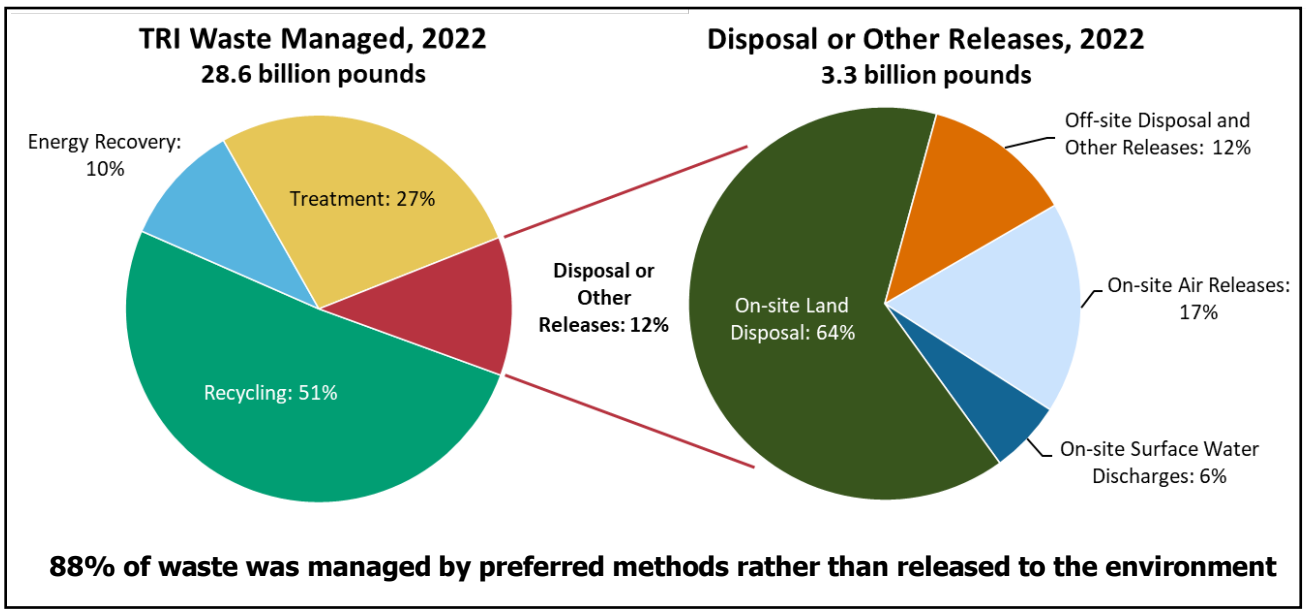
Under Section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA) and Section 6607 of the Pollution Prevention Act (PPA), facilities that meet TRI reporting requirements must report details about their pollution prevention and waste management activities—including releases—of TRI-listed chemicals that occurred during the calendar year by July 1 of the following year.

Watch a short video about the TRI Program and your right to know.

Overview of the 2022 TRI data

The two pie charts below summarize the most recent TRI data: the chart on the left shows the total amount of TRI chemical waste managed through recycling, energy recovery, treatment,

and disposal or other releases. The chart on the right shows the proportions of TRI chemical waste released to air, water, and land, and transferred off site for disposal.



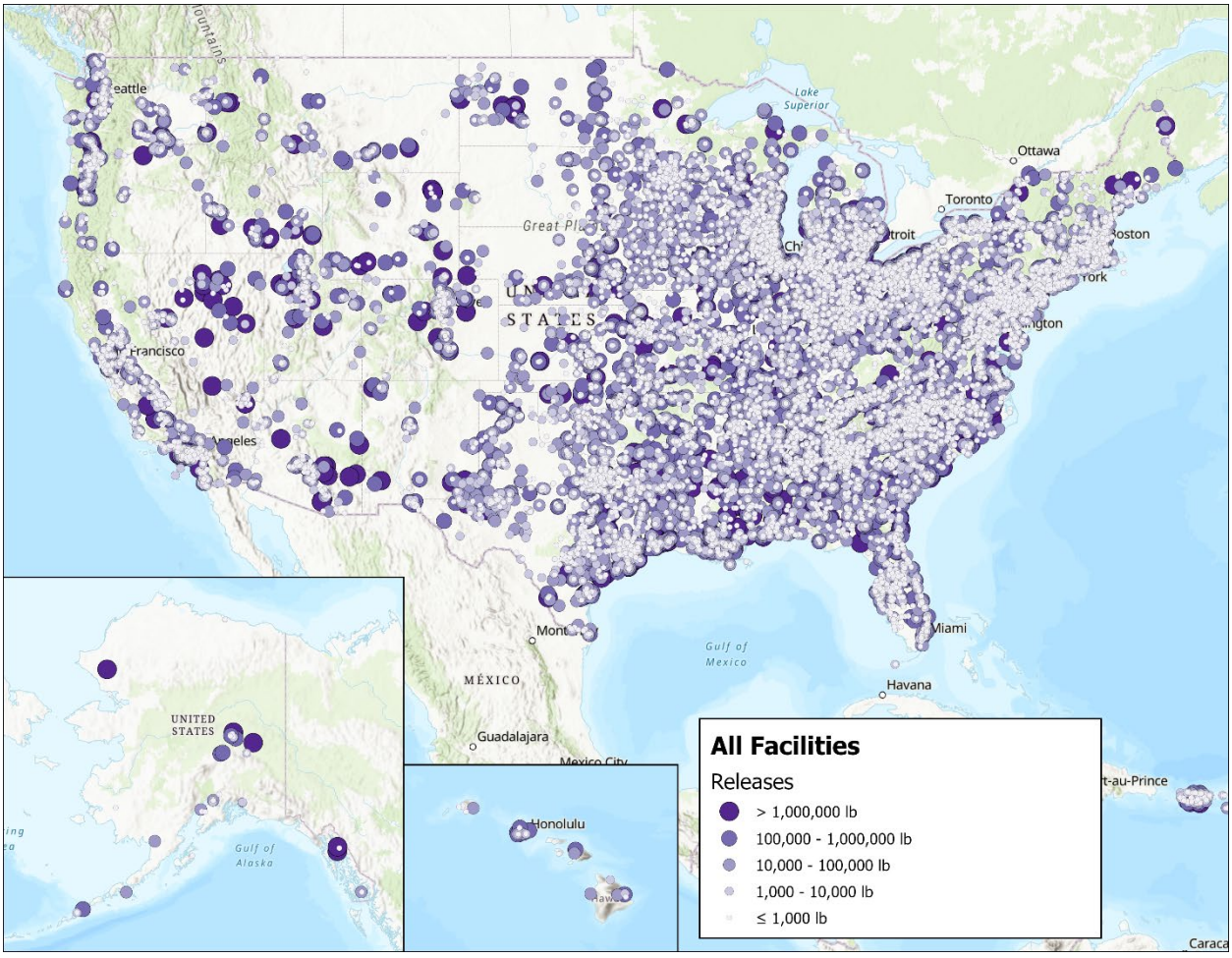
Note: 1) Percentages do not sum to 100% due to rounding. 2) To avoid double counting, the Disposal or Other Releases pie chart on the right excludes quantities of TRI chemicals that are transferred off site from a TRI-reporting facility and subsequently released on site by a receiving facility that also reports to TRI.

- Facilities reported managing 28.6 billion pounds of TRI-listed chemicals as waste during 2022. Waste managed is the quantity of TRI chemicals in waste resulting from routine operations. Facilities manage this waste through recycling, combustion for energy recovery, treatment, and disposing of or otherwise releasing the waste into the environment.
- Of this total, 88% was recycled, combusted for energy recovery, or treated, while 12% was disposed of or otherwise released into the environment.
- For TRI chemicals in waste that were disposed of or otherwise released, facilities report the quantities of these releases and whether the releases were to the air, water, or land. Most releases of TRI chemicals occur on site at facilities. However, waste containing TRI chemicals may also be shipped off site for disposal, such as to a landfill. As shown in the pie chart on the right, most TRI chemical waste was disposed of to land, which includes landfills, underground injection, and other land disposal practices.

What's new in TRI for 2022?

- The TRI Program expanded coverage of the natural gas processing sector to include all natural gas processing facilities that receive and refine natural gas. In prior years, only natural gas processing facilities that primarily recovered sulfur from natural gas were required to report. For 2022, 305 facilities in the sector reported managing 115 million pounds of TRI chemicals as waste, most of which (89 million pounds) were released.
- EPA extended TRI reporting requirements to cover certain contract sterilization facilities that use ethylene oxide. These facilities collectively reported releasing 9,166 pounds of ethylene oxide into the air in 2022.
- Four per- and polyfluoroalkyl substances (PFAS) were added to the TRI chemical list. To learn more, see the PFAS Chemical Profile.
- For the complete list of changes to the TRI reporting requirements for 2022, see the 2022 TRI Reporting Forms and Instructions.

Where are the Facilities that Reported to TRI for 2022 Located?



View Larger Map

TRI Data Considerations

As with any dataset, there are multiple factors to consider when reviewing results or using Toxics Release Inventory (TRI) data. Key factors associated with the data presented in the TRI National Analysis are summarized below; for more information see *Factors to Consider When Using Toxics Release Inventory Data*.

- **Covered chemicals and sectors:** TRI does not include information from all facilities or industry sectors that may manage TRI chemicals in waste, nor does it cover every chemical manufactured, processed or otherwise used by facilities in the United States. The complete TRI chemical list and a list of the sectors covered by the TRI Program are available on TRI's GuideME website.
- **Reporting thresholds:** Facilities in covered sectors that manufacture, process, or otherwise use TRI-listed chemicals above listed threshold quantities within a calendar year and employ at least ten full-time equivalent employees are required to report to the TRI Program. For most TRI chemicals, the threshold quantities are 25,000 pounds of the chemical manufactured or processed, or 10,000 pounds of the chemical otherwise used during a calendar year.
- **TRI trends**: The TRI National Analysis presents trends for the last ten years (2013-2022). While the TRI chemical list has changed since 2013, the quantities of the newly added chemicals released account for less than 0.1% of national totals. To simplify the trend presentations and to enable reproducibility, all chemicals are included in the trend figures, including those that have not been on the TRI chemical list for all ten years of the trend.
- **Risk:** TRI data can be a useful starting point to help evaluate whether chemical releases may pose potential risks to human health and the environment. However, the quantity of a chemical release alone is not necessarily an indicator of exposure to the chemical, or the potential health or environmental risks posed by the chemical. Note that:
    - Chemicals on the TRI list vary in toxicity; and

TRI Reporting is Required

TRI reporting is required for facilities that meet the reporting criteria under Section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA). EPA investigates cases of EPCRA non-compliance and may issue civil penalties, including monetary fines. Since the TRI Program's creation, EPA has taken more than 3,500 TRI-related enforcement actions. For more information, see the TRI Compliance and Enforcement webpage.

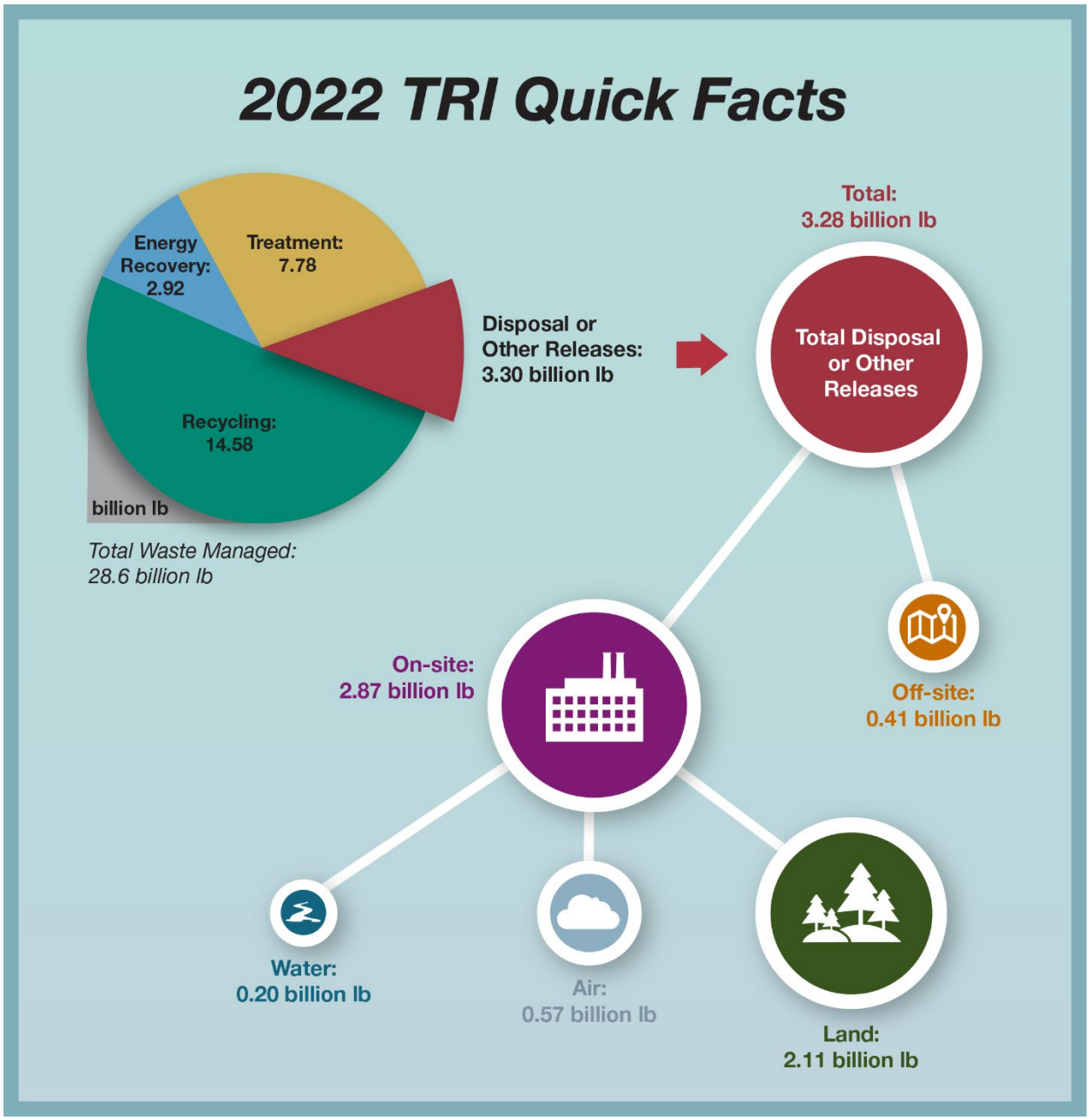
  - The extent of exposure to a chemical depends on many factors such as where the chemical is released, how it is released (i.e., into the air, water, or land), the chemical's properties, and what happens to the chemical in the environment.
  - For more information on the use of TRI data in exposure and risk evaluations, see the TRI and Estimating Potential Risk webpage and Potential Risks from TRI Chemicals in the Releases section.

- **Data quality:** Facilities use their best available data to determine the quantities of chemicals they report to TRI. Each year, EPA conducts an extensive data quality review that includes contacting facilities about potential errors in reported information. This data quality review process helps ensure that the TRI National Analysis is based on accurate and complete information.
- **Data presentation:** The National Analysis is intended to convey key messages from the TRI data submitted by facilities. At times, the National Analysis may simplify certain technical details when they don't have a significant impact on the information presented.
- **Late submissions, revisions, and withdrawals:** TRI reporting forms submitted to EPA or revised after the July 1 reporting deadline may not be processed in time to be included in the National Analysis. After EPA's data quality review, the TRI data are frozen in October and this dataset is used to develop the National Analysis. Any revisions, late submissions, or withdrawals made after this date are not reflected in the National Analysis but are incorporated into the TRI dataset during the spring data refresh and will be reflected in the next year's National Analysis.

Impact of Late Submissions and Revisions on the National Analysis

EPA compared the data released in October 2022 and used for the 2021 National Analysis to the updated version of these data released in October 2023. This allowed EPA to assess how late submissions and revisions to submitted data might have changed the information presented in the 2021 National Analysis, had they been included in the dataset. National waste management and release quantities were 0.1% and 1.5% different, respectively, than what was shown in the 2021 National Analysis.

Quick Facts for 2022



In this figure, the value for "Disposal or Other Releases" in the waste managed pie chart (3.30 billion lb) is greater than the value for "Total Disposal or Other Releases" (3.28 billion lb). There are several reasons why these quantities differ slightly, including:

- **Double counting:** Total disposal or other releases (the 3.28 billion pound value in the figure) removes "double counting" that occurs when a facility reports transfers of TRI chemicals in waste to another TRI-reporting facility. For example, when Facility A transfers a chemical off site for disposal to Facility B, Facility A reports the chemical as

transferred off site for disposal while Facility B reports the same chemical as disposed of on site. In processing the data, 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 waste managed metric in TRI, 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 includes both the off-site transfer and the on-site disposal. Typically, double counting accounts for most of the difference between the two release quantities shown in the TRI Quick Facts figure.

- **Non-production related waste managed**: Non-production-related waste refers to TRI chemical waste that results from one-time events, remedial actions, catastrophic events, or other events rather than standard production activities. Facilities typically report managing these waste quantities as on-site releases or transfers off site which are included in a facility's total disposal or other releases but not in the overall total for waste managed.

For more information on TRI, the chemicals and industry sectors it covers, the reporting requirements, and to access TRI data, visit the TRI website.

Pollution Prevention

Pollution prevention, also known as "P2" or "source reduction," is any practice that reduces or eliminates pollution at its source prior to waste management. With less waste being created, the likelihood of impacts to human health and the environment is reduced. Additionally, it is often less expensive for facilities to prevent pollution from being created than to pay for control, treatment, or disposal of wastes.

Under the Pollution Prevention Act of 1990 (PPA), facilities that report to the Toxics Release Inventory (TRI) Program are required to include information on any newly implemented P2 activities. Many facilities also choose to include additional details that further describe their P2 actions. As a result, TRI serves as a robust tool for identifying effective P2 practices and highlighting pollution prevention successes.

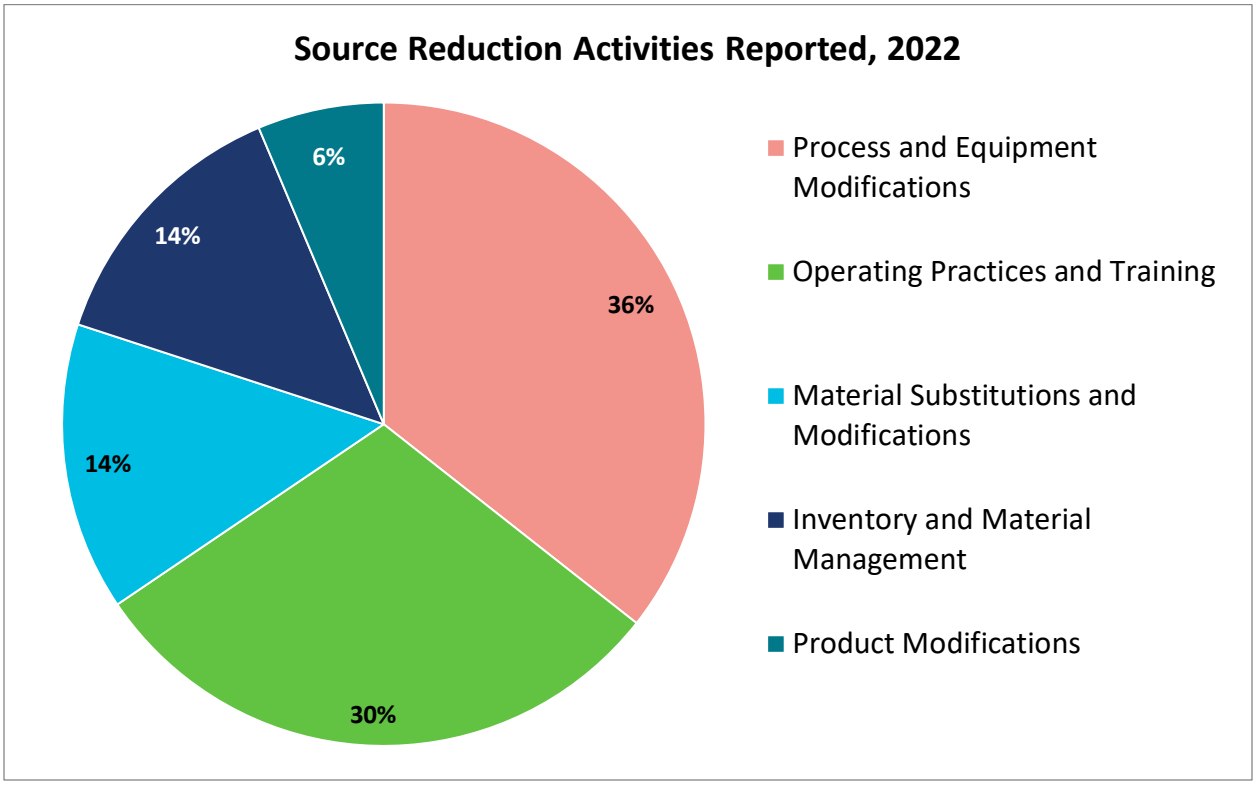
2022 Highlights

- TRI facilities implemented 3,589 new source reduction activities.
- Facilities implemented source reduction activities for almost 200 different chemicals.

As with any dataset, there are many factors to consider when using TRI data. Find a summary of key factors associated with the data used in the National Analysis in the Introduction. For more information see *Factors to Consider When Using Toxics Release Inventory Data*.

Source Reduction Activities

Facilities are required to report any source reduction activities that they initiated or completed during the reporting year to TRI. Source reduction information can help facilities learn from each other's best practices and potentially lead to better environmental stewardship and implementation of more P2 actions. When reporting source reduction activities to TRI, facilities choose from 24 codes that describe the activities they implemented. These codes are grouped into the five categories shown in the graph below. EPA's recent analysis Measuring the Impact of Source Reduction shows the efficacy of different types of source reduction activities.

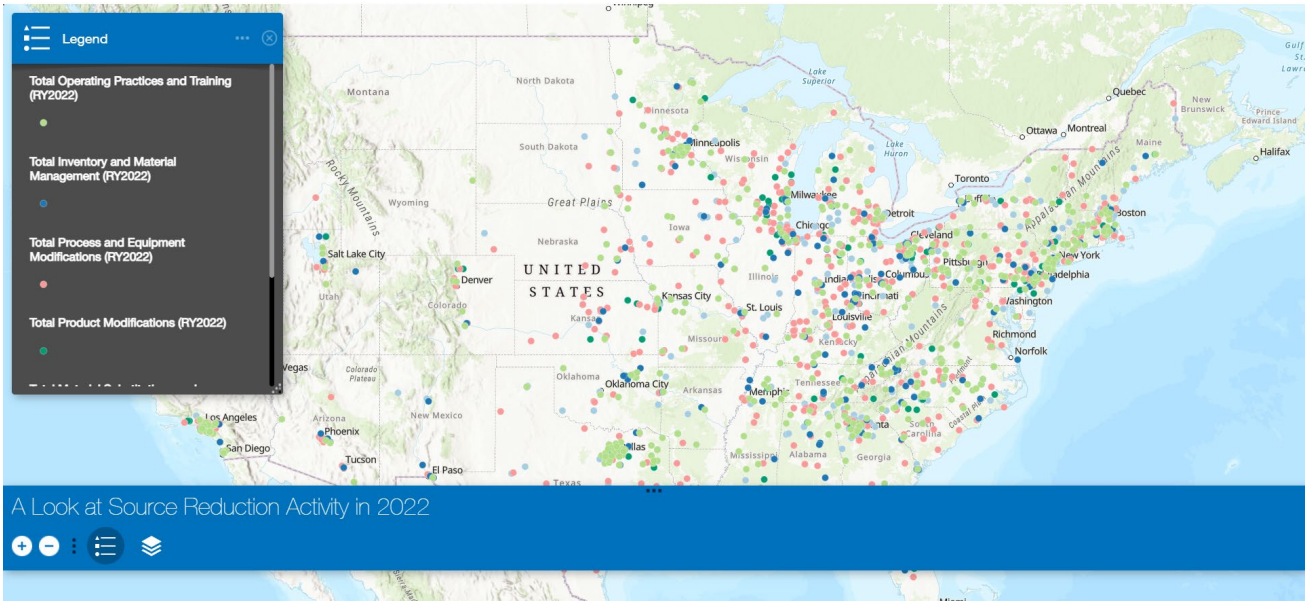


Note: Facilities report their source reduction activities by selecting from a list of 24 codes that describe their activities. These codes fall into one of five categories listed in the graph legend and are defined in the *TRI Reporting Forms and Instructions*.

- In 2022, 1,759 facilities (8% of all facilities that reported to TRI) implemented a combined 3,589 new source reduction activities.
- The most reported source reduction category was **Process and Equipment Modifications**.
    - For example, an adhesive manufacturing facility used historical data to optimize batch sizes which reduced the quantity of methyl methacrylate waste managed.

- Facilities also report how they identified the opportunity to implement each pollution prevention activity. The most reported methods for finding these opportunities were **Participative Team Management** and **Internal Pollution Prevention Audits**.

The map below shows facilities that reported implementing one or more source reduction activity during 2022.



Additional Resources

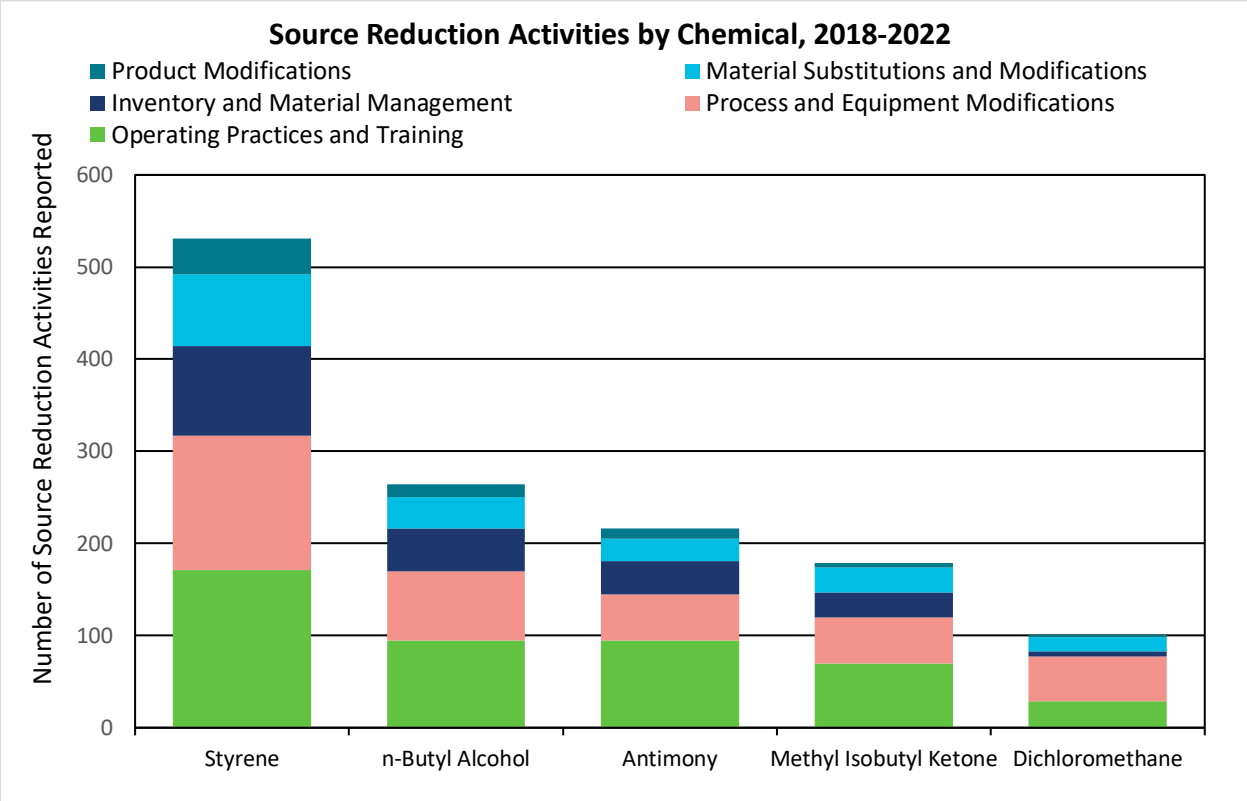
- For more information on how facilities report source reduction to TRI, see the TRI Source Reduction Reporting webpage.
- See the TRI P2 Data Overview Factsheet for more information on source reduction reporting in recent years.
- Facilities may have implemented source reduction activities in earlier years that are ongoing or have been completed. To see details about these activities, use the TRI P2 Search Tool.
- Facilities interested in exploring source reduction opportunities can reach out to their EPA Regional P2 Coordinator to arrange a free, confidential P2 assessment with a third-party P2 expert.
- The TRI Pollution Prevention Reporting Guide provides examples of source reduction activities at facilities and guidance to improve reporting.
- The TRI Green Chemistry and Green Engineering webpage has information about green chemistry and engineering principles and examples of activities that facilities have reported to TRI.

- EPA partners with the American Chemical Society's Green Chemistry Institute® to present Green Chemistry Challenge Awards to organizations that have advanced green chemistry.
- The Solvent Substitutions Reported to TRI webpage is an interactive resource that allows users to find information about specific substitutions for TRI-listed solvents to other solvent chemicals, mixtures, or solvent-free processes.

Source Reduction Activities by Chemical and Industry

Source Reduction Activities by Chemical

This figure shows the number of source reduction activities for the chemicals with the highest source reduction reporting rates over the last five years by the type of activity.



Note: 1) Limited to chemicals with at least 100 reports of source reduction activities from 2018 to 2022. 2) In this figure, antimony is combined with antimony compounds, although metals and compounds of the same metal are listed separately on the TRI list. 3) Facilities report their source reduction activities by selecting from a list of 24 codes that describe their activities. These codes fall into one of five categories listed in the graph legend and are defined in the *TRI Reporting Forms and Instructions*.

From 2018 to 2022:

- Facilities reported 16,462 source reduction activities for more than 240 chemicals and chemical categories.
- Chemicals with the highest source reduction reporting rates included styrene, *n*-butyl alcohol, antimony, methyl isobutyl ketone, and dichloromethane.
- The types of source reduction activities implemented for these chemicals vary depending on the chemicals' characteristics and how they are used. For example:

- **Process and Equipment Modifications,** including optimizing reaction conditions and modifying equipment, layout, or piping, can help reduce the amount of solvents such as *n*-butyl alcohol, needed for a process.
- **Material Substitutions and Modifications** include the use of alternative materials in the manufacturing process, such as replacing styrene, a chemical used to make plastics, and replacing antimony compounds, which are used as a component of flame retardants, batteries, and electronics.

Facilities may also report additional details about their source reduction activities in an optional text field of the TRI reporting form.

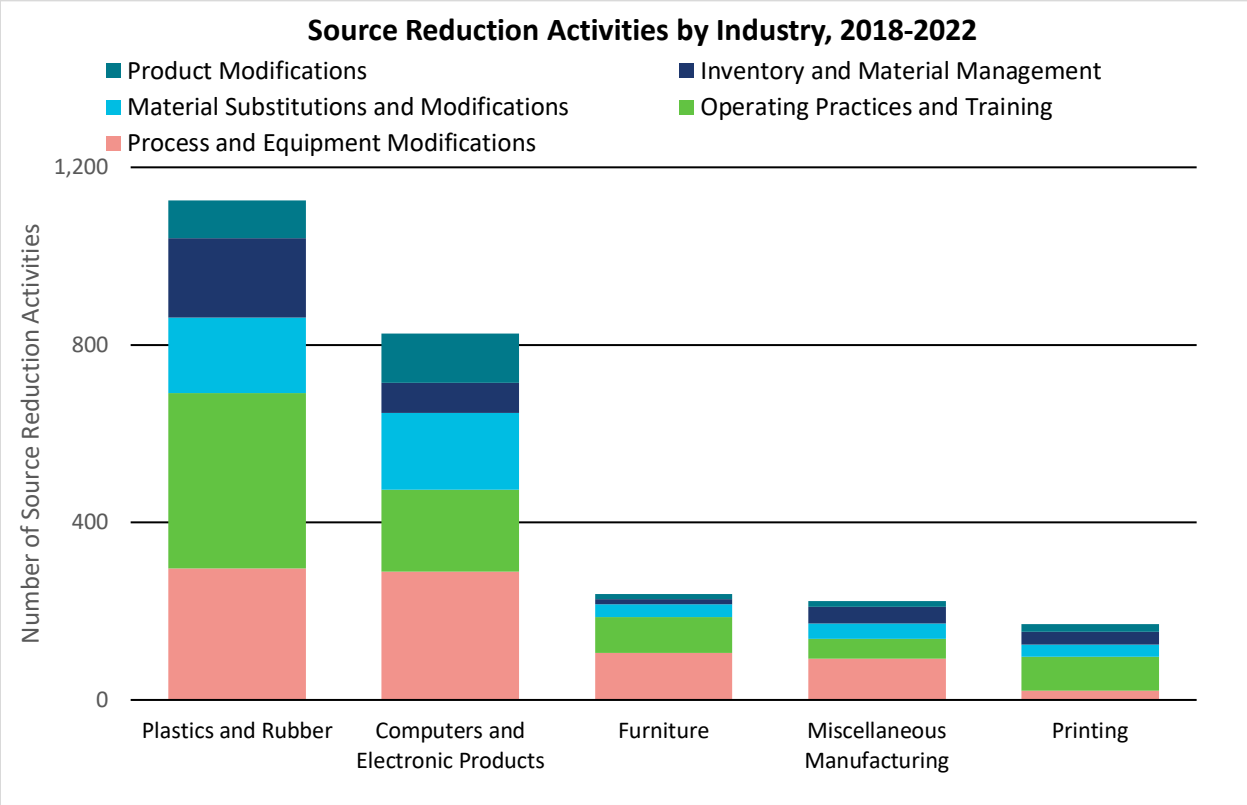
Examples of optional source reduction information for 2022:

- **Styrene**: A plastics plumbing fixture manufacturer improved operating temperatures by shifting employees' casting schedules, which reduced the amount of styrene managed as waste.
- **Antimony**: An electronic connector manufacturing facility reduced the amount of antimony compounds managed as waste by replacing old equipment with newer and more efficient equipment.
- **Methyl isobutyl ketone**: An automobile manufacturer changed to a purge solvent with lower volatile organic compound (VOC) content, reducing the amount of methyl isobutyl ketone managed as waste.

You can compare facilities' waste management methods and trends for any TRI chemical by using the TRI P2 Search Tool.

Source Reduction Activities by Industry

This figure shows the number of source reduction activities reported by the industries with the highest source reduction reporting rates over the last five years.



Note: 1) Limited to industries with at least 100 source reduction activities reported from 2018 to 2022. 2) Facilities report their source reduction activities by selecting from a list of 24 codes that describe their activities. These codes fall into one of five categories listed in the graph legend and are defined in the *TRI Reporting Forms and Instructions*.

From 2018 to 2022:

- The five industry sectors with the highest source reduction reporting rates were plastics and rubber products manufacturing, computers and electronic products manufacturing, furniture manufacturing, miscellaneous manufacturing, and printing.
- For most sectors, **Process and Equipment Modifications** were the most frequently reported types of source reduction activity. Other commonly reported source reduction activities varied by sector. For example, computers and electronic products manufacturers frequently reported **Material Substitutions and Modifications**, often associated with the elimination of lead-based solder.

Facilities may also report additional details on source reduction activities to TRI, as shown in the following examples.

Examples of optional source reduction information for 2022:

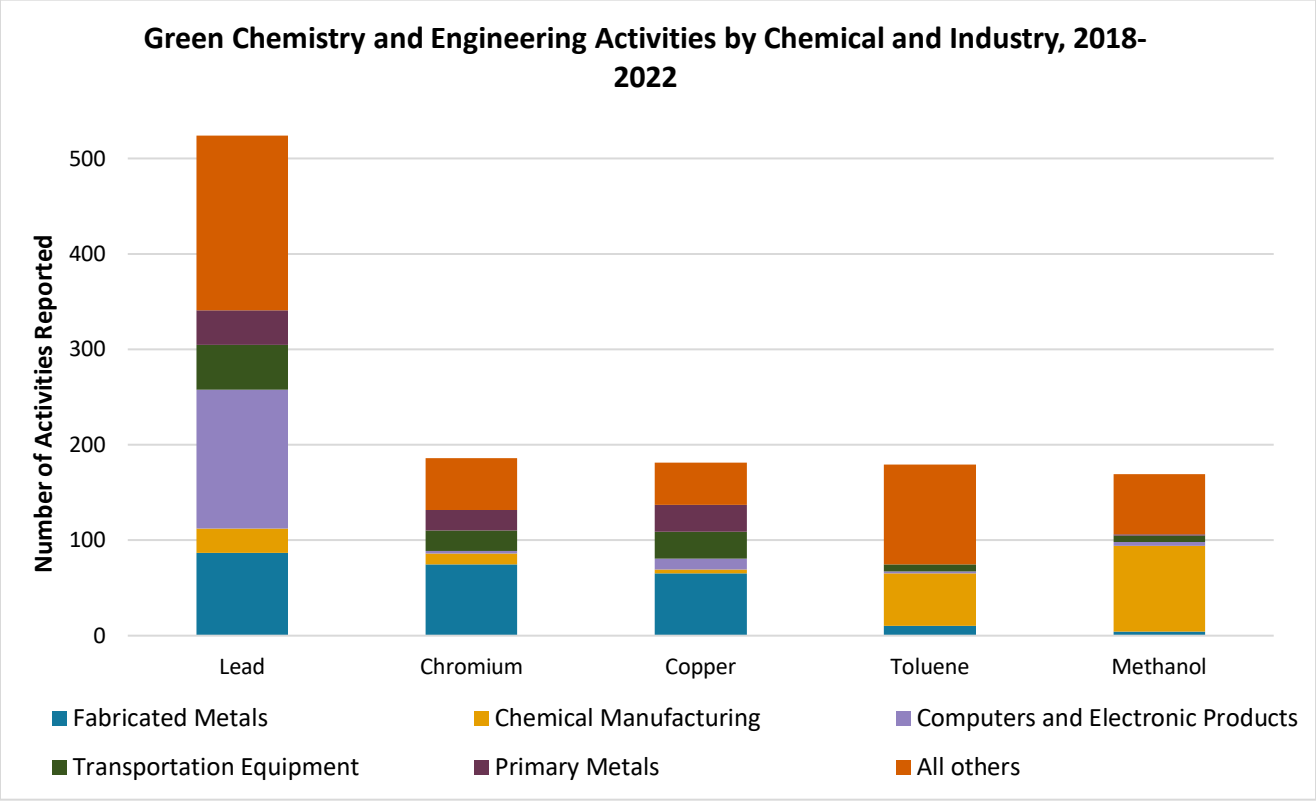
- **Plastics and Rubber Products Manufacturing:** In 2020, a rubber product manufacturer began testing alternative manufacturing aids to reduce the usage of TRI-reportable chemicals. The facility has since eliminated the use of ammonia as a manufacturing aid in a dipping process.
- **Computers and Electronic Products Manufacturing**: An optical communication device manufacturing facility increased bath life which reduced chemical drains containing N-methyl-2-pyrrolidine waste.
- **Furniture Manufacturing**: A wood cabinet manufacturer reduced its use of *n*-butyl alcohol by installing a new flat line finishing system that is recognized in the industry as state of the art technology.

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

Green Chemistry and Engineering Activities

Green chemistry is the design of chemicals, products, and processes that use safer inputs, create more benign outputs, and minimize energy use and the creation of waste. Green engineering considers all stages of the lifecycle of a material, product, process, or system and also aims to reduce pollution, promote sustainability, and minimize risk to human health and the environment without sacrificing economic viability and efficiency. For more information, see TRI Green Chemistry and Green Engineering Reporting.

Advancements in green chemistry and green engineering allow industry to prevent pollution in innovative ways. Implementation of these techniques is required to be reported as source reduction to TRI. Ten of the codes that facilities use to report source reduction to TRI are specific to green chemistry and green engineering activities, although these practices may also fit under other codes. The figure below shows the TRI chemicals with the highest number of green chemistry and green engineering activities reported over the last five years, by sector.



Note: In this figure, the metals (lead, chromium, and copper) are combined with their metal compounds, although metals and compounds of the same metal are listed separately on the TRI list.

- Since 2018, facilities have reported 3,964 green chemistry and engineering activities for 170 TRI chemicals and chemical categories.

  - The chemical manufacturing and fabricated metals manufacturing sectors reported the highest number of activities, reporting 26% and 15% of all green chemistry and engineering activities between 2018 and 2022, respectively.

- Chemical manufacturers used green chemistry and engineering to reduce or eliminate their use of TRI solvent and reagent chemicals, such as methanol and toluene. For example:
  - A basic inorganic chemical manufacturing facility optimized process conditions which reduced the need to use toluene when cleaning equipment.
- Fabricated metal producers and transportation equipment manufacturers applied green engineering techniques to reduce or eliminate their use of metals. For example:
  - A fabricated metal parts manufacturer purchased new laser cutting machines in 2021, and in 2022 used these machines along with water jet cutting machines which reduced the amount of nickel scrap sent to recycling.

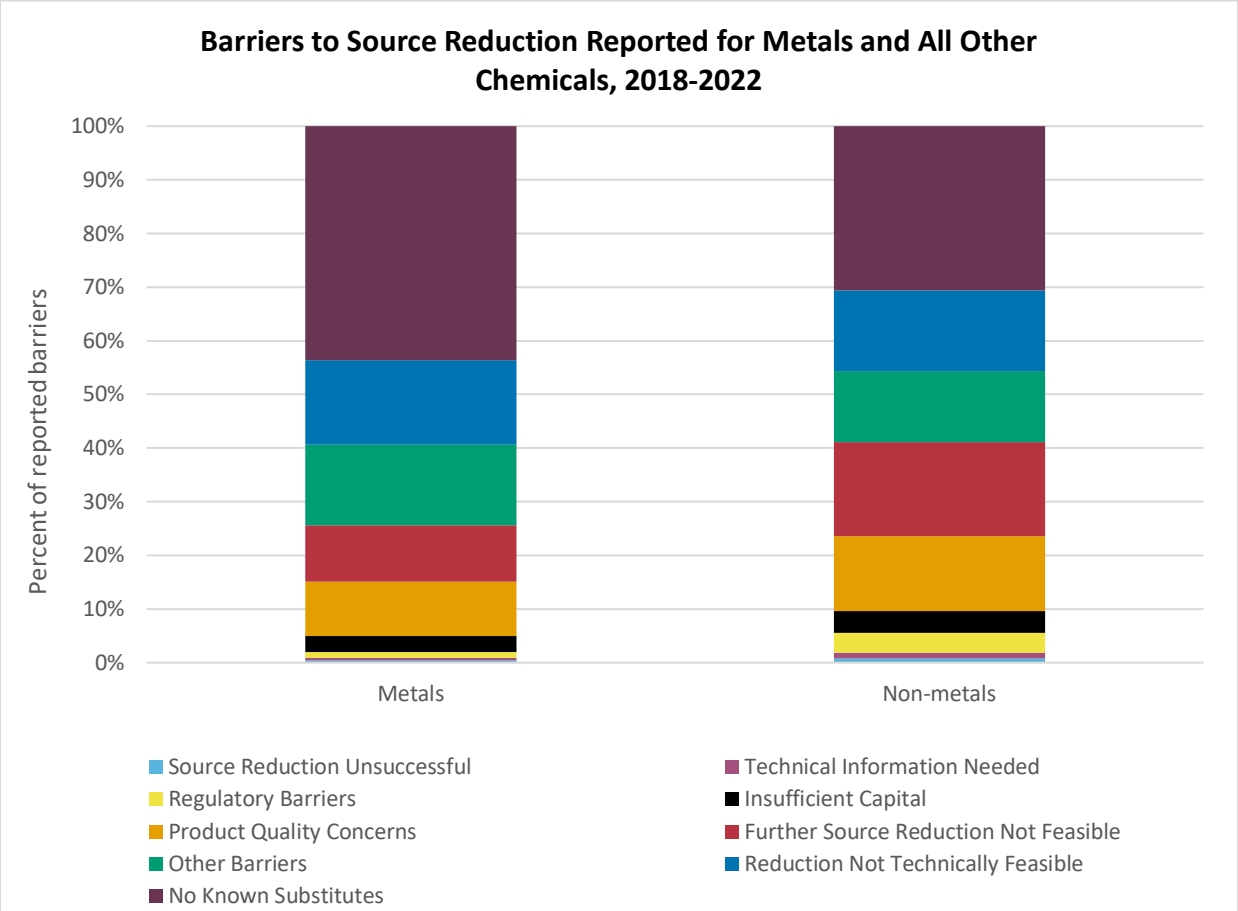
Additional Resources

Source reduction practices such as green chemistry that prevent or reduce the creation of chemical wastes are preferred to downstream pollution control technologies or waste management activities. These resources have more information on green chemistry and green engineering:

- EPA's TRI Toxics Tracker: green chemistry and green engineering examples for a specific chemical and/or industry.
- EPA's Green Chemistry program: information about green chemistry and EPA's efforts to facilitate its adoption.
- EPA's Safer Choice program: information about consumer products with lower hazard.
- For more details on the types of green chemistry activities reported to TRI and trends in green chemistry reporting, see *The Utility of the Toxics Release Inventory (TRI) in Tracking Implementation and Environmental Impact of Industrial Green Chemistry Practices in the United States*.
- Solvent Substitutions Reported to TRI: an interactive resource that allows users to find information about specific substitutions for TRI-listed solvents to other solvent chemicals, mixtures, or solvent-free processes.

Reported Barriers to Source Reduction

Facilities have the option to inform EPA of barriers that prevented them from implementing new source reduction activities by selecting from nine codes that describe common barriers. Analyzing the barrier information that facilities report helps EPA and others identify where more research is needed to address technological challenges or develop viable alternatives. It may also allow for better collaboration between those with knowledge of source reduction practices and those seeking additional assistance. This figure shows the types of barriers facilities reported for metals and for all other (non-metal) TRI chemicals.



Note: Facilities have the option to report barriers to source reduction by selecting from nine codes. These codes are defined in the *TRI Reporting Forms and Instructions*.

From 2018 to 2022:

- Facilities reported barriers to implementing source reduction for 300 TRI chemicals and chemical categories.
- **No Known Substitutes** was the most frequently reported barrier for both metals and non-metals.

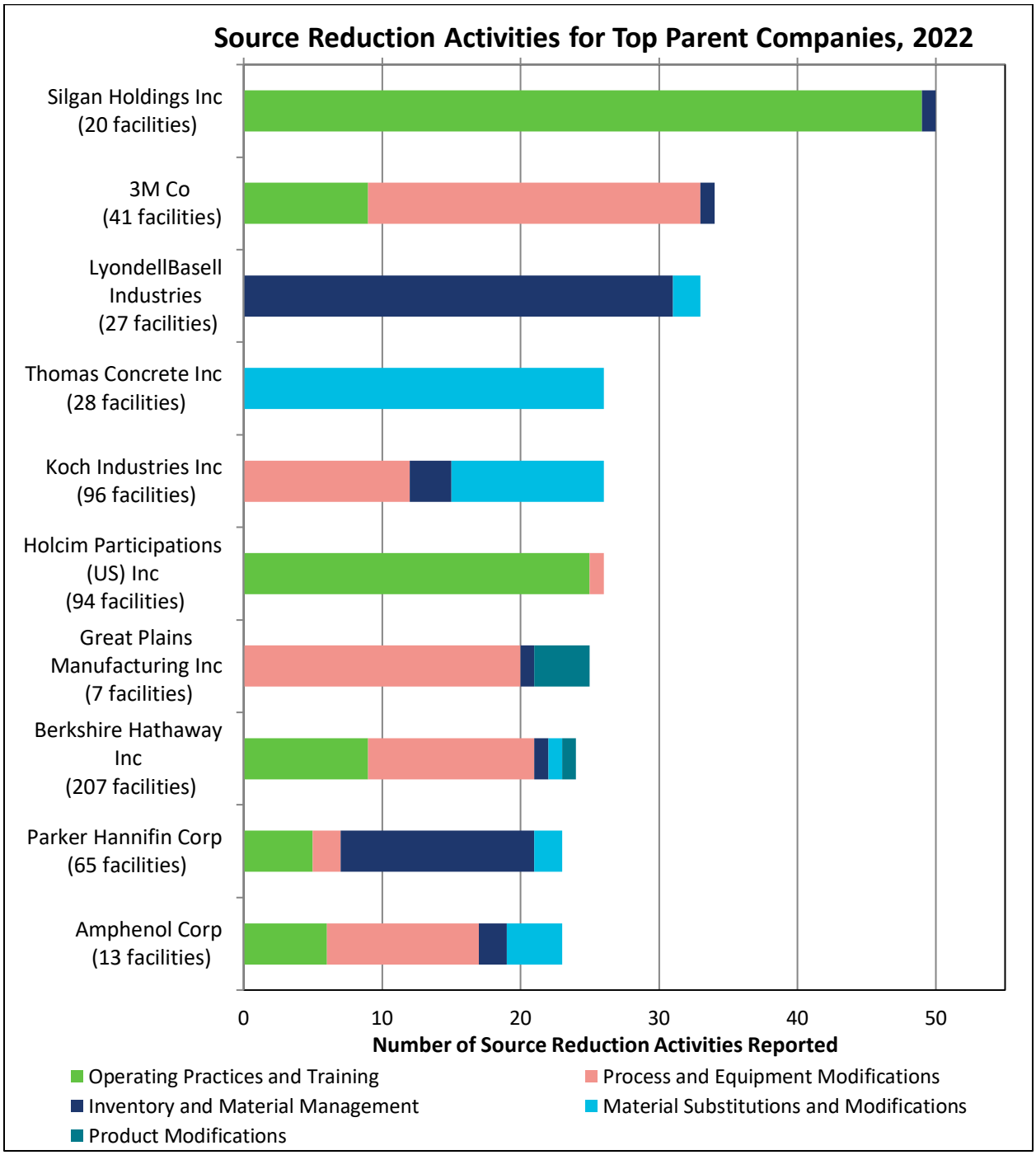
  - Excluding metals, facilities reported **No Known Substitutes** most frequently for nitrate compounds. Facilities often report that nitrate compounds are produced during sanitization or waste treatment processes for which there are no known alternatives.

- For the **No Known Substitutes** barrier for metals, many facilities reported the presence of the TRI metal in their raw materials (e.g., metal alloys) as the reason they could not implement source reduction activities. Examples include:
  - A farm equipment manufacturing facility reported that lead is an impurity in the steel purchased to manufacture equipment.
  - A basic organic chemical manufacturer is exploring alternatives, but reported that currently there are no viable substitutes nor alternative technologies for a process using chromium compounds in a catalyst.
- **Reduction Not Technically Feasible** was a common barrier for metals and non-metals. Facilities select this barrier code when additional reductions do not appear feasible. For example:
  - A dental equipment and supplies manufacturing facility reported that after implementing dry salination in the manufacturing of new composites to reduce methanol use, further source reduction is not feasible because of regulations for Class II Medical Devices.
- You can view source reduction barriers for any TRI chemical by using the TRI P2 Search Tool.

Source Reduction Activities by Parent Company

Facilities are required to report their parent company information to TRI. For TRI reporting, a parent company is defined as the highest-level company located in the United States that directly owns at least 50% of the company's voting stock. EPA groups facilities by parent company to assess waste management at the parent company level and identify companies and industries that regularly implement source reduction activities.

The figure below shows the parent companies whose facilities implemented the most source reduction activities for 2022. Facilities outside of the manufacturing sector, such as electric utilities and coal and metal mines, are not included in this chart because those facilities' activities do not lend themselves to the same source reduction opportunities as the activities at manufacturing facilities.



