

## Toxic Chemicals in Wastes

Toxic chemicals are contained in waste materials produced by a wide variety of industrial activities, in both public (e.g., sewage treatment plants) and private facilities. These chemical wastes are a composite matrix of various chemicals, some of which may be hazardous or toxic, and therefore may be subject to reporting under the Toxics Release Inventory (TRI) program. Some of these chemicals are released onsite or offsite to air, water, or land (including surface impoundments and underground injection wells). The rest are treated, recycled, or combusted for energy recovery. Reductions in the quantities of TRI chemicals are desirable for both environmental and economic reasons. TRI chemicals have known toxic properties, rendering them potentially hazardous to workers in both production and waste management facilities, and more generally to ecosystems and human health. As elements of overall business strategies, companies target waste reduction as a means to reduce costs and increase profits.

This indicator tracks trends in the amounts of TRI chemicals in production-related wastes that are released to the environment or treated, recycled, or combusted for energy recovery. Toxic chemicals in non-production-related waste, which can be associated with catastrophic events and remedial actions (cleanup), are not included in this indicator because they are not directly related to routine production practices. An exception to this is shown in Exhibit 2, where data that include small quantities of non-production waste<sup>1</sup> are used to show how releases are distributed across media.

TRI contains information on more than 650 chemicals and chemical categories from manufacturing operations, certain service businesses, and federal facilities. Facilities are required to report to TRI if they employ 10 or more employees, are covered by a North American Industry Classification System (NAICS) code corresponding to a TRI-covered Standard Industrial Classification (SIC) code, and manufacture more than 25,000 pounds, and/or process more than 25,000 pounds, and/or otherwise use more than 10,000 pounds of a TRI-listed chemical during a calendar year. Starting in 2000, EPA established more stringent thresholds for persistent bioaccumulative toxic (PBT) chemicals. The TRI reporting threshold for PBT chemicals is either 100 pounds or 10 pounds, except for dioxin and dioxin-like compounds, which have a threshold of 0.1 gram. These PBT chemicals are of particular concern not only because they are toxic but also because they remain in the environment for long periods of time, are not readily destroyed, and build up or accumulate in body tissue (U.S. EPA, 2013). EPA requires reporting of 16 PBT chemicals and four PBT chemical compound categories (U.S. EPA, 2007b).

TRI is national in coverage and includes all U.S. territories. For the reporting year 2011, 20,927 facilities reported to TRI (U.S. EPA, 2013). Reporting requirements for TRI began in 1988 and have varied somewhat over the years. Chemicals that were reported consistently from 2001 to 2011 are presented in this indicator. Metal mining sector<sup>2</sup> releases are analyzed separately because they represent the largest single industry sector, accounting for about one-third of all releases and 84 percent of PBT releases over the 2001-2011 period.

<sup>1</sup>Over the period 2001-2011, non-production-related waste represented less than 0.5 percent of the total quantity of waste released.

<sup>2</sup>The metal mining sector consists of facilities that fall within North American Industry Classification System (NAICS) code 2122 and must report to TRI in accordance with Section 313 of the Emergency Planning and Community Right to Know Act.

### What the Data Show

**For all industry sectors, non-PBT chemicals:** In 2011, the quantities of TRI non-PBT chemicals associated with production-related wastes tracked in this indicator totaled 21.4 billion pounds (Exhibit 1). Quantities of non-PBTs generally decreased between 2001 and 2009, then increased in 2010 and 2011. The amount of TRI non-PBT chemicals reported as *treated* declined 11 percent between 2001 and 2011, varying from a high of nearly 9.0 billion pounds in 2004 to a low of 7.0 billion pounds in 2009. The amount of TRI non-PBT chemicals *recycled* declined by 0.76 billion pounds (8.6 percent) from 2001 to 2011, varying from a high of 8.9 billion pounds in 2002 to the low of 7.1 billion pounds in 2009. TRI non-PBT chemicals managed through *energy recovery* processes showed a decline of 1.03 billion pounds (29 percent) in the 11-year period, fluctuating between 2.2 and 3.7 billion pounds. Some of the year-to-year fluctuations may reflect changes in aggregate production levels in the national economy.

**For all industry sectors, PBT chemicals:** Reported PBT chemicals in production-related waste totaled 1.34 billion pounds in 2011, having increased 38 percent since the recent low point of 0.98 billion pounds in 2009 (Exhibit 1). The amount of PBT chemicals *recycled* declined by 38 percent between 2001 and 2011 (0.32 billion pounds). PBT releases to the environment increased to 0.79 billion pounds in 2011 after having been in the range of 0.40 to 0.58 billion pounds during the preceding ten years.

**For all sectors except metal mining, non-PBT chemicals:** Approximately 2.2 billion pounds of toxic chemicals were released offsite or onsite to air, land, or water in 2011. This amount is 34 percent less than the amount reported in 2001 (Exhibit 2).