Note: This figure uses EPA's standardized parent company names.

Operating Practices and Training, such as improving maintenance or scheduling and installing quality monitoring systems, were the most reported types of source reduction activities for these parent companies. **Process and Equipment Modifications** were also commonly reported.

Some of the facilities in these parent companies submitted additional text to describe their pollution prevention activities. Examples include:

- A printed circuit board manufacturing facility owned by Amphenol Corp updated equipment and optimized a metal plating process to extend plating bath life and reduce nitric acid usage.
- A farm equipment manufacturing facility owned by Great Plains Manufacturing Inc. changed the layouts for sheet and plate steel cutting to be more efficient and generate less scrap metal.

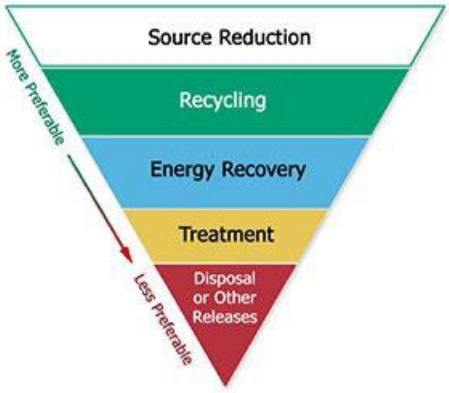
You can find P2 activities reported by a specific parent company and compare facilities' waste management methods and trends for any TRI chemical by using the TRI P2 Search Tool.

Waste Management

Each year, the Toxics Release Inventory (TRI) Program receives information from more than 21,000 facilities on the quantities of TRI-listed chemicals they recycle, combust for energy recovery, treat, and dispose of or otherwise release as part of their normal operations. These quantities are collectively referred to as production-related waste managed or 'waste managed'[1].

Looking at waste managed over time helps track facilities' progress toward reducing the amount of chemical waste they manage. Additionally, these trends show whether facilities are shifting toward waste management practices that are preferable to disposing of or otherwise releasing waste into the environment.

Waste Management Hierarchy



EPA encourages facilities to implement source reduction (or pollution prevention) to reduce or eliminate the use of TRI-listed chemicals and the resulting creation of chemical waste. For waste that is generated, the preferred management methods are recycling, followed by combustion for energy recovery, treatment, and, as a last resort, safe disposal or release of chemical waste into the environment. This order of preference, called the Waste Management Hierarchy, is consistent with the national policy established by the Pollution Prevention Act (PPA) of 1990.

How a facility manages its waste depends on multiple factors, such as its size, location, and production capacity, as well as the type of chemicals being managed. Some facilities have systems that allow them to manage their waste on site. For example, waste streams may be recycled to recapture chemicals and extend their useful life, or may be destroyed such as in incinerators or wastewater treatment systems. Facilities may also pay to transfer their wastes to specialized waste management companies.

[1] Some quantities of waste that are not related to production but are recycled, treated, or combusted for energy recovery on site may be included in a facility's "waste managed."

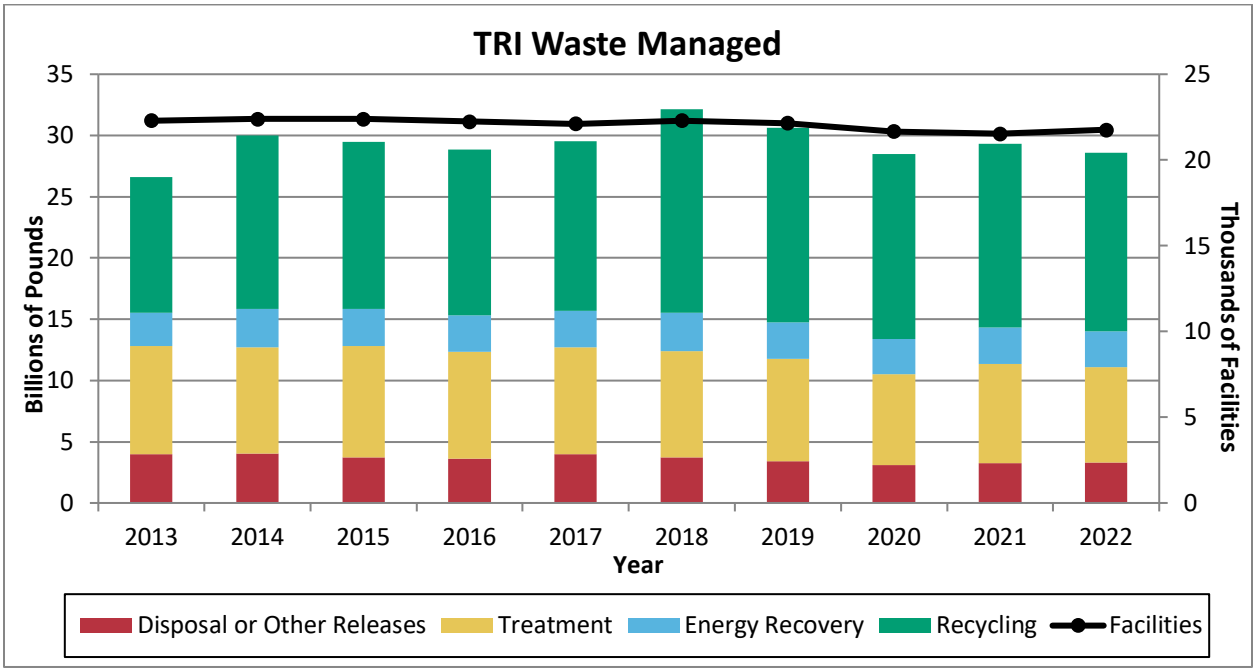
2022 Highlights

- Facilities managed 28.6 billion pounds of TRI chemical waste, 88% of which was not released into the environment due to preferred waste management practices such as recycling.
- Waste managed increased by 2.0 billion pounds (7%) since 2013, with a 3.5 billion pound (32%) increase in recycling during this time.

As with any dataset, there are many factors to consider when using TRI data. Find a summary of key factors associated with the data used in the National Analysis in the Introduction. For more information see *Factors to Consider When Using Toxics Release Inventory Data.*

Trends in Waste Management

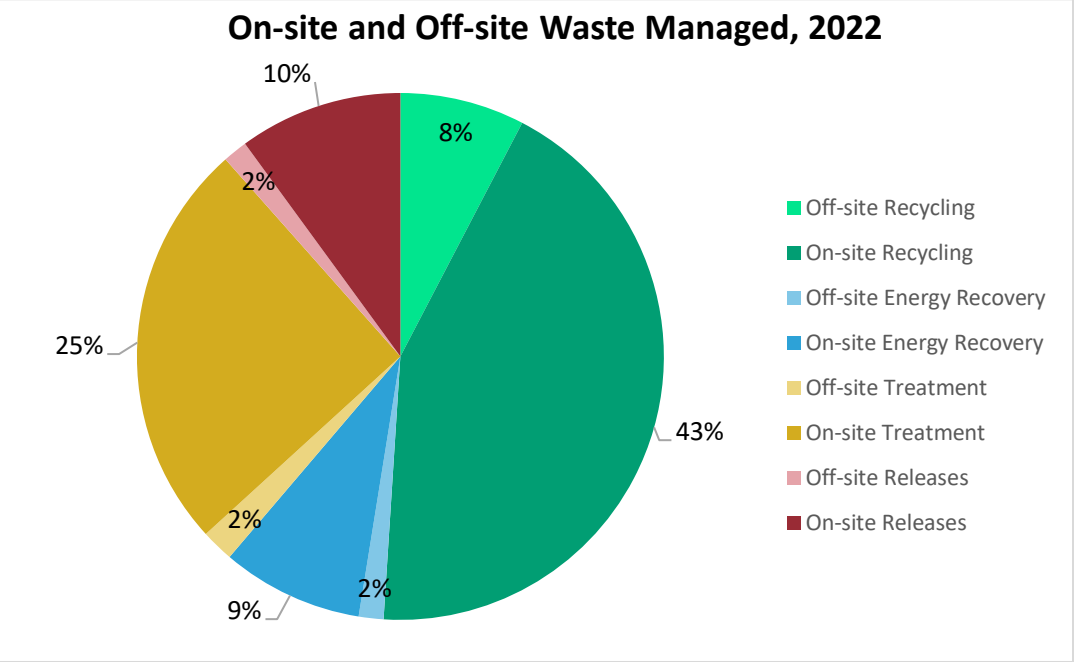
Waste streams generated during normal industrial operations may be recycled, combusted for energy recovery, treated, or released. For example, facilities report the recovery of solvents as a recycling method, or the destruction of a chemical waste through incineration as treatment. This figure shows the 10-year trend in on-site and off-site waste managed.



From 2013 to 2022:

- Waste managed increased by 2.0 billion pounds (7%).
  - Recycling increased by 3.5 billion pounds (32%), largely driven by several chemical manufacturing facilities that each reported recycling more than one billion pounds annually in recent years.
  - Disposal or other releases decreased by 703 million pounds (-18%).
  - Treatment decreased by 1.0 billion pounds (-12%).
  - Energy recovery increased by 191 million pounds (7%).
- The number of facilities that report to TRI has declined by 2% since 2013. Reasons for this decrease include facility closures, outsourcing of operations to other countries, and facilities reducing their manufacture, processing, or other use of TRI-listed chemicals to below the reporting thresholds.

Facilities report both on- and off-site waste management. The following chart shows the relative quantities of on-site and off-site waste management methods for 2022.



Note: Percentages do not sum to 100% due to rounding.

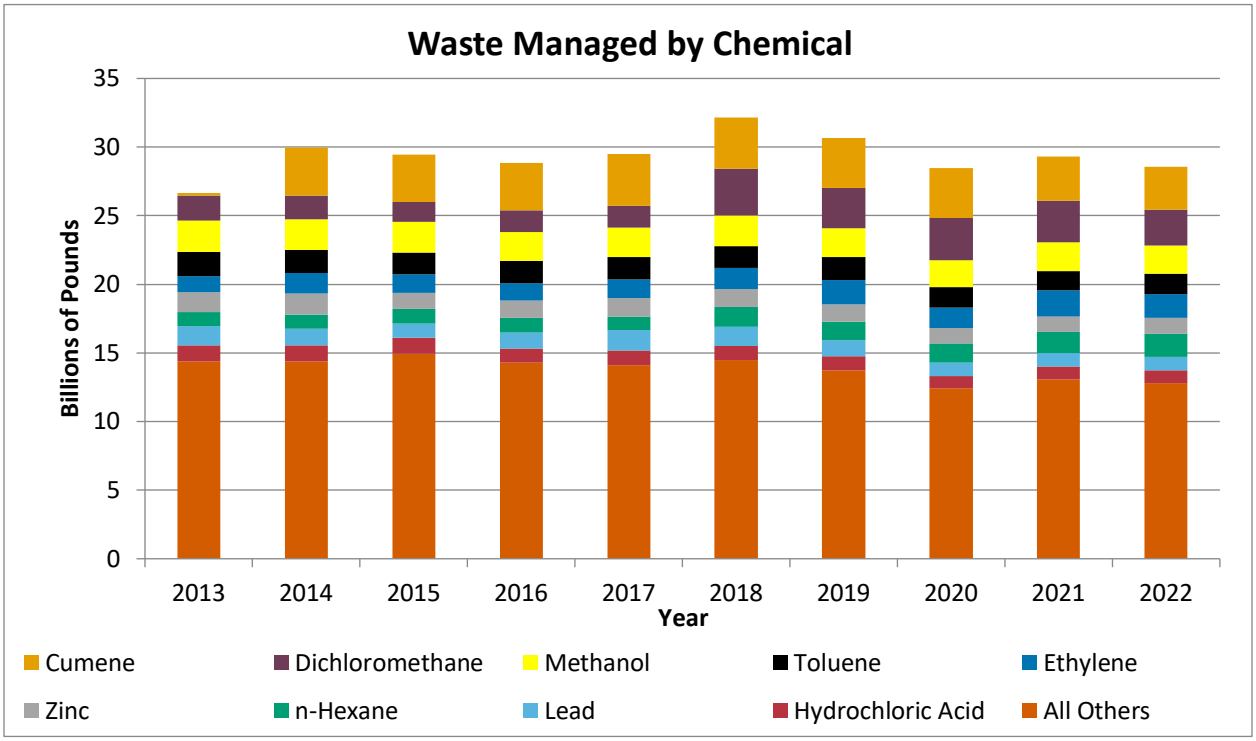
For 2022, 87% of waste was managed on site.

- Most waste managed off site is recycled. Most of this recycling is reported by the primary and fabricated metals sectors. Facilities in these sectors often send scrap metal containing TRI chemicals such as zinc and copper off site for recycling.
- The 2022 distribution of waste managed on site and off site is similar to previous years.

Waste Management by Chemical and Industry

Waste Managed by Chemical

This figure shows the TRI chemicals managed as waste in the greatest quantities from 2013 to 2022.



Note: In this figure, the metals (lead and zinc) are combined with their metal compounds, although metals and compounds of the same metal are listed separately on the TRI list.

From 2013 to 2022:

- Facilities reported waste managed for almost 600 chemicals and chemical categories. The graph above shows the nine chemicals managed as waste in the largest quantities. Together, these chemicals represent 53% of the total waste managed reported to TRI.
- Of the chemicals shown above, facilities reported increased quantities of waste managed for: cumene, dichloromethane (methylene chloride), ethylene, and *n*-hexane.
    - Cumene waste managed during 2022 was almost twenty times higher than the quantity of cumene waste managed during 2013, mostly driven by one facility in the petrochemical manufacturing sector that reported recycling over 3 billion pounds of cumene annually from 2014 to 2022.
    - Dichloromethane waste managed increased by 803 million pounds (44%). Trends in dichloromethane waste management were driven by recycling from two plastics

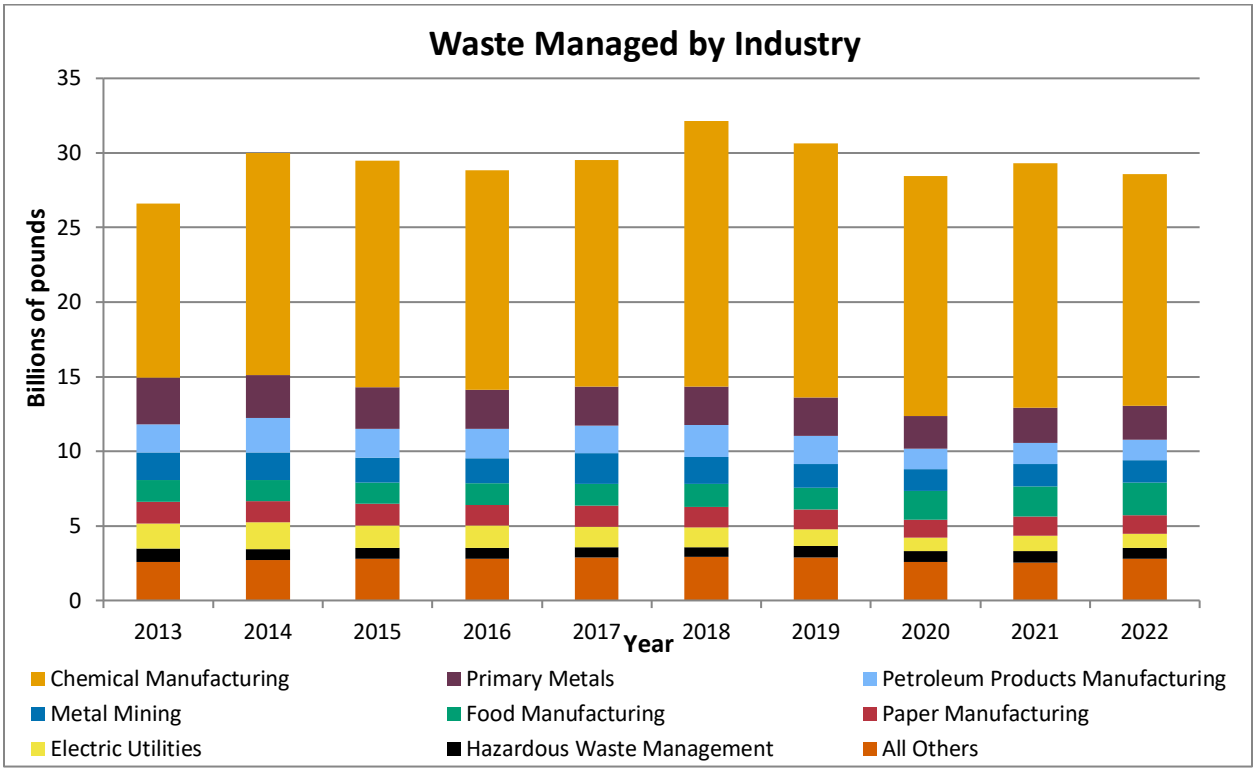
material and resin manufacturing facilities which together reported 95% of all dichloromethane waste managed for 2022.
  - Ethylene waste managed increased by 546 million pounds (46%), driven by facilities in the chemical manufacturing sector.
  - *n*-Hexane waste managed increased by 652 million pounds (63%). This was mostly driven by one soybean processing facility which increased its *n*-hexane recycling by almost 600 million pounds since 2013.

From 2021 to 2022:

- Quantities of TRI chemical waste managed increased for several chemicals including:
  - *n*-Hexane increased by 129 million pounds (8%).
  - Toluene increased by 56 million pounds (4%).
  - Lead increased by 41 million pounds (4%).
- Quantities of TRI chemical waste managed decreased for several chemicals including:
  - Dichloromethane decreased by 435 million pounds (-14%).
  - Ethylene decreased by 149 million pounds (-8%).
  - Cumene decreased by 63 million pounds (-2%).
- Quantities of TRI chemical waste managed remained about the same for zinc, methanol, and hydrochloric acid.

Waste Managed by Industry

This figure shows the industry sectors that managed the most TRI chemical waste from 2013 to 2022.



From 2013 to 2022:

- The eight sectors in this chart consistently reported managing the most waste since 2013. The amount of waste managed by these sectors has changed year to year, especially for the chemical manufacturing sector. The chemical manufacturing sector accounted for 44% of all waste managed in 2013 and increased to 54% in 2022.
- Two of the sectors shown in the graph increased their quantities of waste managed:
  - Chemical manufacturing increased by 3.8 billion pounds (33%).
  - Food manufacturing increased by 777 million pounds (54%).
- The quantity of waste generated in some industries fluctuates considerably from year to year due to changes in production or other factors. For example, quantities of waste managed reported by metal mining facilities can change significantly based on differences in the composition of waste rock.

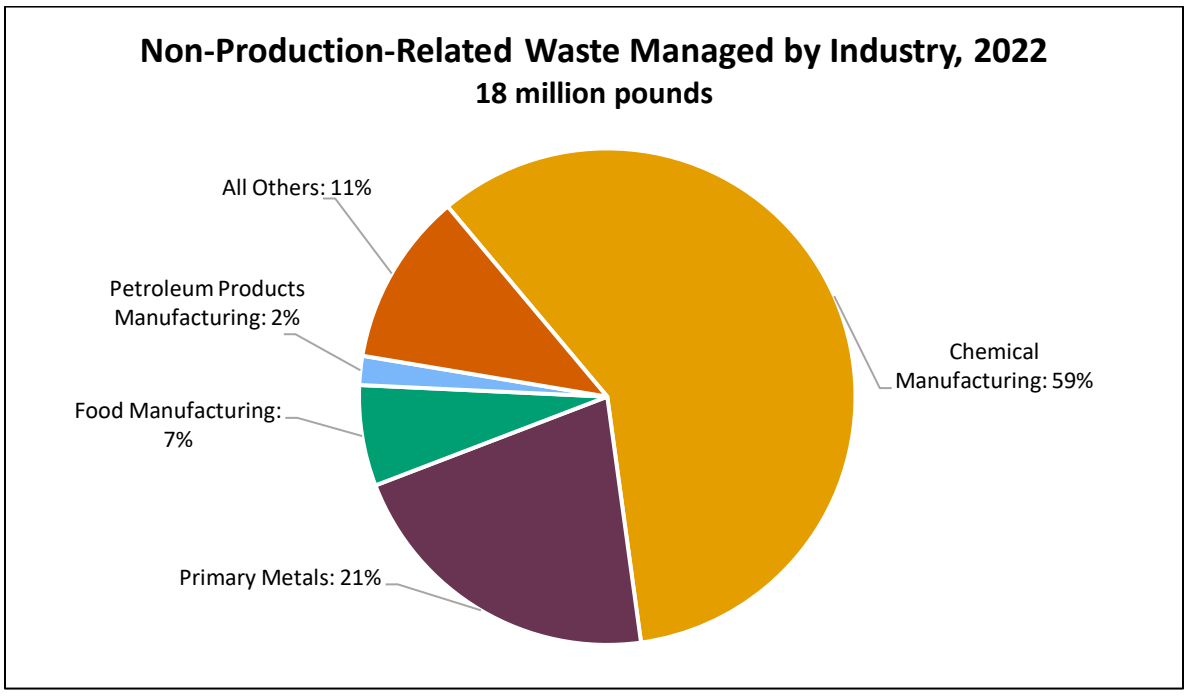
From 2021 to 2022:

- Industry sectors that reported the greatest changes in waste management quantities were:

- Chemical manufacturing decreased by 875 million pounds (-5%).
- Food manufacturing increased by 157 million pounds (8%).
- Electric utilities decreased by 100 million pounds (-10%).

Non-Production-Related Waste Managed

Sometimes, chemical waste is created by one-time events like remedial actions and natural disasters rather than routine production processes. Waste generated this way, referred to as non-production-related waste, is largely unpredictable and less amenable to pollution prevention. Non-production-related waste is typically reported separately from production-related waste. Throughout the National Analysis, non-production-related waste managed through release or disposal is included in a facility's "total disposal or other releases" but not in its "waste managed." The following graph shows the quantities of non-production-related waste reported to TRI for 2022.

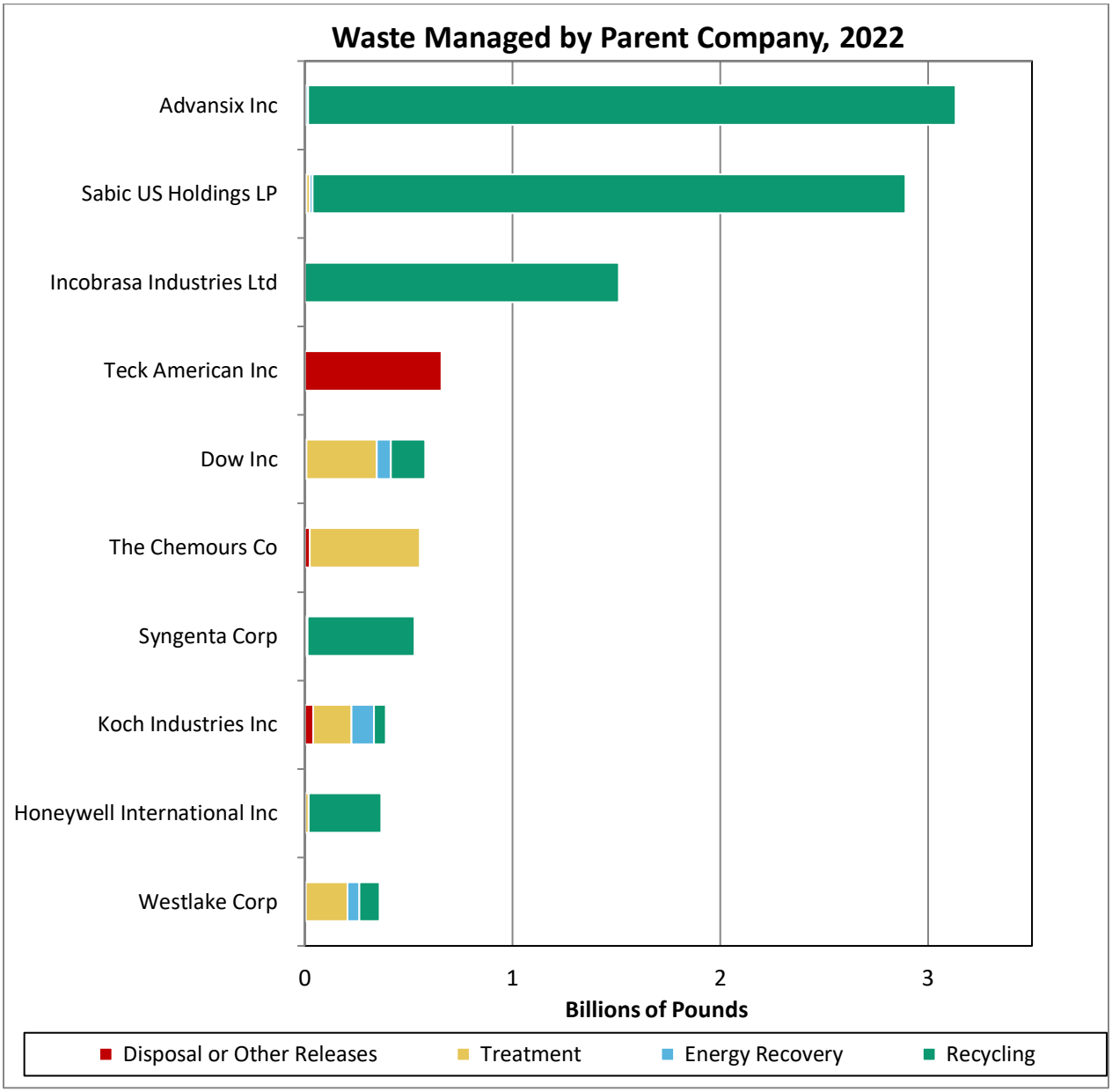


- For 2022, over 500 facilities reported managing a total of 18 million pounds of non-production-related waste. This represents 0.06% of the total amount of TRI waste managed in 2022, which is similar to other years.

Waste Managed by Parent Company

Facilities that report to the Toxics Release Inventory (TRI) must provide information about their parent company. For TRI reporting, parent company means the highest-level company (or companies) of the facility's ownership hierarchy as of December 31 of the year for which data are being reported. EPA groups facilities by parent company to assess waste management at the parent company level and identify companies that regularly implement source reduction activities.

This figure shows the parent companies whose facilities reported the most waste managed for 2022.



Notes: 1) This figure uses EPA's standardized parent company names. 2) Incobrasa Industries Ltd does not report a parent company but it is included in this figure because it reported a comparable quantity of waste managed.

These parent companies' TRI-reporting facilities mostly operate in the following industry sectors:

- **Chemical manufacturing**: Sabic US Holdings LP, Advansix Inc, Dow Inc, The Chemours Company, Syngenta Corp, Westlake Corp
- **Soybean processing**: Incobrasa Industries Ltd
- **Metal mining**: Teck American Inc

- **Multiple sectors**, e.g., pulp and paper, petroleum refining, computer and electronic products, and chemical manufacturing: Koch Industries Inc, Honeywell International Inc

You can find information about a specific parent company and compare facilities' waste management methods and trends for any TRI chemical by using the TRI P2 Search Tool.

Releases of Chemicals

Release or disposal of Toxics Release Inventory (TRI) chemicals into the environment occurs in several ways. Facilities may release chemical waste directly into the air or water or dispose of it to land. Some facilities also transfer waste that contains TRI chemicals to off-site locations for disposal. Facilities releasing or disposing of TRI chemical waste must comply with a variety of regulatory requirements and restrictions that are designed to help protect human health and the environment.

Facilities must report the quantities of TRI-listed chemicals they release into the environment. Analyzing these release data along with data from other sources helps to:

- Identify potential concerns in communities.
- Better understand health impacts chemical releases may pose.
- Identify opportunities to engage with facilities or provide technical assistance on implementing pollution prevention techniques.

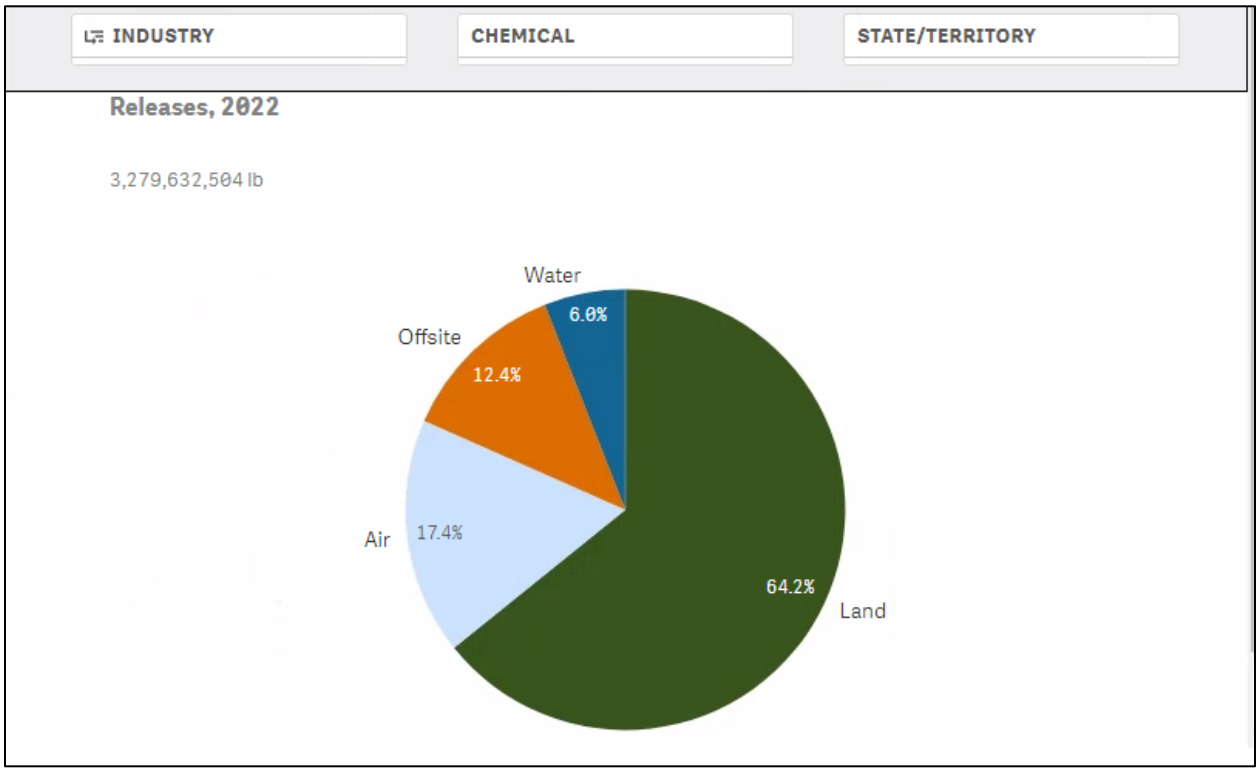
It is important to understand that the quantity of chemical releases alone is not necessarily an indicator of human health outcomes or environmental impacts. Other important factors that contribute to potential harm and risks from releases of chemicals are discussed in the Potential Risks from TRI Chemicals section.

Helpful Concepts

What is a release?

In the context of TRI, a "release" of a chemical generally refers to a chemical that is emitted to the air, discharged to water, or disposed of in some type of land disposal unit. Most TRI releases happen during routine production operations at facilities. To learn more about what EPA is doing to help limit the release of toxic chemicals into the environment, see the EPA laws and regulations webpage.

The chart below shows 2022 TRI chemical releases by medium. Visit the full TRI National Analysis data visualization dashboard to explore even more information about releases of TRI chemicals.



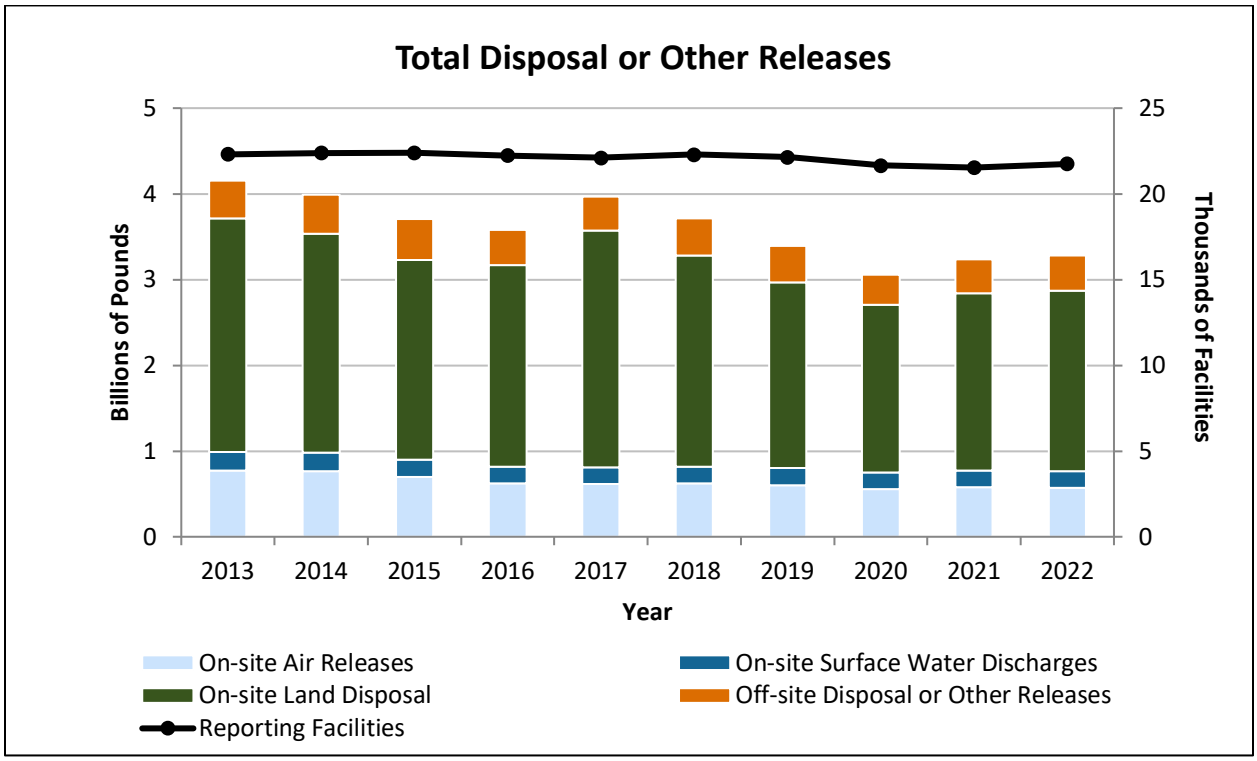
2022 Highlights

- Facilities released 3.3 billion pounds of TRI chemicals, a 21% decrease since 2013.
- Air releases decreased 26% in the last 10 years, driven by reductions from electric utilities.

As with any dataset, there are many factors to consider when using TRI data. Find a summary of key factors associated with the data used in the National Analysis in the Introduction. For more information see *Factors to Consider When Using Toxics Release Inventory Data*.

Trends in Releases

The following graph shows the latest 10-year trend in total releases (also referred to as "total disposal or other releases"). Many factors can affect the trend in releases over time, including changes in facilities' production rates, waste management practices, the composition of raw materials, and pollution control technologies.



From 2013 to 2022:

- Total releases of TRI chemicals decreased by 21%.
    - Reduced disposal to land from metal mines contributed most to this decline.
- Air releases decreased by 26%, surface water discharges decreased by 9%, on-site land disposal decreased by 23%, and off-site disposal decreased by 8%.
- Reductions in air releases from electric utilities drove the overall decrease in air releases. The number of facilities that reported to TRI declined by 2%.

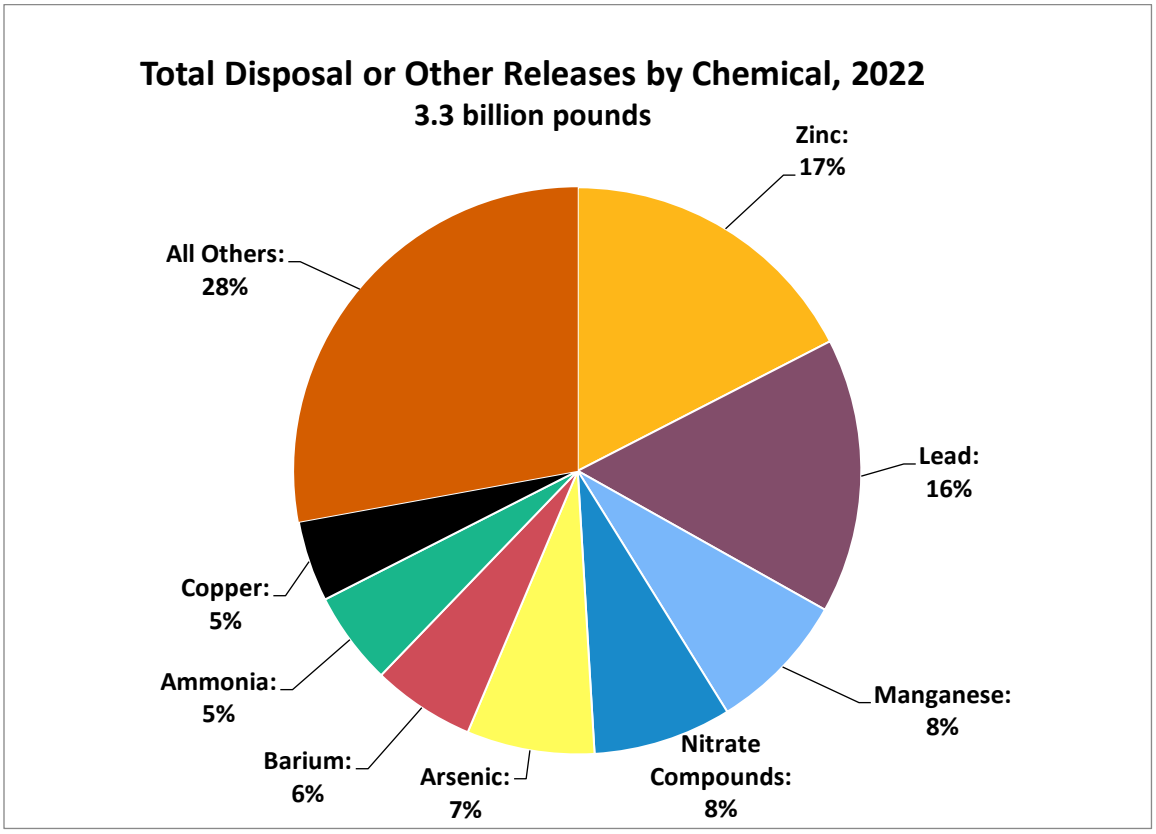
From 2021 to 2022:

- Total releases increased by 1%, driven by increased land disposal. Releases reported by facilities in the natural gas processing sector drove this increase. Many facilities in this sector reported to TRI for the first time for 2022 due to an expansion in the regulatory requirements for TRI reporting.

Releases by Chemical and Industry

Releases by Chemical

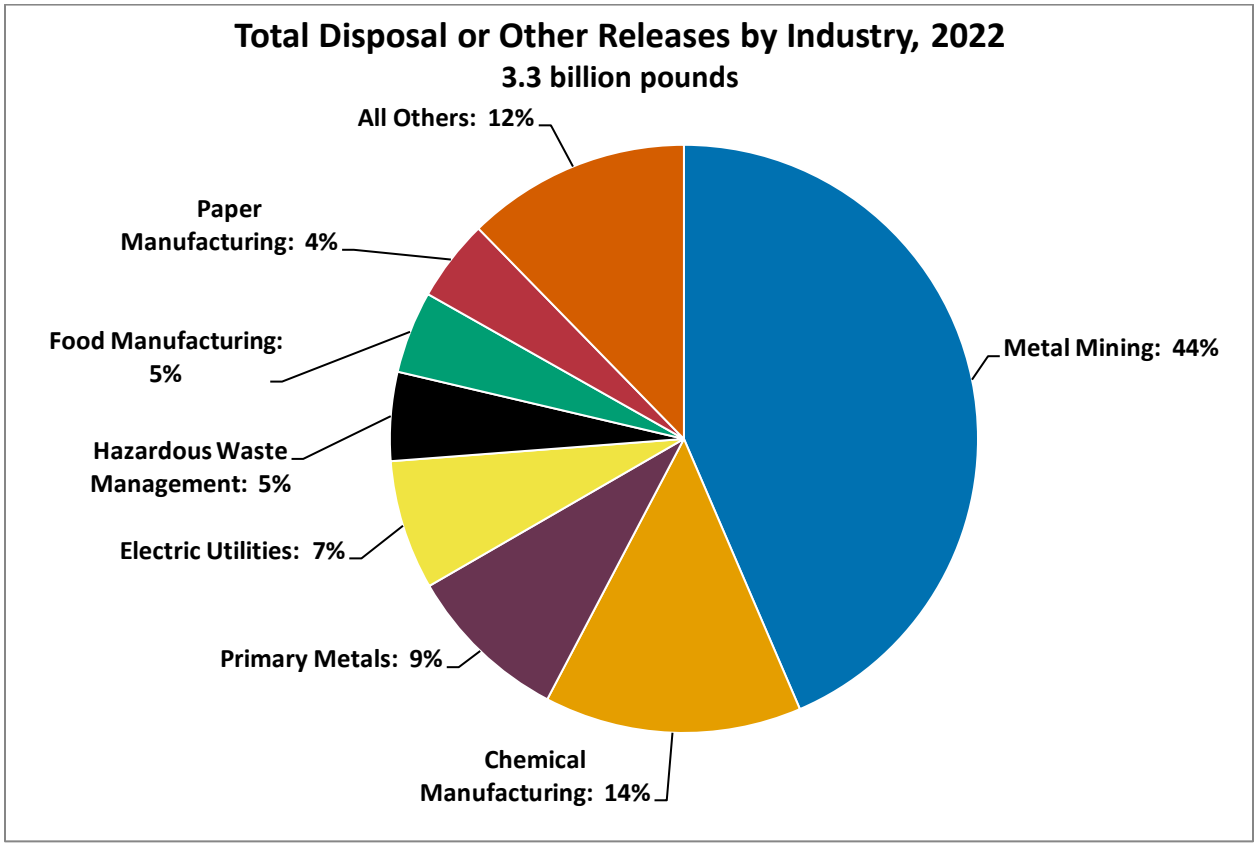
Metals accounted for nearly two-thirds of the 3.3 billion pounds of TRI chemicals released in 2022. Metals are primarily disposed of to land, while most nitrate compounds are discharged to water and ammonia is primarily released to air.



Note: In this figure, metals are combined with their metal compounds, although metals and compounds of the same metal are listed separately on the TRI list (e.g., lead is listed separately from lead compounds).

Releases by Industry

The metal mining sector accounted for 44% of releases (1.43 billion pounds), which were primarily in the form of on-site land disposal. Learn more about this sector in the Metal Mining sector profile.

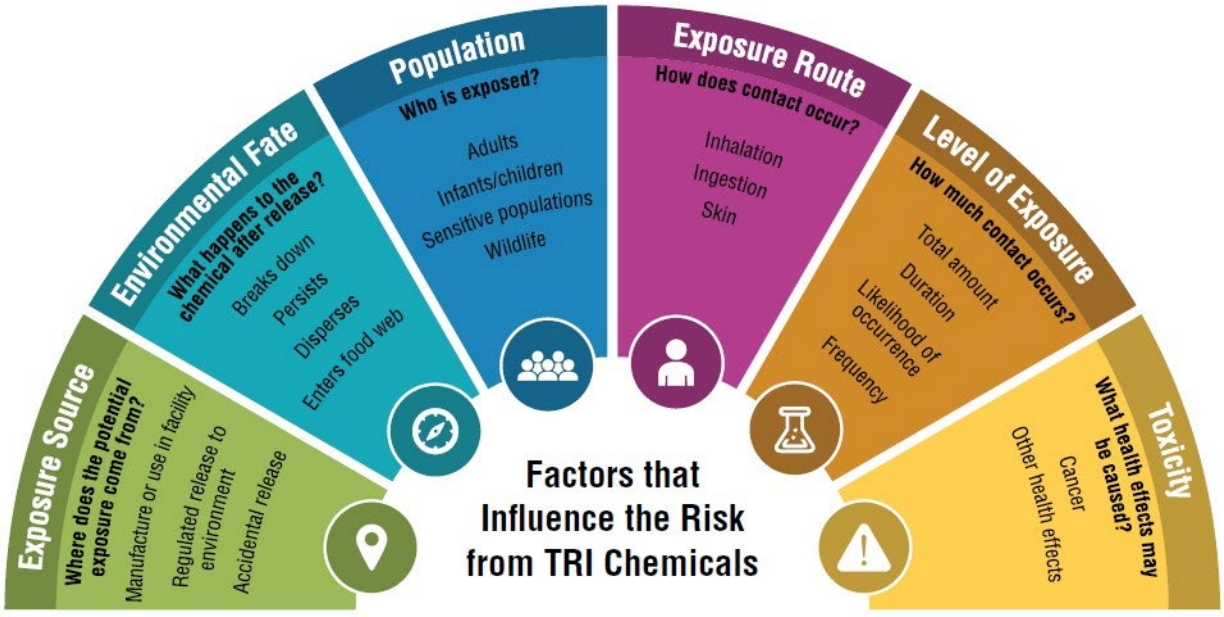


Potential Risks from TRI Chemicals

Chemicals that are included on the TRI chemical list can cause harm to humans, organisms, and ecosystems. **Risk** is the likelihood that a TRI chemical released into the environment will cause harm to humans or the environment. Many factors determine the risks that may come from exposure to toxic chemicals. The figure below lists factors that influence risks posed by TRI chemicals.

The quantities of TRI chemicals released into the environment do not indicate potential risks to health because these quantities alone do not consider the extent of exposure or the toxicity of the chemicals. The chemical release data collected through TRI reporting can be used as a starting point—along with other resources such as EPA's Risk-Screening Environmental Indicators (RSEI) model—to help evaluate potential harm and risks to health from TRI chemical exposure.

Overview of Factors that Influence Risk



EPA developed the Risk-Screening Environmental Indicators (RSEI) model to help identify geographic areas, industry sectors, and chemical releases that may be associated with significant human health risks and to examine how these potential risks change over time. RSEI incorporates information from TRI on the amount of chemicals released along with factors such as how chemicals change and where they go as they move through the environment, each chemical's relative toxicity, and the potential for human exposure.

People are most likely to be exposed to TRI chemicals through the air or water, so RSEI focuses on releases to air and water, including releases to air from waste incinerators and releases to water following transfers to publicly owned treatment works (POTWs). Using the release quantities reported to TRI, the RSEI model produces two primary results—hazard-based values (RSEI Hazard) and risk-related scores (RSEI Score)—that enable screening-level comparisons of relative potential harm and potential risks to human health from TRI chemicals.

- **RSEI Hazard** consists of the pounds of a chemical released or transferred multiplied by the chemical's toxicity weight.
- A **RSEI Score** is a calculated estimate of relative potential human health risk. It is a unitless value that accounts for the amount of a chemical released to air or water, what happens to the chemical in the environment, the size and location(s) of potentially exposed populations, and the chemical's relative toxicity.

Helpful Concepts

The ***hazard*** of a chemical is its inherent ability to cause an adverse effect on health (e.g., cancer, birth defects).

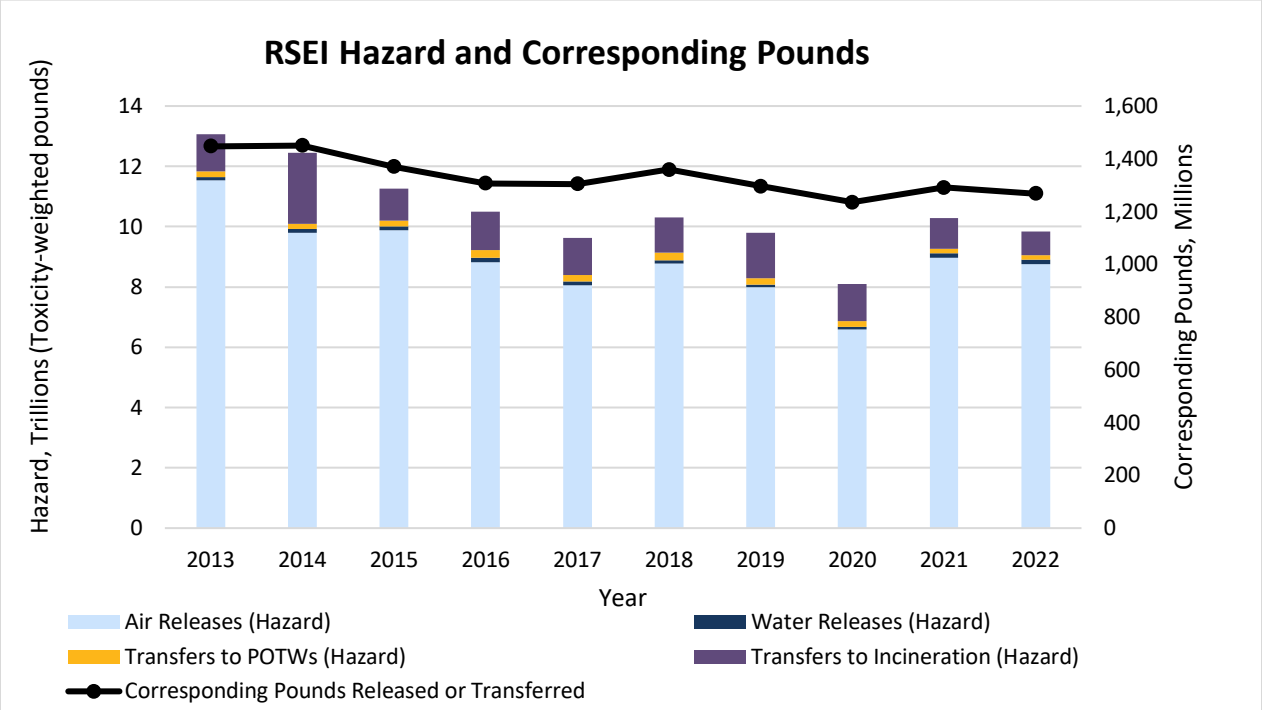
Exposure is how a person comes into contact with a chemical (e.g., inhalation, ingestion) and can be described in terms of its magnitude (how much), frequency (how often), and duration (how long).

The likelihood that a toxic chemical will cause an adverse health effect is often referred to as ***risk***. Risk is a function of hazard and exposure.

Both RSEI Hazard and RSEI Score provide greater insight on potential health impacts than TRI release quantities alone. However, RSEI Hazard or RSEI Score values do not provide actual levels of harm or risks to human health from TRI chemicals. Rather, these screening-level values are used for relative comparisons, such as the analysis of trends over time or comparison of sectors. Studies and analyses that use RSEI information can help establish priorities for further investigation and to look at changes in potential human health impacts over time. More information on RSEI and its applications is available at EPA's RSEI website.

Hazard Trend

RSEI Hazard, also called toxicity-weighted pounds, is a descriptor of relative potential harm to human health. It is based on the toxicity of a chemical and the quantity of the chemical released into the environment. Weighting releases based on toxicity gives greater significance to more toxic chemicals and more context than the release quantities alone. The following graph shows the 10-year trend in calculated RSEI Hazard compared to the trend in the unweighted quantity of chemicals used to calculate RSEI Hazard (corresponding pounds).



Note: For comparability, trend graphs include only those chemicals with toxicity weights. RSEI Hazard values and corresponding pounds include only on-site air releases, on-site water releases, transfers to publicly owned treatment works (POTWs), and transfers to incineration.

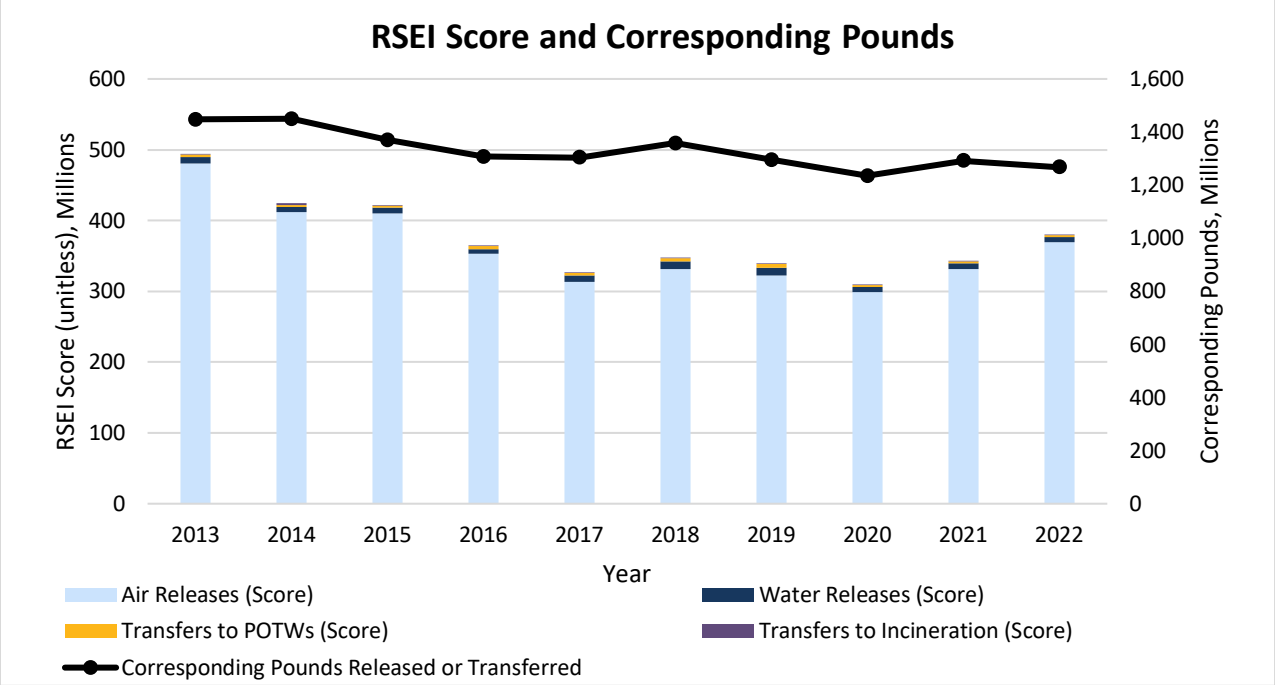
From 2013 to 2022:

- The calculated RSEI Hazard values shown in the figure above decreased by 22%, while the corresponding release quantities (in pounds) decreased by 12%. This suggests that TRI facilities are not only releasing or transferring fewer pounds of TRI chemicals for these activities, but are also releasing fewer pounds of the more toxic TRI chemicals.
- The largest decreases in RSEI hazard were from ethylene oxide, chromium, arsenic compounds, chloroprene and polycyclic aromatic compounds.

Risk-Screening Trend

RSEI Scores are indicators of relative potential risk to human health and are intended for use in comparative analysis. RSEI Scores consider the locations and quantities of TRI chemical releases as well as the number of people living in the surrounding areas. The scores also account for what happens to the chemical in the environment, where it might go, and how much of the chemical people might be exposed to.

The following graph shows the 10-year trend in calculated RSEI Score compared to the trend in the corresponding pounds of TRI chemicals released or transferred that are used to calculate the RSEI Score.



Note: RSEI Score values and corresponding pounds include only on-site air releases (Air Releases), on-site water releases (Water Releases), transfers to POTWs, and transfers to incineration.

From 2013 to 2022:

- The overall calculated RSEI Score decreased by 24%, while corresponding release quantities (in pounds) decreased by 12%. This suggests that TRI reporting facilities are: releasing or transferring fewer pounds of TRI chemicals; releasing fewer pounds of the more toxic TRI chemicals; or that releases are occurring in areas that are less populated.
- While RSEI Score does not describe actual risks to human health from TRI chemicals, the overall decrease in RSEI Score indicates that, at the national level, the relative potential risk from toxic chemicals reported to TRI has declined from 2013 to 2022.

- Of the types of releases modeled by RSEI, air releases contribute the most to potential human health risks based on calculated RSEI Scores.
- The decrease in RSEI Score from 2013 to 2022 was driven in part by large decreases in air releases of ethylene oxide and chromium and chromium compounds.

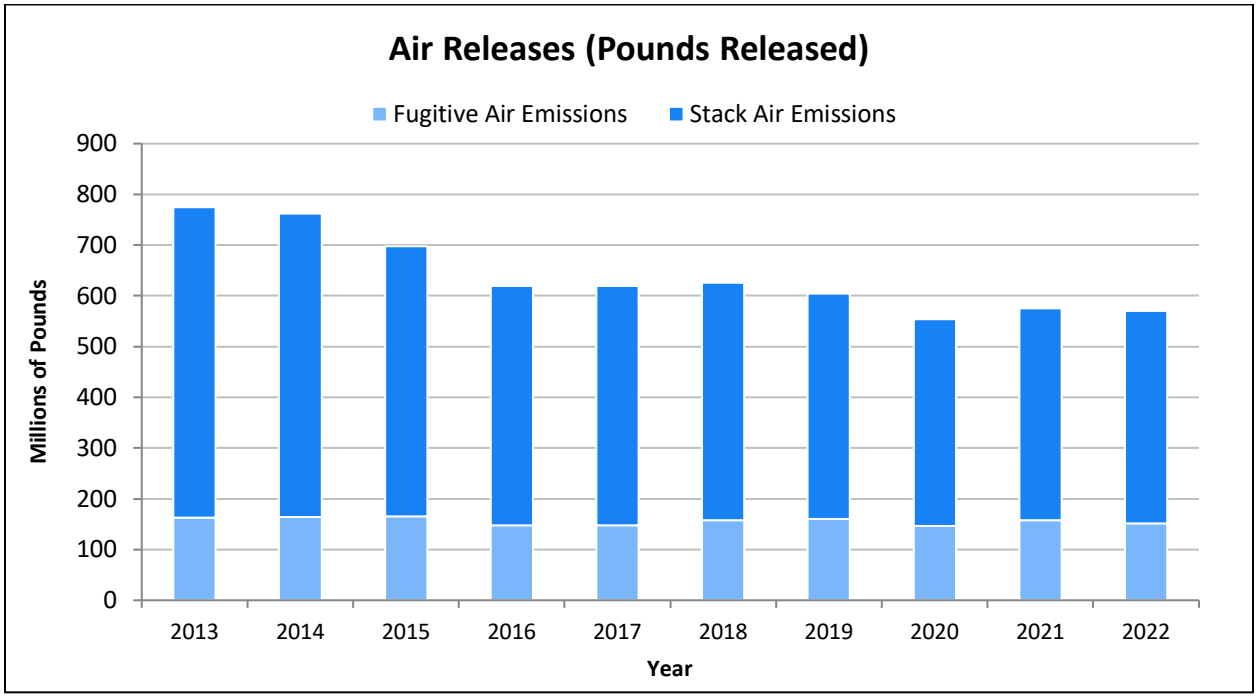
RSEI Dashboard

- Use EPA's EasyRSEI Dashboard to view the national trend in RSEI Hazard and RSEI Score, or use the Dashboard's filter capabilities to view other RSEI information for a specific chemical or location of interest.

Air Releases

Releases of TRI chemicals into the air have declined notably over the last 10 years. These releases include both fugitive air emissions and stack air emissions.

This graph shows the 10-year trend in the quantity of chemicals released into the air. EPA regulates air emissions under the Clean Air Act. Facilities must comply with permitting requirements if they meet certain criteria such as pollutant releases above specified thresholds.



From 2013 to 2022:

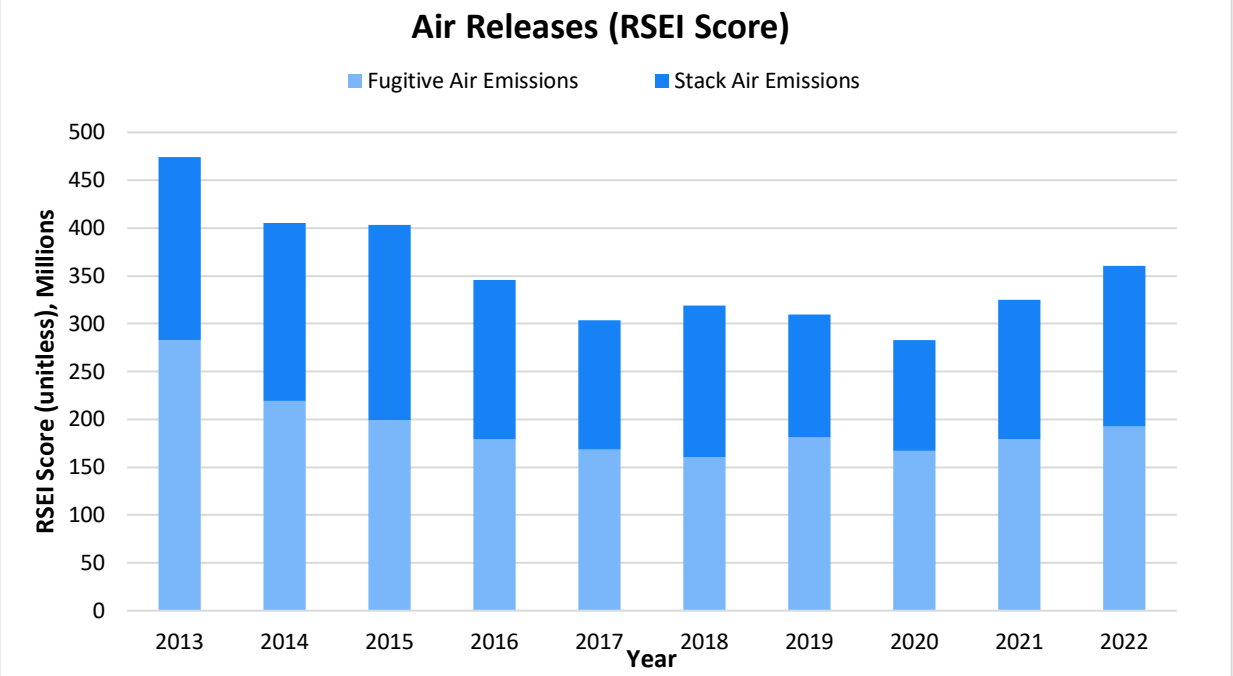
- Releases into the air decreased by 26% (-204 million pounds).
- Air releases of hydrochloric acid, sulfuric acid, hydrogen fluoride, methanol, and toluene decreased the most.
- The decrease in air releases was driven by reduced releases of hydrochloric acid and sulfuric acid to air from electric utilities due to: a shift from coal to other fuel sources (e.g., natural gas); and the installation of pollution control technologies at coal-fired power plants.
- Note that only those electric utilities that combust coal or oil to generate power for distribution into commerce are covered under TRI reporting requirements. Electric utilities that use only fuels other than coal or oil (such as natural gas) are not required to report to TRI. More information about this sector is available in the Electric Utilities sector profile.

- Air releases of chemicals classified as carcinogens by the Occupational Safety and Health Administration (OSHA) increased; see the Air Releases of OSHA Carcinogens figure.
- For trends in air releases of chemicals of special concern, including lead and mercury, see the Chemical Profiles section.

In 2022:

- The TRI chemicals released into the air in the largest quantities were ammonia and methanol.
- Air releases of TRI chemicals decreased by 1% since 2021.
- Air releases from the paper manufacturing, primary metals manufacturing, and chemical manufacturing sectors drove the decrease. For 2022, TRI reporting requirements were expanded to include additional natural gas processing facilities; air releases from these newly-covered facilities partially offset the decrease in air releases from other sectors.

This graph shows the 10-year trend in RSEI Scores for TRI air releases.



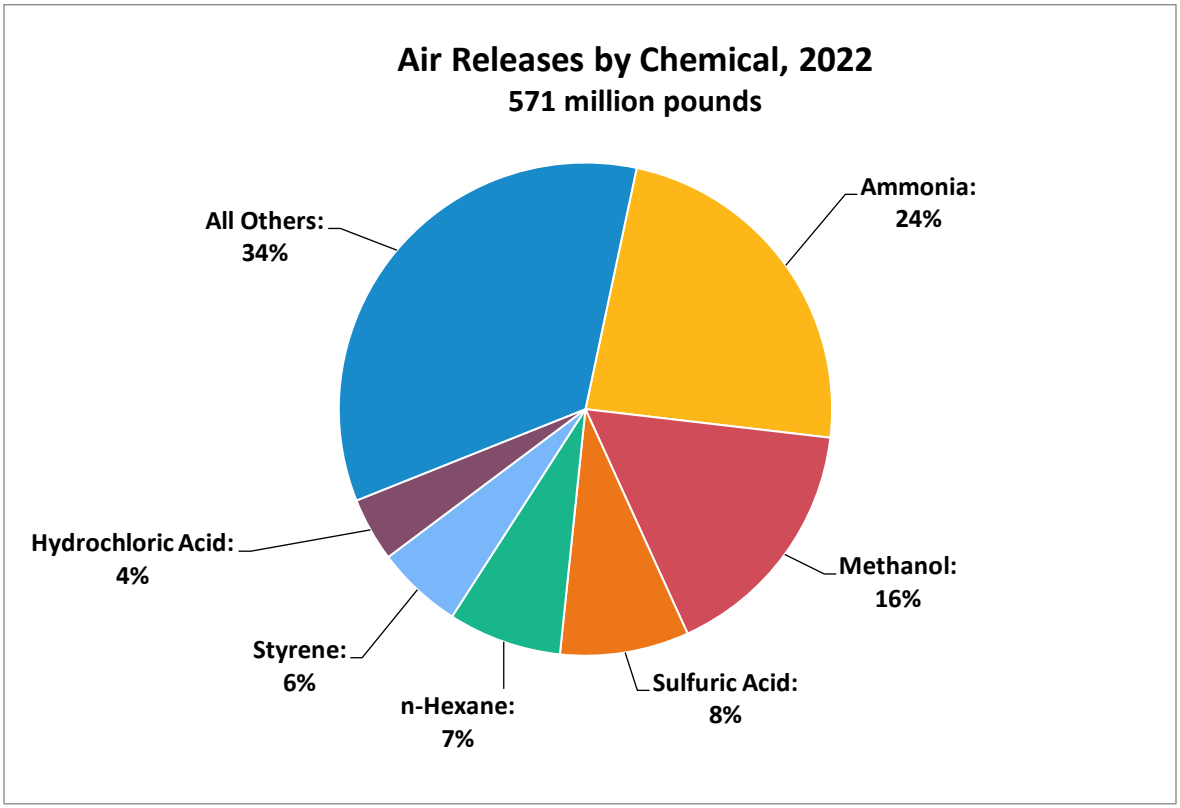
- The chemicals that contributed the most to the RSEI Score values for air releases were chromium and ethylene oxide.
    - While the combined quantities of chromium and ethylene oxide released to air accounted for less than one percent of total air releases in 2022, they accounted for 30% and 27% of total RSEI Score, respectively.

- The increase in score for air releases from 2020 to 2022 is due in part to increases in releases of ethylene oxide, nickel, and cobalt compounds.
- As shown in the "Pounds Released" chart, facilities reported considerably more stack air emissions than fugitive air emissions, but their relative contributions to the RSEI Score values have been similar in recent years, as shown in the "RSEI Score" chart. This is because chemicals released through stacks tend to be dispersed over a wider area than fugitive air emissions, resulting in lower average concentrations in the environment. As a result, surrounding populations are less likely to be exposed to chemicals released through stacks compared to fugitive emissions like leaks from equipment or releases from building ventilation systems.
- For a complete step-by-step description of how EPA's RSEI model derives RSEI Score values from stack air emissions and fugitive air emissions, see "Section 5.3: Modeling Air Releases" of EPA's Risk-Screening Environmental Indicators (RSEI) Methodology.
- For general information on how RSEI Scores are derived, see Potential Risks from TRI Chemicals.

Air Releases by Chemical and Industry

Air Releases by Chemical

This pie chart shows which TRI chemicals were released into the air in the greatest quantities during 2022.

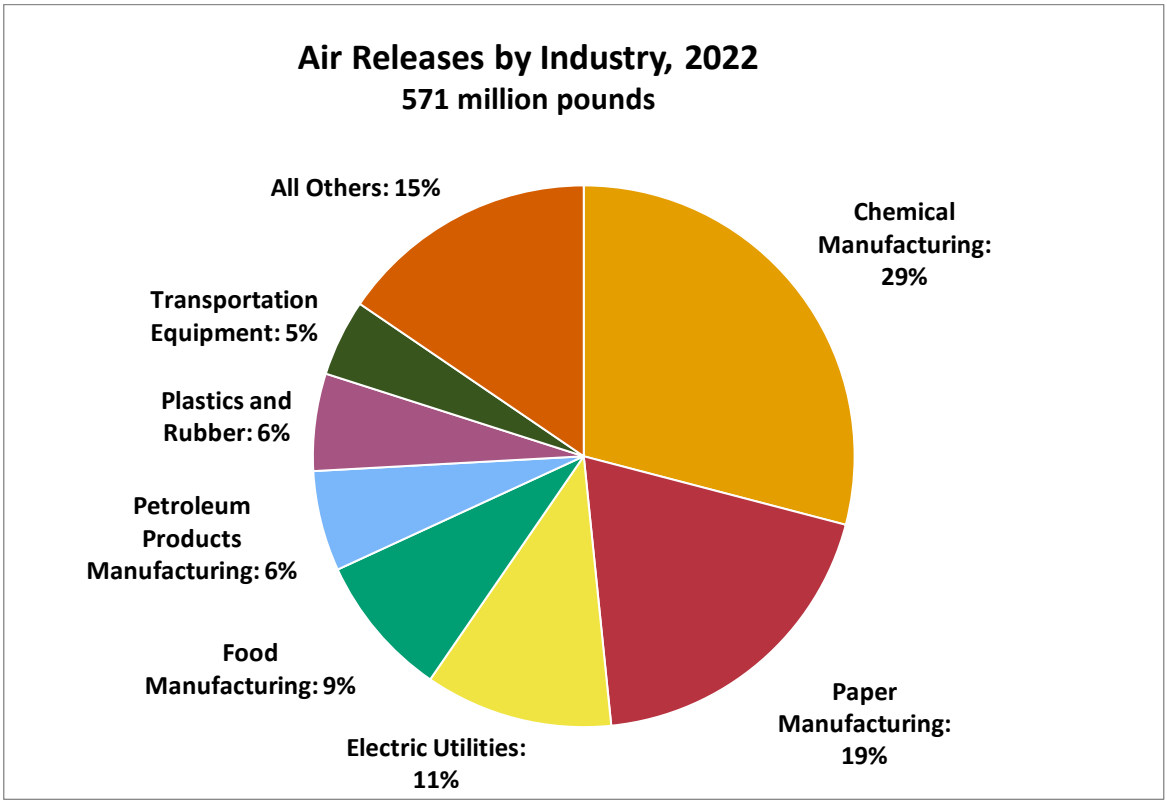


Note: Percentages do not sum to 100% due to rounding.

- The chemicals released to air in the greatest quantities during 2022 were:
  - Ammonia: Facilities that manufacture nitrogen-based fertilizers accounted for 42% of ammonia air releases.
  - Methanol: Most air releases of methanol were from paper manufacturing facilities.
  - Sulfuric acid and hydrochloric acid: Electric utilities released more of these chemicals into the air than any other sector.

Air Releases by Industry

This pie chart shows the TRI-covered industry sectors that reported the largest quantities of air releases during 2022.

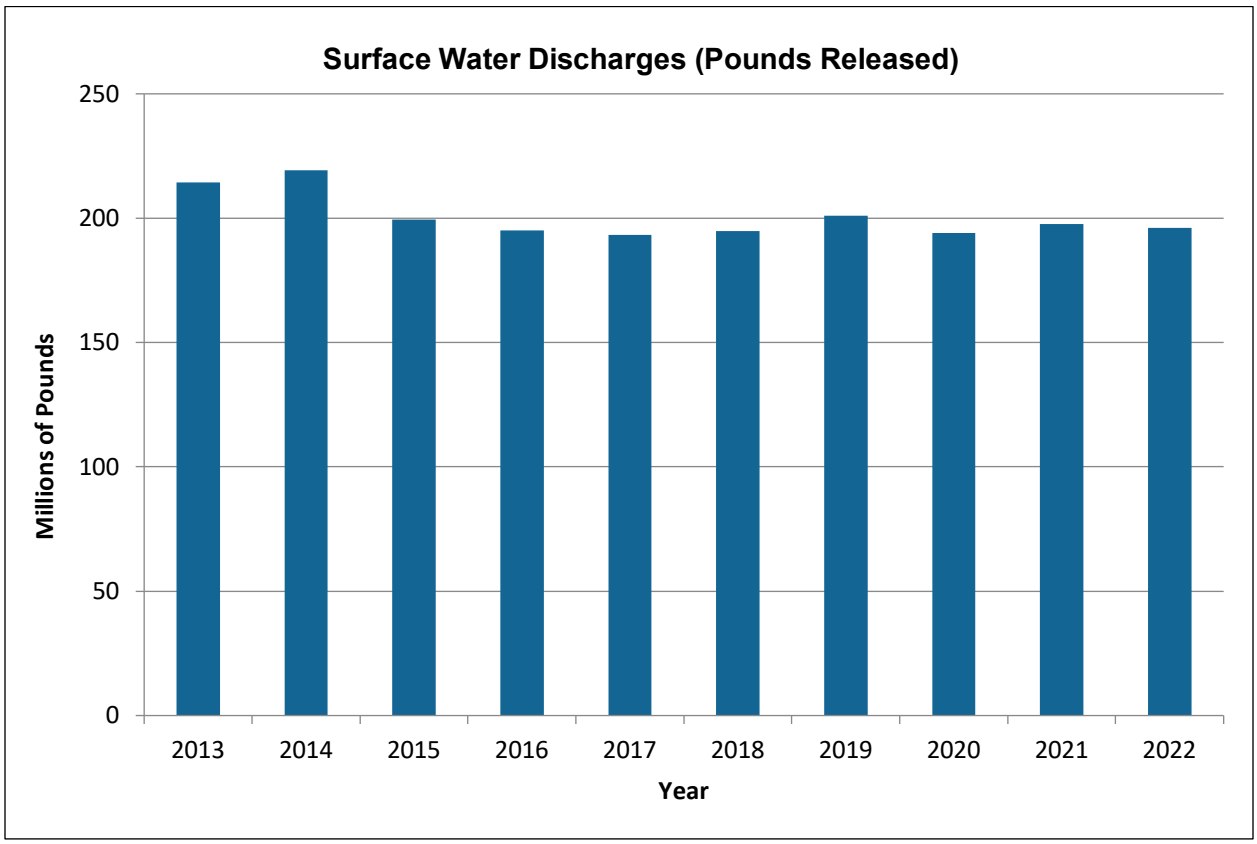


- Facilities in the following sectors accounted for the largest air releases of TRI chemicals during 2022. The chemicals released in the largest quantities by these sectors were:
  - Chemical manufacturing: ammonia and ethylene.
  - Paper manufacturing: methanol.
  - Electric utilities: sulfuric acid.

Water Releases

TRI chemicals released into streams or other water bodies are referred to as "water releases" or "surface water discharges." They are regulated by the Clean Water Act, which requires facilities that discharge pollutants into surface water to obtain permits under the National Pollutant Discharge Elimination System (NPDES).

The following graph shows the 10-year trend in the amount of TRI chemicals directly released into water bodies.



From 2013 to 2022:

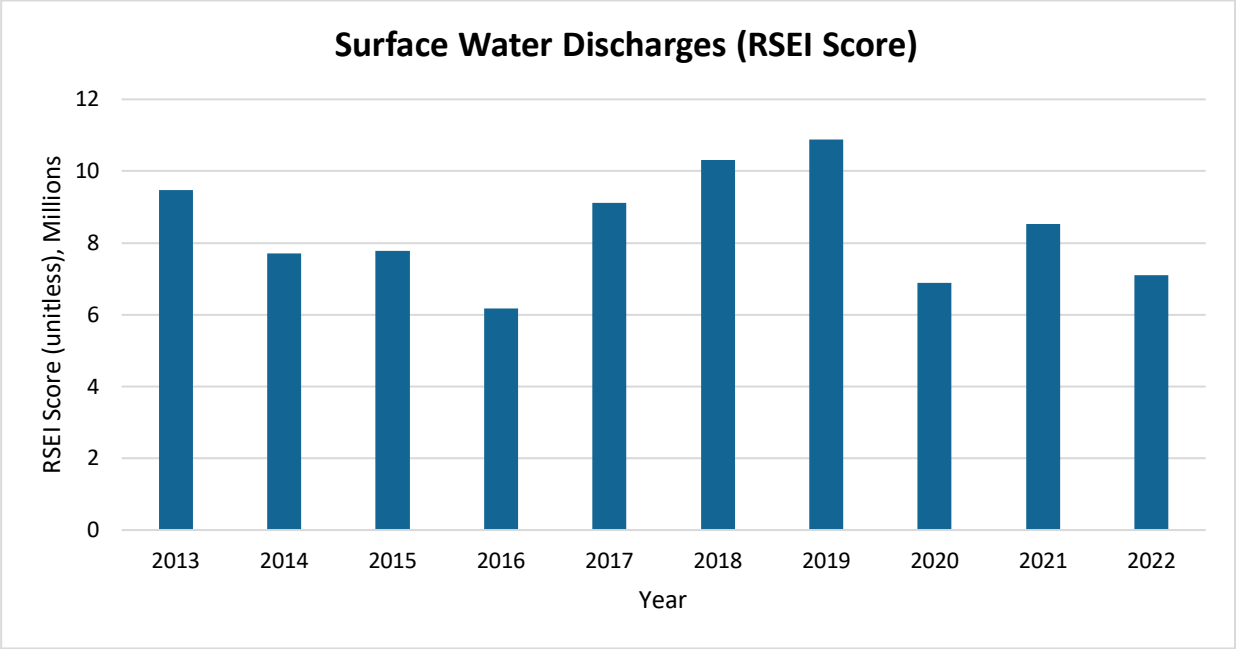
- Discharges of TRI chemicals into surface water decreased by 18 million pounds (-9%). Most of this decline was due to reductions in releases of nitrate compounds.
    - Nitrate compounds are often formed as byproducts during wastewater treatment processes such as neutralization of nitric acid, or when nitrification takes place to meet standards under EPA's effluent guidelines.

In 2022:

- Nitrate compounds alone accounted for 90% of total releases of TRI chemicals to water.

- Many sectors release nitrate compounds, but facilities in the food manufacturing sector released the most.

The following graph shows the 10-year trend in RSEI Scores for TRI chemicals directly released into water bodies.



- While total water releases have been fairly steady from 2013 through 2022, associated RSEI Scores have fluctuated substantially. Nitrate compounds account for most water releases, and the quantity of nitrate compounds released has not changed significantly from year to year. Although nitrate compounds can cause serious problems in the environment like eutrophication, their relatively low toxicity means they do not impact RSEI Scores as much as more toxic chemicals. Relatively small changes in release quantities of more toxic chemicals can have large impacts on RSEI Scores but little impact on the trend in total pounds released.
- The largest chemical contributors to the changes RSEI Scores for water releases between 2013 and 2022 were arsenic compounds and mercury compounds.
- For a complete, step-by-step description of how EPA's RSEI model derives RSEI Score values for surface water discharges of TRI chemicals, see "Section 5.4: Modeling Surface Water Releases" of EPA's Risk-Screening Environmental Indicators (RSEI) Methodology.

- For general information on how RSEI Scores are derived, see Potential Risks from TRI Chemicals.

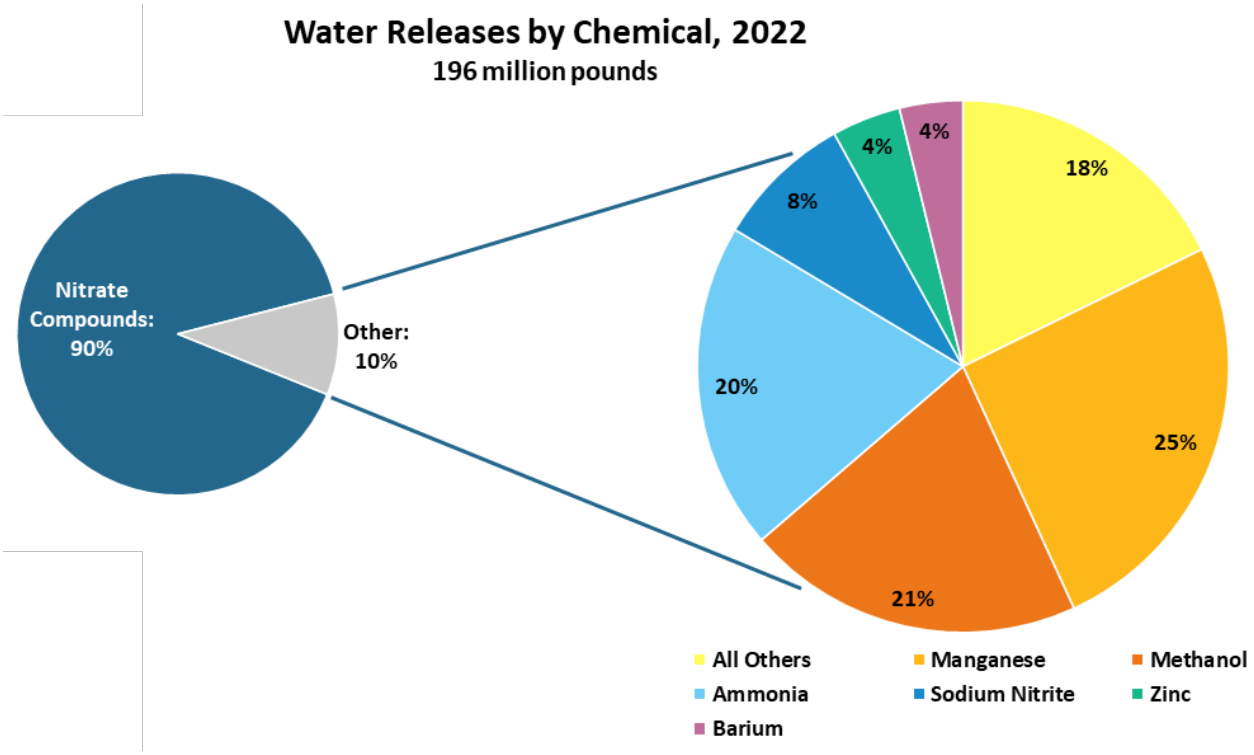
What Are Nitrate Compounds?

Nitrate compounds are a group of chemicals with relatively low toxicity to humans compared to many other TRI compounds. However, these compounds have the potential to cause increased algal growth leading to eutrophication in the aquatic environment. See EPA's Nutrient Pollution webpage for more information about the issue of eutrophication.

Water Releases by Chemical and Industry

Water Releases by Chemical

This pie chart shows the TRI-listed chemicals released into water bodies in the largest quantities during 2022.

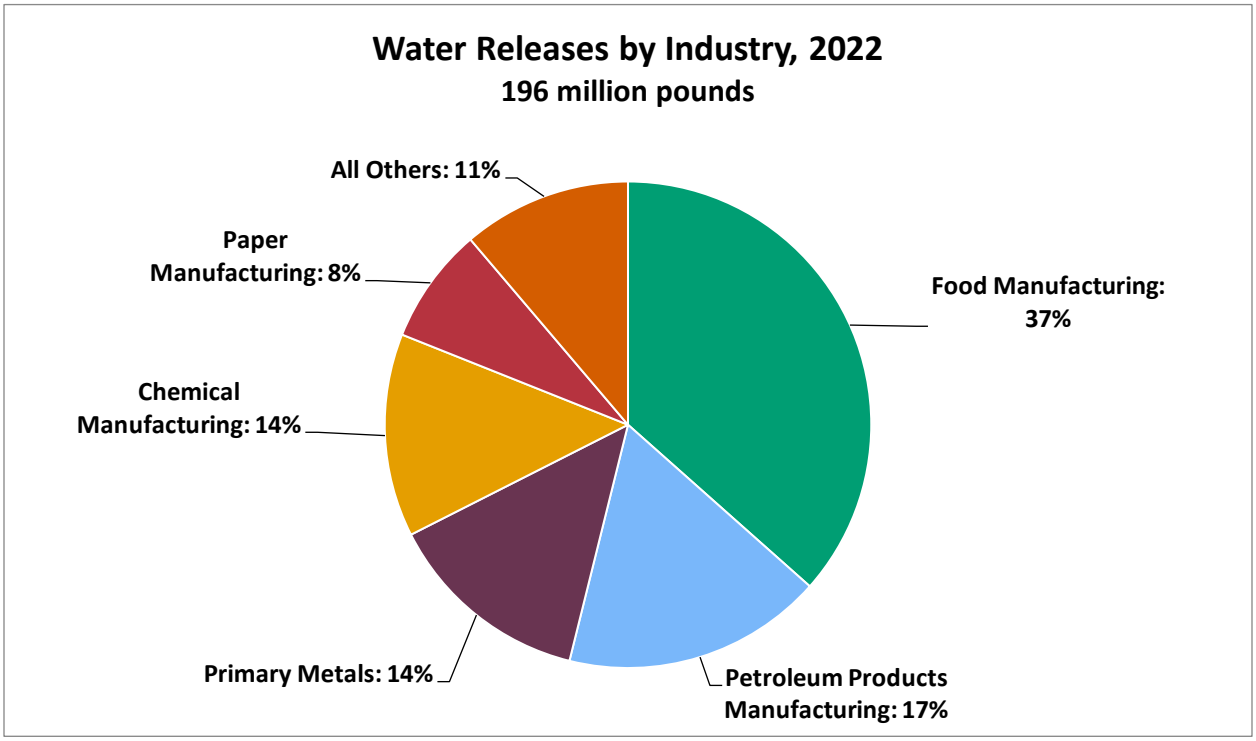


Note: 1) In this chart, metals are combined with their metal compounds, although metals and compounds of the same metal are listed separately on the TRI list (e.g., manganese is listed separately from manganese compounds). 2) The nitrate compounds category in TRI includes only water dissociable nitrate compounds.

- Nitrate compounds accounted for 90% of the total quantity of TRI chemicals released to water in 2022. Nitrate compounds are commonly formed as part of facilities' on-site wastewater treatment processes. The food manufacturing sector contributed 40% of total nitrate compound releases to water, largely due to the treatment required for biological materials in wastewater, such as from meat processing facilities.
- After nitrate compounds, manganese, methanol, and ammonia were released in the largest quantities, accounting for a combined 7% of the chemicals released into water.

Water Releases by Industry

This pie chart shows the TRI-covered industry sectors that reported the largest quantities of TRI water releases during 2022.



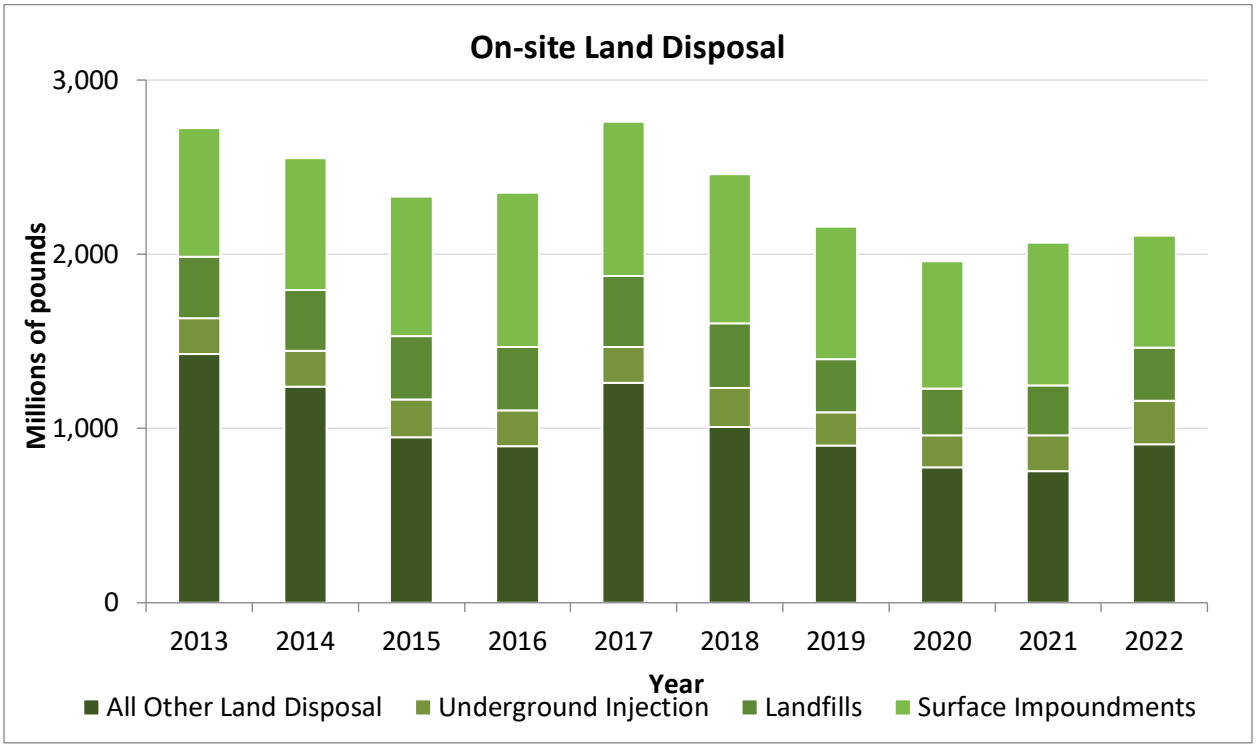
Note: Percentages do not sum to 100% due to rounding.

- Facilities in the food manufacturing sector accounted for 37% of water releases for 2022 and approximately one-third of annual water releases over the past ten years.
    - Nitrate compounds accounted for 99% of the total quantity of water releases from the food manufacturing sector.

Land Disposal

Facilities report the quantities of TRI chemical waste disposed of in landfills, underground injection wells, surface impoundments, and other types of containment. Land disposal of chemicals is often regulated by EPA under the Resource Conservation and Recovery Act (RCRA). RCRA design standards for hazardous waste landfills and surface impoundments include double liners, leachate collection and removal systems, and leak detection systems. Operators of these disposal units must also comply with RCRA inspection and monitoring requirements.

This graph shows the 10-year trend in on-site land disposal of TRI chemicals. The metal mining sector accounted for most of this disposal.



From 2013 to 2022:

- On-site land disposal has fluctuated over the last ten years, driven by year-to-year changes from metal mines.
- The "All Other Land Disposal" category in the figure includes spills and leaks to land, waste rock piles at metal mines, and application of waste to land (such as in agricultural fertilizer).

From 2021 to 2022:

- Land releases increased by 41 million pounds (2%).
- The increase in land disposal was due to the expansion of TRI reporting requirements to cover all natural gas processing facilities as of 2022. Facilities in this sector managed most of their releases through underground injection.

Land releases from metal mines:

In 2022, the metal mining sector accounted for 68% of land disposal quantities.

- The TRI chemicals disposed to land by metal mines in 2022 were primarily lead (32%), zinc (28%), and arsenic (16%).
- Metal mining facilities typically handle large volumes of material. Mines often note that changes in the chemical composition of extracted ore can result in large fluctuations in quantities of waste managed. In some cases, small changes in the ore's composition can impact whether TRI chemicals in ore qualify for a concentration-based exemption from TRI reporting in one year but not in the next year or vice versa.
- Regulations require that waste rock, which contains TRI chemicals, be placed in engineered piles, and may also require that waste rock piles, tailings impoundments, and heap leach pads be stabilized and re-vegetated to provide for productive post-mining land use.
- For more information on the mining industry, see the Metal Mining sector profile and the "Explore a Metal Mine" webpage.

This graph shows the 10-year trend in on-site land disposal, excluding quantities reported by the metal mining sector. The metal mining sector accounts for about 70% of the quantities of TRI chemicals disposed of to land in most years.

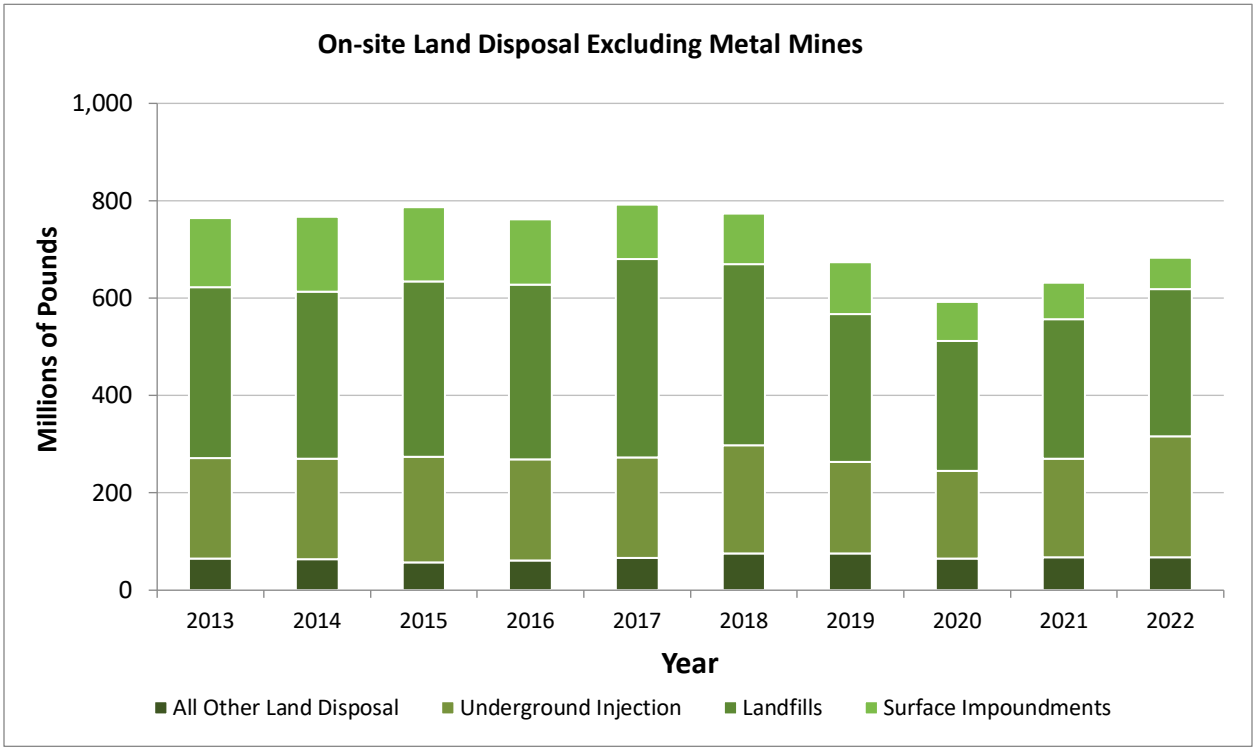
Helpful Concepts

What is underground injection?

Underground injection involves placing fluids underground in porous formations through wells. EPA regulates underground injection through its Underground Injection Control Program under the Safe Drinking Water Act.

What is a surface impoundment?

Surface impoundments are natural or artificial depressions, excavations, or diked areas used to hold liquid waste. Construction of surface impoundments must follow criteria including having a double liner and leak detection system. Surface impoundments containing hazardous waste are regulated through the Resource Conservation and Recovery Act.



From 2013 to 2022:

- Total on-site land disposal for all industries other than metal mining was relatively steady from 2013 to 2018.
- Since 2018, the decrease in land disposal for industries other than metal mining was driven by reduced land disposal by facilities in the primary metal and chemical manufacturing sectors.

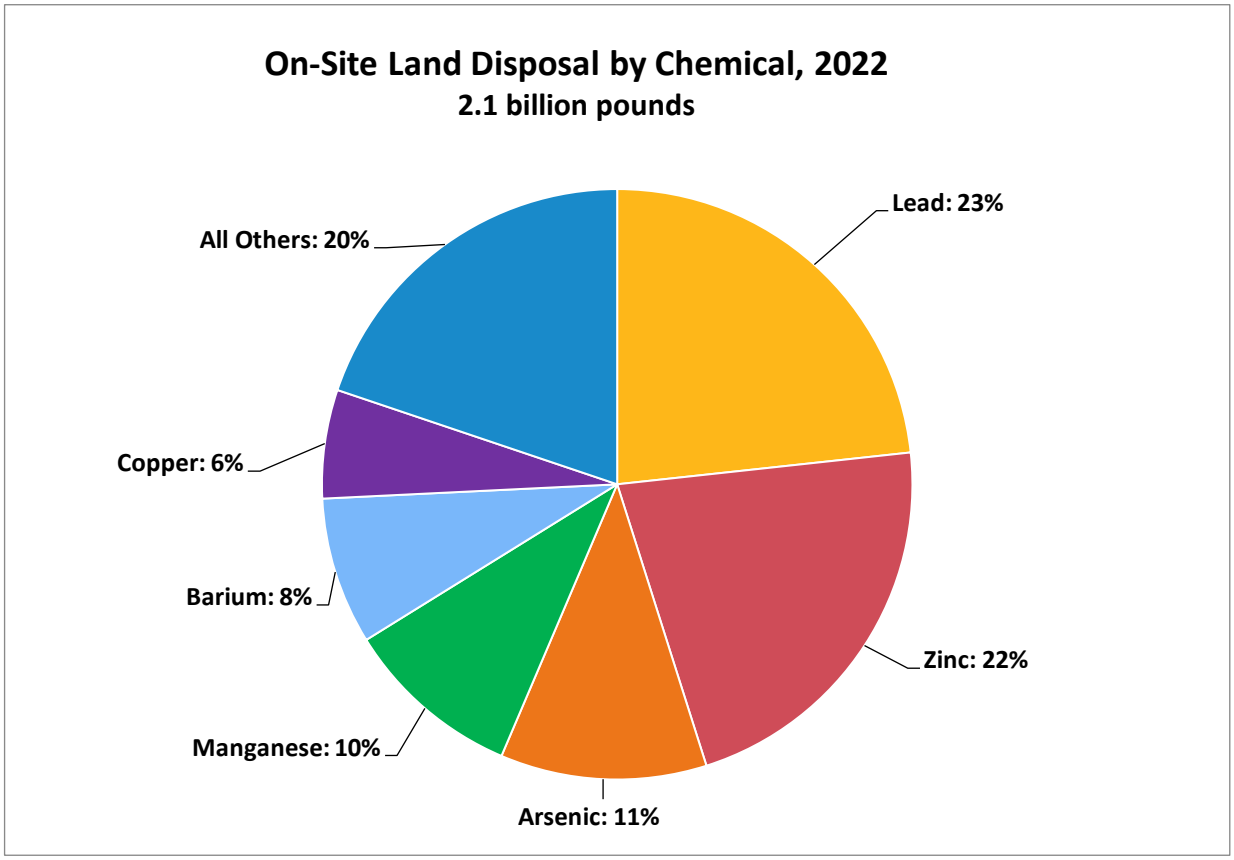
In 2022:

- Excluding the quantities of TRI chemicals disposed of to land by metal mines, the chemicals disposed of on site to land in the largest quantities were: barium (15%), manganese (11%), hydrogen sulfide (10%), and zinc (8%).
- Excluding metal mines, most on-site land disposal quantities were reported by the chemical manufacturing, hazardous waste management, electric utilities, and primary metals sectors.
- The natural gas processing sector reported 72 million pounds of land disposal, most of which was hydrogen sulfide disposed of by underground injection.

Land Disposal by Chemical and Industry

Land Disposal by Chemical

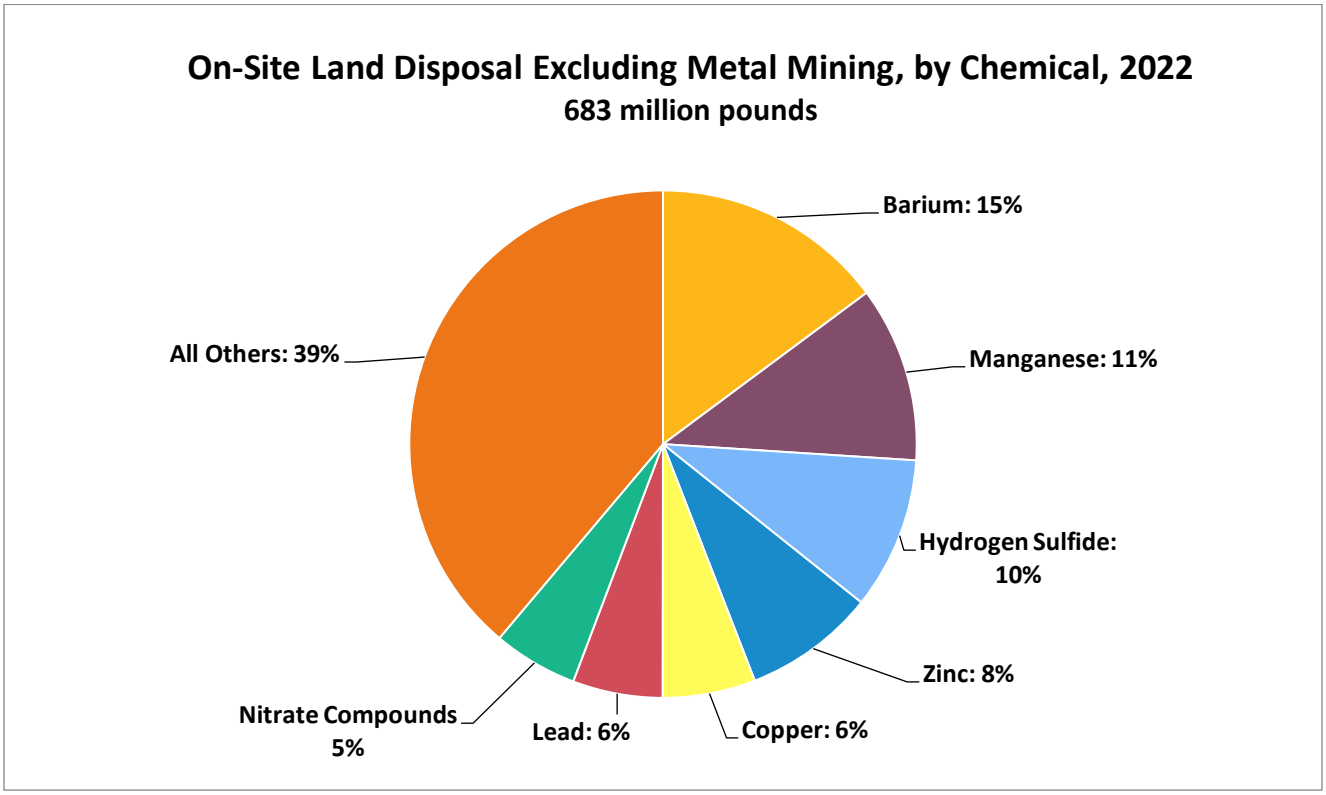
This pie chart shows the chemicals disposed of to land on site in the greatest quantities during 2022. The metal mining sector accounts for most of this disposal.



Note: In this chart, metals are combined with their metal compounds, although metals and compounds of the same metal are listed separately on the TRI list (e.g., lead is listed separately from lead compounds).

The metal mining sector alone was responsible for 91% of the lead, zinc, and arsenic disposed of to land in 2022. These three chemicals made up 56% of the total quantities of TRI chemicals disposed of to land.

This pie chart shows the chemicals disposed of on site to land in the greatest quantities during 2022, excluding quantities from facilities in the metal mining sector.