Between 2001 and 2011 there were also distinct trends in media-specific and offsite releases of non-PBT toxic chemicals (Exhibit 2). Air releases declined by 52 percent (858 million pounds) between 2001 and 2011. Releases to surface waters averaged about 246 million pounds from 2001 through 2008, and then decreased to an average of 213 million pounds over the years 2009 through 2011. Onsite releases to land dropped by 17 percent (156 million pounds) between 2001 and 2011. Offsite releases, which cannot be apportioned by medium in TRI, averaged about 474 million pounds from 2001 through 2008, then decreased to an average of

370 million over 2009-2011.

For all sectors except metal mining, PBT chemicals: Nearly 0.062 billion (62 million) pounds of PBTs were released offsite or onsite to air, land, or water in 2011 (Exhibit 2). Over the years, the amounts of reported PBT releases have fluctuated, ranging from approximately 110 million pounds in 2003 to a new low of 62 million pounds in 2011.

PBT chemicals released to air decreased 64 percent (1.8 million pounds) between 2001 and 2011 (Exhibit 2). Onsite PBT releases to land decreased 46 percent between 2001 and 2011. Releases to water, which represent a small fraction (0.12 percent in 2011) of total PBT releases, varied between 0.07 and 0.16 million pounds between 2001 and 2011. Offsite PBT releases exhibit a gradual decreasing trend over the 2001-2011 time period.

For the metal mining sector, non-PBT chemicals: Excluding PBT chemicals, the metal mining sector accounted for 25 percent (10.7 billion pounds) (Exhibit 3) of the total production-related wastes (42.7 billion pounds) (Exhibit 1) released to the environment from 2001 through 2011. Nearly all of the production-related wastes managed by metal mining facilities were releases to land. There was a significant downward trend for the quantities of total releases by the metal mining sector from 2001 to 2004 (Exhibit 3); releases were relatively steady from 2005 to 2009, then increased in 2010 and 2011<sup>3</sup>

For the metal mining sector, PBT chemicals: Over the 11-year period covered by this indicator, the metal mining sector released 4.65 billion pounds of PBT chemicals, representing 84 percent of total PBT chemicals released by all TRI industries during this time (Exhibit 3). Nearly all of these releases (99.3 percent) are reported as releases to land. Releases of PBTs by the metal mining sector were relatively steady between 2001 and 2008, decreased in 2009, and more than doubled between 2009 and 2011. Mine production remained relatively steady during this recent increase, suggesting that factors other than production, such as changes in the composition of the ore body and waste rock, have contributed to this upward trend (U.S. EPA, 2013). Lead and lead compounds account for the vast majority (98 percent) of the disposal or other releases of PBT chemicals by the metal mining sector (U.S. EPA, 2012).

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<sup>3</sup>In 2001, the metal mining industry reported 2.3 billion pounds in total releases, and in 2004, 1.1 billion pounds were reported. Part of this trend can be attributed to the court decision (*Barrick Goldstrike Mines, Inc. v. Whitman*) in 2003, in which the court determined that non-PBT chemicals present in the waste rock below concentrations of 1 percent (or 0.1 percent for Occupational Safety and Health Administration-defined carcinogens) are eligible for the *de minimis* exemption. For TRI reporting purposes, the *de minimis* exemption allows facilities to disregard certain minimal concentrations of non-PBT chemicals in mixtures or other trade name products when making threshold determinations and release and other waste management calculations (U.S. EPA, 2007a,c).

## Limitations

- TRI data reflect only “reported” chemicals, and not all chemicals with the potential to affect human health and the environment. TRI does not cover all toxic chemicals or all industry sectors. The following are not included in this indicator: (1) toxic chemicals that are not on the list of approximately 650 toxic chemicals and toxic chemical categories; (2) wastes from facilities within industrial categories that are not required to report to TRI; (3) wastes from facilities with fewer than 10 full-time employee equivalents (FTEs); and (4) toxic chemical waste managed at facilities that manufactured, processed, or otherwise used less than a threshold amount of the chemical in question.
- TRI chemicals vary widely in toxicity, meaning that some low-volume releases of highly toxic chemicals might actually pose higher risks than high-volume releases of less toxic chemicals. The release or disposal of chemicals also does not necessarily result in the exposure of people or ecosystems.
- National trends in toxic chemicals in wastes released to the environment are frequently influenced by a dozen or so large facilities in any particular reporting category. These trends may not reflect the broader trends in the more than 20,700 smaller facilities that report to TRI each year.
- Some facilities report offsite transfers for release to other TRI-covered facilities that report these quantities as onsite releases. This double-counting of release quantities is taken into account in the case of release for all sectors in total, but not for releases within individual sectors. This may cause some discrepancy in certain release numbers for specific sectors when compared with release data on all sectors.