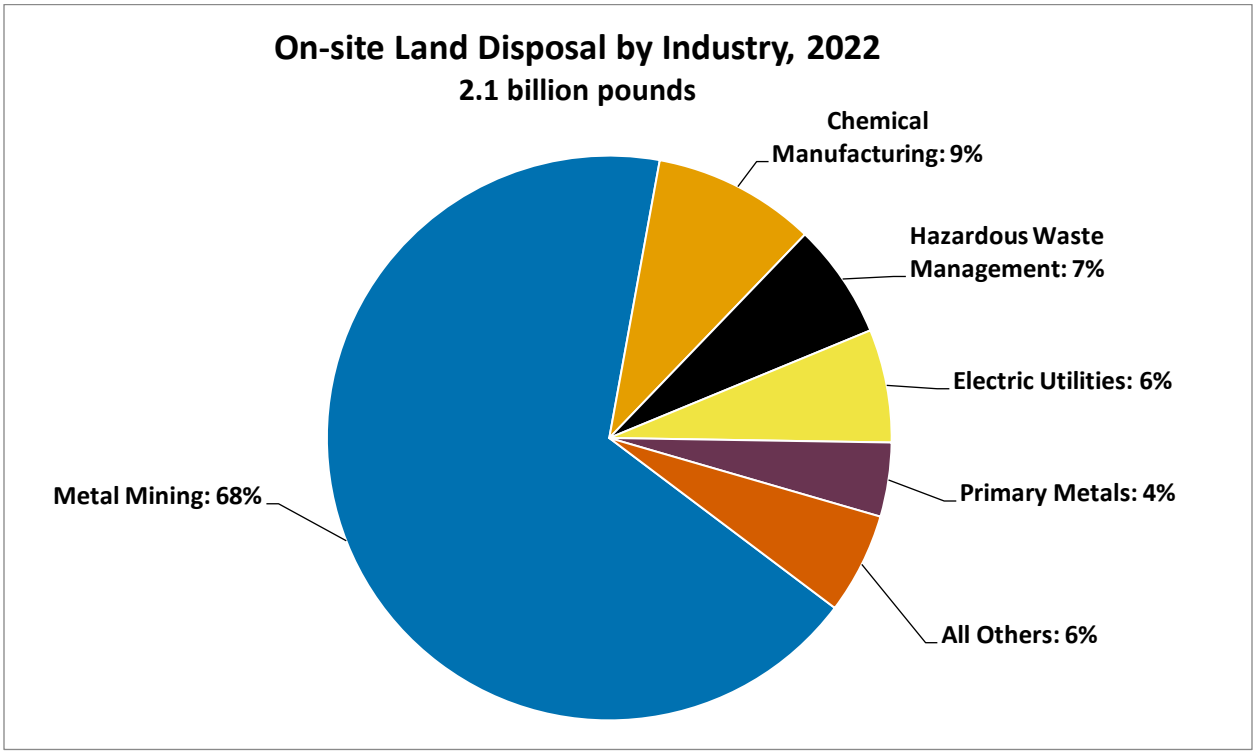


Note: In this chart, metals are combined with their metal compounds, although metals and compounds of the same metal are listed separately on the TRI list (e.g., lead is listed separately from lead compounds).

- When the metal mining sector is excluded, a wider variety of chemicals make up the majority of land releases. For example, six different chemicals made up 56% of land releases when metal mining facilities are excluded, while three chemicals made up 56% of land releases when these facilities are included (as shown on the "Land Disposal, All Sectors" chart).
- Barium: Most land releases were from the electric utilities sector.
- Manganese: Most land releases were from the chemical manufacturing, primary metals, and electric utilities sectors.
- Zinc: Most land releases were from the primary metals sector.

Land Disposal by Industry

This pie chart shows the industry sectors that reported the greatest quantities of on-site land disposal of TRI chemicals during 2022.



- Metal mines accounted for most of the land disposal in 2022.
- The relative contribution by each industry sector to on-site land disposal has not changed considerably in recent years.

Chemical Profiles

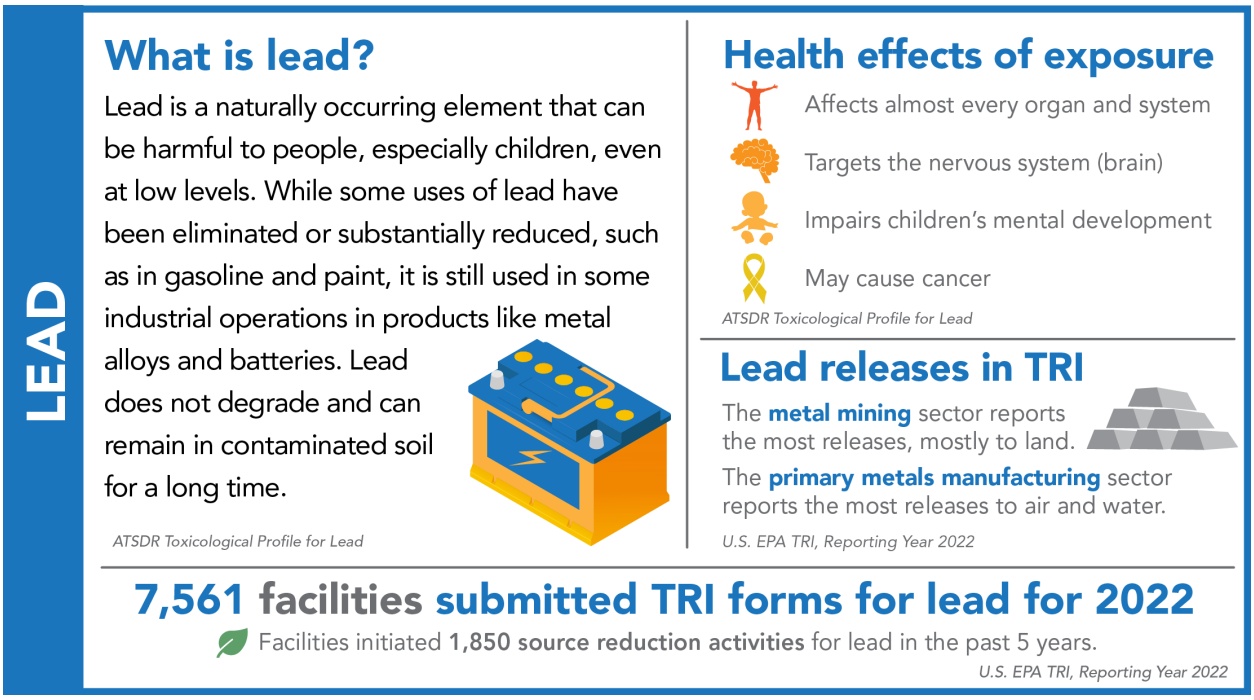
In this section, we take a closer look at some of the Toxics Release Inventory (TRI) chemicals of interest to the public, the Environmental Protection Agency (EPA), lawmakers, and industry. These profiles include chemicals that are classified by the TRI Program as chemicals of special concern, such as chemicals that are persistent, bioaccumulative, and toxic (PBTs), and carcinogens (chemicals that cause cancer).

PBT chemicals are not only toxic, but they also break down slowly in the environment and tend to build up (bioaccumulate) in organisms throughout the food web. These organisms are food sources for other organisms, including humans, which are sensitive to the toxic effects of PBT chemicals. Reporting thresholds for the PBTs on the TRI chemical list are either 10 pounds or 100 pounds, which is much lower than the reporting threshold for most TRI chemicals. For dioxin and dioxin-like compounds, the reporting threshold is even lower, at 0.1 gram. The chemicals of special concern covered in this section are lead and lead compounds, mercury and mercury compounds, dioxin and dioxin-like compounds, and per- and polyfluoroalkyl substances (PFAS).

You can generate a fact sheet for any TRI chemical using TRI Explorer.

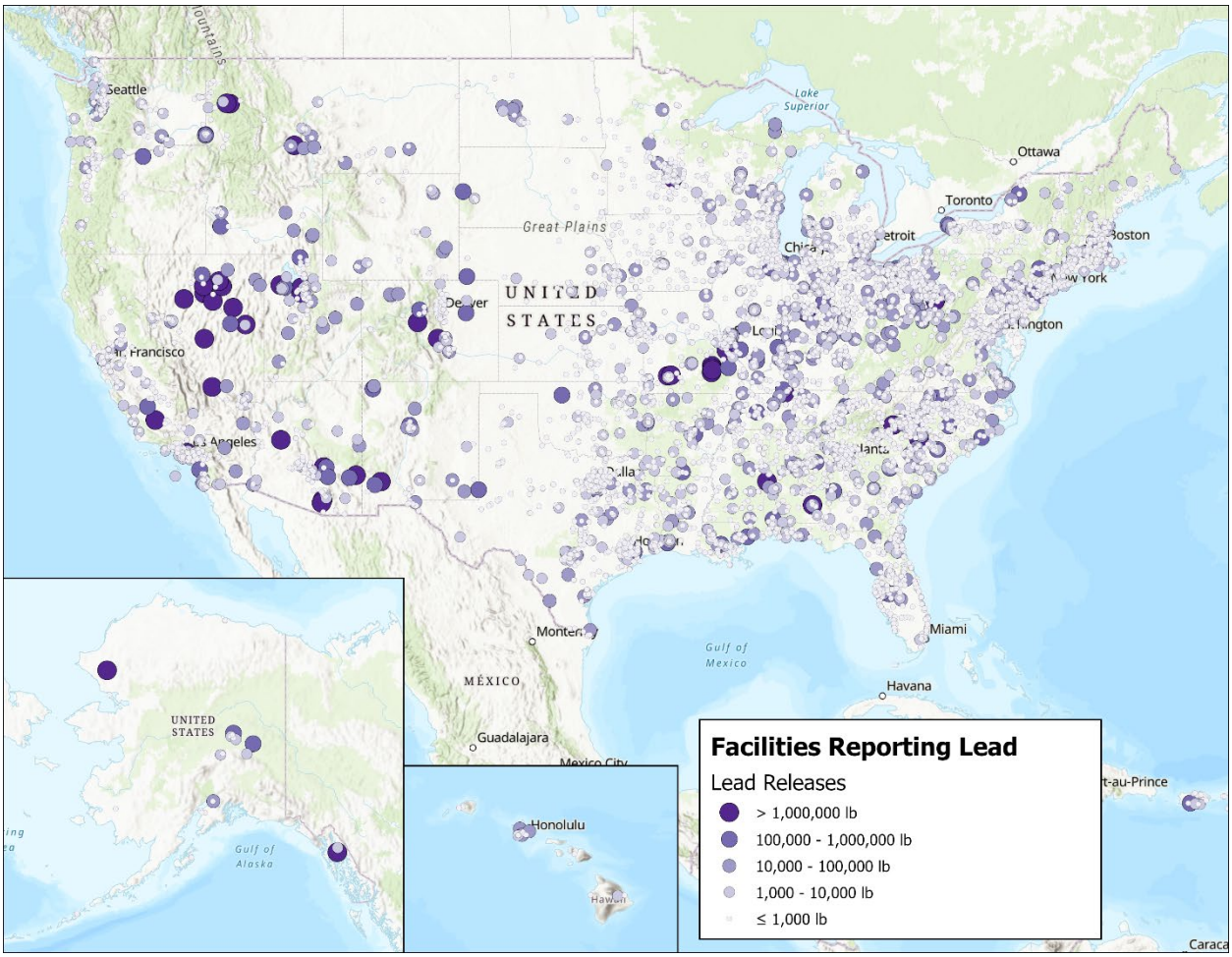
Lead

This chemical profile focuses on releases of lead and lead compounds.



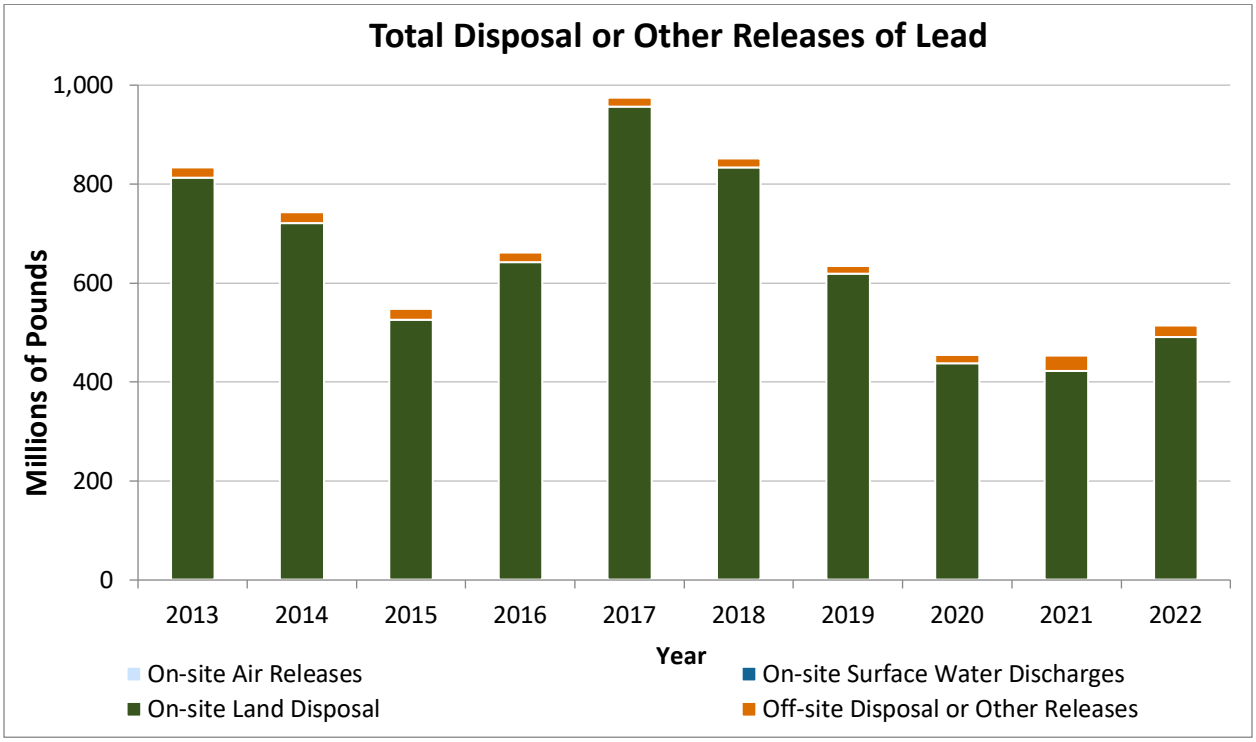
Facilities report their management of both lead and lead compounds in waste to TRI. For TRI, "lead" only includes elemental lead, while "lead compounds" includes lead that is part of another chemical. Although facilities may report for lead compounds separately from lead, the two are combined and referred to simply as "lead" in this analysis.

This map shows the locations of the facilities that reported lead to TRI for 2022, sized by their relative release quantities.



View Larger Map

Each year, EPA receives more TRI forms for lead than for any other chemical. This graph shows the 10-year trend in lead disposed of or otherwise released by facilities in all TRI reporting industry sectors.



One parent company erroneously reported tens of thousands of pounds of lead releases to air at four facilities and has since corrected these reports. These facilities are not included in this chart.

From 2013 to 2022:

- Total releases of lead fluctuated between 2013 and 2022, with substantial increases and decreases from year to year.
- Land disposal by metal mines drives annual lead releases. For 2022, metal mines reported 88% of all releases of lead, almost all of which was disposed of to land.

From 2021 to 2022:

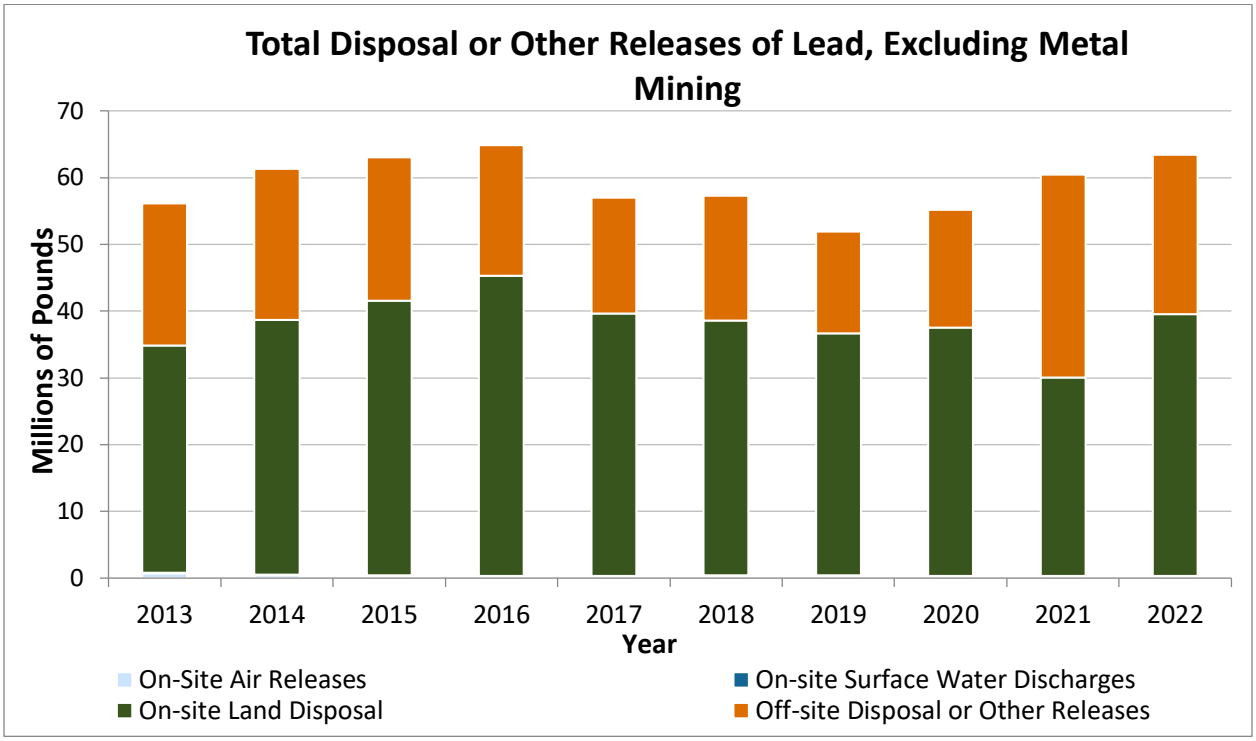
- Total releases of lead increased by 14%, driven by an increase in on site lead disposal at metal mines.

Learn more about lead

Visit EPA's lead homepage for more information about lead and EPA's actions to reduce lead exposures.

Visit the Agency for Toxic Substances and Disease Registry's ToxFAQs for lead to learn more about the effects of lead exposure and what you can do to prevent it.

This graph shows the 10-year trend in lead released, but excludes quantities reported by the metal mining sector.



Facilities from one parent company erroneously reported tens of thousands of pounds of lead releases to air at four facilities and has since corrected these reports. These facilities are not included in this chart.

From 2013 to 2022:

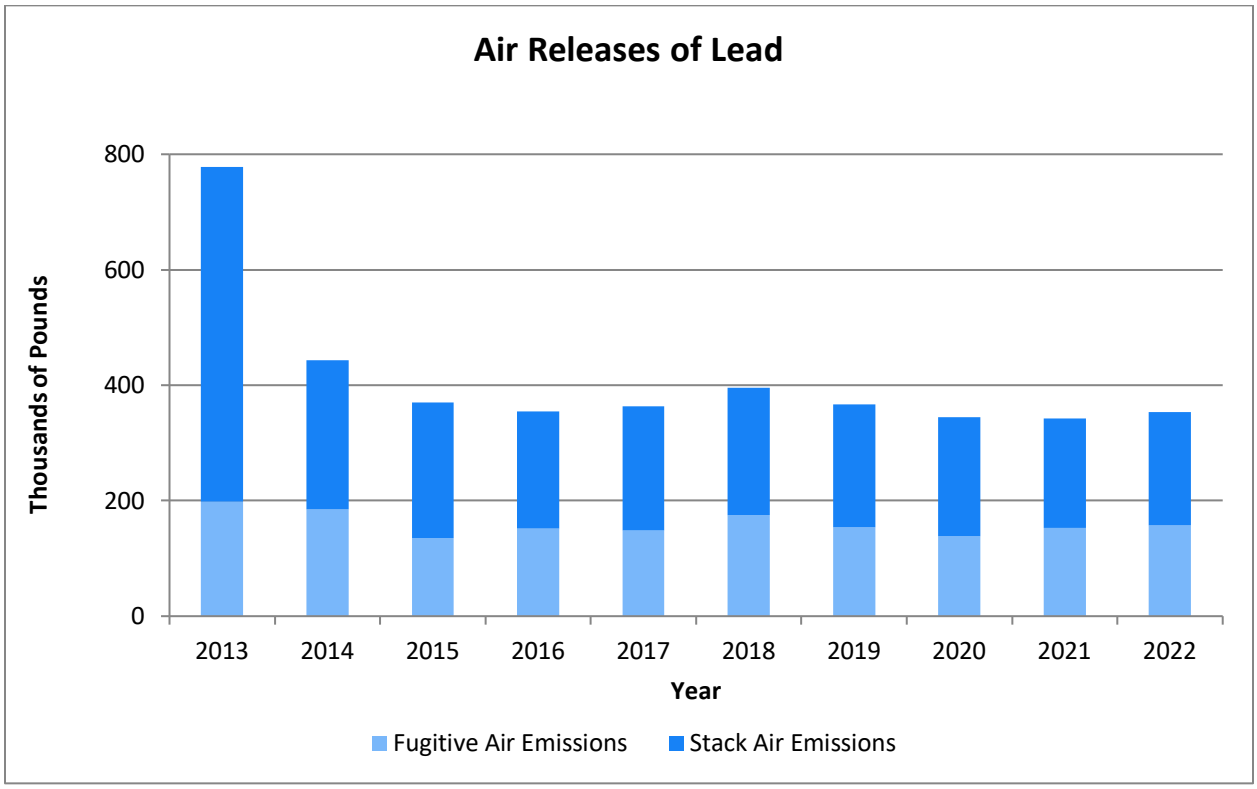
- For sectors other than metal mining, total releases of lead fluctuated between 2013 and 2022, and increased each year from 2019 to 2022.
    - On-site disposal to land and off-site transfers of lead for disposal increased from 2013 to 2022, while air and water releases of lead decreased.
- Among sectors other than metal mining, most releases of lead came from the hazardous waste management and primary metals sectors.

From 2021 to 2022:

- Air releases, land disposal, and water releases of lead all increased, while off-site disposal decreased.

Lead Air Releases

This graph shows the 10-year trend in air releases of lead.



Facilities from one parent company erroneously reported tens of thousands of pounds of lead releases to air at four facilities and has since corrected these reports. These facilities are not included in this chart.

From 2013 to 2022:

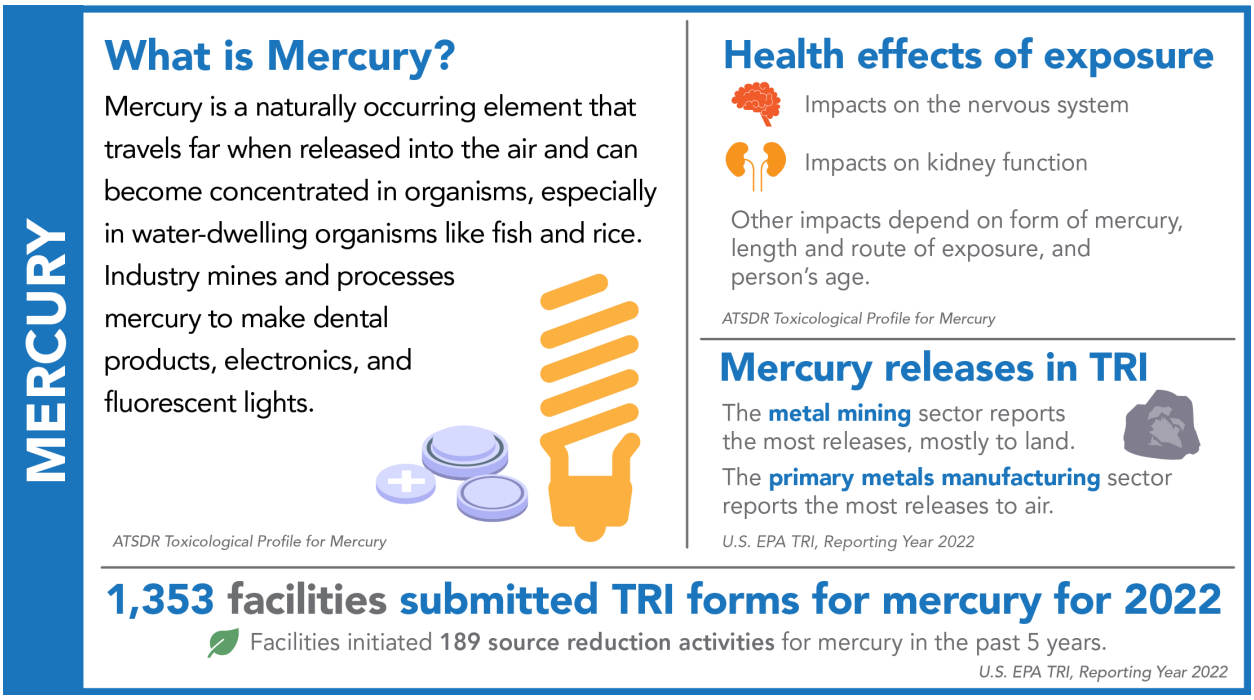
- Air releases of lead decreased by 55%. Most of this decrease comes from reduced stack emissions.
- The primary metals sector, which includes copper smelting and iron and steel manufacturing, released the largest quantities of lead to air. This sector has also been the biggest driver of reduced air releases since 2013, although lead air releases have decreased in most sectors.
- One facility ceased lead smelting operations in 2013. This facility was one of the biggest contributors to lead air releases reported to TRI, causing a substantial reduction in nationwide lead air releases for 2014 and beyond, when smelting operations had ceased.

From 2021 to 2022:

- Air releases of lead increased by 3%.
- In 2022, the primary metals sector accounted for 32% of lead released into the air.

Mercury

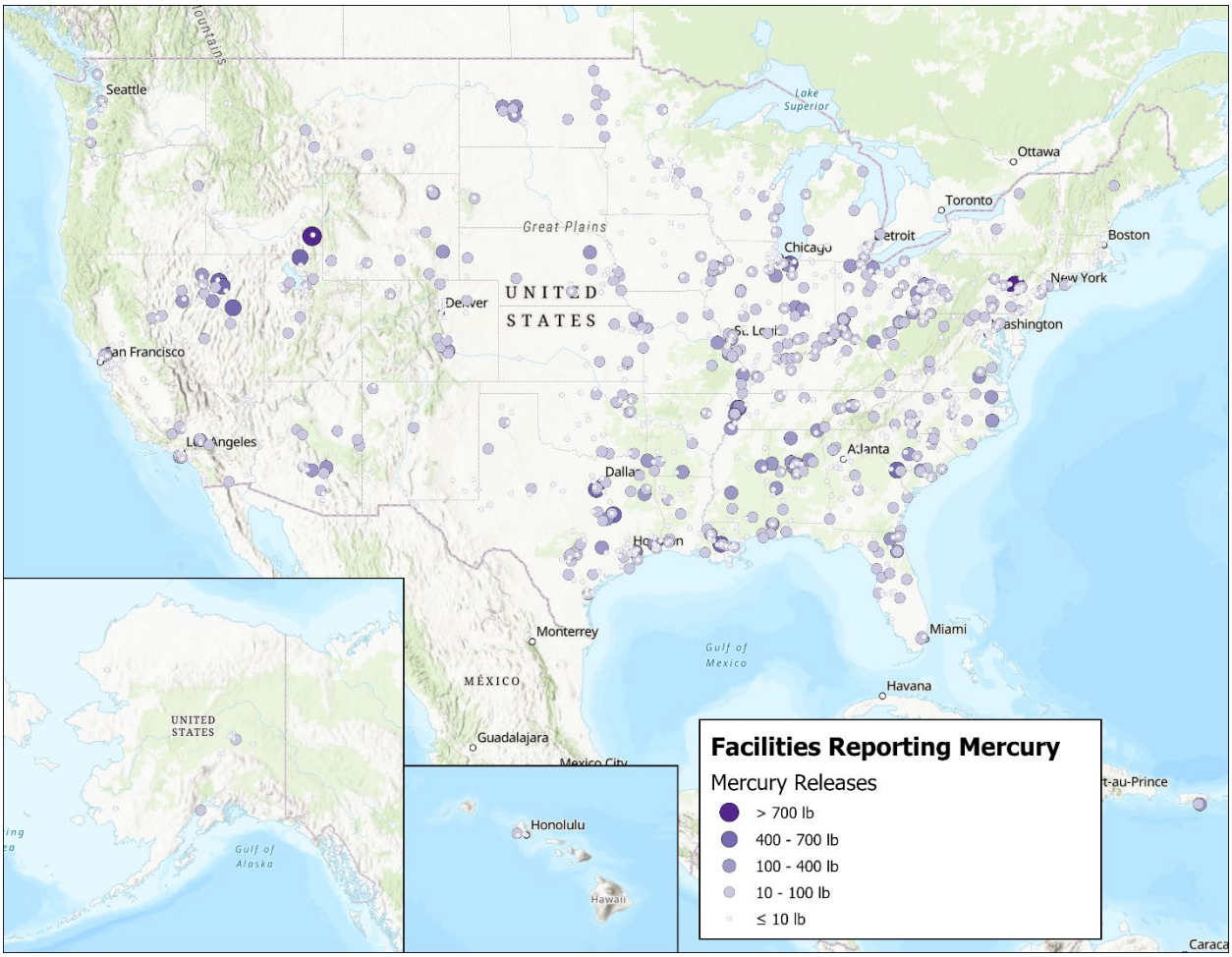
This chemical profile focuses on releases of mercury and mercury compounds.



Facilities report waste management of both mercury and mercury compounds to TRI. For TRI, "mercury" only includes elemental mercury, while "mercury compounds" includes mercury that is part of another chemical. Although facilities may report for mercury compounds separately from mercury, the two are combined and referred to simply as "mercury" in this analysis.

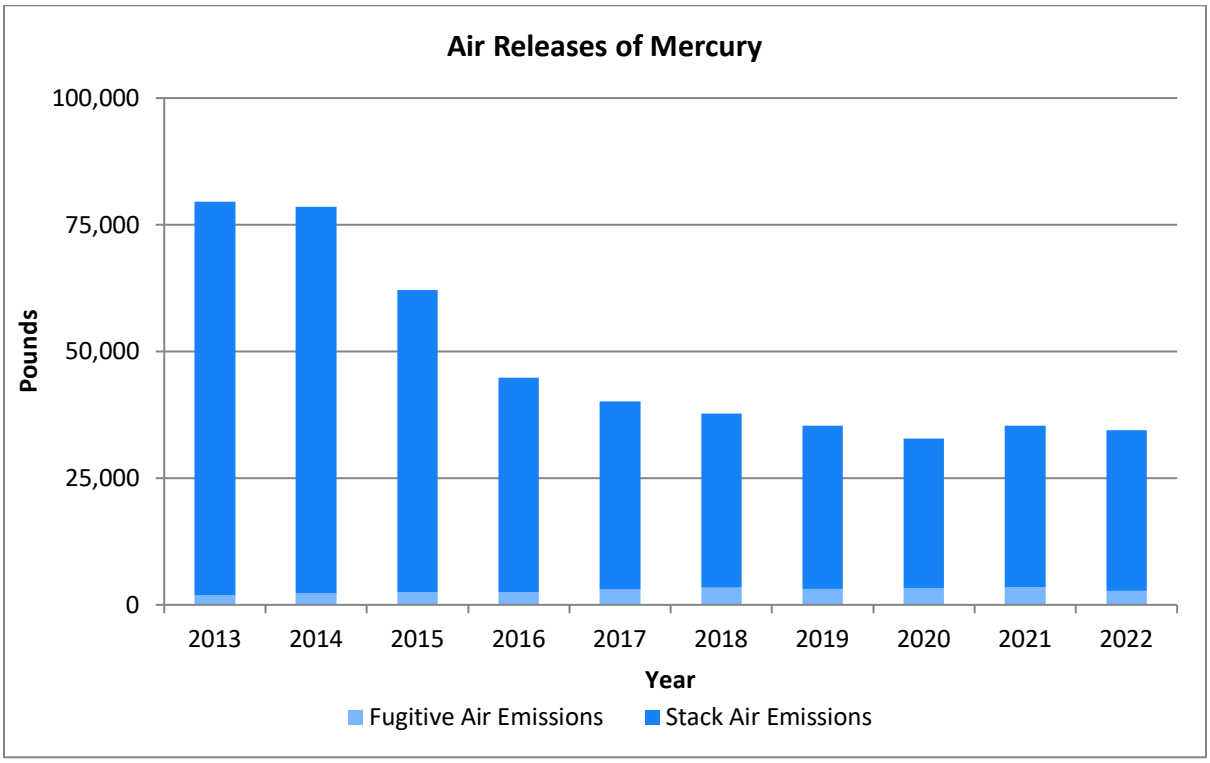
This profile focuses on air releases of mercury as they are the type of release most likely to impact human health.

This map shows the locations of the facilities that reported mercury to TRI for 2022, sized by their relative release quantities to air.



View Larger Map

This graph shows the 10-year trend in mercury released to air.



From 2013 to 2022:

- Releases of mercury to air decreased by 57%.
- An 85% reduction (-41,000 pounds) in mercury air emissions from electric utilities drove the overall decline from 2013 to 2022. The decrease was driven by a shift from coal to other fuel sources (e.g., natural gas) and by the installation of pollution control technologies at coal-fired power plants.
    - Note that only those electric utilities that burn coal or oil to generate power for distribution into commerce are covered under TRI reporting requirements. Electric utilities that do not burn coal or oil are not required to report to TRI.

Learn more about mercury

Visit EPA's mercury homepage for more information about mercury and EPA's actions to reduce mercury exposures.

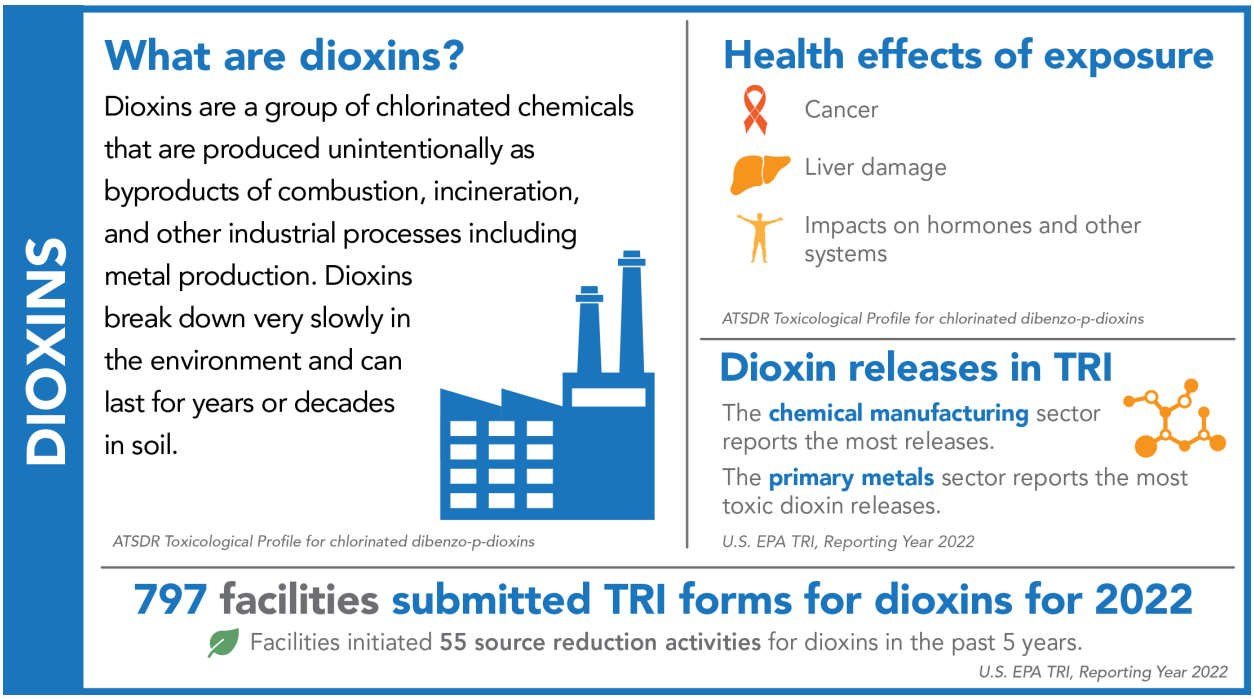
Visit the Agency for Toxic Substances and Disease Registry's ToxFAQs for mercury to learn more about the effects of mercury exposure and what you can do to prevent it.

From 2021 to 2022:

- Releases of mercury to air decreased by 3%, driven by the primary metals sector.
- For 2022, the primary metals sector, which includes iron and steel manufacturers, accounted for 36% of the air emissions of mercury. The electric utilities sector accounted for 21% of mercury air emissions.

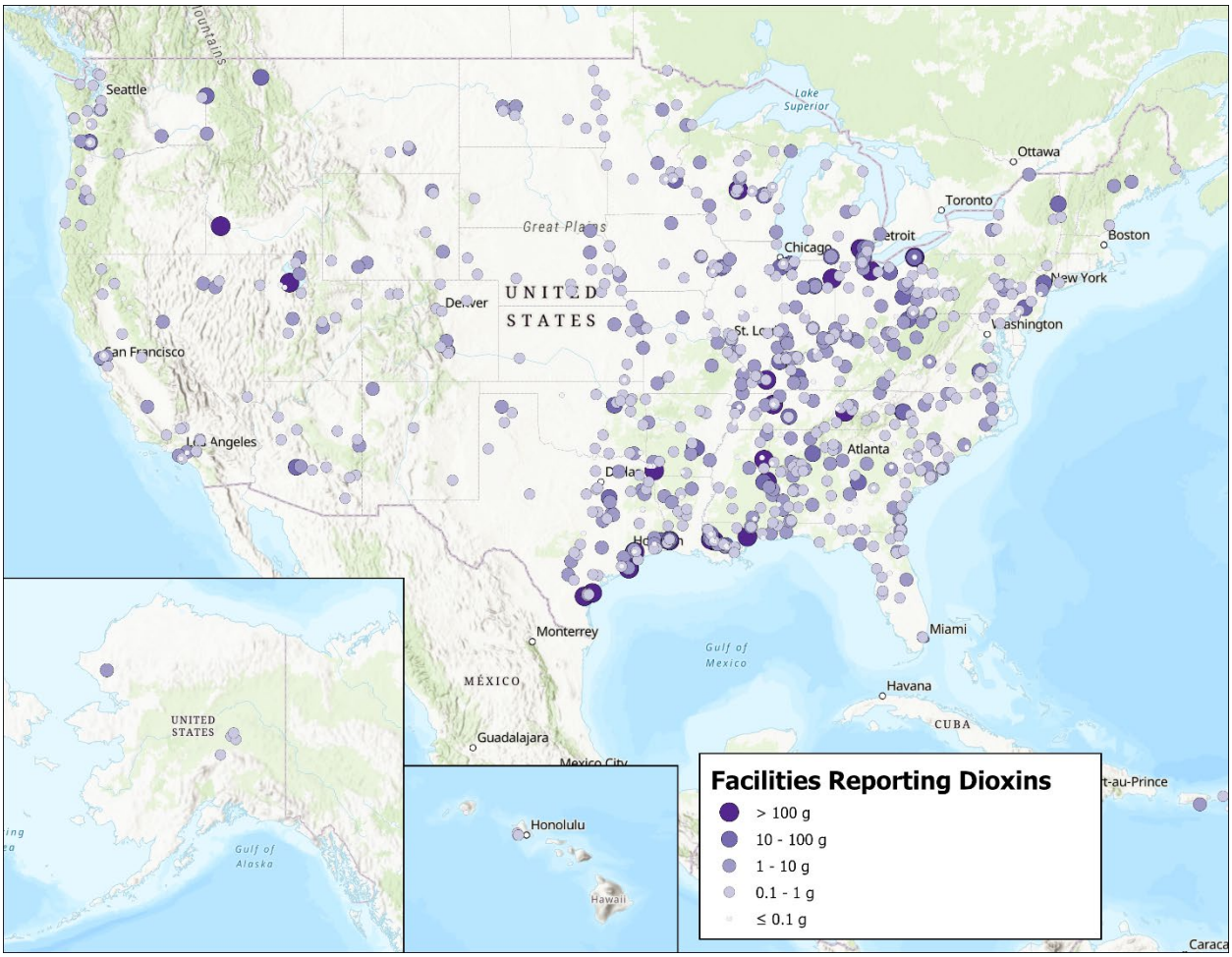
Dioxins

This chemical profile focuses on releases of dioxin and dioxin-like compounds.



Dioxin and dioxin-like compounds ("dioxins") are a group of chemically-similar compounds that are typically produced in very small quantities but are toxic at much lower concentrations than most other chemicals. Additionally, they persist in the environment and bioaccumulate in the food chain. Dioxins have a lower reporting threshold and are reported in grams instead of pounds to capture smaller amounts of these chemicals.

This map shows the locations of the facilities that reported dioxins to TRI for 2022, sized by their relative release quantities.



View Larger Map

TRI requires facilities to report data on the 17 individual members of the TRI dioxin and dioxin-like compounds category. While each chemical in the dioxin and dioxin-like compounds category causes the same toxic effects, some cause these effects at lower levels of exposure than others because the chemicals have different toxicities. As a result, one mixture of dioxins can have a very different toxic potency than the same amount of a different mixture. Facilities in different sectors tend to release different mixtures of dioxins depending on their operations, so the potential for harm from their releases may also be different.

EPA accounts for the varying toxicities of the different dioxins by using Toxic Equivalent Factor (TEF) and Toxic Equivalency (TEQ) values. TEFs help to understand the toxic potency of each dioxin. TEFs are then used to derive TEQs, which add context to releases of different mixtures of dioxins. TEQs are most useful when comparing releases of dioxins from different sources or different time periods, where the mix of congeners may vary.

Helpful Concepts

Toxic Equivalent Factor (TEF)

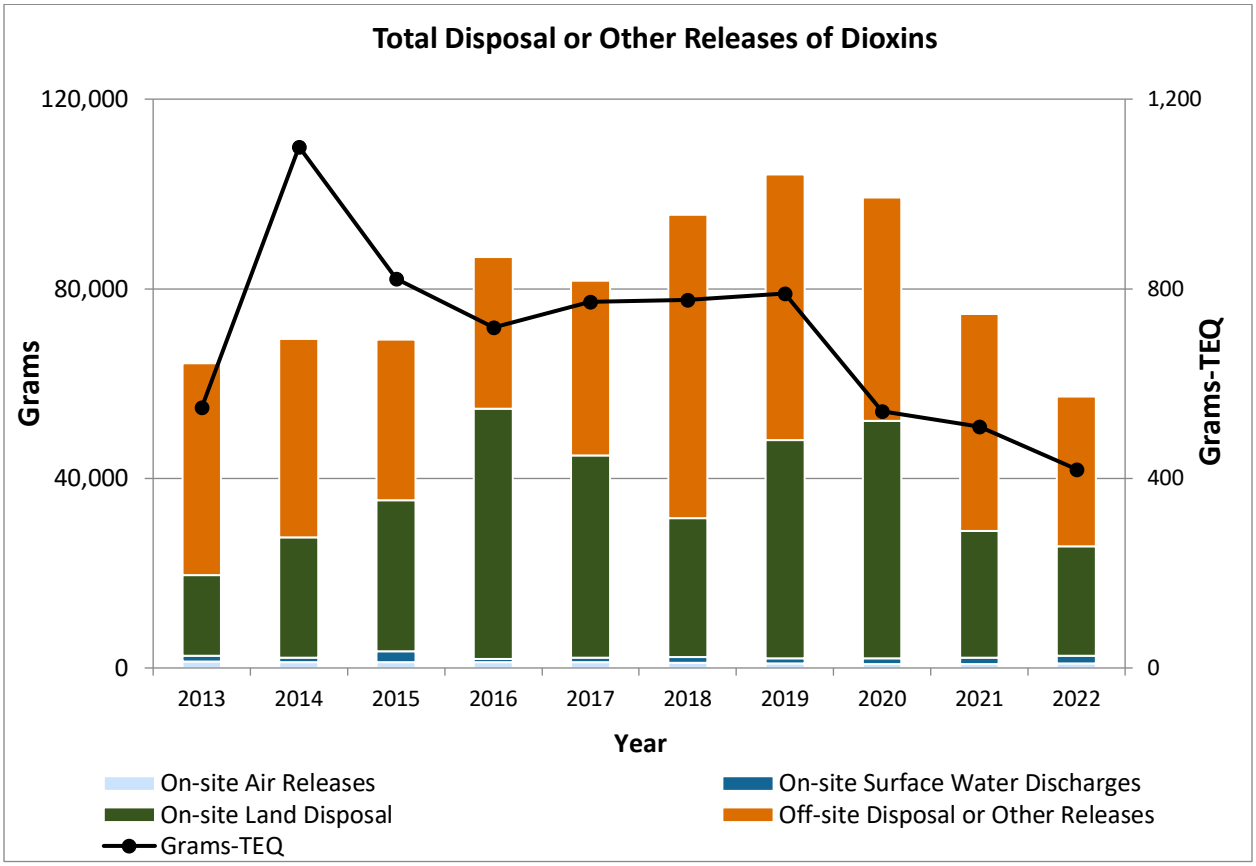
Each individual dioxin is assigned a TEF that compares that compound's toxicity to the most toxic dioxin in the category.

Toxic Equivalency (TEQ)

A TEQ is calculated by multiplying the reported grams of each compound by its corresponding TEF and summing the results, referred to as grams-TEQ.

Learn more about dioxins at EPA's Dioxins homepage and ATSDR's dioxins ToxFAQs.

This graph shows the 10-year trend in the quantity of dioxins that facilities released from 2013 to 2022.



From 2013 to 2022:

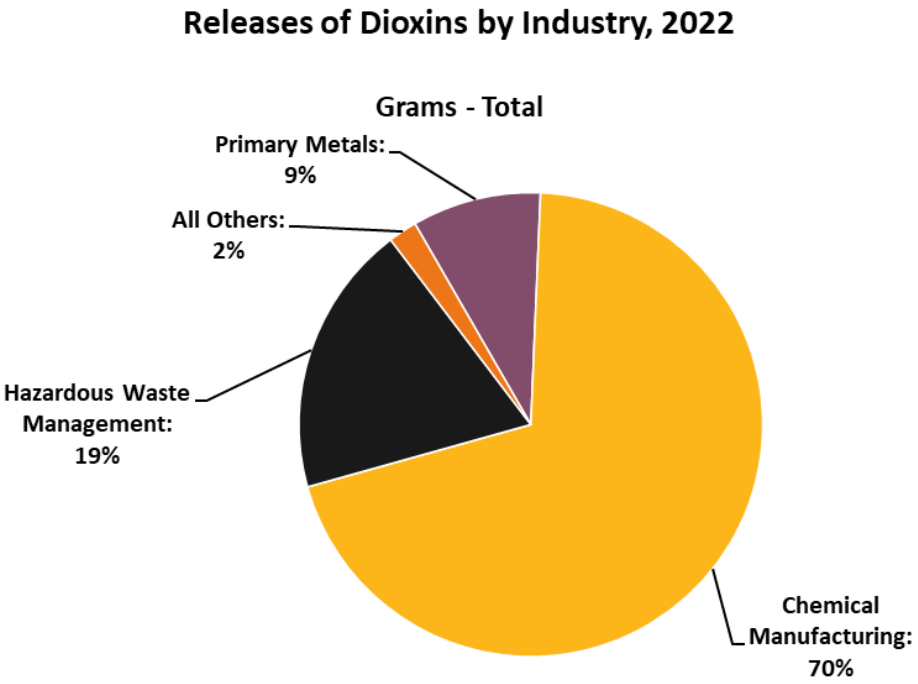
- Dioxin releases fluctuated over the last ten years, with a decrease of 11% between 2013 and 2022. Toxicity equivalents (grams-TEQ) decreased by 24%, indicating that the overall **toxicity** of dioxin releases decreased even more than the **quantity** released. This is due to changes in which dioxin congeners were released.

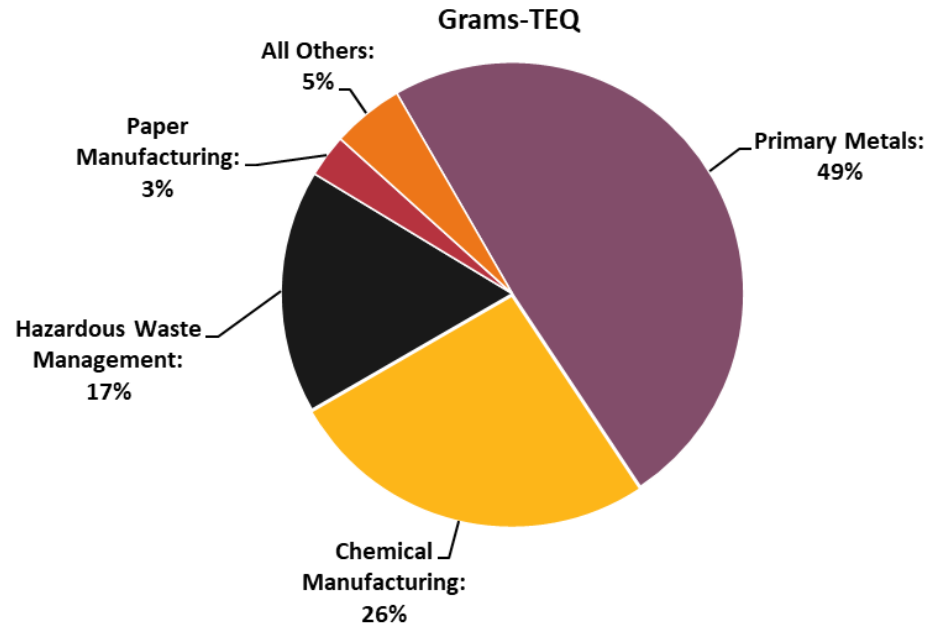
From 2021 to 2022:

- Grams released of dioxins decreased by 23%, driven by decreased releases reported by an organic chemical manufacturing facility.
    - Toxicity equivalents (grams-TEQ) decreased by 18%, similar to the decrease in grams released.
- In 2022, 55% of dioxin releases were disposed of at off-site locations, primarily in landfills.

Dioxins Releases by Industry

The following two pie charts compare the industry sectors that reported the greatest releases of dioxins (in grams) to those that reported the greatest releases of dioxins based on toxicity equivalency (in grams-TEQ).

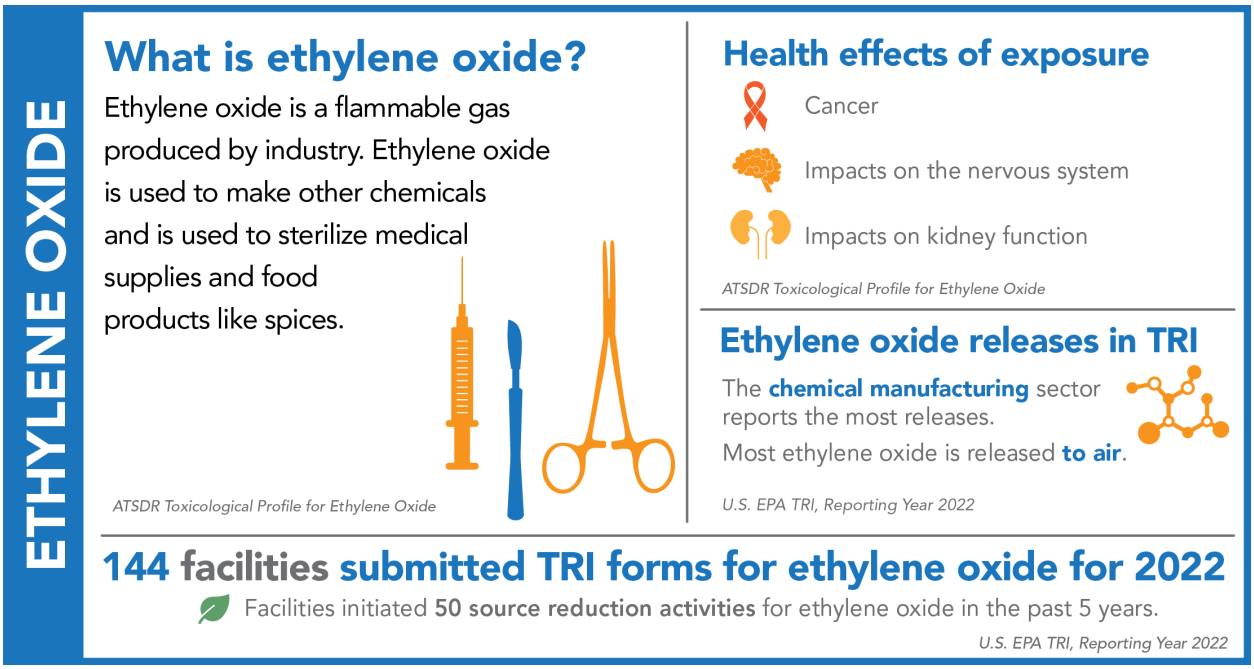




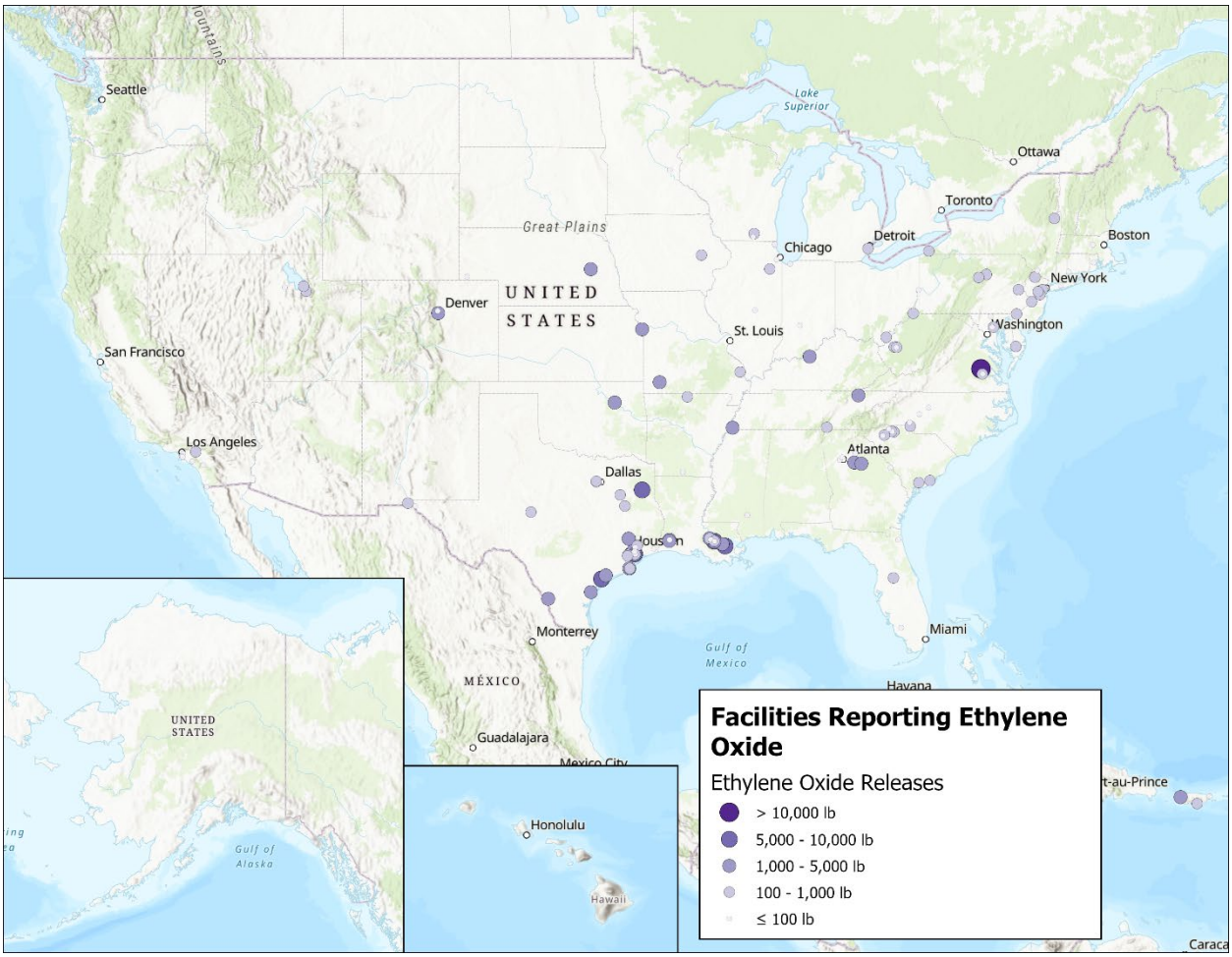
- The mix of dioxins released varies across industry sectors.
- The chemical manufacturing industry accounted for 70% and the primary metals sector for 9% of total grams of dioxins released. In terms of toxicity equivalents, however, the primary metals sector accounted for 49% and the chemical manufacturing sector for 26% of the total grams-TEQ.

Ethylene Oxide

This section focuses on ethylene oxide, a human carcinogen.

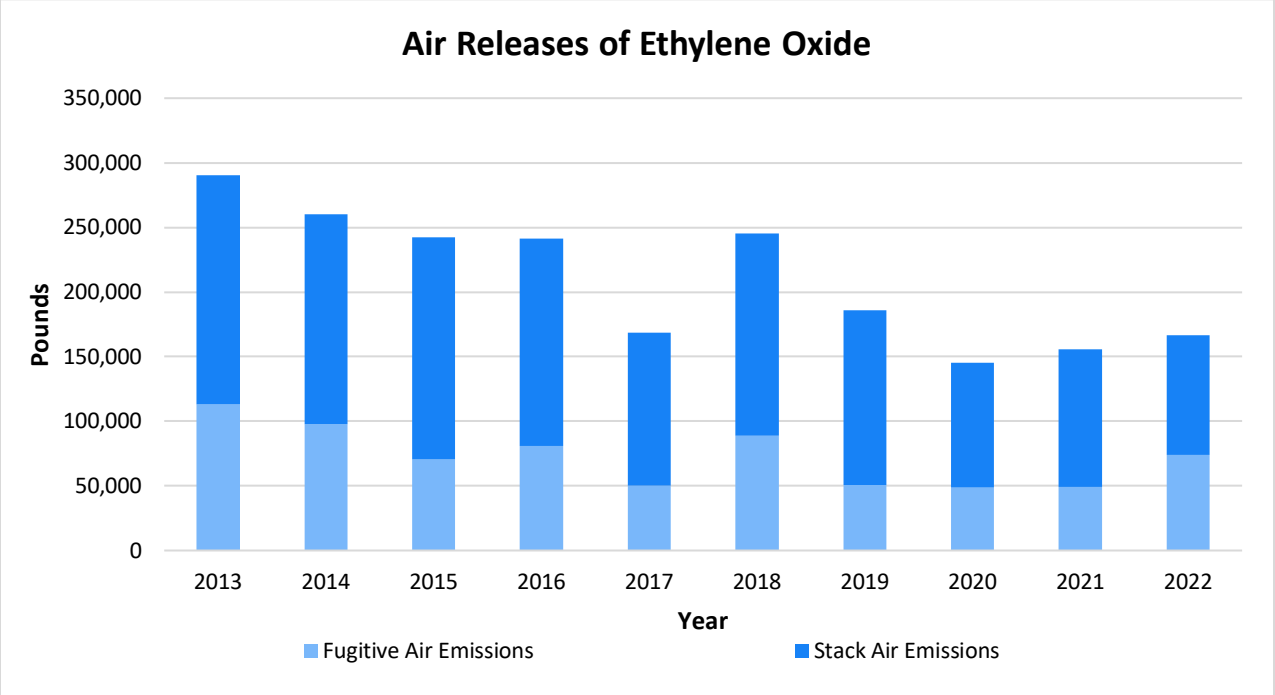


This map shows the locations of the facilities that reported ethylene oxide to TRI for 2022, sized by their relative release quantities to air.



View Larger Map

The figure below presents the 10-year trend in air releases of ethylene oxide.



- From 2013 to 2022, releases of ethylene oxide to air decreased by 124,000 pounds (-43%).
- EPA recently extended TRI reporting requirements to specific contract sterilization facilities that use ethylene oxide. These facilities reported for the first time for 2022.
    - These facilities reported a total of 9,166 pounds of ethylene oxide released to air in 2022.
- While the chemical manufacturing sector accounts for most of the ethylene oxide air releases, the 7% increase in air releases of ethylene oxide from 2021 to 2022 was driven by the newly-reporting contract sterilization facilities.

Learn More About Ethylene Oxide

Ethylene oxide is a human carcinogen, meaning that it is known to cause cancer in humans. It is used for a variety of industrial purposes including sterilizing food and medical equipment and producing other chemicals.

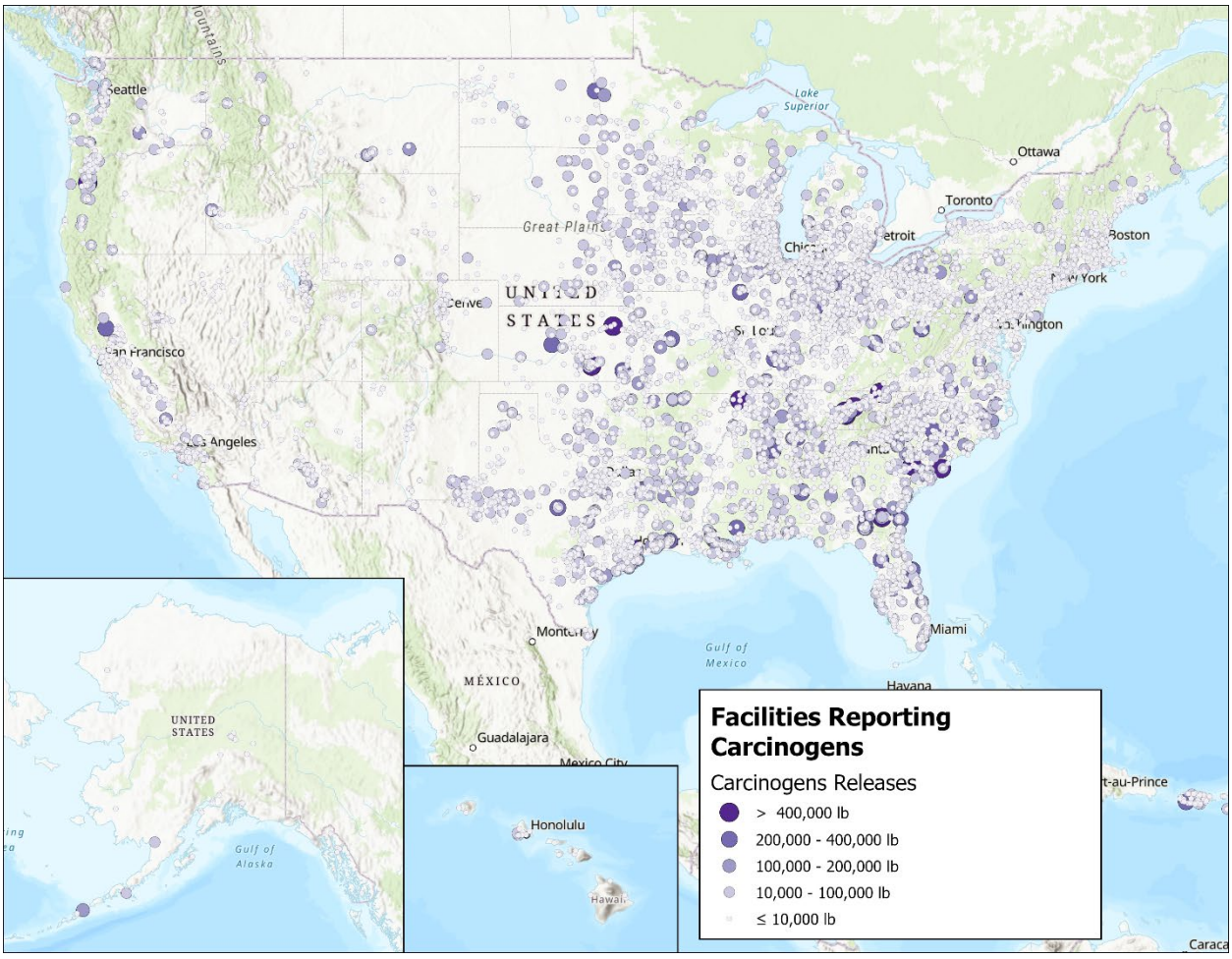
Visit EPA's ethylene oxide homepage for more information and to learn about EPA's actions to reduce exposures.

Visit ATSDR's ToxFAQs for ethylene oxide to learn more about the effects of exposure.

Occupational Safety and Health Administration (OSHA) Carcinogens

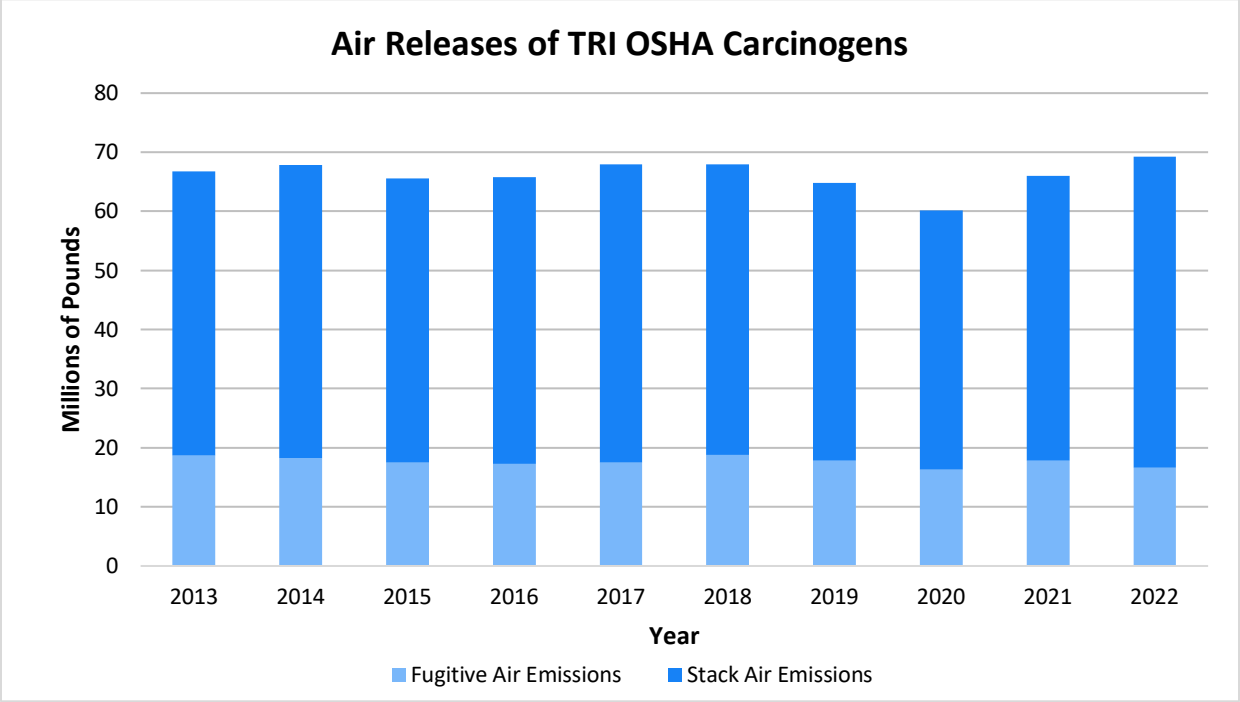
Some chemicals that are reportable to the TRI Program are included on OSHA's list of carcinogens. EPA refers to these chemicals as TRI OSHA carcinogens. These chemicals are either known or believed to cause cancer in humans. A list of the TRI carcinogens can be found in the TRI basis of OSHA carcinogens technical document.

This map shows the locations of the facilities that reported carcinogens to TRI for 2022, sized by their relative release quantities to air.



View Larger Map

This graph shows the 10-year trend in air releases of TRI OSHA carcinogens.

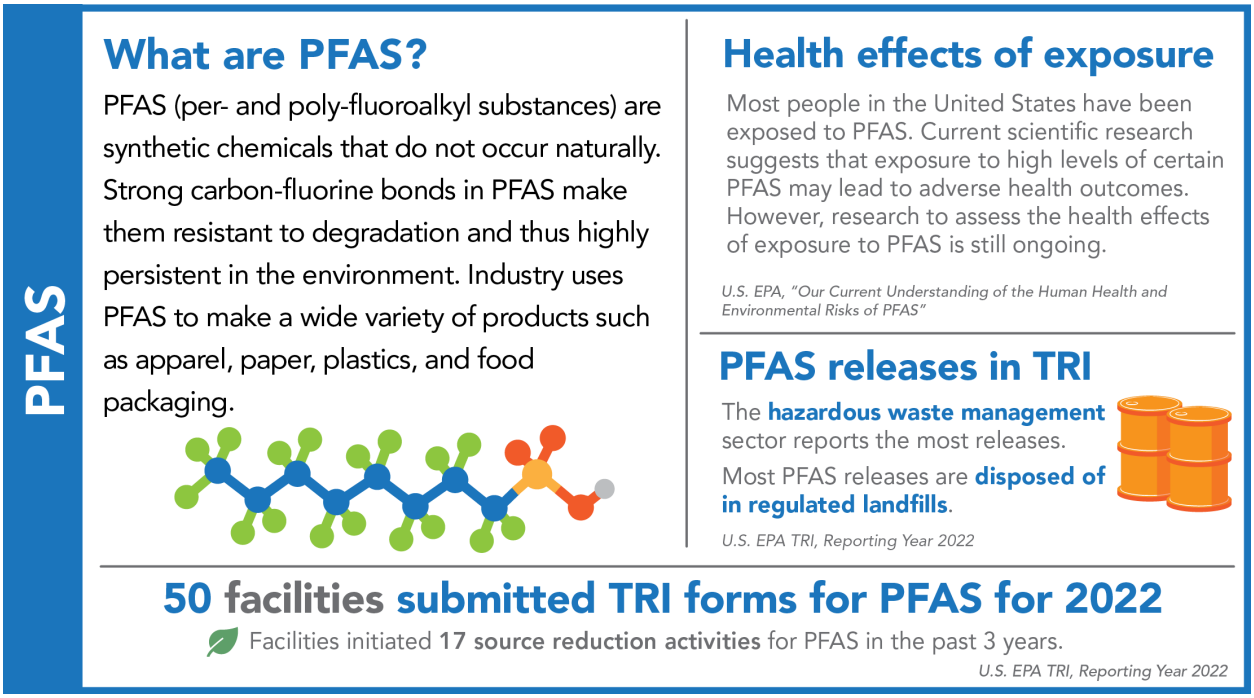


From 2013 to 2022:

- Air releases of TRI OSHA carcinogens increased by 4% since 2013.
- While most sectors reduced their air releases of many of these carcinogens, these decreases were offset by increased releases of styrene by the plastics and rubber products manufacturing sector and the transportation equipment manufacturing sector.
- In 2022, the TRI OSHA carcinogens released into air in the highest quantities were styrene, acetaldehyde, and formaldehyde.
- EPA recently added natural gas processing facilities to the scope of facilities required to report to TRI. These facilities reported for the first time for 2022, contributing to the increase in reported air releases of TRI OSHA carcinogens.

Per- and Polyfluoroalkyl Substances (PFAS)

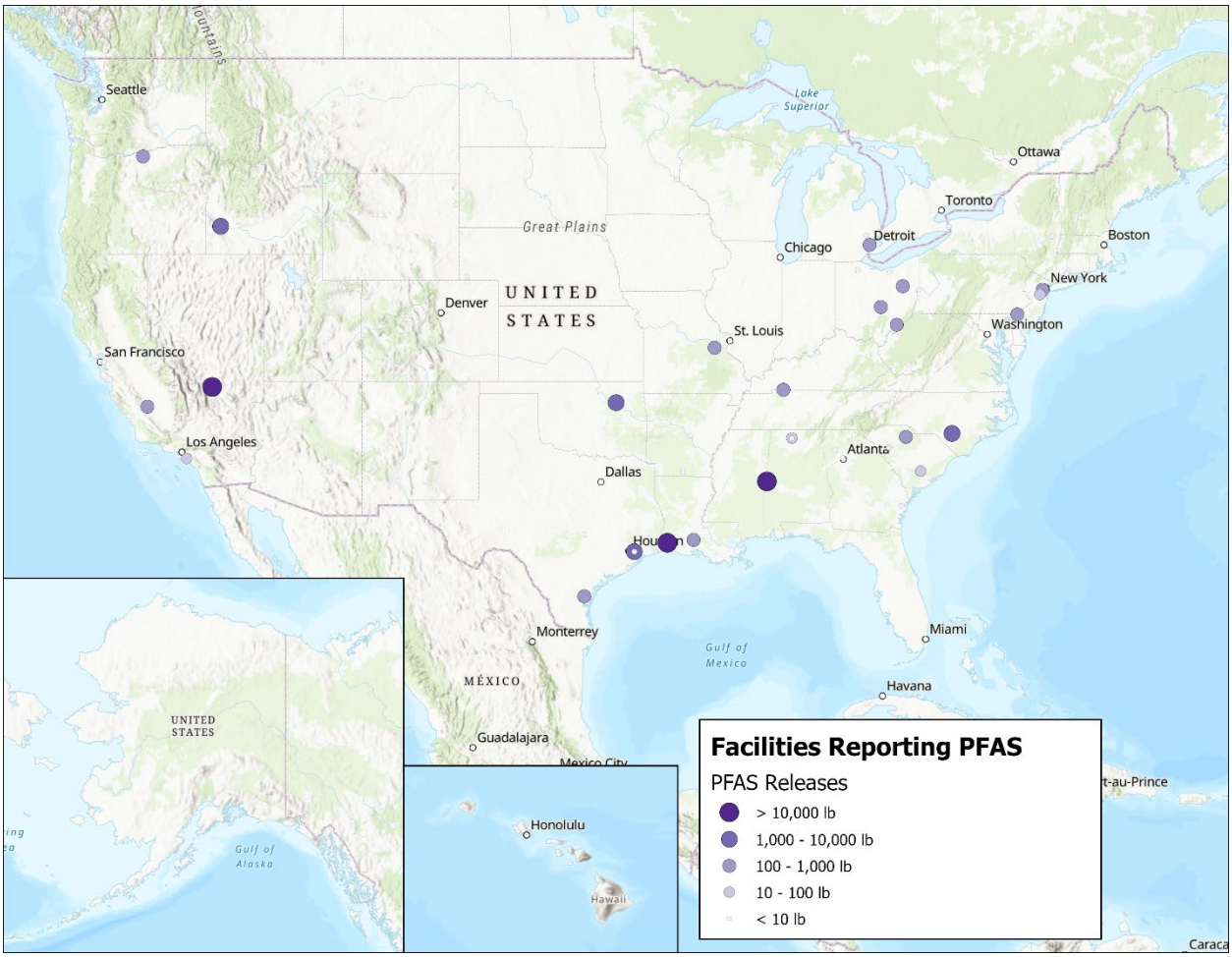
The TRI chemical list for reporting year 2022 includes 180 per- and polyfluoroalkyl substances (PFAS). Each year, the TRI Program reviews newly available information and adds PFAS to the TRI chemical list if they meet certain criteria.



Facilities reported their releases and other waste management practices for these PFAS for the first time for 2020. Additional PFAS have been added to the list for each subsequent reporting year. The TRI reporting threshold for PFAS is 100 pounds, which is lower than the thresholds for most TRI chemicals. PFAS were also recently designated as chemicals of special concern, which changes certain reporting requirements beginning in 2024. Read more about the rule.

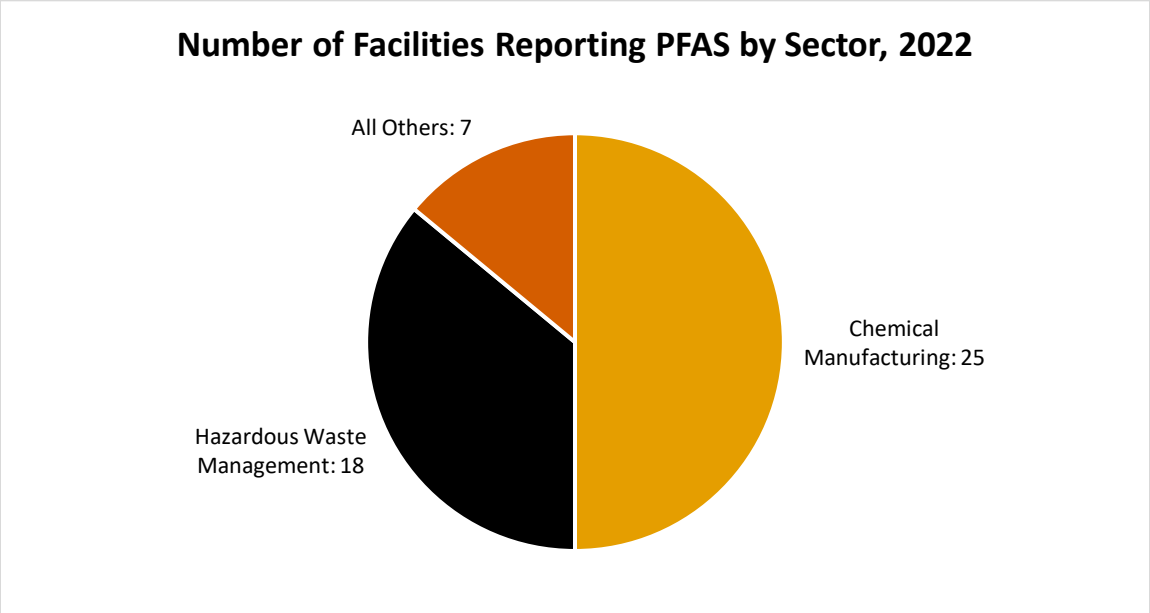
Note that definitions of which chemicals are considered PFAS vary, and that the PFAS on the TRI chemical list do not include all known per- and polyfluoroalkyl substances. See EPA's *PFAS Explained* page for more information about these chemicals and EPA actions related to PFAS.

This map shows the locations of the facilities that reported a PFAS to TRI for 2022, sized by their relative release quantities.



View Larger Map

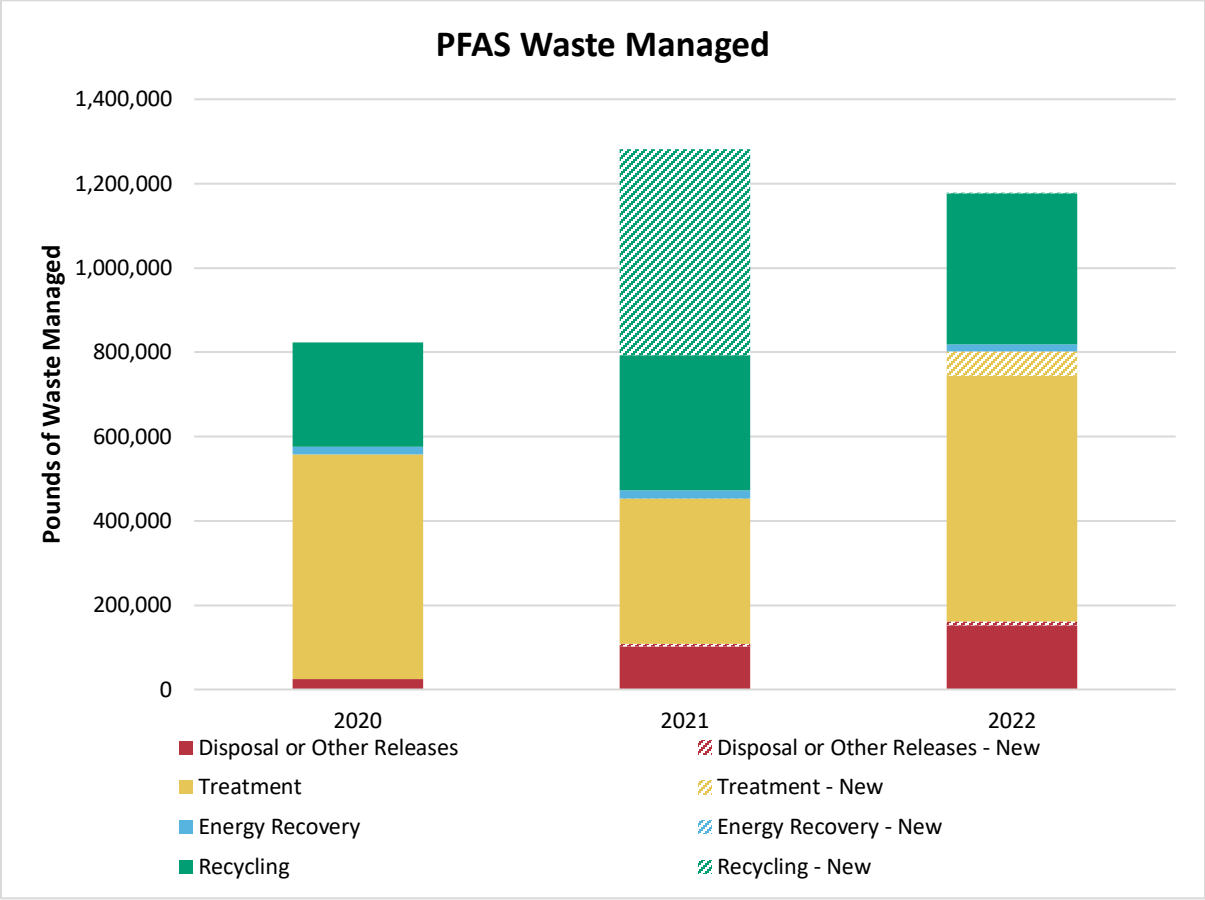
This chart shows the number of facilities in each sector reporting any of the 180 PFAS for 2022.



- Most facilities reporting PFAS were in the chemical manufacturing sector or the hazardous waste management sector.
- Facilities have reported 63 different PFAS since 2020. The most-reported PFAS from 2020-2022 were perfluorooctanoic acid (PFOA), perfluorooctane sulfonic acid (PFOS), and hexafluoropropylene oxide dimer acid (HFPO-DA).

PFAS Waste Management

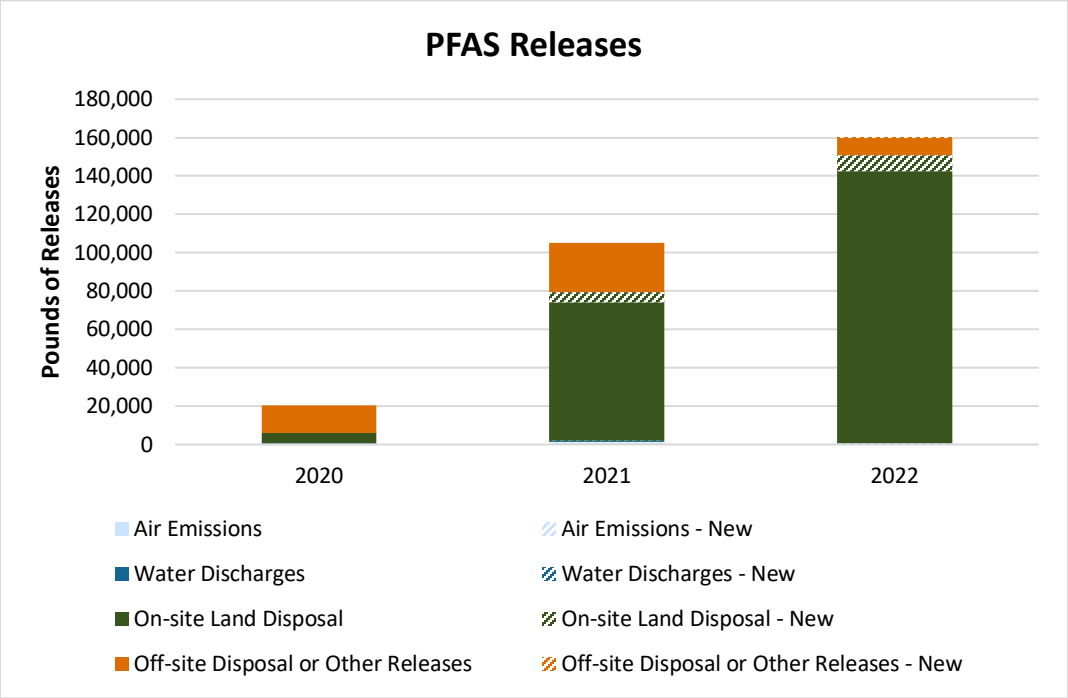
This chart shows how facilities managed PFAS waste.



Note: The dashed areas in this chart show waste of PFAS that were not reportable for 2020.

- The quantity of PFAS reported as managed as waste increased by 354,000 pounds from 2020 to 2022.
- The year-to-year changes in PFAS waste management have been driven primarily by one chemical manufacturing facility.
- Each year, combined quantities of hexafluoropropylene oxide dimer acid (HFPO-DA) and its ammonium salt accounted for more waste managed than any other PFAS.
- The chemical manufacturing and hazardous waste management sectors have reported managing the most PFAS waste each year.

This chart shows PFAS releases by environmental medium.



Note: The dashed areas in this chart show releases of PFAS that were not reportable for 2020.

- Releases of PFAS were almost eight times greater in 2022 compared to 2020.
- Releases of PFAS newly added to the TRI chemical list for 2021 or 2022 accounted for only a small portion of the increase.
- The increase in PFAS releases was mainly driven by the hazardous waste management sector.
- The hazardous waste management sector reported 98% of all PFAS releases for 2022.

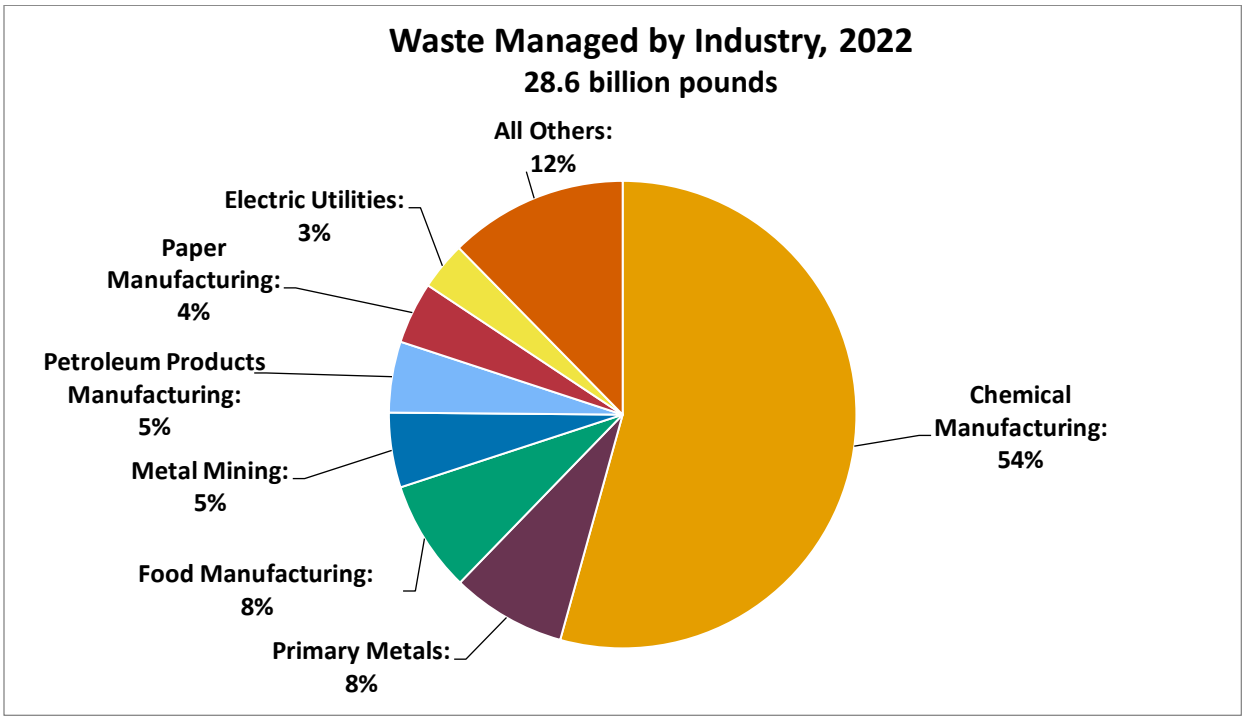
Comparing Industry Sectors

This section examines how industry sectors manage Toxics Release Inventory (TRI) chemical waste. Looking at data from individual sectors can highlight progress in improving environmental performance and reveal opportunities for better waste management practices within individual sectors.

Industries subject to TRI reporting requirements vary substantially in size, scope, and business type. As a result, the amounts and types of chemicals managed as waste by facilities across industrial sectors often differ. For facilities in the same sector, however, the processes, products, and regulatory requirements are often similar, resulting in similar use and handling of TRI chemicals.

This section presents trends in key sectors' waste managed, including TRI chemical releases into the environment. For analytical purposes, the TRI Program has combined the North American Industry Classification System (NAICS) codes at the 3- and 4-digit levels, creating 30 industry sector categories. To learn more about which business activities are subject to TRI reporting requirements, see this list of covered NAICS codes.

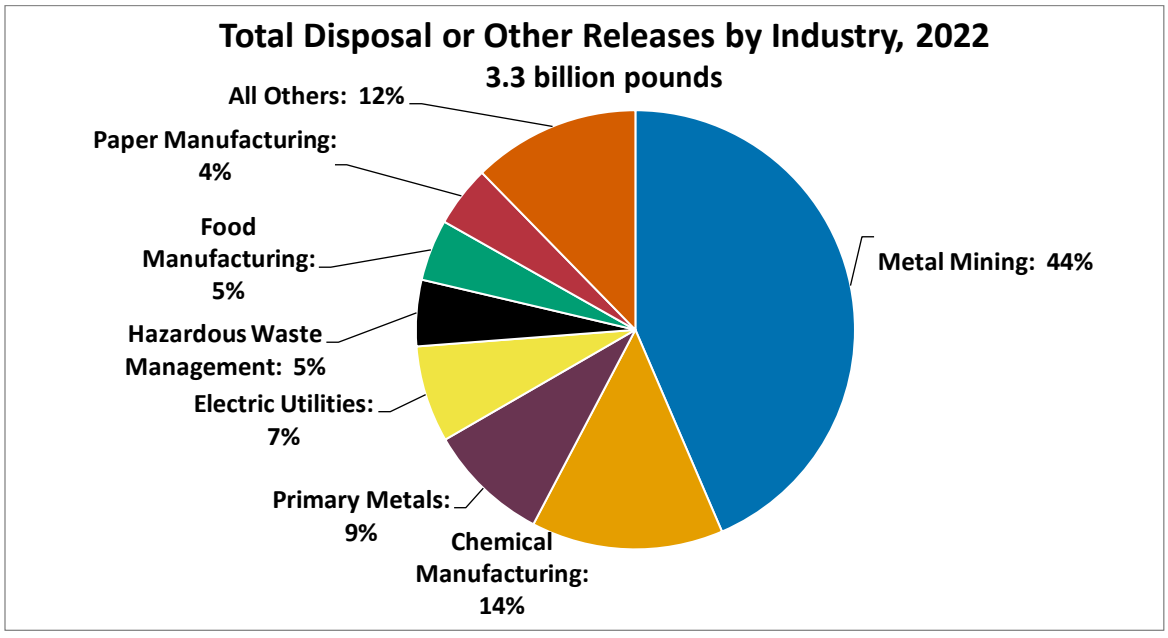
The following pie chart shows the total quantities of TRI chemical waste managed through recycling, energy recovery, treatment, and disposal or other release by sector.



Note: Percentages do not sum to 100% due to rounding.

Seven industry sectors reported 88% of the TRI waste managed in 2022. Most of this waste originated from the chemical manufacturing sector (54%). See the Chemical Manufacturing Sector Profile for more information on this sector.

The following pie chart shows the industry sectors that reported the most releases for 2022.



This pie chart shows that the metal mining, chemical manufacturing, primary metals, and electric utilities sectors reported the most releases. This section of the National Analysis features these sectors in more detail.

For more details on how the amounts and proportions of TRI chemicals managed as waste have changed over time, see the waste managed by industry trend graph.

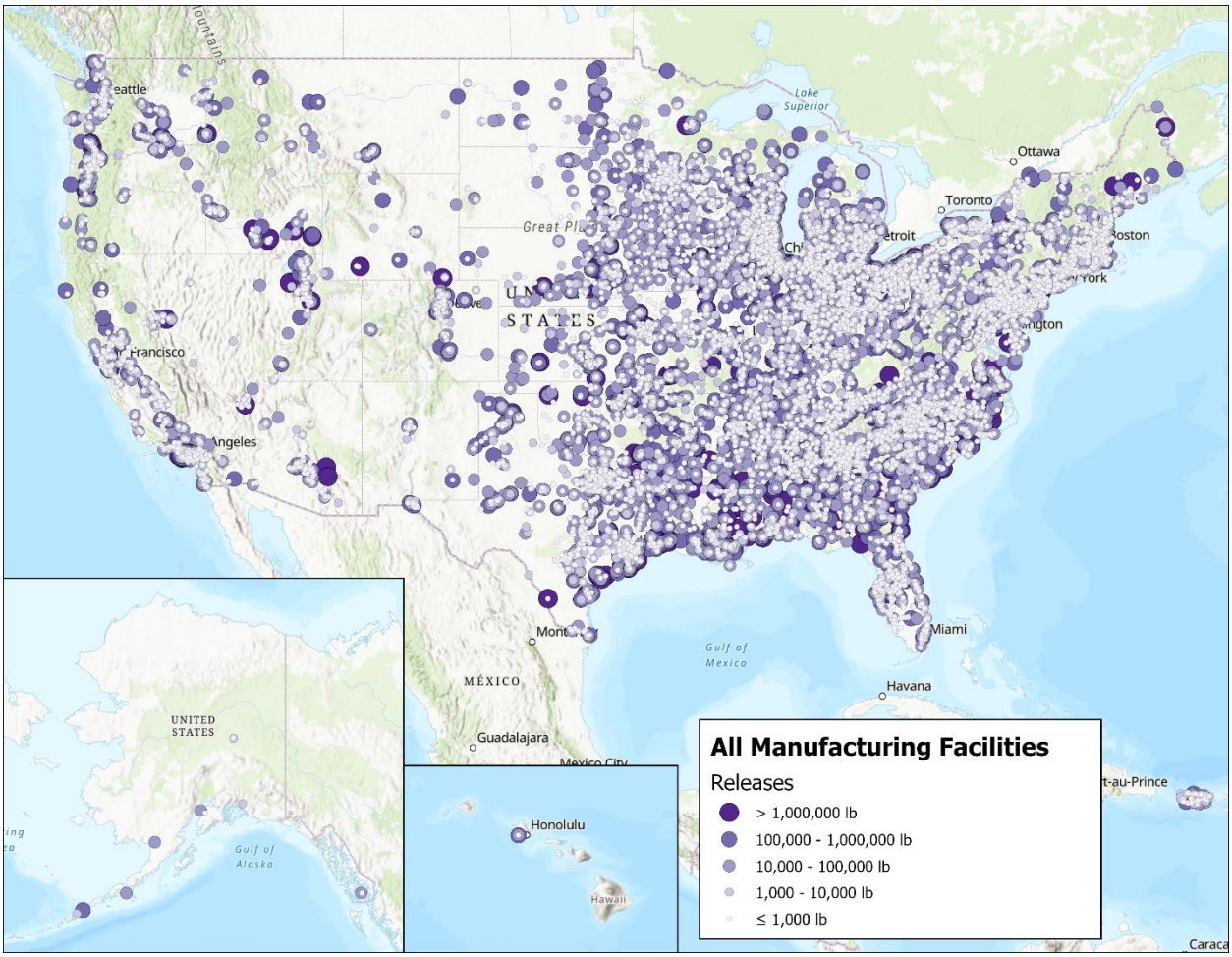
For more information on the breakdown of these releases by environmental medium, see air releases by industry, water releases by industry and land disposal by industry.

As with any dataset, there are multiple factors to consider when using the TRI data. Find a summary of key factors associated with data used in the National Analysis in the Introduction. For more information see *Factors to Consider When Using Toxics Release Inventory Data.*

Manufacturing Sectors

This section examines how TRI chemical wastes are managed in manufacturing sectors (defined as facilities reporting their primary NAICS codes as 31-33).

This map shows the locations of the manufacturing facilities that reported to TRI for 2022, sized by their releases.



Manufacturing Facilities Reporting to TRI, 2022

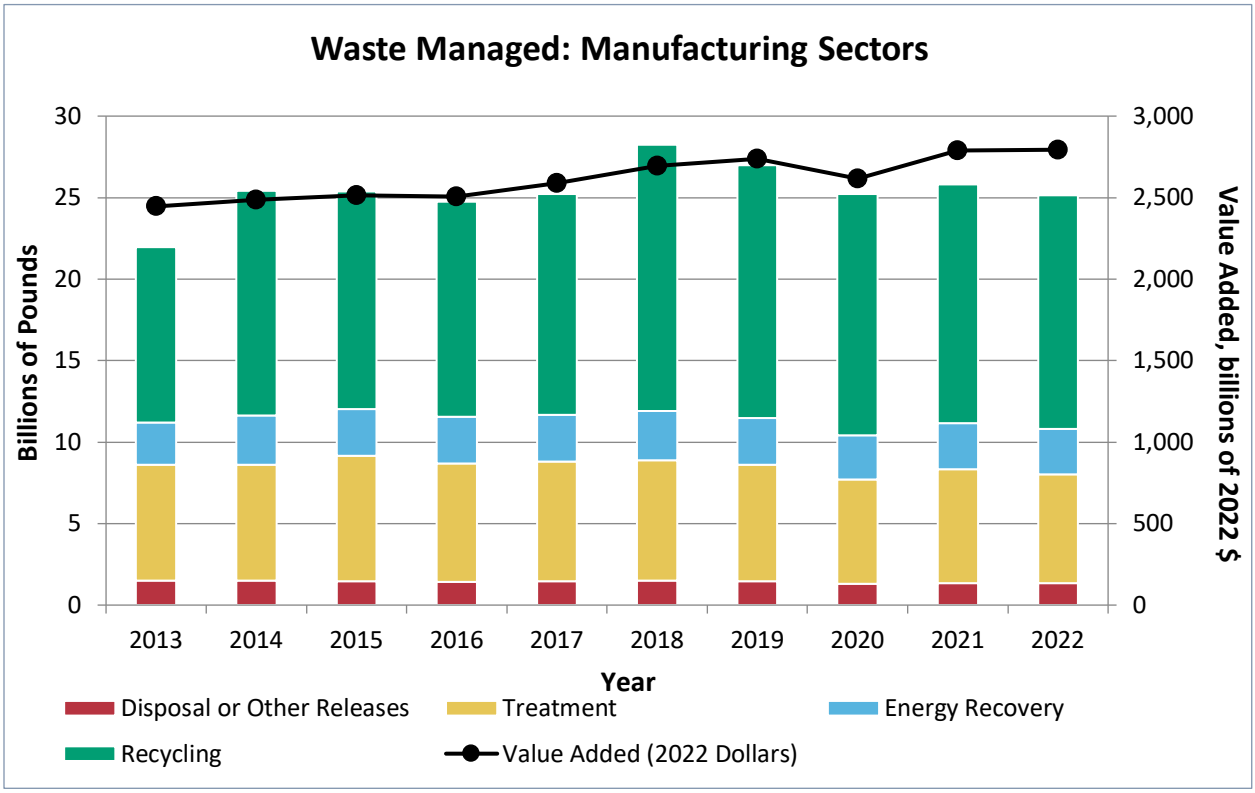
View Larger Map

For 2022, 88% of the facilities that reported to TRI were in a manufacturing sector and manufacturing sectors accounted for most (88%) of the 28.6 billion pounds of waste managed for 2022. Two manufacturing sectors, chemical manufacturing and primary metals manufacturing, are highlighted in more detail later in this section.

TRI-covered industry sectors not categorized under manufacturing include metal mining, coal mining, electric utilities, hazardous waste management, and others.

Manufacturing Waste Management Trend

The following graph shows the 10-year trend in TRI chemical waste managed through recycling, energy recovery, treatment, and disposal or other releases by the manufacturing sectors.



From 2013 to 2022:

- Quantities of waste managed by the manufacturing sectors generally increased from 2013 to 2018. Since then, these quantities have decreased.
- Releases and treatment of chemical waste decreased, while recycling and combustion for energy recovery increased. Recycling and combustion for energy recovery are preferred to disposal and treatment, because recycling and energy recovery use waste materials for a useful purpose instead of destroying or disposing of them.
- It is important to consider how the economy influences waste generation at facilities. This figure includes the trend in the manufacturing sectors' value added (represented by the black line, as reported by the Bureau of Economic Analysis, Value Added by Industry).

- Since 2013, value added by the manufacturing sectors and waste managed by these sectors both increased by 14%. The overall increase in waste management was caused by large increases in recycling that started in 2014, driven by several facilities that each reported recycling one billion pounds or more annually.
- Waste managed and value added both increased, which suggests that manufacturing facilities managed about the same quantity of waste per unit of product in 2022 compared to 2013.

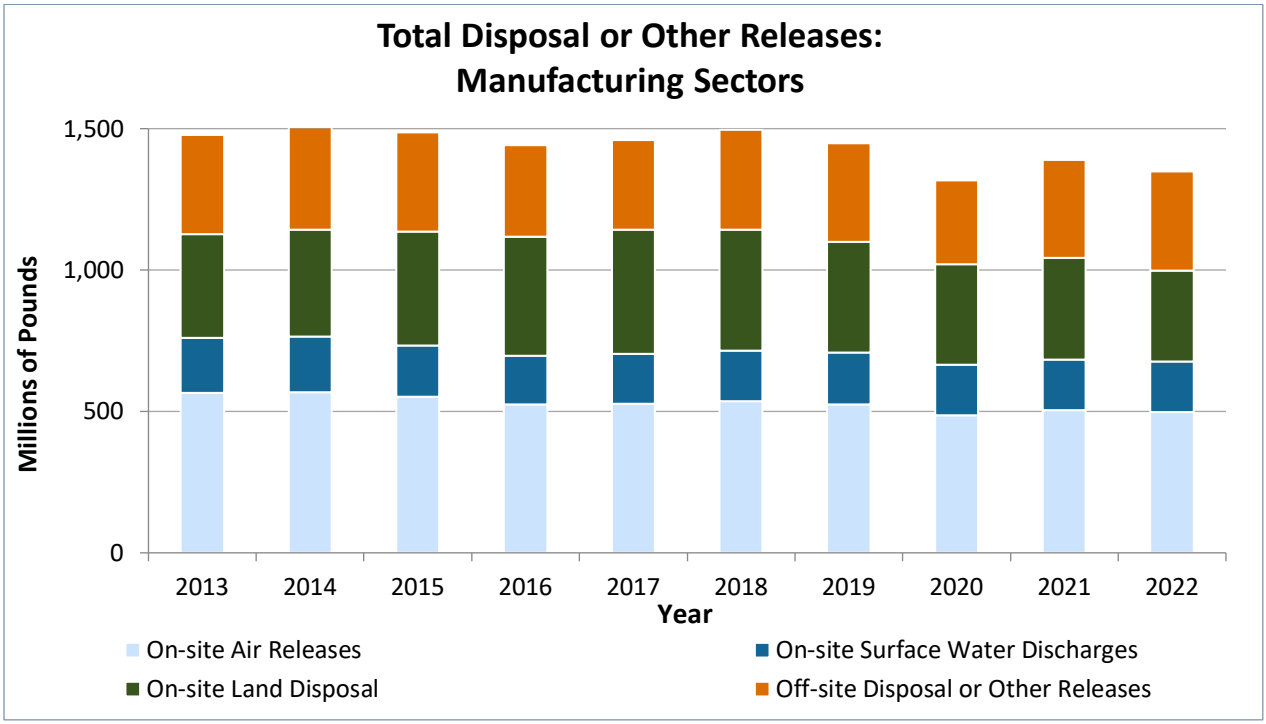
What is Value Added?