## Data Sources

This indicator is based on data from EPA's Toxics Release Inventory from 2001 to 2011 (U.S. EPA, 2012), and in particular the dataset released in mid-2012 called “TRI2001-2011: NA 2011” (U.S. EPA, 2012). This dataset was analyzed using TRI.NET, an online downloadable tool that allows users to generate customized reports on toxic releases reported to TRI and other online resources (U.S. EPA, 2012).

## References

U.S. EPA (United States Environmental Protection Agency). 2013. 2011 Toxics Release Inventory national analysis overview. <http://www2.epa.gov/toxics-release-inventory-tri-program/2011-tri-national-analysis>.

U.S. EPA. 2012. TRI.NET. Dataset TRI2001-2011: NA 2011. Accessed December 31,

2012. <http://www2.epa.gov/toxics-release-inventory-tri-program/trinet>.

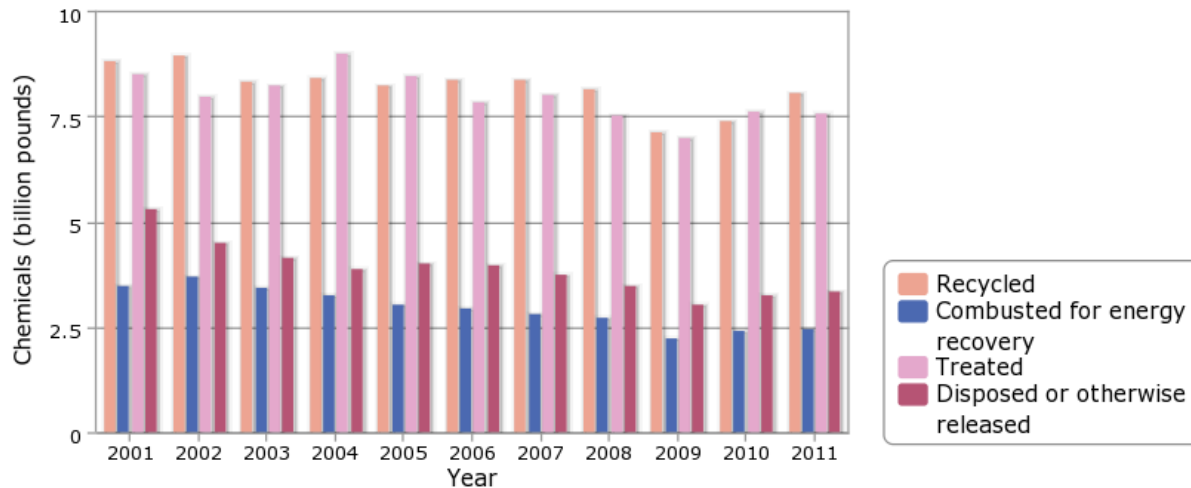
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U.S. EPA. 2007b. Persistent, bioaccumulative, and toxic (PBT) chemicals rules. Accessed November 29, 2007. <http://www2.epa.gov/toxics-release-inventory-tri-program/persistent-bioaccumulative-toxic-pbt-chemicals-rules-under-tri>.

U.S. EPA. 2007c. Toxic Chemical Release Inventory reporting forms and instructions: Revised 2006 version. EPA/260/C-06/901. <http://www2.epa.gov/sites/production/files/documents/2006rfi.pdf> (PDF) (206 pp, 2.4MB).

### Exhibit 1. Quantities of toxic chemicals recycled, combusted for energy recovery, treated, and disposed of or otherwise released, in the U.S., as reported to EPA's Toxics Release Inventory, 2001-2011

Non-PBT chemicals



**Coverage:** Production-related waste from facilities required to report to TRI, including more than 650 chemicals and chemical categories.