An industry's value added is the market value it adds in production; it is the difference between the price at which it sells its products and the cost of its inputs. Value added for all U.S. industries combined is equal to the nation's gross domestic product.

From 2021 to 2022:

- Waste managed decreased by 694 million pounds (-3%), while value added remained about the same, which may suggest that manufacturers managed less waste per unit of product made in 2022 than in 2021.
- In 2022, only 5% of the manufacturing sectors' waste generated was released into the environment, while the rest was managed through treatment, energy recovery, and recycling.

The following graph shows the 10-year trend in quantities of TRI chemicals released by facilities in manufacturing sectors.



From 2013 to 2022:

- TRI chemical releases from manufacturing sectors decreased by 9%, primarily due to reduced air releases (69 million pounds) and on-site land disposal (47 million pounds).
- Off-site disposal or other releases remained about the same.

From 2021 to 2022:

- Releases decreased by 41 million pounds (-3%), driven by the chemical manufacturing sector.

Pollution Prevention in the Manufacturing Sectors:

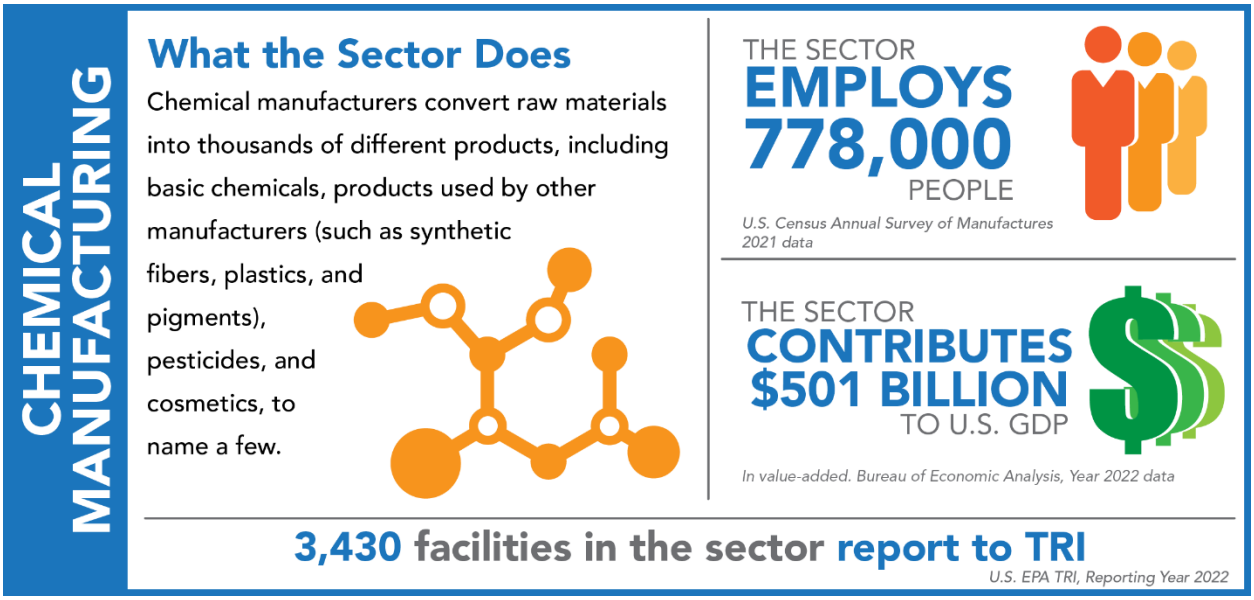
In 2022, 1,674 manufacturing facilities initiated over 3,400 pollution prevention activities to reduce TRI chemical use and waste creation. The most commonly reported type of pollution prevention activity was Process and Equipment Modifications. For example:

- A fabric coating mill implemented a new enterprise resource planning (ERP) system in 2022 which improved onsite inventory management and helped reduce the amount of toluene managed as waste.

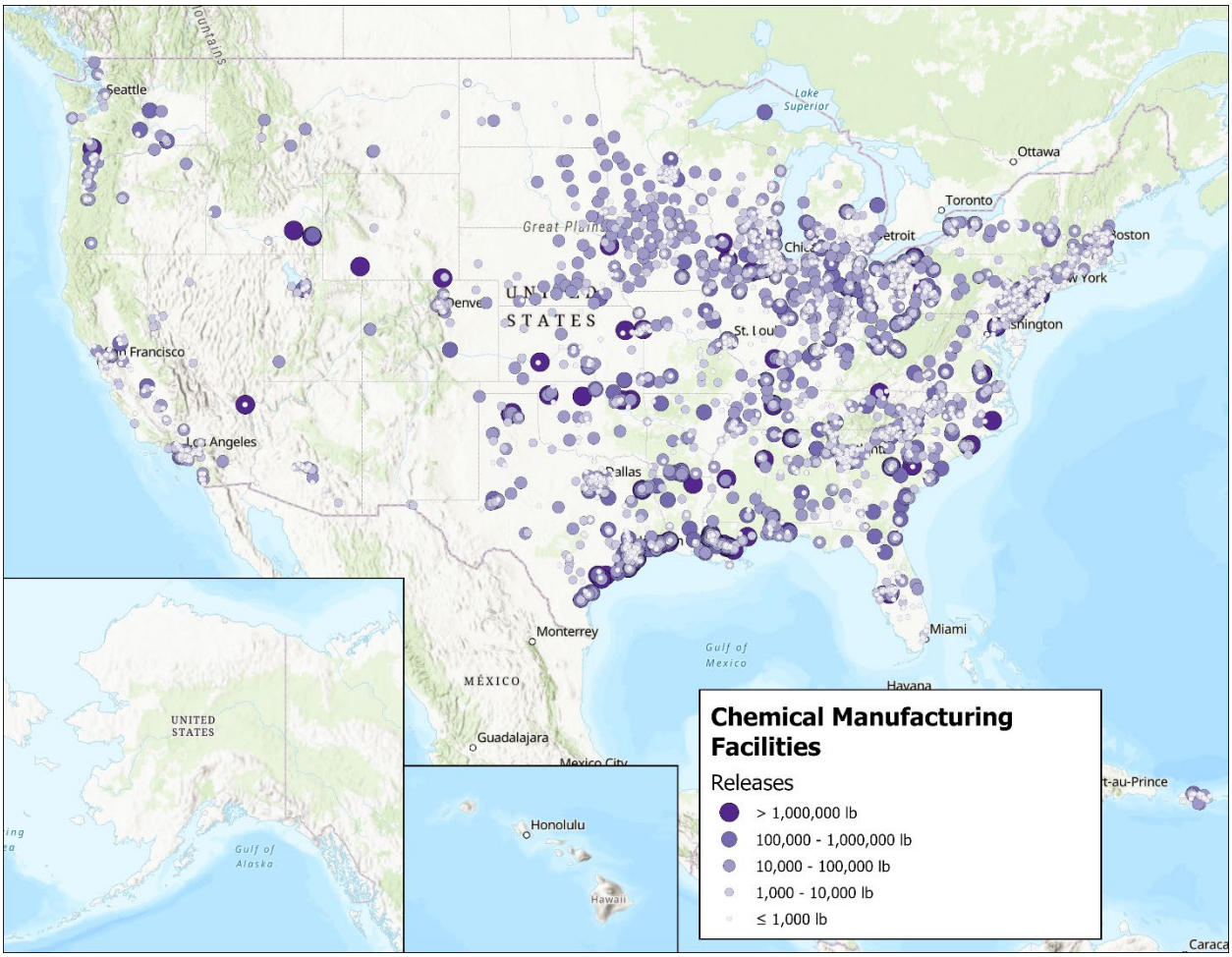
You can learn more about pollution prevention opportunities in this sector by using the TRI P2 Search Tool. Facilities interested in exploring pollution prevention opportunities at their site can contact their Regional P2 Coordinator to arrange a free on-site P2 assessment.

Chemical Manufacturing

This section examines how TRI chemical wastes are managed in the chemical manufacturing sector (defined as facilities reporting their primary NAICS code as 325).



This map shows the locations of the chemical manufacturing facilities that reported to TRI for 2022, sized by their releases.

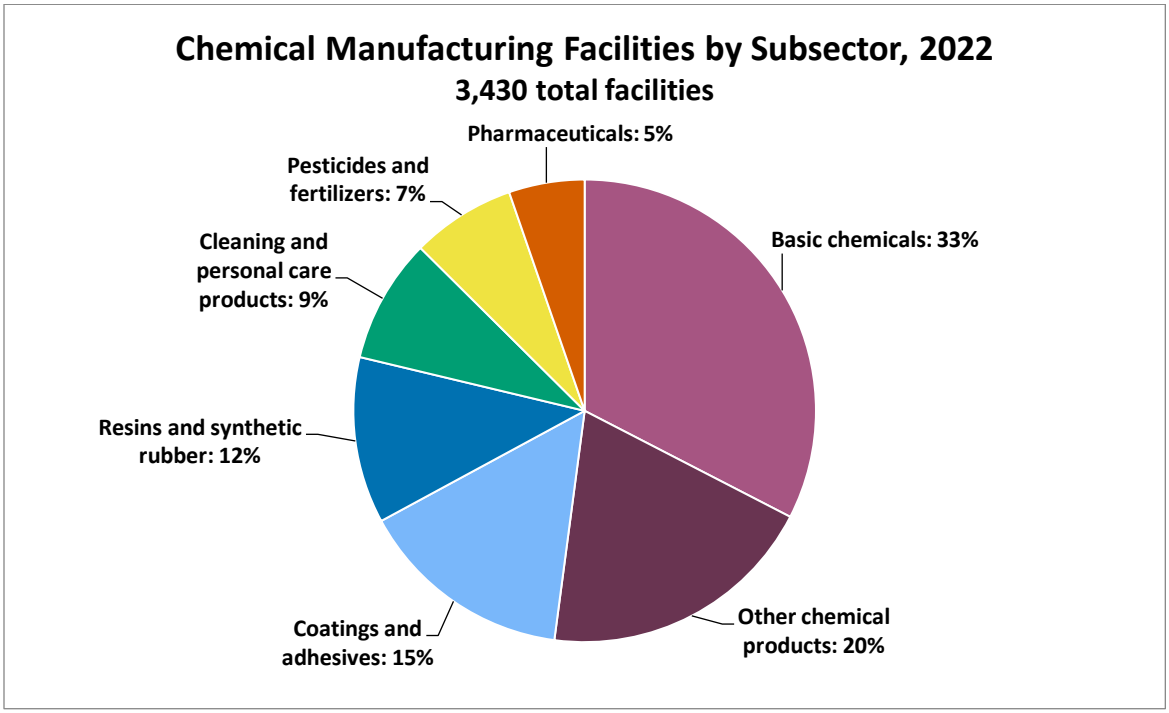


Chemical Manufacturing Facilities Reporting to TRI, 2022

View Larger Map

For 2022, more facilities reported to TRI from the chemical manufacturing sector than from any other industry sector (3,430 facilities; 16% of all facilities that reported to TRI for 2022). This sector reported 54% of all waste managed, more than any other sector.

This large and diverse sector includes facilities producing basic chemicals and those that manufacture products through further processing of chemicals. The chart below shows the number of facilities by chemical manufacturing subsectors that reported to TRI for 2022.

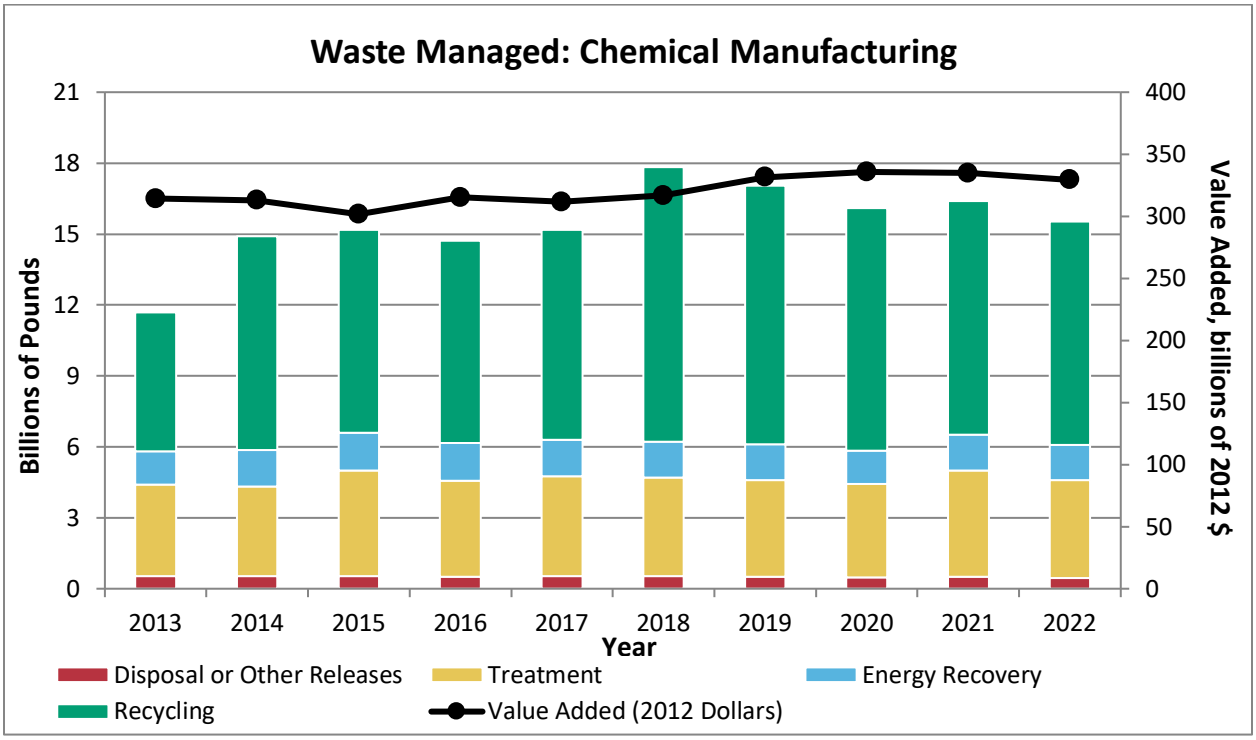


Operations in the chemical manufacturing sector include:

- Basic chemicals facilities produce large quantities of chemicals that are often used to make other chemicals or products. Basic chemicals include petrochemicals, industrial gases, and synthetic dyes and pigments.
- Coatings and adhesives facilities mix pigments, solvents, and binders into architectural and industrial paints; manufacture paint products such as paint removers and thinners; and manufacture adhesives, glues, and caulking compounds.
- Resins and synthetic rubber facilities manufacture resins, plastic materials, synthetic rubber, and fibers and filaments.
- Facilities in the "Other Chemical Products" subsector make chemicals for a wide variety of applications. These include chemicals used in photography, explosives, inks and toners, and transportation equipment like antifreeze or brake fluid.

Chemical Manufacturing Waste Management Trend

The following graph shows the quantities of TRI chemical waste managed through recycling, energy recovery, treatment, and disposal or other releases by the chemical manufacturing sector.



From 2013 to 2022:

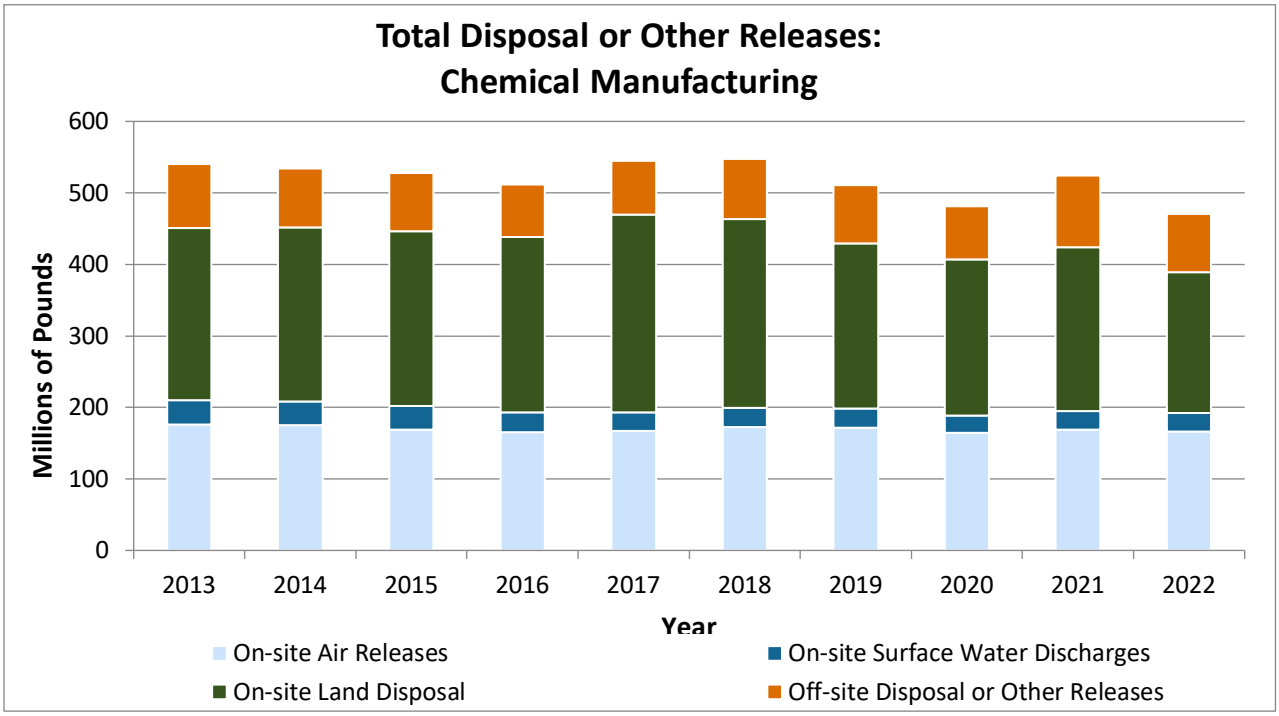
- Quantities of waste managed by the chemical manufacturing sector increased by 33%, while the sector's value added (represented by the black line), as reported by the Bureau of Economic Analysis, Value Added by Industry, increased by 5%.
    - The increase in waste recycled was driven by a few facilities. For example, the large increase in chemical waste recycled in 2014 compared to 2013 was primarily due to one petrochemical manufacturing facility that began reporting large quantities of on-site cumene recycling annually from 2014 to present.
- Quantities of TRI chemicals recycled, treated, and combusted for energy recovery increased, while the quantities of TRI chemicals released decreased.

From 2021 to 2022:

- Waste managed at chemical manufacturing facilities decreased by 875 million pounds (-5%).

- In 2022, facilities in this sector released 3% of their waste into the environment and managed the other 97% through treatment, energy recovery, and recycling.

The following graph shows the 10-year trend in quantities of TRI chemicals released by facilities in the chemical manufacturing sector.

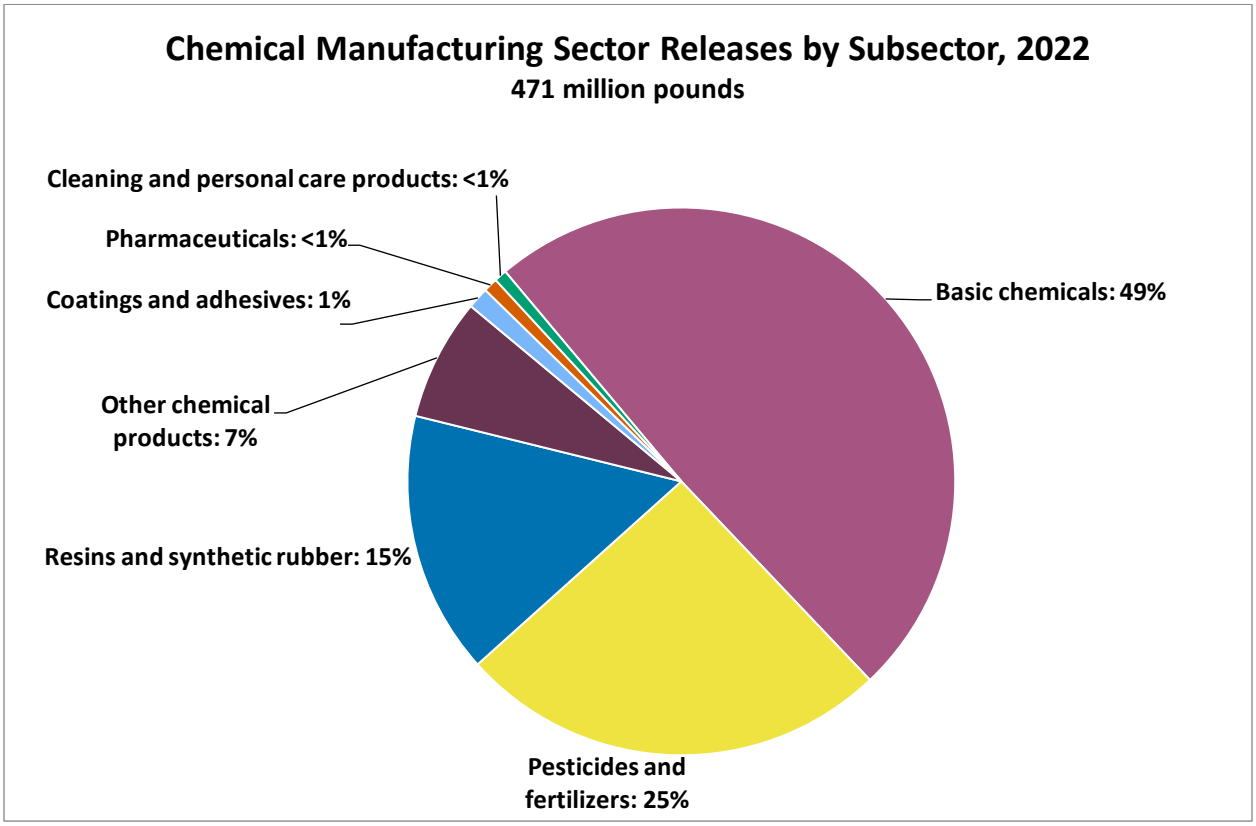


From 2013 to 2022:

- Releases reported by chemical manufacturing facilities decreased by 13%.
- Quantities of on-site releases to all media decreased, as did off-site disposal.

From 2021 to 2022:

- Releases decreased by 53 million pounds (-10%), partly driven by one facility reporting a large decrease in off-site disposal of zinc compounds and another facility that changed its primary NAICS code (i.e., the facility previously reported as a chemical manufacturer but determined that chemical manufacturing did not account for most of its value added in 2022). Excluding these facilities, releases from chemical manufacturing still decreased.
- For 2022, one-third of the 3,430 chemical manufacturing facilities were in the basic chemicals manufacturing subsector, which accounted for almost half (49%) of the chemical manufacturing sector's releases.



Pollution Prevention in the Chemical Manufacturing Sector:

In 2022, 336 facilities in this sector initiated 864 pollution prevention activities. The most commonly reported types of pollution prevention activities were Process and Equipment Modifications and Operating Practices and Training. For example:

- A basic chemical manufacturer successfully piloted a new formulation that does not contain barium compounds, and will use the barium compound-free formulation for all future production of these products.
- A pharmaceutical manufacturing facility substituted methanol with ethanol for several cleaning processes, reducing the amount of methanol managed as waste.

Additional Resources on Pollution Prevention

- To find more examples of chemical manufacturers' pollution prevention activities and the pollution prevention barriers they reported, visit TRI's P2 Search Tool.
- EPA's Smart Sectors Program is partnering with chemical manufacturing trade associations to develop sensible approaches to industrial operations that better protect the environment and public health.
- For more information on how this and other industry sectors can choose safer chemicals, visit EPA's Safer Choice Program.

- EPA supports the adoption of green chemistry and green engineering practices that reduce the environmental impacts from this sector, including reductions in the use of toxic chemicals, water, and electricity. For more information, see the TRI Green Chemistry and Green Engineering Reporting webpage.
- Facilities interested in exploring P2 opportunities or getting technical assistance can contact their regional P2 coordinator. Find the P2 coordinators for your state and region.

Greenhouse Gas Reporting in the Chemical Manufacturing Sector

While many chemical releases are required to be reported to TRI, the TRI Program does not cover all chemicals released by industrial activities. Notably, most greenhouse gas (GHG) emissions are not reported to TRI. Industrial emissions of GHGs increase the concentration of these gases in the atmosphere, which alter the amount of heat trapped by the Earth's atmosphere and contribute to climate change.

From the Fifth National Climate Assessment:

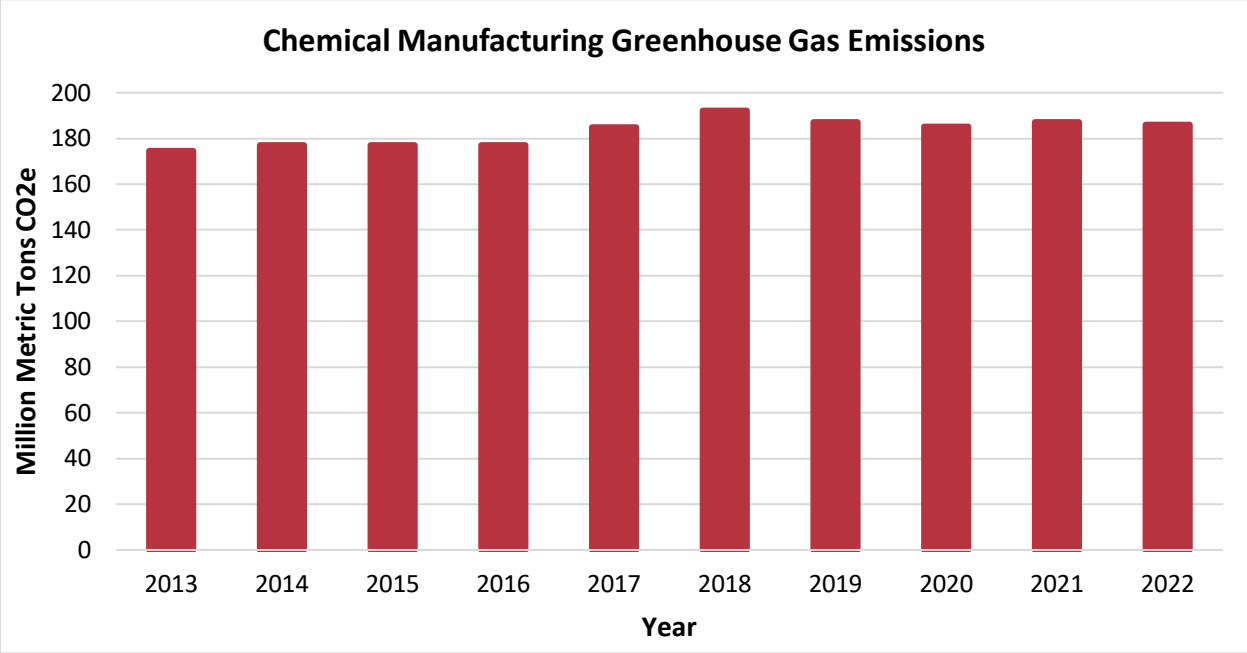
Climate change is already harming human health across the US, and impacts are expected to worsen with continued warming. Climate change harms individuals and communities by exposing them to a range of compounding health hazards, including the following:

- More severe and frequent extreme events
- Wider distribution of infectious and vector-borne pathogens
- Air quality worsened by smog, wildfire smoke, dust, and increased pollen
- Threats to food and water security
- Mental and spiritual health stressors

Climate change is projected to reduce US economic output and labor productivity across many sectors, with effects differing based on local climate and the industries unique to each region. Climate-driven damages to local economies especially disrupt heritage industries (e.g., fishing traditions, trades passed down over generations, and cultural heritage–based tourism) and communities whose livelihoods depend on natural resources.

Source: Fifth National Climate Assessment

EPA's Greenhouse Gas Reporting Program (GHGRP) tracks facility-level emissions from the largest U.S. sources of GHGs. The chart below shows GHG emissions reported to the GHGRP by facilities in the chemical manufacturing sector from 2013 to 2022.



- Note that while most TRI chemical quantities are reported in pounds, the GHGRP collects GHG emissions data measured in metric tons of carbon dioxide equivalents ($MTCO_2e$), as shown in this chart.
- The chemical manufacturing sector reported emissions of 186 million $MTCO_2e$ for 2022, a 6% increase since 2013.
- 459 facilities in the sector reported to the GHGRP for 2022, most of which also reported to TRI.

What are carbon dioxide equivalents (CO_2e)?

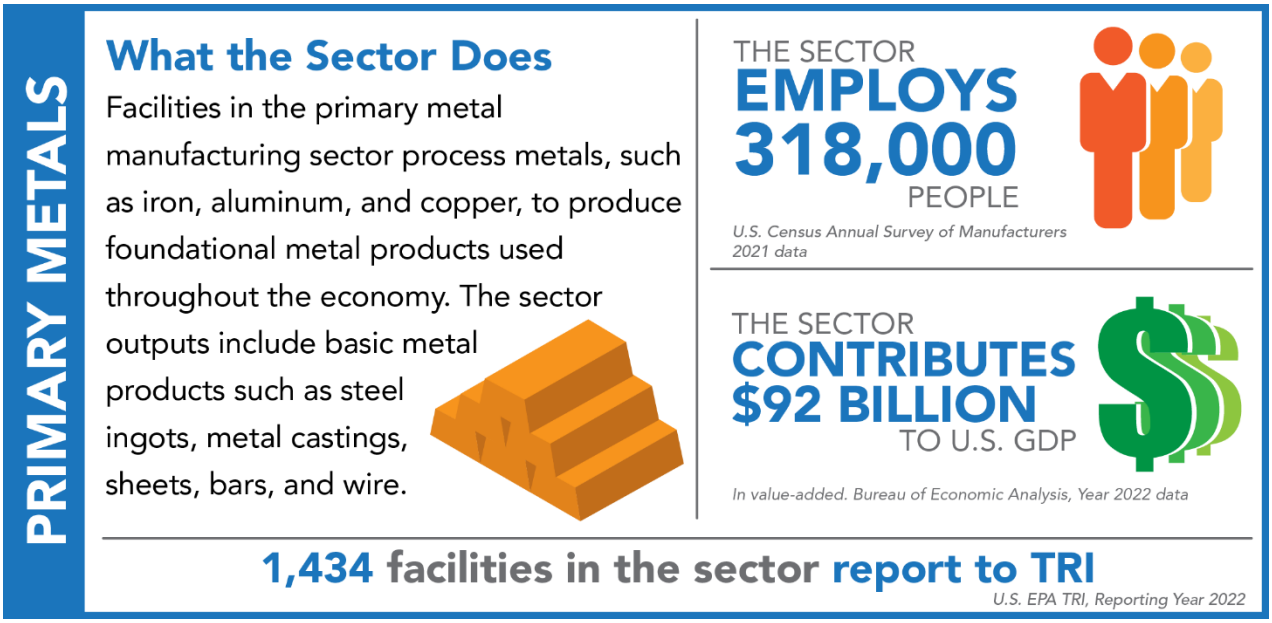
Different GHGs can have different effects on the Earth's warming; Global Warming Potential (GWP) values allow for comparisons of the global warming impacts of different gases. $MTCO_2e$ is a weighted measurement that considers the tonnes of the gases and their associated global warming potentials.

Additional Resources on GHGs and Climate Change

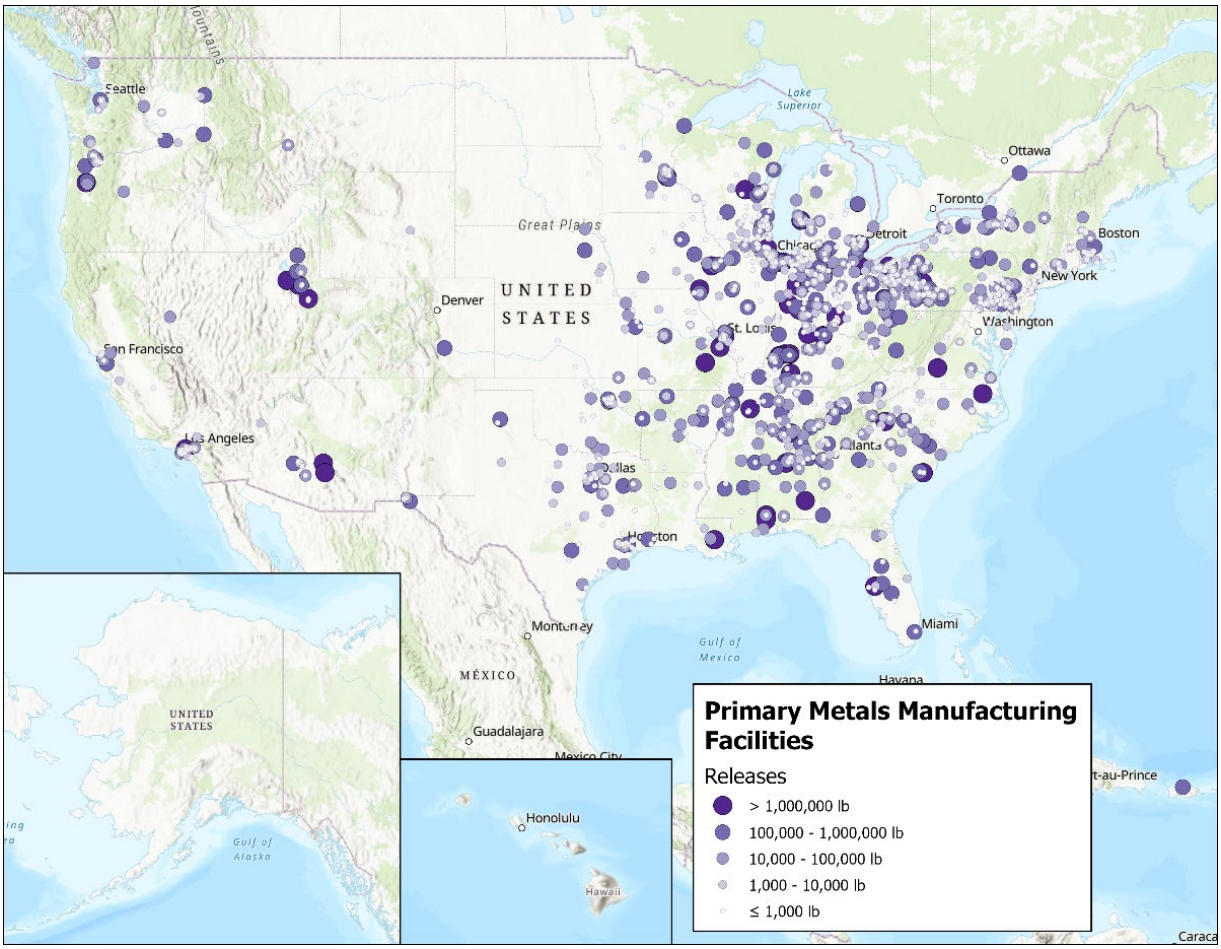
- To explore the data reported to EPA on GHG emissions, see the Facility Level Information on GreenHouse gases Tool (FLIGHT).
- See the Fifth National Climate Assessment for information on climate change impacts, risks, and responses.
- For more details on the chemical manufacturing sector's GHG emissions, visit GHGRP Chemicals.
- The TRI P2 Search Tool lets you compare facilities' waste management reported to TRI and their GHG emissions reported to the GHGRP.

Primary Metals Manufacturing

This section examines how TRI chemical wastes are managed within the primary metals manufacturing sector (defined as facilities reporting their primary NAICS code as 331).



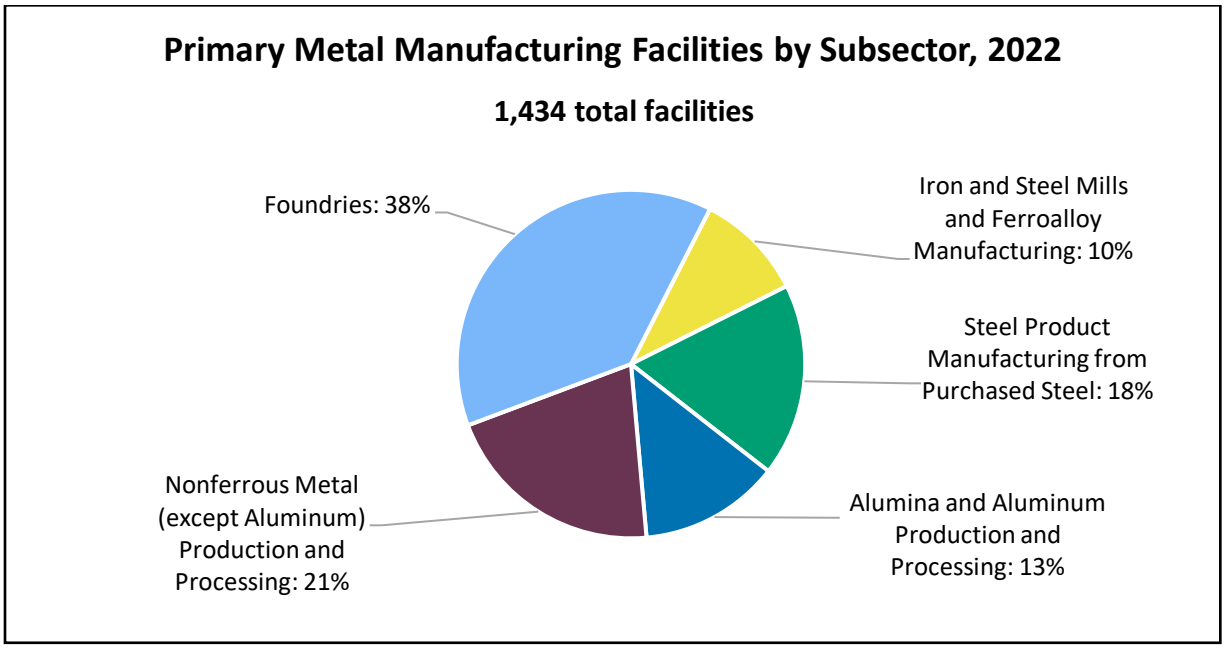
This map shows the locations of the primary metals manufacturing facilities that reported to TRI for 2022, sized by their releases.



Primary Metals Manufacturing Facilities Reporting to TRI, 2022

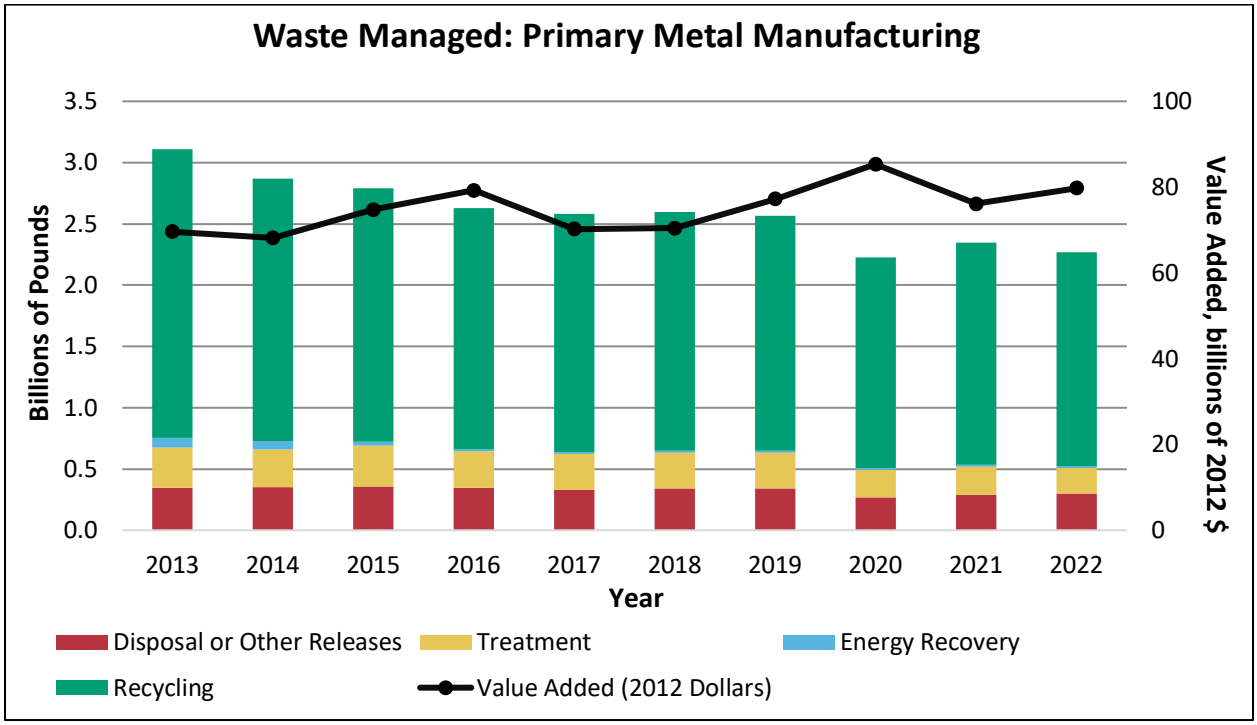
View Larger Map

For 2022, 1,434 facilities in the primary metal manufacturing sector reported to TRI. The sector includes iron and steel mills; facilities producing steel products such as pipes, plates, and wire; foundries; and facilities that make nonferrous metal and metal products. The chart below shows the number of facilities and the TRI releases by primary metals subsector for 2022. While iron and steel mills account for few (10%) of the sector's facilities, this subsector reports more releases than any other subsector. Conversely, foundries account for the most (38%) facilities reporting to TRI in the sector but only report 8% of the releases.


Primary Metal Manufacturing Facilities by Subsector, 2022
1,434 total facilities
Foundries: 38%
Iron and Steel Mills and Ferroalloy Manufacturing: 10%
Steel Product Manufacturing from Purchased Steel: 18%
Alumina and Aluminum Production and Processing: 13%
Nonferrous Metal (except Aluminum) Production and Processing: 21%

Primary Metals Waste Management Trend

The following graph shows the 10-year trend in quantities of TRI chemical waste managed through recycling, energy recovery, treatment, and disposal or other releases by facilities in the primary metals manufacturing sector.



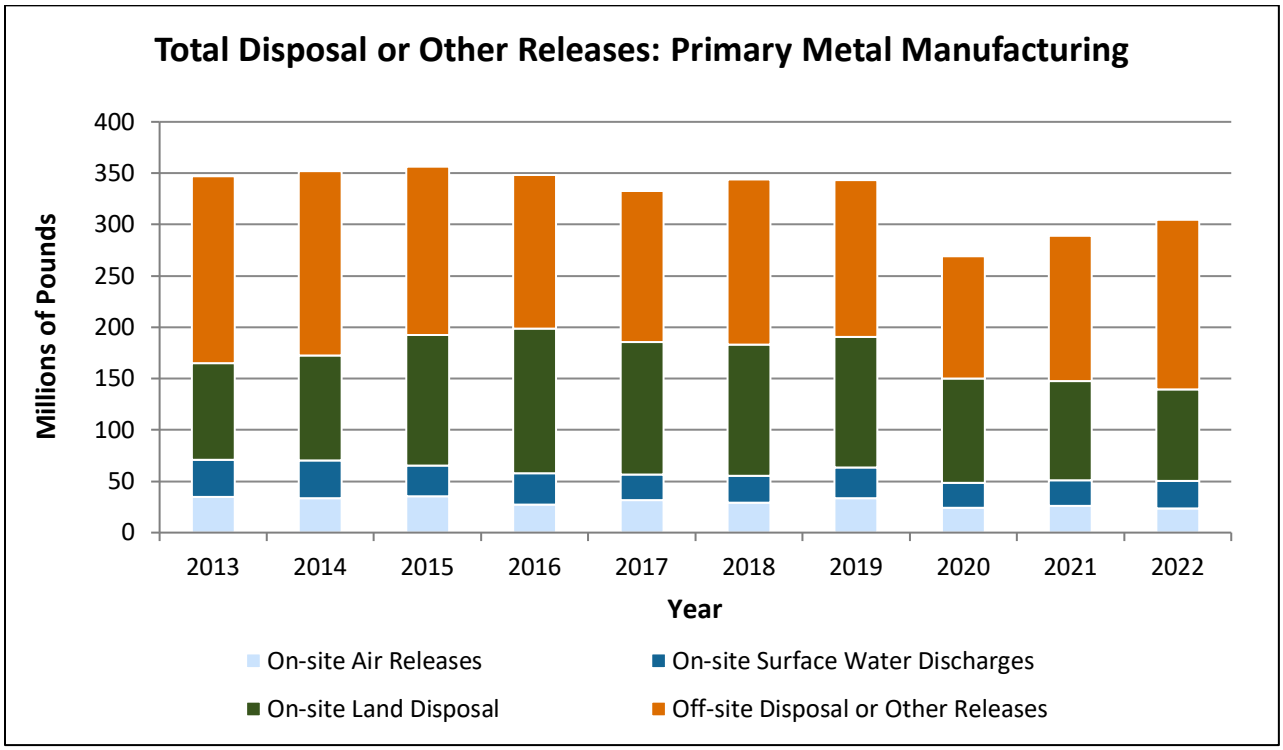
From 2013 to 2022:

- Chemical waste reported by primary metals manufacturing facilities was largely metals which were mostly recycled.
- Quantities of waste managed by the primary metals manufacturing sector decreased by 27% since 2013 (843 million pounds), while the sector's value added (represented by the black line), as reported by the Bureau of Economic Analysis, Value Added by Industry, increased by 15%.
- The overall decrease in waste managed was largely driven by a 609 million pound decrease in quantities of waste recycled over this time. Quantities of TRI chemical waste managed by all methods decreased as well.

From 2021 to 2022:

- Waste managed at primary metals manufacturing facilities decreased by 3% (80 million pounds), driven by decreases in waste recycled. Nonetheless, in 2022 the sector recycled 1.6 billion pounds of metals, more than any other sector.
- Zinc, copper, and lead accounted for 55% of the sector's TRI waste managed.

The following graph shows the quantities of TRI chemicals released by facilities in the primary metals manufacturing industry.



From 2013 to 2022:

- TRI chemical releases by the primary metals manufacturing sector decreased by 43 million pounds (-12%), driven mainly by reductions in off-site disposal.
- Each year since 2013, about half of the primary metal manufacturing sector's releases have been transferred for off-site disposal.

From 2021 to 2022:

- Releases increased by 16 million pounds (5%), driven by increased off-site disposal of metals.
- In 2022, zinc, manganese, and copper accounted for 62% of the sector's releases.

Pollution Prevention in the Primary Metals Manufacturing Sector:

In 2022, 93 facilities in the sector initiated 252 pollution prevention activities to reduce TRI chemical use and waste creation. The most commonly reported types of pollution prevention activities were Process and Equipment Modifications followed by Operating Practices and Training. For example:

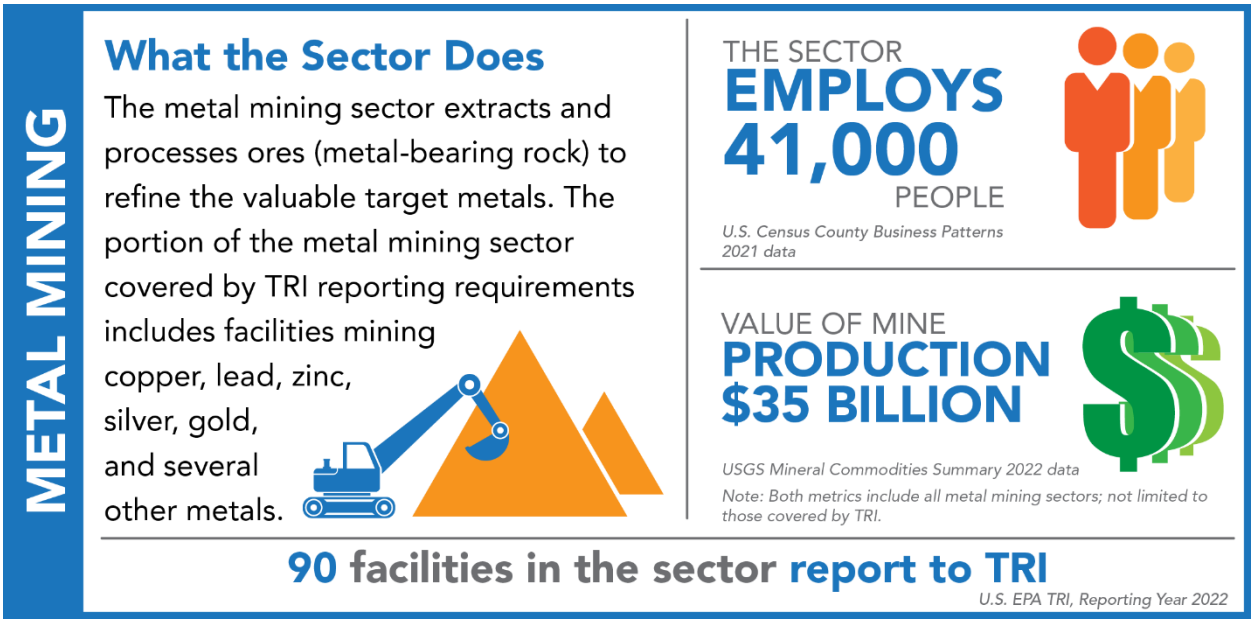
- A wire manufacturing facility installed new machinery and modified its plant layout to increase efficiency and minimize copper scrap.

- A specialty metal tubing manufacturer implemented a new surface etching process that reduces the amount of nitric acid needed to etch a specific line of tubes used for aerospace applications. The facility expects the impact of this alternative will grow in the next 5-10 years as their customers begin placing orders for this method of production.

To find other examples of the sector's pollution prevention activities and the pollution prevention barriers they face, visit TRI's P2 Search Tool.

Metal Mining

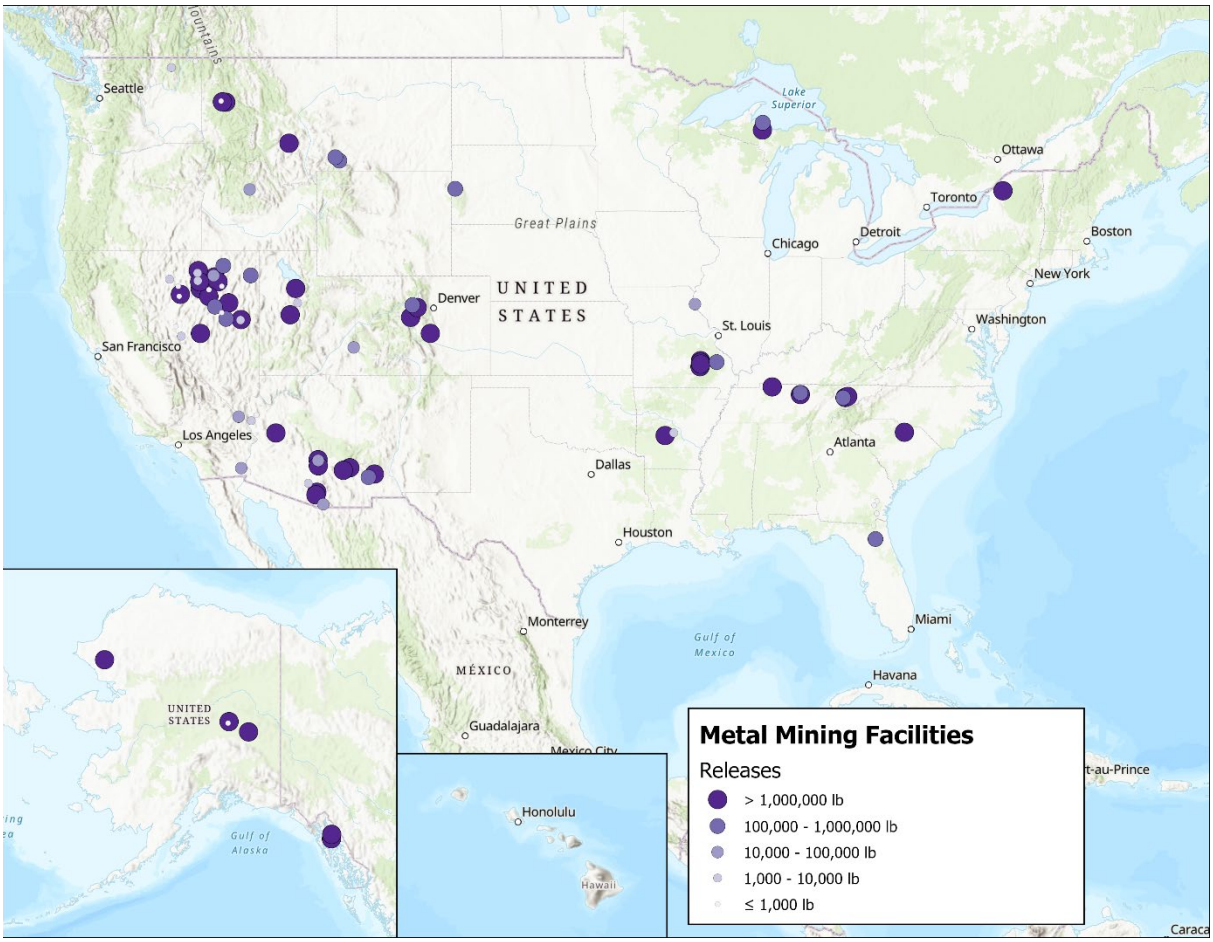
This section examines how TRI chemical wastes are managed by facilities in the metal mining sector (defined as facilities reporting their primary NAICS code as 2122).



Although the number of metal mines reporting to TRI makes up only a small portion of the total number of TRI-reporting facilities, the sector accounted for 44% of all releases reported to TRI for 2022.

This map shows the locations of the metal mining facilities that reported to TRI for 2022, sized by their releases.

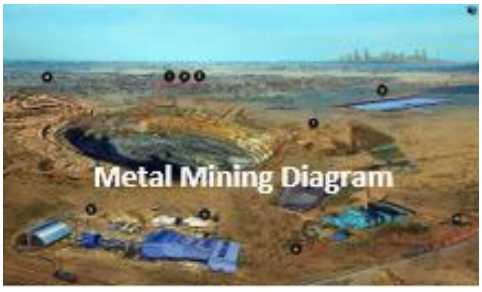
Note: Mines are shown on this map based on their longitude/latitude, which may be miles from the city identified on the mine's TRI reporting forms. Mines can qualify their location relative to the city by noting the distance in the street address data field of their TRI reporting forms.



Metal Mines Reporting to TRI, 2022

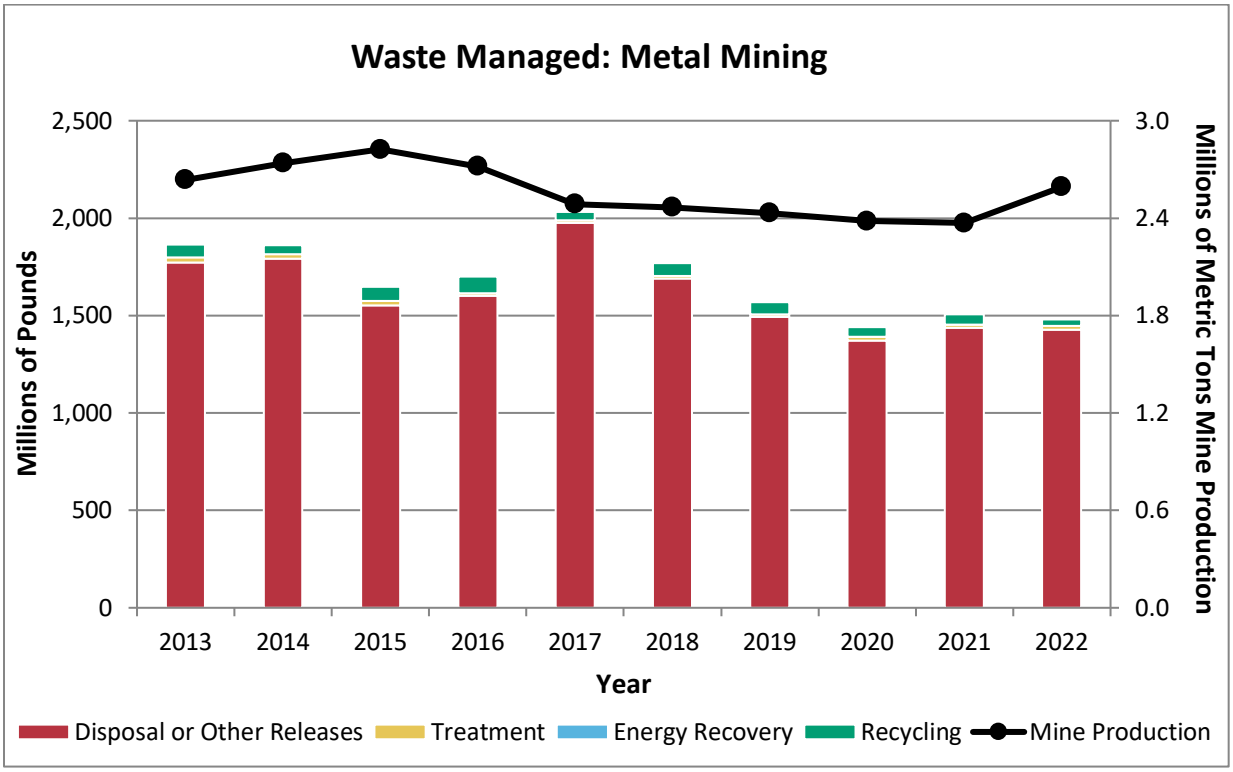
View Larger Map

For 2022, 90 metal mining facilities reported to TRI. Most are in the western states, where copper, silver, and gold mining are most common. Farther east, some metal mines in Missouri and Tennessee extract zinc and lead. U.S. mining operations extract metals that are used in a wide range of products, including automobiles, electric and industrial equipment, jewelry, and decorative objects. The extraction and processing of these minerals generate large amounts of on-site land disposal, primarily of metal-bearing rock (called ore) and waste rock. To learn more about metal mining operations and their TRI reporting, explore the interactive metal mining diagram.



Metal Mining Waste Management Trend

The following graph shows the quantities of TRI chemical waste managed by the metal mining industry from 2013 to 2022, mainly in the form of on-site land disposal. The nature of metal mining operations limits the feasibility of other methods of waste management.



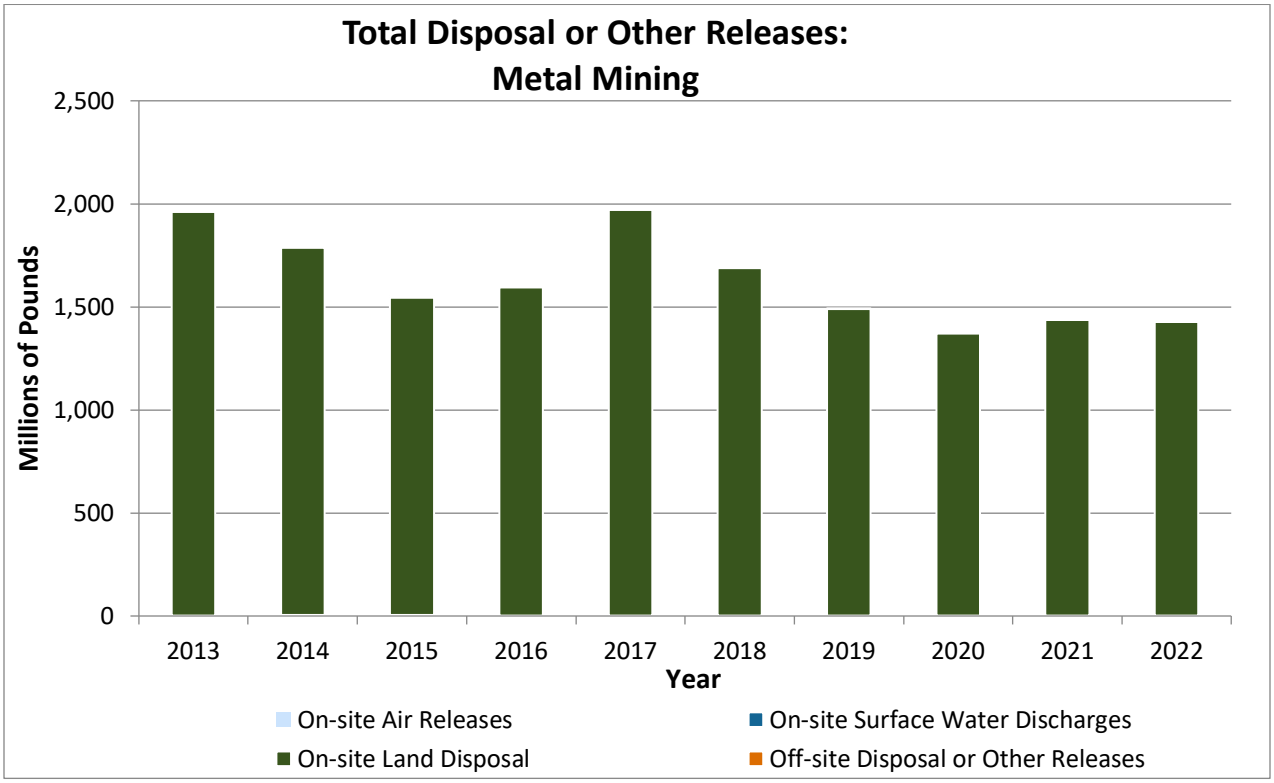
From 2013 to 2022:

- The TRI waste managed by the metal mining sector consists mostly of metals. The year-to-year fluctuations in waste managed do not closely reflect changes in the sector's production (as reported by the United States Geological Survey).
- Mining facilities often cite changes in the chemical composition of the ore they extract as one reason for annual fluctuations in the quantities of waste they manage. In some cases, small changes in the ore's composition can impact whether TRI chemicals in ore qualify for a concentration-based TRI reporting exemption in one year but not in the next year or vice versa.

From 2021 to 2022:

- The quantity of TRI chemical waste managed by this sector decreased by 28 million pounds (-2%).
- During 2022, 97% of the metal mining sector's waste was disposed of or otherwise released, primarily to land on site at the mine.

The following graph shows the 10-year trend in quantities of TRI chemicals released by the metal mining industry, primarily through on-site land disposal.



From 2013 to 2022:

- More than 99% of the metal mining sector's releases of TRI chemicals were on site and to land. Quantities of on-site land disposal by metal mines fluctuated from year to year.
    - Facilities have the option to indicate whether reported land releases represent disposal of TRI chemicals in waste rock piles. For 2022, waste rock piles accounted for at least 49% of the on-site land disposal of TRI chemicals at metal mines.
- The quantity of TRI chemicals released alone is not an indicator of health risks posed by the chemicals, as described in the Potential Risks from TRI Chemicals section. For more information, see the document, Factors to Consider When Using Toxics Release Inventory Data.

In 2022:

- Among the sectors reporting to TRI, the metal mining sector reported the largest quantity of waste disposed of or otherwise released, accounting for 44% of total TRI releases and 68% of on-site land disposal for all industries.
- The chemicals released in the greatest quantities by metal mines were lead, zinc, and arsenic compounds.

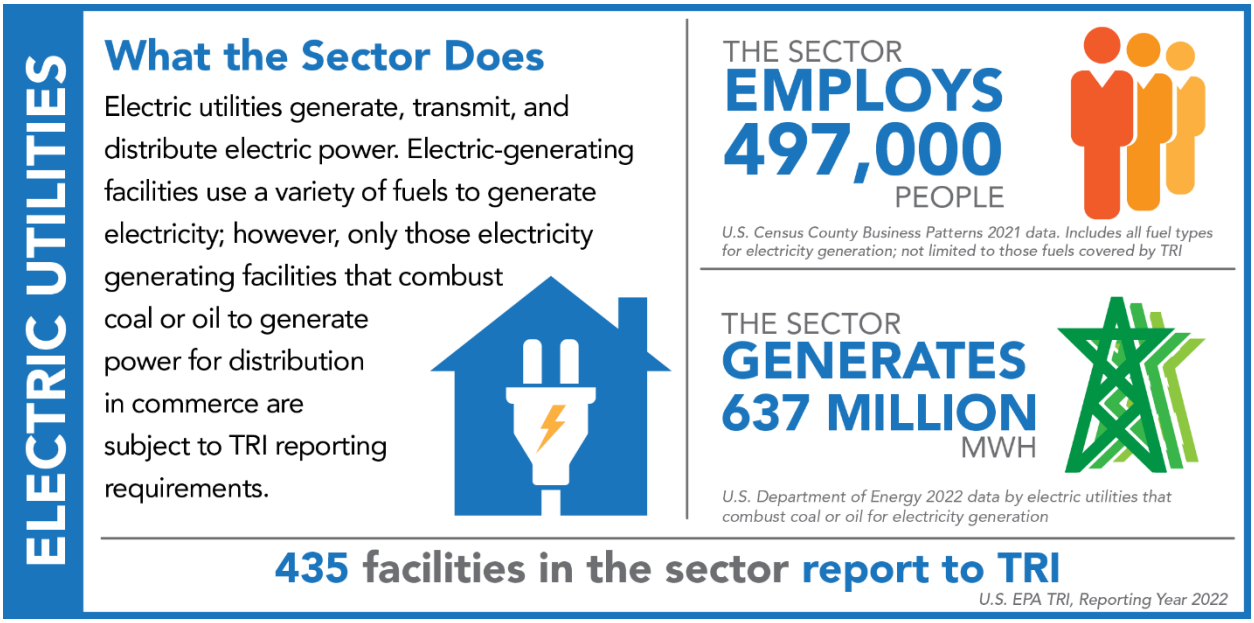
Pollution Prevention in the Metal Mining Sector:

Unlike manufacturing, the nature of mining—the necessary movement and disposal of large volumes of rock to access the target ore—does not lend itself to pollution prevention. To find examples of metal mining pollution prevention activities and the pollution prevention barriers mining facilities face, visit the TRI P2 Search Tool.

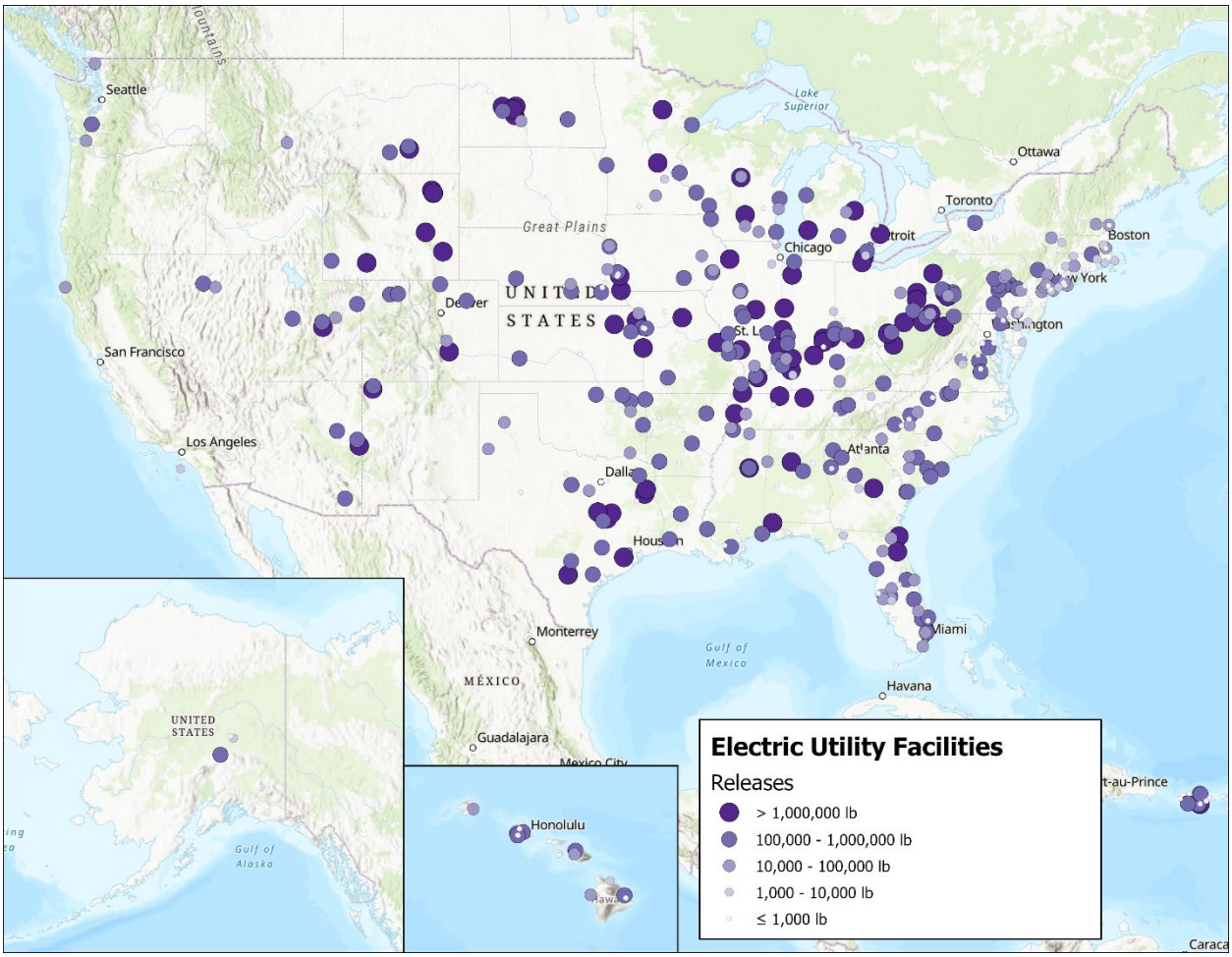
EPA's Smart Sectors Program has partnered with the mining sector to develop sensible approaches to better protect the environment and public health.

Electric Utilities

This section examines how TRI chemical wastes are managed by facilities in the electric utilities sector (defined as facilities reporting their primary NAICS code as 2211).



This map shows the locations of the electric utilities that reported to TRI for 2022, sized by their releases.



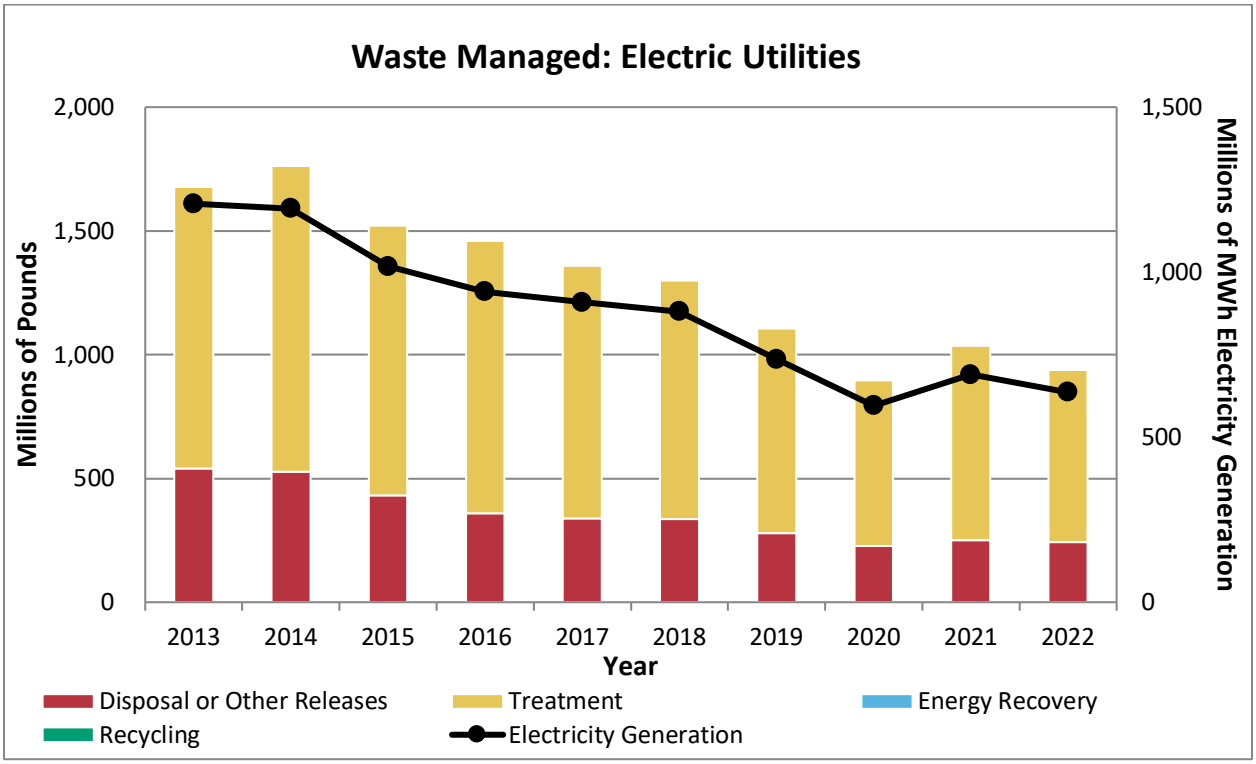
Electric Utilities Reporting to TRI, 2022

View Larger Map

For 2022, 435 electricity generating facilities reported to TRI. Facilities in the sector use different fuels to produce electricity, but only those that combust coal or oil to generate electricity for distribution in commerce are subject to TRI reporting requirements.

Electric Utilities Waste Management Trend

The following graph shows the 10-year trend in quantities of TRI chemical waste that electric utility facilities managed, primarily through treatment or release.



From 2013 to 2022:

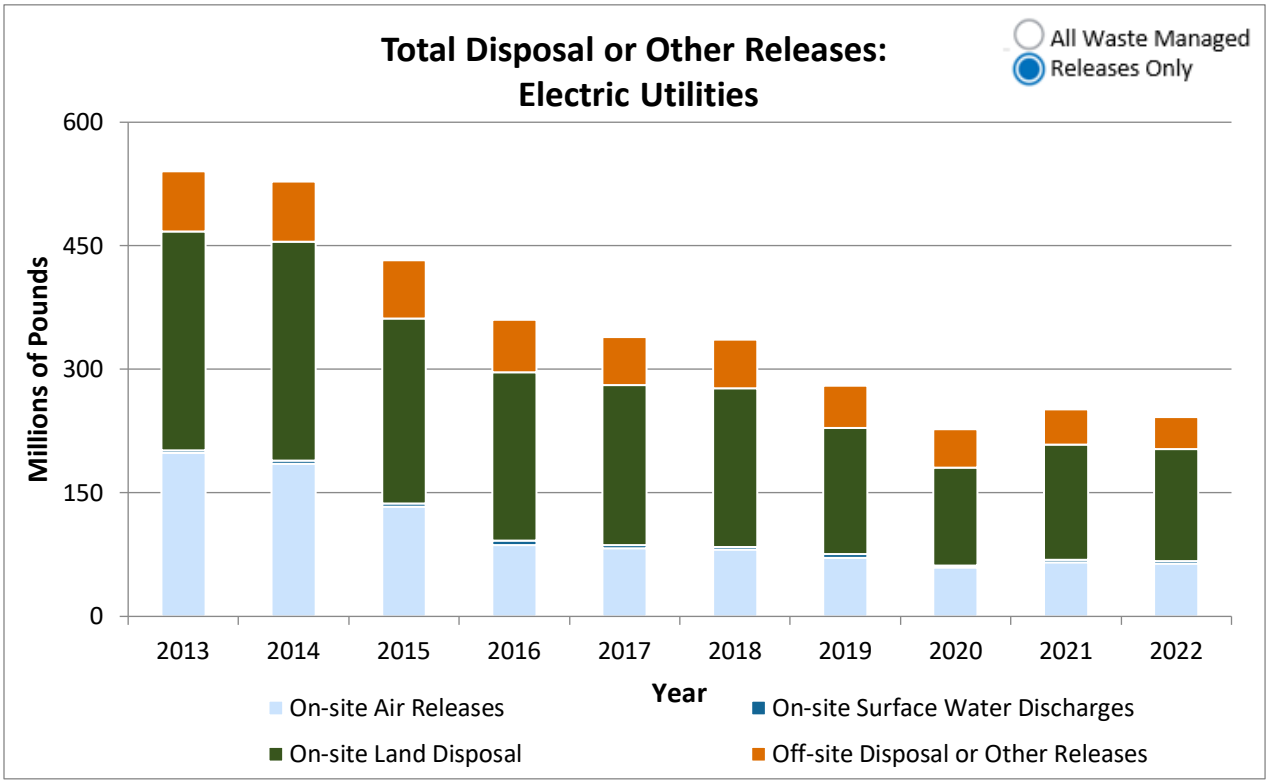
- Quantities of waste managed decreased by 740 million pounds (-44%) since 2013, driven by reduced releases and treatment.
- Net electricity generation by electric utilities from coal and oil fuels decreased by 47% (as reported by the U.S. Department of Energy's Energy Information Administration). Note that only facilities that combust coal or oil to generate electricity are covered under TRI reporting requirements.
    - Data from the Energy Information Administration indicate that the mix of energy sources for U.S. electricity generation has changed over time. Natural gas and renewable energy sources account for an increasing share of U.S. electricity generation, while coal-fired electricity generation has declined. Use of oil for electric power generation continues to contribute a small percentage of total U.S. electricity generation.
    - In recent years, the amount of electricity generated has been the main driver of the amount of waste generated by electric utilities. Waste generation from TRI-

reporting electric utilities has decreased in line with decreasing U.S. electricity generation from coal and oil.

In 2022:

- Approximately three-quarters of the sector's waste was treated, while about one-quarter was released into the environment. Facilities in this sector most commonly reported using scrubbers and/or electrostatic precipitators to treat their gaseous waste streams.

The following graph shows the annual quantities of TRI chemicals released by electric utilities.



From 2013 to 2022:

- Releases from the electric utilities sector decreased by 298 million pounds (-55%). This decrease was driven by a 135 million pound (-68%) decrease in air releases and a 129 million pound (-49%) decrease in on-site land disposal. Surface water discharges and off-site disposal also decreased, but to a lesser extent.

From 2021 to 2022:

- Releases by electric utilities decreased by 9 million pounds (-4%), driven by decreased air releases of sulfuric acid and decreased off-site disposal of metals.

Pollution Prevention in the Electric Utilities Sector:

Of the 435 facilities in the electric utilities sector that reported to TRI for 2022, 8 initiated pollution prevention activities to reduce their generation of wastes containing TRI chemicals. In this sector, implementing these activities may also lead to reduced greenhouse gas emissions. For example, one facility reported that they retired their coal combustion unit, and another facility reported that they are experimenting with biomass alternatives to the fuels currently combusted.

To find examples of electric utilities' pollution prevention activities and the pollution prevention barriers they face, visit TRI's P2 Search Tool.

EPA's Smart Sectors Program is partnering with this sector to develop sensible approaches to industrial operations that better protect the environment and public health.

Greenhouse Gas Reporting in the Electric Utilities Sector

While many chemical releases are required to be reported to TRI, the TRI Program does not cover all chemicals released by industry. Notably, most greenhouse gas (GHG) emissions are not reported to TRI. Industrial emissions of GHGs increase the concentration of these gases in the atmosphere, which alter the amount of heat trapped by the Earth's atmosphere and contribute to climate change.

From the Fifth National Climate Assessment:

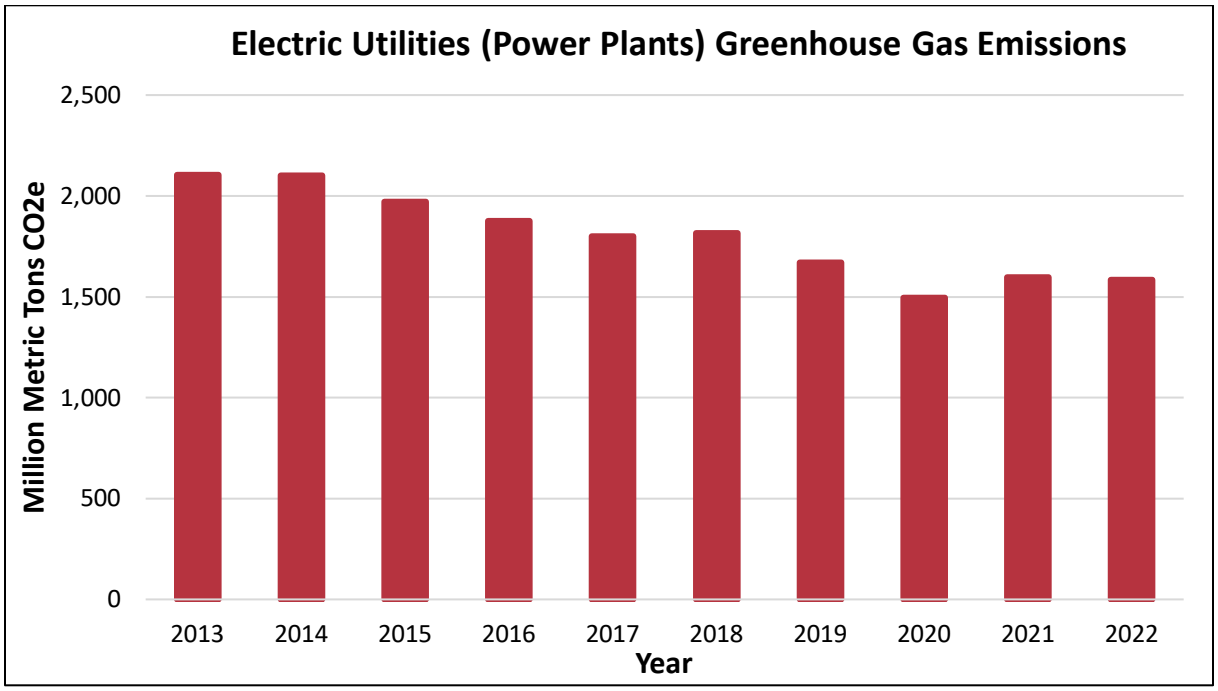
Climate change is already harming human health across the US, and impacts are expected to worsen with continued warming. Climate change harms individuals and communities by exposing them to a range of compounding health hazards, including the following:

- More severe and frequent extreme events
- Wider distribution of infectious and vector-borne pathogens
- Air quality worsened by smog, wildfire smoke, dust, and increased pollen
- Threats to food and water security
- Mental and spiritual health stressors

Climate change is projected to reduce US economic output and labor productivity across many sectors, with effects differing based on local climate and the industries unique to each region. Climate-driven damages to local economies especially disrupt heritage industries (e.g., fishing traditions, trades passed down over generations, and cultural heritage–based tourism) and communities whose livelihoods depend on natural resources.

Source: Fifth National Climate Assessment

EPA's Greenhouse Gas Reporting Program (GHGRP) tracks facility-level emissions from the largest U.S. sources of GHGs. Under the GHGRP, the Power Plants Sector consists mainly of facilities that produce electricity by burning fossil fuels such as coal, oil, and natural gas, or biomass. The sector also includes facilities that burn fossil fuels to produce steam, heated air, or cooled air. The chart below shows GHG emissions reported to the GHGRP by facilities in the Power Plants sector from 2013 to 2022.



- Note that while almost all TRI data are reported in pounds, the GHGRP collects GHG emissions data in metric tons of carbon dioxide equivalents ($MTCO_2e$), as shown in this chart.
- In 2022, 1,332 facilities in the Power Plants sector submitted GHG reports while 435 facilities in this sector reported to TRI. Some facilities report to only one of these programs due to different applicability requirements. TRI covers only electric utilities that burn coal or oil to generate electricity (i.e., natural gas power plants are not covered by TRI) while the GHGRP covers all power plants that meet the applicability requirements, including natural gas-fueled power plants.
- Total reported GHG emissions from the sector were 1,585 million $MTCO_2e$ in 2022, which represented more than half of total direct emissions reported to the GHGRP.
- From 2013 to 2022, GHG emissions from this sector have decreased by 25%. According to data from the U.S. Department of Energy's Energy Information Administration, use of renewables, such as wind and solar, and of natural gas increased during this time while the use of coal decreased. These trends likely contributed to the decreased emissions from this sector.

What are carbon dioxide equivalents (CO_2e)?

Different GHGs can have different effects on the Earth's warming; Global Warming Potential (GWP) values allow for comparisons of the global warming impacts of different gases. $MTCO_2e$ is a weighted measurement that considers the tonnes of the gases and their associated global warming potentials.

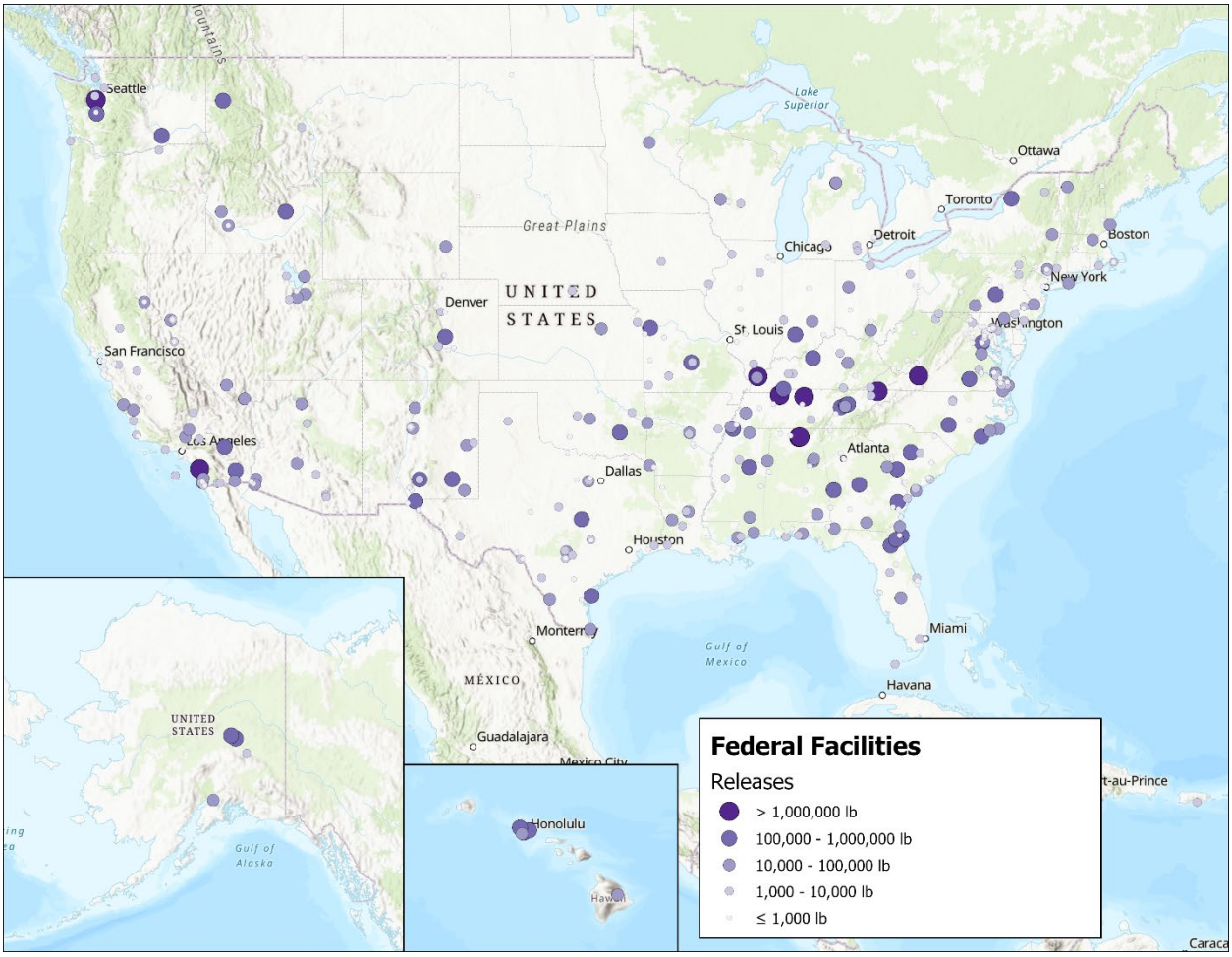
Additional Resources on GHG Emissions and Climate Change

- To explore the data reported to EPA on GHG emissions, see the Facility Level Information on GreenHouse gases Tool (FLIGHT).
- See the Fifth National Climate Assessment for information on climate change impacts, risks, and responses.
- For more details on the electric utility sector's GHG emissions, visit GHGRP Power Plants.
- The TRI P2 Search Tool lets you compare facilities' waste management reported to TRI and their GHG emissions reported to the GHGRP.

Federal Facilities

All federal facilities, including those operated by the EPA, the Department of Defense, and the Department of the Treasury, are subject to TRI reporting requirements, regardless of the type of operations at the facility.

This map shows the locations of the 444 federal facilities that reported to TRI for 2022, sized by their releases.

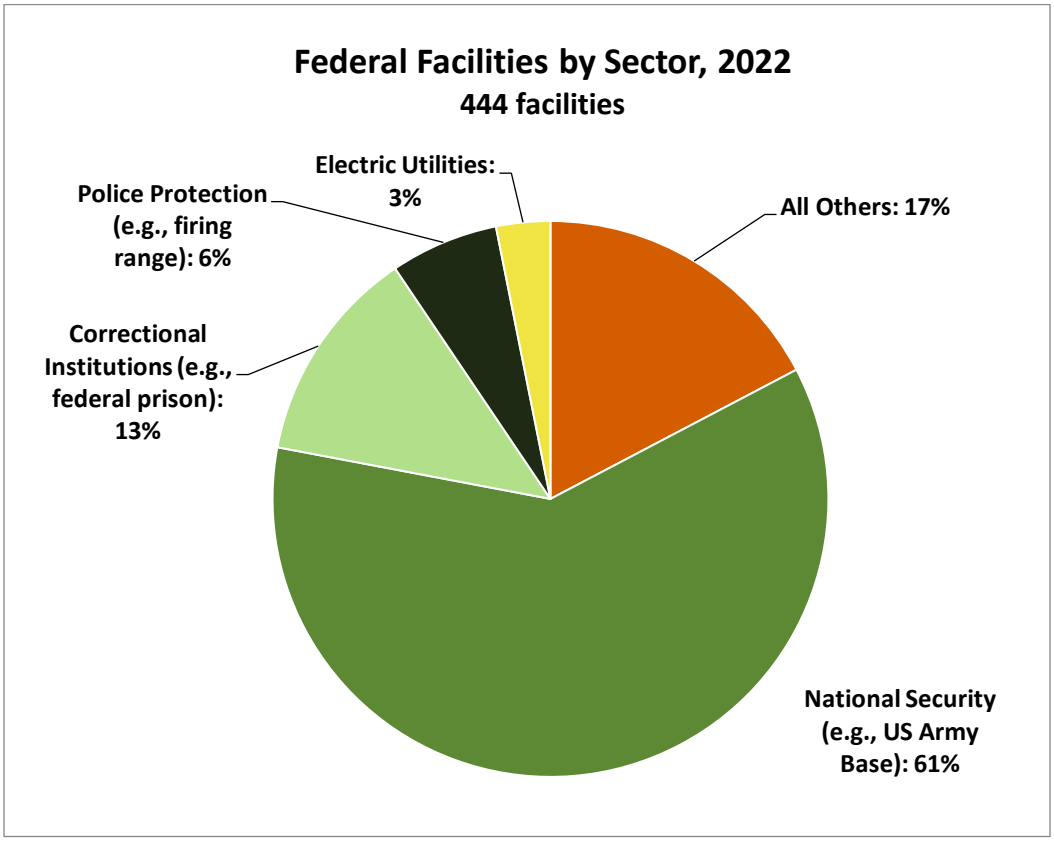


Federal Facilities Reporting to TRI, 2022

View Larger Map

Federal Facilities by Industry

The following chart shows the number of federal facilities reporting to TRI by sector for 2022.

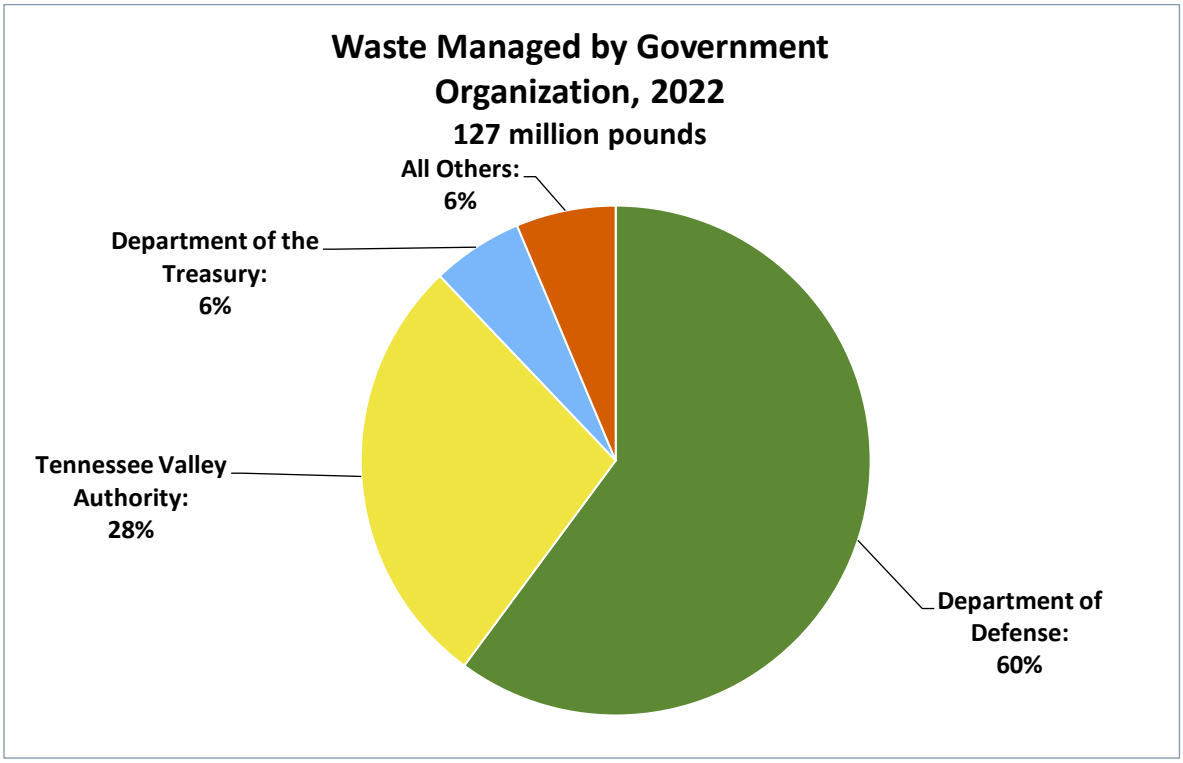


For 2022, 444 federal facilities in 41 different types of operations (based on their 6-digit NAICS codes) reported to TRI. Unlike non-federal facilities, federal facilities are subject to TRI reporting requirements regardless of their industry sector. Many federal facilities that report to TRI operate in sectors where federal facilities are the only facilities required to report to TRI, including military bases; correctional institutions; and police protection, such as training sites for border patrol stations. Almost two-thirds of the federal facilities that reported for 2022 are in the National Security sector, which includes Department of Defense facilities such as Army and Air Force bases.

As with non-federal facilities, the type of activities occurring at federal facilities determines the amount of chemical waste managed and the management methods used. Some activities occurring at federal facilities are similar to those at non-federal facilities, such as electricity production. In other cases, federal facilities may report waste managed from specialized activities. For example, the federal facilities included under police protection and correctional institutions almost exclusively reported for lead and lead compounds, likely due to the use of lead ammunition on their firing ranges.

Waste Management by Federal Facilities

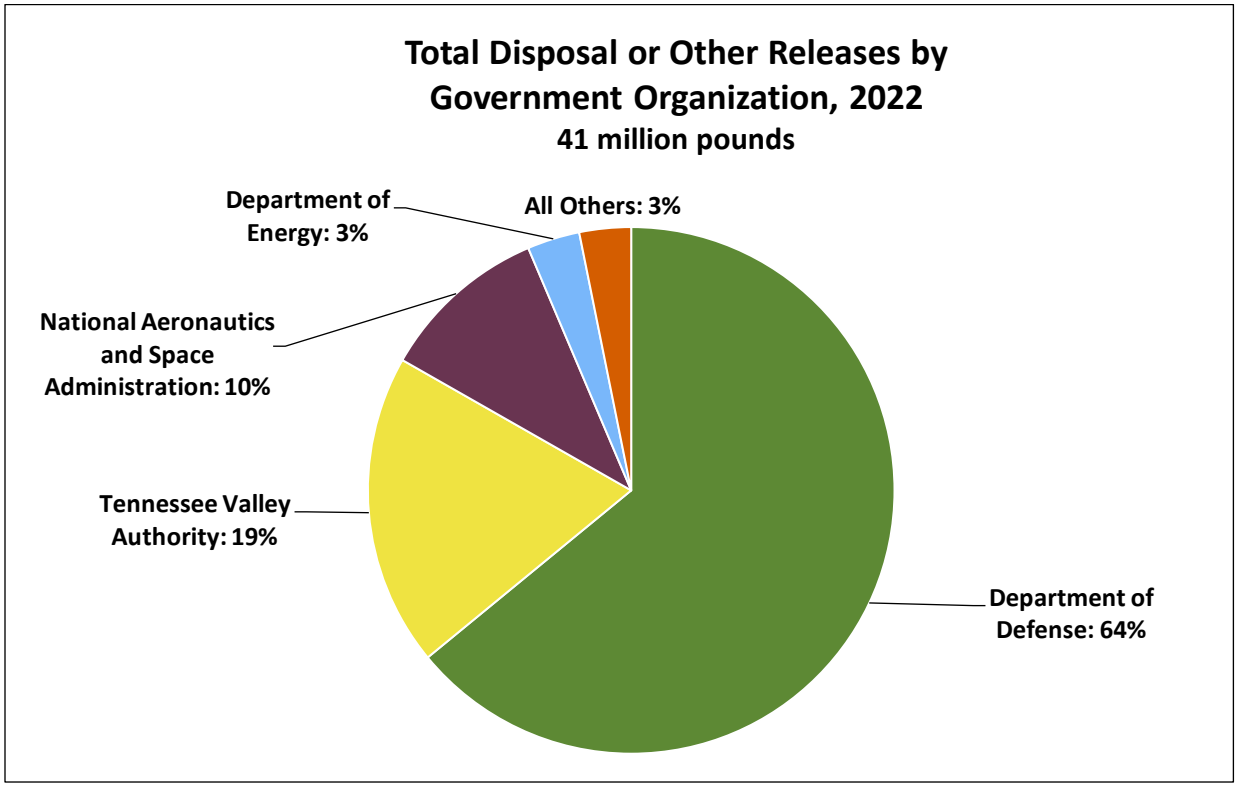
The following pie chart shows the percentages of total TRI chemical waste managed through recycling, energy recovery, treatment, and disposal or other releases by federal government organizations in 2022.



- The types of waste reported by federal facilities vary by the type of operation. For example:
  - Department of Defense facilities include Army, Marine, Navy and Air Force bases, and other military establishments. The majority of TRI waste managed by these facilities come from the use of lead- or copper-containing ammunition used in firing ranges.
  - The Tennessee Valley Authority, a government-owned electric utility, provides power to southeastern states. 80% of its reported waste was hydrochloric and sulfuric acid aerosols, which were mostly treated on site.
  - The Department of the Treasury facilities reporting to TRI are mints for manufacturing currency and, accordingly, they report metals (e.g., copper and nickel) to TRI. Almost all their metal waste was recycled off site.

Releases by Federal Facilities

The following graph shows the percentages of TRI chemicals released by federal government organizations in 2022.



- Most of the Department of Defense's releases were on-site releases of nitrate compounds to water and on-site land disposal of metals and metal compounds.
- The chemicals released by the Tennessee Valley Authority are similar to the chemicals released by other electric utilities that report to TRI. On-site land disposal of barium compounds and air releases of sulfuric acid make up a large portion of releases from the Tennessee Valley Authority and other electric utilities.

Pollution Prevention at Federal Facilities:

Federal facilities' operations are diverse and few focus on manufacturing processes. Due to the varied functions, operations at some federal facilities are better suited to pollution prevention strategies than others. For the 2022 reporting year, 32 federal facilities reported implementing pollution prevention activities.

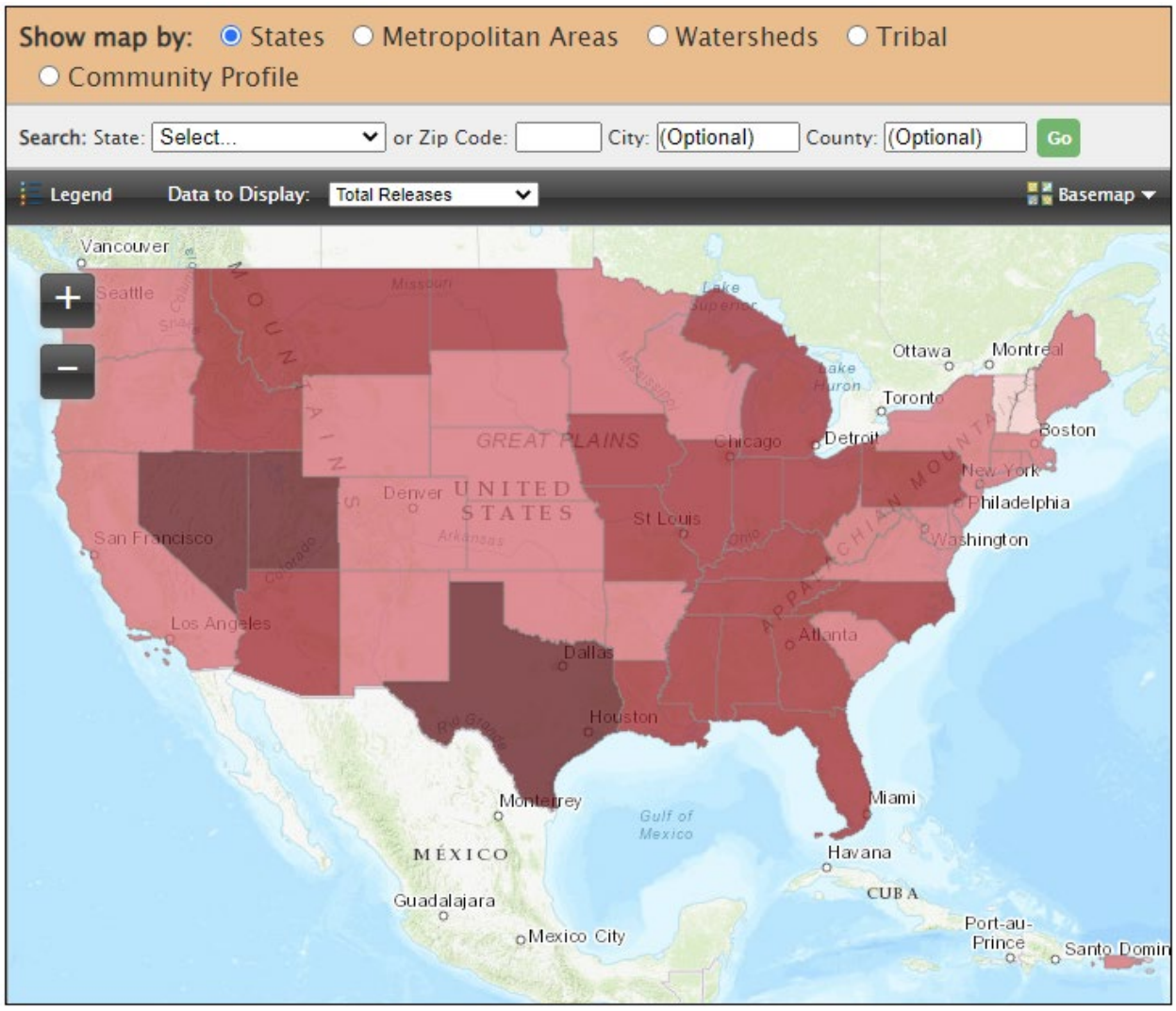
Federal facilities have often reported difficulties when trying to reduce their use of lead because it is contained in ammunition used at National Security and Park Service facilities. For 2022,

several federal facilities reported using non-lead ammunition in accordance with National Park Service policy to do so where feasible.