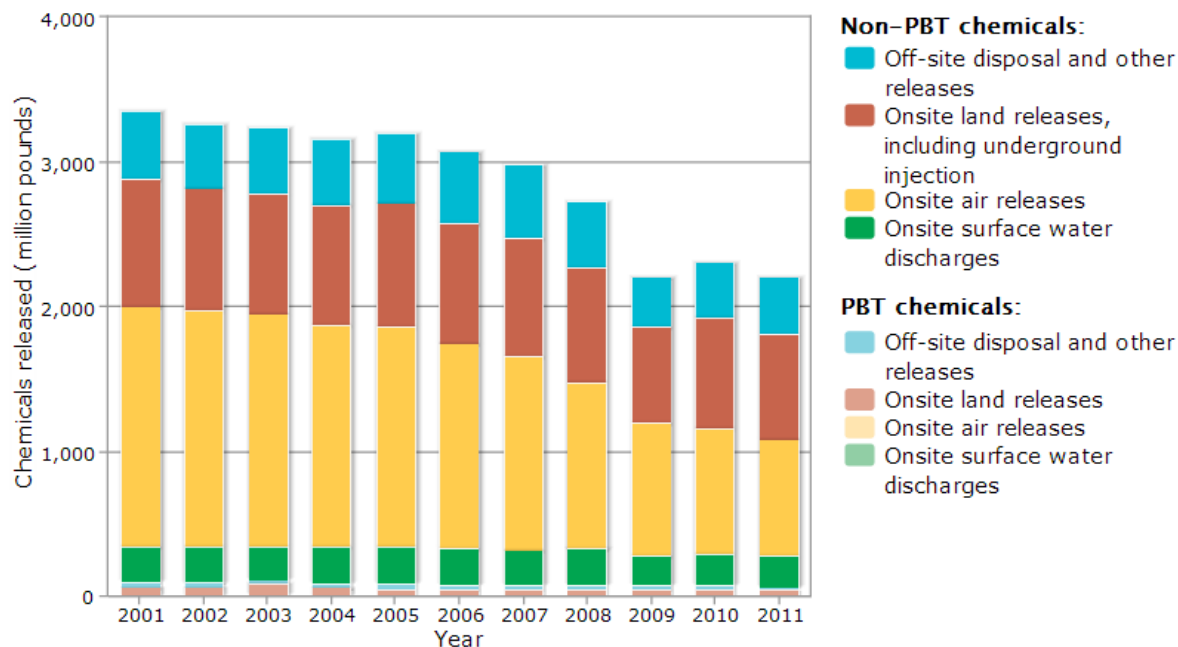
Some waste quantities may be double-counted when waste has been transferred from one TRI facility (which has counted waste as offsite disposal or as other releases) to another facility (which has counted transferred waste as onsite disposal or releases to air, land, or water).

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

**Data source:** U.S. EPA, 2012

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

**Exhibit 2. Quantities of toxic chemicals released in the U.S., by type of release (excluding metal mining), as reported to EPA's Toxics Release Inventory, 2001-2011**



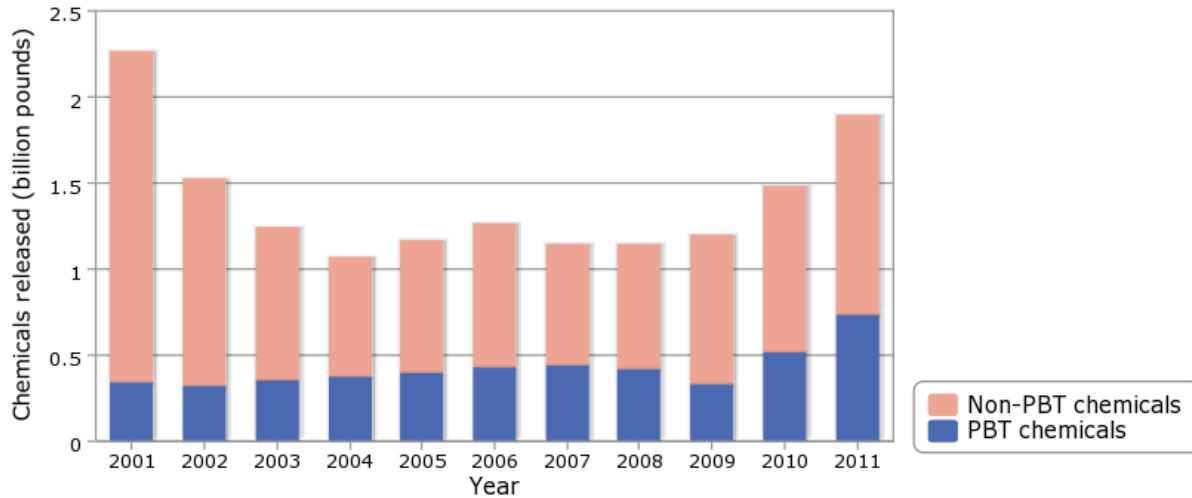
**Coverage:** Disposal and other releases from facilities required to report to TRI (except the metal mining sector), including more than 650 chemicals and chemical categories. Includes small quantities of non-production-related, one-time waste.

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

**Data source:** U.S. EPA, 2012

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

**Exhibit 3. Quantities of toxic chemicals released in the U.S. by the metal mining sector, as reported to EPA's Toxics Release Inventory, 2001-2011**



**Coverage:** Production-related disposal and other releases from metal mining facilities required to report to TRI, including more than 650 chemicals and chemical categories.

Percentages reported in the "What the Data Show" section are based on the original data, which include more significant figures than shown in this exhibit.

Due to a 2003 court decision affecting reporting at metal mining facilities, quantities prior to reporting year 2002 are not directly comparable to quantities reported subsequent to this court decision.

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

**Data source:** U.S. EPA, 2012

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