To find more examples of federal facilities' pollution prevention activities and the pollution prevention barriers they face, visit TRI's P2 Search Tool and select industry sectors such as National Security, Correctional Institutions, or Police Protection from the dropdown menu under "Search Criteria."

Where You Live

Use the online Where You Live tool to explore releases of Toxics Release Inventory (TRI) chemicals reported throughout the United States for 2022.



View Larger Map

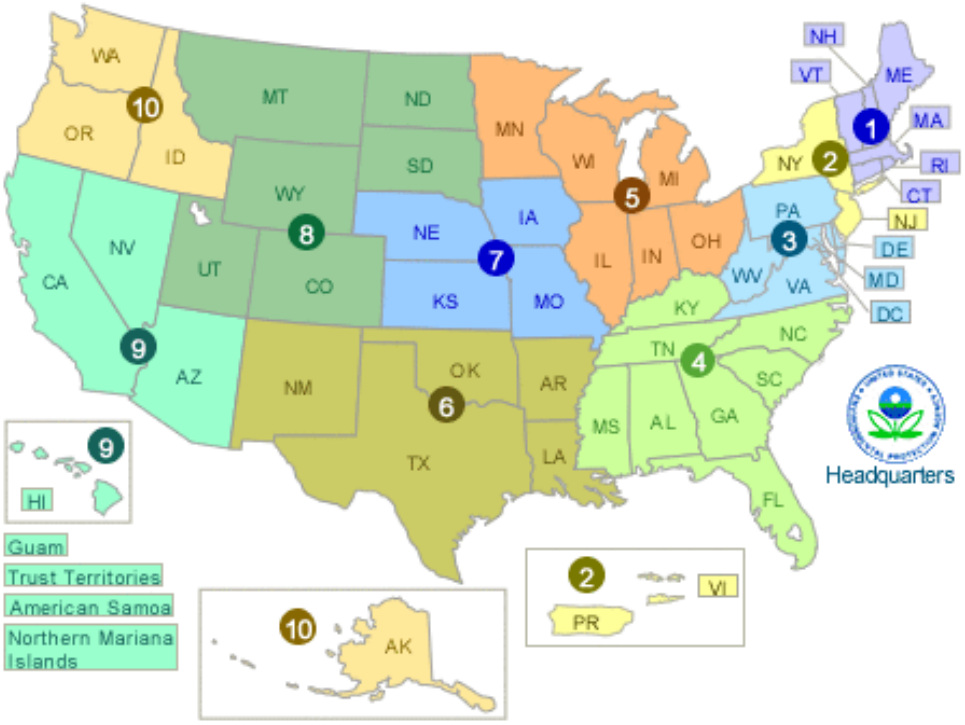
In the Where You Live tool, you can view TRI information by state, tribe, metropolitan area, and watershed. You can also view TRI facility locations along with demographic characteristics of the surrounding communities. Choose the "Community Profile" option to see community demographics using EPA's demographic index or supplemental demographic index. Use the "Data to Display" dropdown to select the metric to display. Use the Search bar to generate a fact sheet about an area of interest.

In addition to viewing maps based on release quantities, you can view maps based on risk-screening environmental indicator score (RSEI Score) which is an indicator of relative potential risks to human health following exposure to TRI chemical releases. RSEI Scores are generated by EPA's Risk-Screening Environmental Indicators (RSEI) model to allow you to compare the relative potential for impacts to human health across various locations. For more on RSEI, see the Potential Risks from TRI Chemicals section.

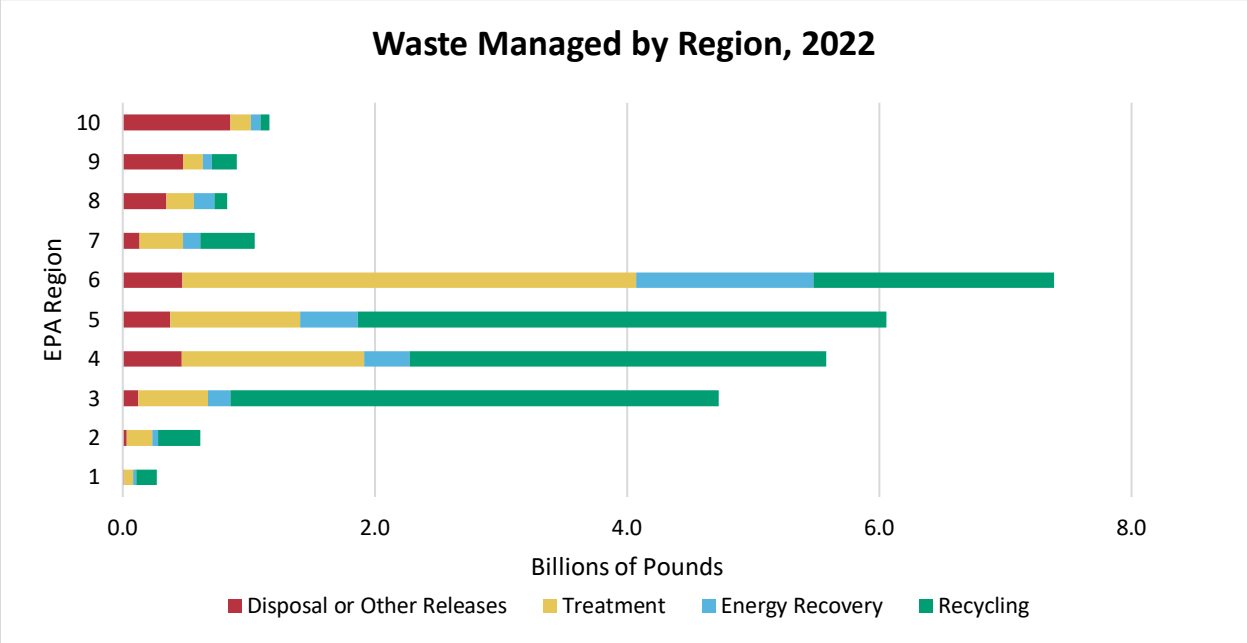
As with any dataset, there are many factors to consider when using the TRI data. A summary of key factors associated with data used in the National Analysis is in the Introduction. For more information, see *Factors to Consider When Using Toxics Release Inventory Data*.

EPA Regions

EPA has 10 regional offices, each of which is responsible for managing the TRI Program across multiple states. Some regional offices are also responsible for territories and tribes.



EPA regions vary in the type and number of facilities located in each. This results in significant differences in TRI chemical waste management practices and quantities, as shown in the figure below.



The differences in quantities of waste managed across EPA regions are largely due to the types and number of industrial facilities in each region. For example:

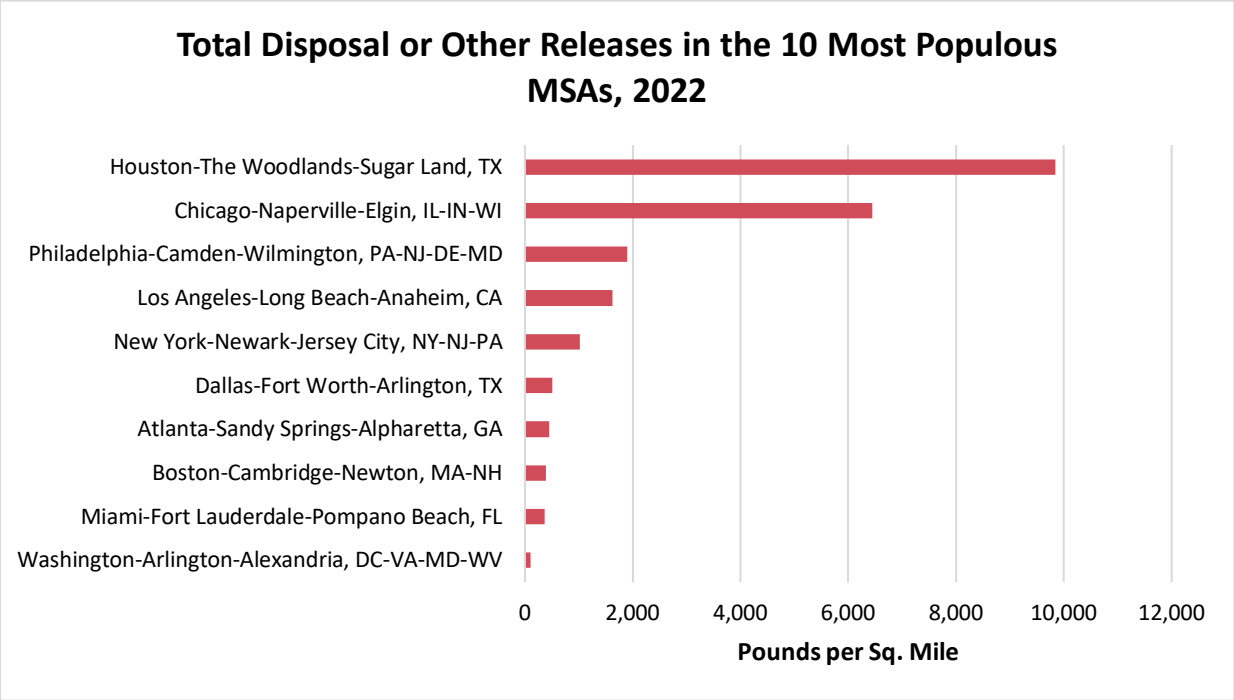
- **Region 10** facilities reported more releases for 2022 than those in any other region, totaling 855 million pounds.
    - Release quantities were driven by one metal mine in Alaska.
- In **Regions 8, 9, and 10**, the metal mining sector accounted for more releases than any other sector.
    - Metal mines tend to report high releases due to the large quantities of metals disposed of on site to land. The extraction and processing of minerals generates large amounts of on-site land disposal, primarily of metal-bearing rock (called ore) and waste rock.
    - Metal mines manage very little of their waste through treatment, combustion for energy recovery, or recycling. As a result, regions with significant metal mining operations tend to have higher releases but lower treatment, recycling, and energy recovery quantities than other regions.
- In **Region 7,** metal mines reported more releases than almost all other sectors, although only five metal mining facilities in the region reported to TRI for 2022.
- **Region 6** reported the most waste managed, driven by facilities in the chemical manufacturing sector. This sector also accounted for more of the region's releases than any other sector.

- Waste managed in **Regions 3, 4, and 5** was driven by recycling in the chemical and food manufacturing sectors. These regions all have one or two facilities reporting high quantities (i.e., more than a billion pounds) of chemicals recycled on site for 2022.
- **Regions 4 and 5** had the most facilities reporting for 2022: 4,737 and 5,275 facilities, respectively. Combined, almost half of all facilities that reported to TRI are in these two regions.
- **Regions 1 and 2** had the lowest releases and total waste managed. Nationally, most releases and waste managed are reported by facilities in the metal mining, chemical manufacturing, primary metals manufacturing, electric utilities, food manufacturing, or hazardous waste sectors. Relatively few facilities in these sectors operate in **Regions 1 and 2**, contributing to lower release and waste management quantities in these two regions.

States and Metropolitan Areas

For 2022, facilities located in all 56 states and territories reported to the TRI Program. Texas, Ohio, and California had the most facilities report to TRI, and together accounted for 20% of the total number of facilities that reported for 2022.

Approximately 80% of the U.S. population and many industrial and federal facilities that report to TRI are in urban areas. The Office of Management and Budget defines Metropolitan Statistical Areas (MSAs) as areas consisting of the county or counties "associated with at least one urban area of at least 50,000 population, plus adjacent counties having a high degree of social and economic integration" as measured through commuting ties. All MSAs are displayed on the "Where You Live" map. The chart below shows TRI chemical releases for 2022 for the 10 most populous MSAs.



Watersheds

To assess U.S. water resources, the U.S. Geological Survey divides the nation into 22 hydrologic regions, or watersheds, based on the flow of water throughout the country. Each watershed represents a major river drainage area (e.g., the Missouri region) or combines rivers' drainage areas (e.g., the Texas-Gulf region which includes several rivers draining into the Gulf of Mexico).

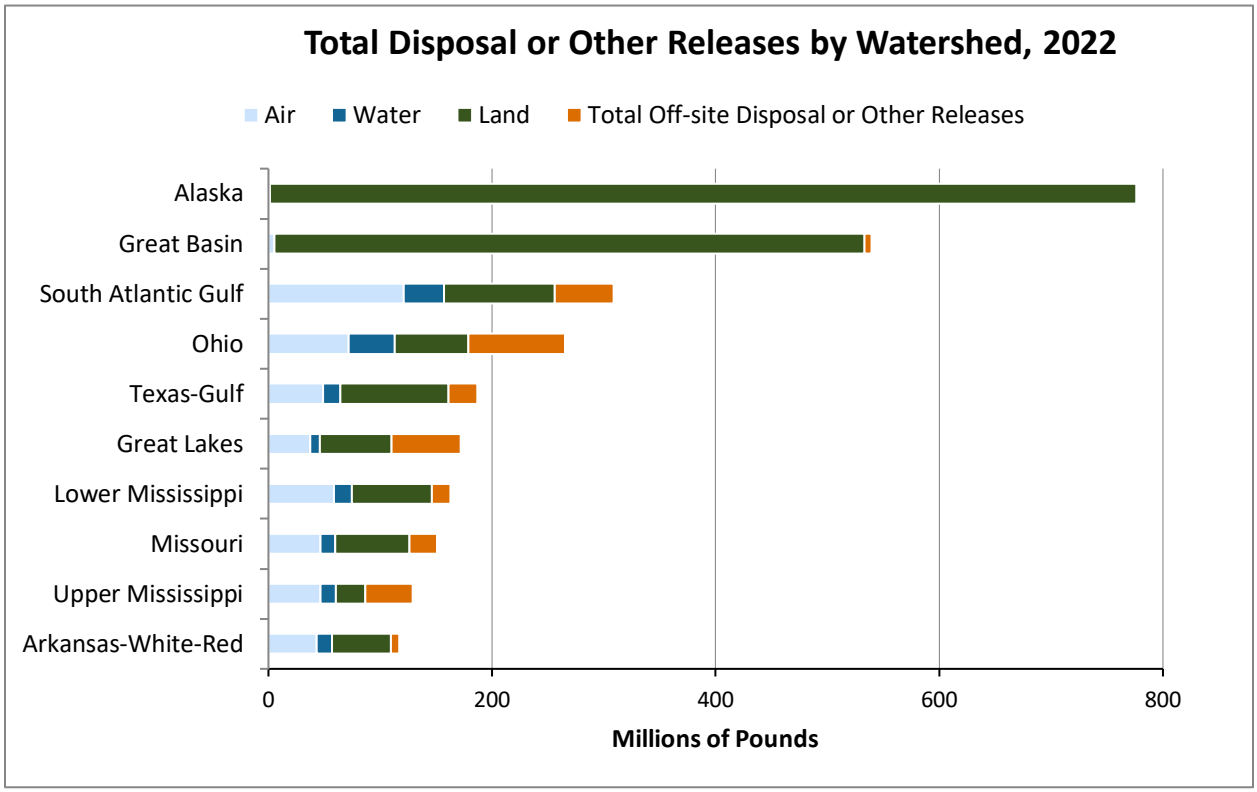
Source: USGS Science in Your Watershed

Note that the South Pacific region, consisting of Guam, the Northern Mariana Islands, and American Samoa, is not shown on this map.

Hydrologic regions are connected by the complex movement of water, such as rainwater draining into streams that flow into rivers. Every part of the US is part of a hydrologic region because water systems are connected; even chemicals released to land far from any lakes, rivers, or oceans, can eventually be carried into a faraway water body. Releases to air, land, or water can all end up impacting fish, wildlife, and other living things that depend on a water body.

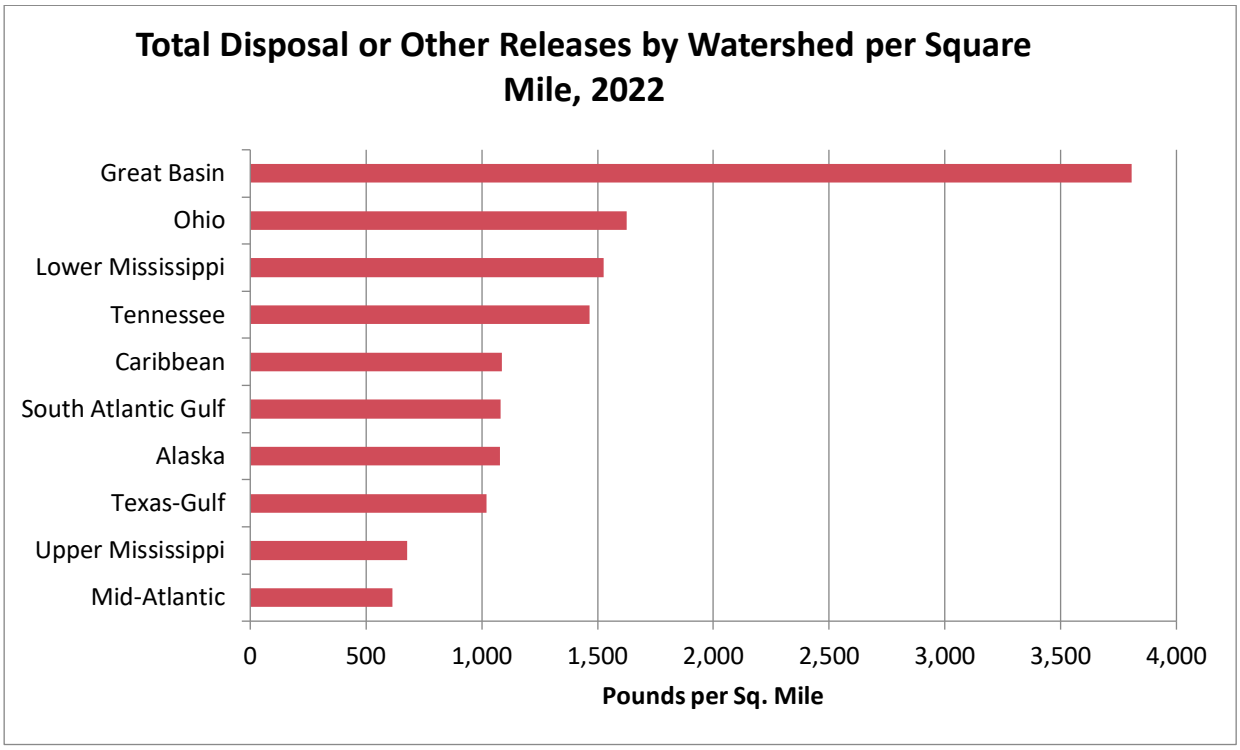
Certain chemicals can remain in the environment for a long time after they are released and build up in the tissues of wildlife living in or drinking contaminated water. These chemicals can become more concentrated as predators farther up the food chain eat these organisms. This process, called bioaccumulation, sometimes causes health problems for wildlife and humans.

All 22 watersheds are displayed on the Where You Live map. The chart below shows the ten watersheds with the most TRI chemical releases in 2022. Releases were highest in the Alaskan and Great Basin regions. In these regions, most releases were from metal mines.



Note: Chart shows the ten watersheds with the most TRI chemical releases in pounds.

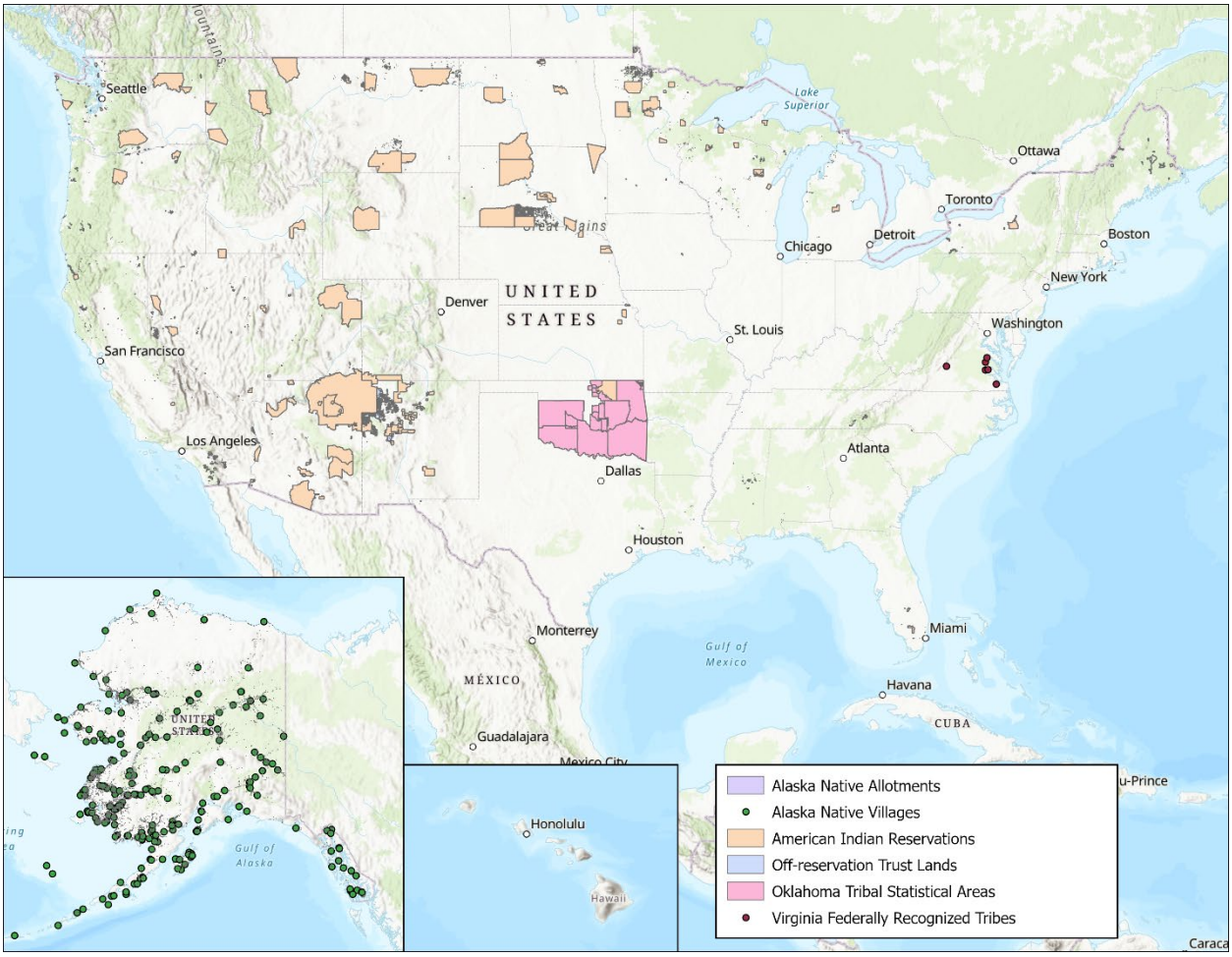
The chart below shows the ten watersheds with the most TRI chemical releases per square mile. Releases per square mile were greatest in the Great Basin region, which encompasses much of Nevada and Utah. Releases from metal mines made up 90% of the releases in this region.



Note: Chart shows the ten watersheds with the most TRI chemical releases in pounds per square mile.

Tribal Communities

Under EPA policy, the agency works with federally recognized tribes on a government-to-government basis to protect the land, air, and water in Indian Country and Alaska Native villages and to support tribal assumption of program authority.



In 2022, 374 facilities located on the land of 49 federally recognized tribes reported to TRI. These facilities collectively managed 250 million pounds of waste, 36 million pounds (14%) of which were disposed of or otherwise released. Of these releases, 60% were disposed of on site by metal mining, electric utilities, paper, and chemical manufacturing facilities. These facilities primarily disposed of metal compounds such as lead and barium. Lead is often present in the mineral ore disposed of by metal mines, and barium is present in coal and oil combusted at electric utilities.

Many more facilities are located within a 10-mile radius of tribal land. 2,150 facilities on or within 10 miles of tribal land reported to TRI for 2022, representing 250 different federally recognized tribes. These facilities collectively managed 1.29 billion pounds of waste, 207 million pounds (16%) of which were disposed of or otherwise released. Of the releases reported, 53% were released on site by chemical manufacturing, primary metals, and metal mining manufacturing facilities.

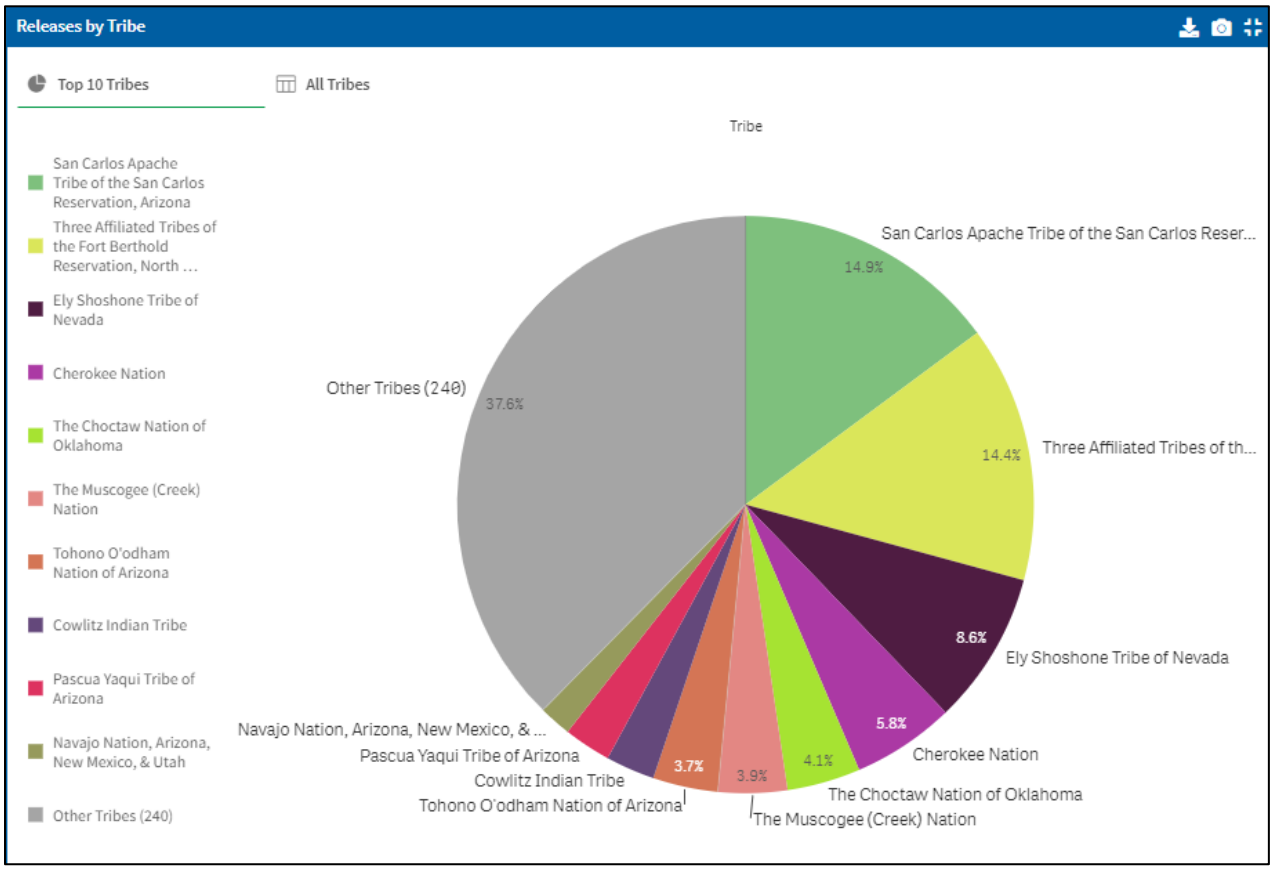
The table below provides more details about the types of releases and other waste management reported by facilities on federally recognized tribal lands.

Quick Facts for 2022: Facilities on Tribal Lands

Measure	*Facilities on Tribal Land*	*Facilities on or within 10 miles of tribal land*
Number of Facilities that Reported to TRI	**374**	**2,150**
Number of Tribes	49	250
Waste Managed	**249.9 million lb**	**1.29 billion lb**
Recycling	86.4 million lb	441 million lb
Energy Recovery	39.3 million lb	164 million lb
Treatment	88.3 million lb	475 million lb
Disposal or Other Releases	36.0 million lb	206 million lb
Total Disposal or Other Releases	**36.0 million lb**	**207 million lb**
On-site	**30.7 million lb**	**171 million lb**
Air	12.6 million lb	64.6 million lb
Water	4.1 million lb	14.4 million lb
Land	13.9 million lb	92.3 million lb
Off-site	**5.4 million lb**	**35.4 million lb**

Note: The amount of waste managed by disposal or other releases may differ from the amount shown as "total disposal or other releases" because several facilities reported managing large quantities of non-production-related waste, which is included in "total disposal or other releases" but not in "waste managed."

The TRI Toxics Tracker is one way to explore information about releases and other waste management of TRI chemicals from facilities on or near tribal lands. The chart below shows the type of TRI information in the Tribal Lands section of the TRI Toxics Tracker.



The table below lists the federally recognized tribes that had at least one TRI-reporting facility on their lands, along with the total releases and waste managed on the tribe's lands.

Total Disposal or Other Releases on Tribal Lands by Tribe, 2022

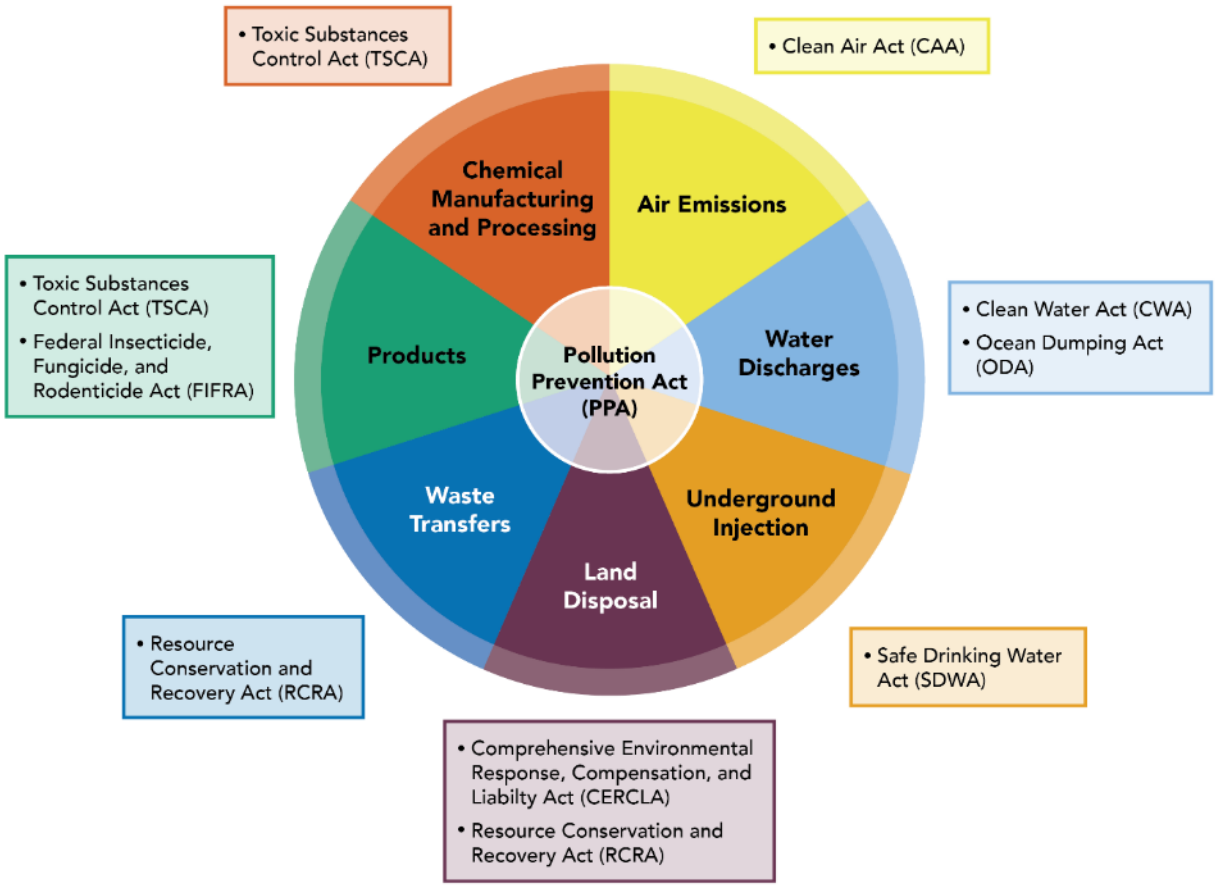
	Totals	
	Releases (lb)	Waste Managed (lb)
Totals	206,717,488	1,286,868,725
⊕ Absentee-Shawnee Tribe of Indians of Oklahoma	197,501	1,777,420
⊕ Agua Caliente Band of Cahuilla Indians of the Agua Caliente Indian Reservation, California	5	27
⊕ Ak-Chin Indian Community	40,923	146,171
⊕ Alabama-Coushatta Tribe of Texas	72,758	204,228
⊕ Apache Tribe of Oklahoma	602,247	3,424,837
⊕ Augustine Band of Cahuilla Indians, California	32,865	106,654
⊕ Bad River Band of the Lake Superior Tribe of Chippewa Indians of the Bad River Reservation, Wisconsin	2	69,245
⊕ Bay Mills Indian Community, Michigan	0	0
⊕ Bear River Band of the Rohnerville Rancheria, California	149,686	235,566
⊕ Big Valley Band of Pomo Indians of the Big Valley Rancheria, California	374	374
⊕ Blackfeet Tribe of the Blackfeet Indian Reservation of Montana	106	106

You can also view a fact sheet for each tribe using TRI Explorer.

Additional resources for tribes are available on the TRI for Tribal Communities webpage, including more detailed analyses of TRI data, links to other online tools, and contact information for EPA's Tribal Program Managers.

TRI Connections

Beyond TRI, there are many other EPA programs that collect information about regulated chemicals. The figure below is an overview of key laws that EPA implements with some associated regulated activities or industrial processes.

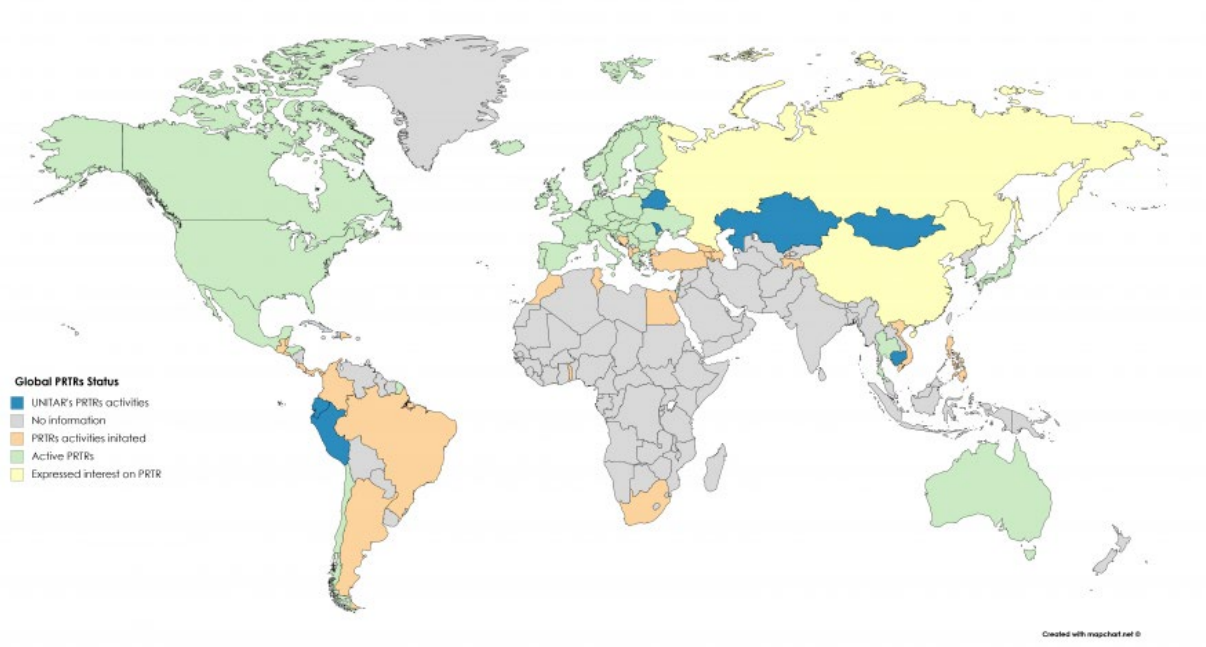


The Toxics Release Inventory (TRI) is a uniquely powerful resource that collects information about how toxic chemicals are managed by certain facilities in the United States. While most EPA programs focus on one environmental medium, the TRI Program covers all environmental media by tracking toxic chemical releases to air, water, and land, as well as chemical waste transfers. TRI also tracks other waste management practices and the implementation of pollution prevention. Since facilities report annually, TRI is one of EPA's most up-to-date sources of data. The data can be used with other datasets to provide a more complete understanding of national trends in chemical waste management practices.

Throughout EPA, offices use TRI data to support their mission to protect human health and the environment. These uses include technical analysis for regulation, informing program priorities, providing information to stakeholders, and many other applications.

TRI Around the World

In 1986, with the enactment of the Emergency Planning and Community Right-to-Know Act (EPCRA), TRI was established as the first national Pollutant Release and Transfer Register (PRTR) in the world. Since then, environmental agencies in other countries have implemented their own PRTR programs modeled after the TRI Program. Currently, at least 50 countries have fully established PRTRs or have implemented pilot programs (see map below). With assistance from international organizations like the United Nations Institute for Training and Research (UNITAR), more countries are expected to develop PRTRs, particularly in Asia, South America, and Africa.



Source: United Nations Institute for Training and Research PRTR Global Map

As global PRTR implementation expands, the TRI Program will continue to work with international organizations to:

- Assist in the development of new PRTR programs.
- Promote data standards and core data elements to improve PRTR comparability and harmonization as well as to support global scale analyses.
- Showcase the usefulness of PRTR data for assessing progress towards sustainability.

See the TRI Around the World webpage for more information on the TRI Program's international partners.

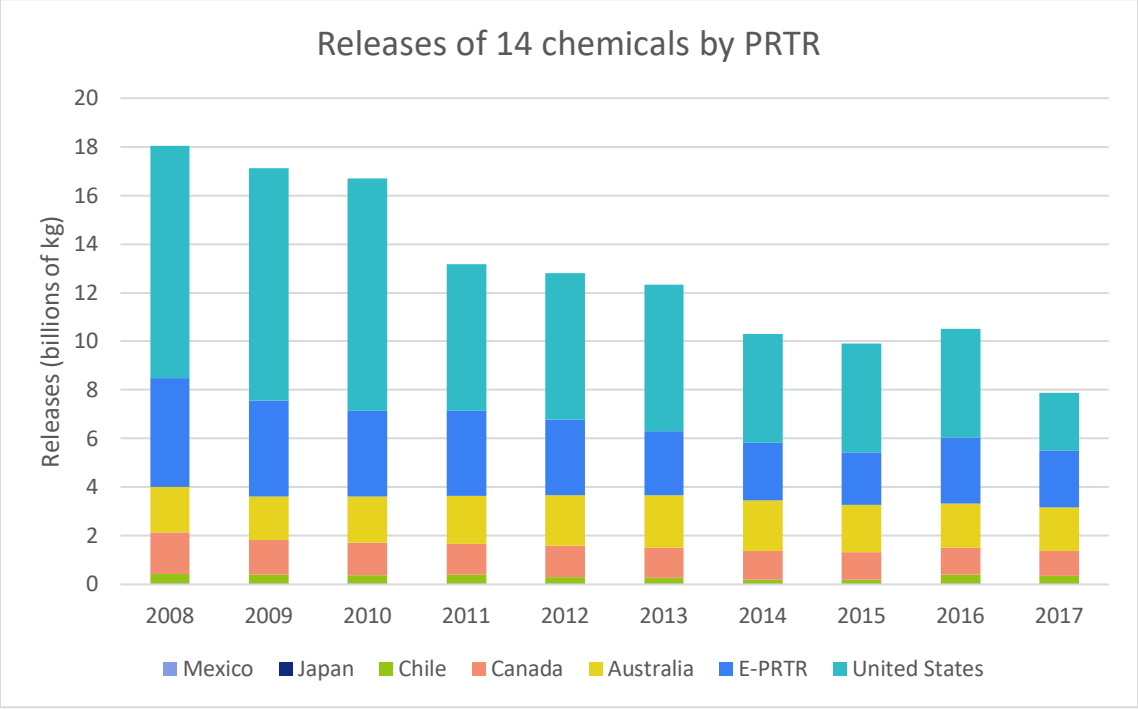
International Project Spotlight: Using PRTR Data to Assess Progress toward the U.N. Sustainable Development Goals

Watch a short video on the report on global PRTRs

Background. The TRI Program collaborates with the Organization for Economic Cooperation and Development (OECD) on PRTR projects, including a project to use global PRTR data to assess progress toward the United Nations' (U.N.) Sustainable Development Goals (SDGs). These goals are designed to "shift the world on to a sustainable and resilient path" by setting targets that encompass the economic, environmental, and social dimensions of sustainability. As stakeholders work toward the SDGs, the U.N. will measure progress using existing data where possible. Existing data sources for tracking some of the SDGs may include countries' PRTR data.

Project Focus. The U.N. SDG Target 12.4 was identified as most relevant to PRTR data; it focuses on reducing chemical releases to the environment.

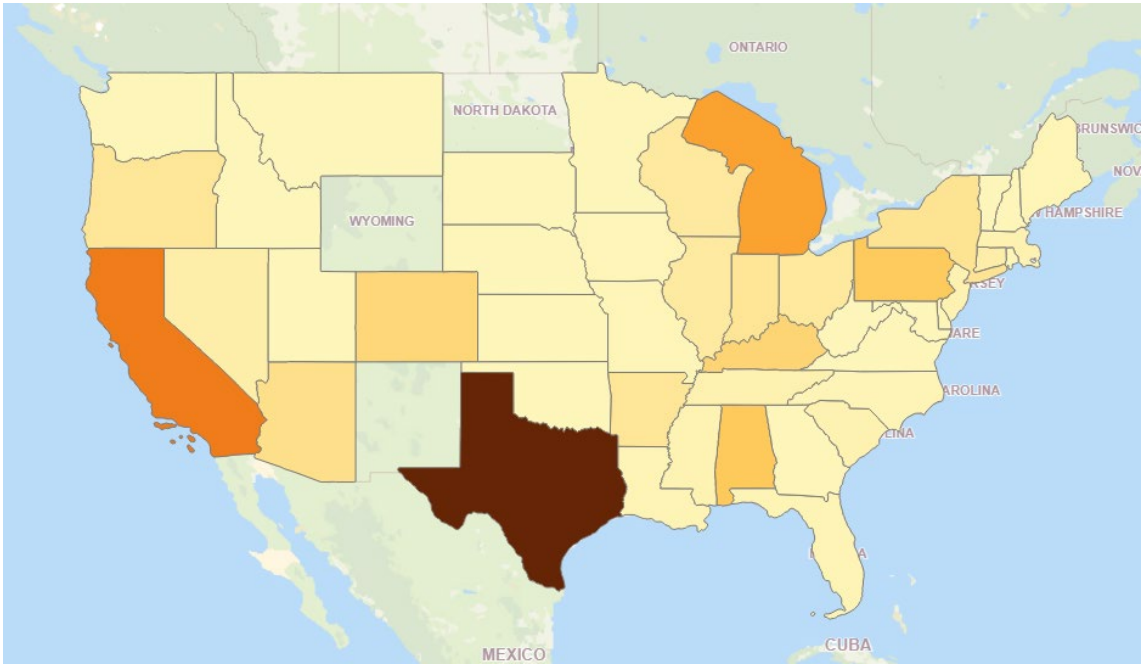
Project Status. OECD published the project report (including Spanish, French, and Japanese versions of the Executive Summary) based on aggregated data for 14 chemicals from multiple countries to assess progress toward achieving SDG Target 12.4. EPA is working with OECD to define the next steps for building on this work. Users can explore the report's underlying data using the interactive data tool on the OECD PRTR webpage.



Note: PRTRs included in the analyses: Australia – National Pollutant Inventory (NPI), Canada – National Pollutant Release Inventory (NPRI), Chile – Registro de Emisiones y Transferencia de Contaminantes (RETC), European Union – European Pollutant Release and Transfer Register (E-PRTR), Japan Pollutant Release and Transfer Register (PRTR), Mexico – Registro de Emisiones y Transferencia de Contaminantes (RETC), United States – Toxics Release Inventory (TRI). *Chemicals included in the analyses*: 1,2-Dichloroethane, Benzene, Cadmium, Chromium, Di-(2-ethylhexyl) phthalate, Dichloromethane, Ethylbenzene, Mercury, Nickel, Particulate matter, Styrene, Sulfur oxides, Tetrachloroethylene, Trichloroethylene.

Mapping Cross-Border Transfers

Facilities must report on the TRI chemicals in wastes they transfer off site for further management at other facilities, including the name and address of the receiving facility and how the waste is managed. This map shows states with TRI facilities that shipped waste containing TRI chemicals outside of the U.S. Explore the data in more depth in the full TRI National Analysis Dashboard.



- Transfers of TRI chemical waste to Mexico and Canada accounted for 84% of all cross-border transfers by weight for 2022.
    - Almost all TRI chemical waste transfers (99%) to Mexico were for recycling, primarily of metals and metal compounds. Zinc made up 77% of all transfers to Mexico by weight.
    - Most transfers to Canada were from northeastern and midwestern states. About two-thirds of the TRI chemicals sent to Canada were transferred for recycling. Transfers to Canada were mostly metals (e.g., copper, nickel) and chemicals commonly used as solvents (e.g., acetonitrile, methanol).
- The North American Commission for Environmental Cooperation (CEC) is an international collaboration between the U.S., Canada, and Mexico focused on environmental issues of common interest. Among other activities, the CEC develops *Taking Stock* reports that combine data from TRI and the equivalent programs in Mexico

and Canada. The most recent Taking Stock report includes a feature on cross-border transfers, supported by a cross-border transfers tool.

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January 22, 2025

The Honorable Brett Guthrie, Chairman
The Honorable Frank Pallone, Jr., Ranking Member
Committee on Energy and Commerce
2125 Rayburn House Office Building
Washington DC 20515-6115

Re: Microporous, LLC Comments on EPA's TSCA Trichloroethylene Final Rule

Dear Chairman Guthrie and Ranking Member Pallone:

I am the Chief Executive Officer of Microporous, LLC ("Microporous"). Microporous is one of the nation's largest manufacturers of lead-acid battery separators, and one of only two manufacturers of lead acid battery separators in the U.S. Entek International, LLC ("Entek") is the other. Together, Microporous and Entek account for 22.3% of the global battery separator capacity.

Battery separators provide the necessary separation between the internal anode and cathode components that make all batteries work, and separators hold the electrolyte in the proper location. A battery separator serves as an electronic insulator that prevents the battery from shorting, and maintains chemical stability. Microporous operates three well-invested, world-class battery separator manufacturing facilities in the U.S. and Europe, two in Piney Flats, Tennessee and one in Feistritz im Rosental, Austria. The Microporous facilities in Tennessee employ 165 people.

On December 17, 2024, U.S. EPA published a final rule ("Final Rule") banning industrial/commercial uses of trichloroethylene ("TCE") under the federal Toxic Substances Control Act ("TSCA"), which was to take effect January 16, 2025, just days before the new Presidential Administration was to come into office. The Third Circuit Court of Appeals has temporarily stayed the effective date of the Final Rule, halting, at least temporarily, the political gamesmanship employed by EPA to get the Final Rule adopted.

EPA's Final Rule recognized that using TCE to produce battery separators is critical and essential for national security, the national economy, and to maintain critical infrastructure. Therefore, EPA exempted battery separator manufacturers from the TCE ban for 20 years. However, what EPA gave in the 20-year exemption, EPA took away in the conditions on the

exemption that: (1) are impossible to meet; and (2) ultimately will shutter all domestic manufacturing of battery separators, including Microporous, causing severe economic impacts and endangering a supply chain essential to national security.

Microporous' battery separators are essential, irreplaceable components for all rechargeable batteries in the U.S. and around the world. Every single heavy-duty vehicle and every mass-market passenger vehicle—including electric vehicles—relies on one or more lead acid batteries that are critical to the operation of the vehicle. Lead acid batteries also provide critical back-up emergency power to nearly all data centers, telecommunications centers, and other essential assets. Both lead acid and lithium-ion batteries require battery separators for operation. Of the battery separator market, 80% is supplied by batteries utilizing TCE.

The TCE Final Rule was not based on good science and poses a serious threat to the national economy, national security, and critical infrastructure:

- Lack of Good Science: EPA failed to demonstrate that the Final Rule reflects the best available science and the weight of the scientific evidence, as required by TSCA. The Final Rule is tainted by EPA's reliance on a single, flawed study for imposing impossible workplace mandates that reduce the allowable workplace TCE limits by 500 times (from 100 ppm to .2 ppm). EPA did not acknowledge or address the well-documented scientific flaws and uncertainties in EPA's position that have been published in the peer-reviewed literature, but rather arbitrarily and capriciously adopted the Final Rule with no sound scientific basis.

- National Economy: The Final Rule would force domestic battery separator manufacturers to close, leading to the direct loss of 20,000 high-quality jobs in the battery sector and countless more across downstream industries. At the same time, global manufacturing capacity is so constrained that it lacks the excess capacity to make up for lost U.S. battery separator supply. Economists estimate that the rule would cause a cumulative shortage of more than 270 million lead-acid batteries in the U.S. in the five years after the Final Rule is implemented, leading to losses in the battery sector of at least $14 billion and over $98 billion economy-wide.

- National Security: Batteries are vital to military vehicles and equipment. As a result of the Final Rule, the U.S. military will have to rely on batteries with foreign-made separators, if available. This will leave our military vulnerable to shortages and supply shocks—and jeopardize our national security.

- Critical Infrastructure: Batteries requiring separators produced with TCE are used throughout our critical infrastructure, including in construction, safety equipment, the airline and automotive industries, healthcare, and emergency services. By immediately threatening domestic battery supplies, the TCE Final rule likewise imminently threatens all of these applications.

Please feel free to contact me should you have questions or need additional information.

With best regards,

John Reeves
Chief Executive Officer, Microporous, LLC