

Disposal or Other Releases of TRI Chemicals

Disposal or other releases of chemicals into the environment occur through a range of practices. They may take place at a facility as an on-site disposal or other release to air, water, land, or an underground injection well; or they may take place at an off-site location when a facility transfers waste that contains TRI chemicals as an off-site disposal or other release.

Evaluating disposal and other releases can help the public identify potential concerns and gain a better understanding of possible hazards related to TRI chemicals. It can also help identify priorities and opportunities for government to work with industry to reduce toxic chemical disposal or other releases and potential associated risks.

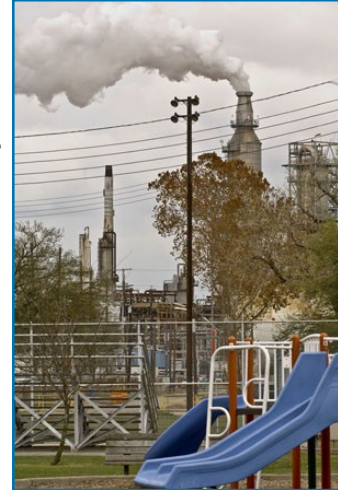
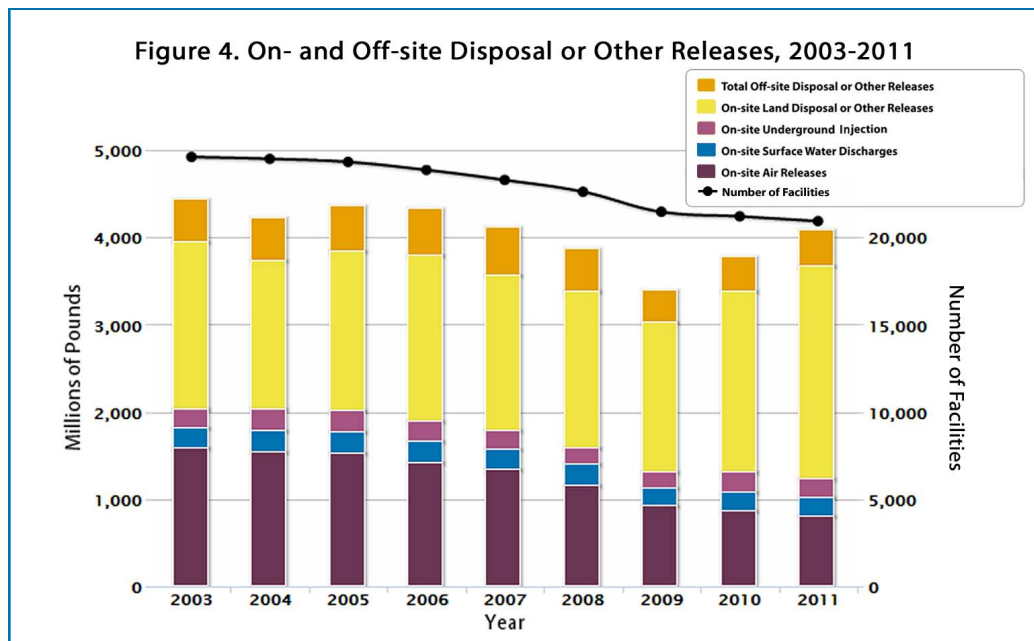


Figure 4 shows that disposal or other releases of TRI chemicals have generally decreased in the long-term: down 8% from 2003 to 2011. This downward trend over the nine-year period was driven by reductions in on-site air emissions. From 2010 to 2011, however, there was an 8% increase in disposal or other releases, mostly due to increases from the metal mining sector. The number of facilities reporting to TRI remained relatively steady from 2010 to 2011, decreasing by 1%.



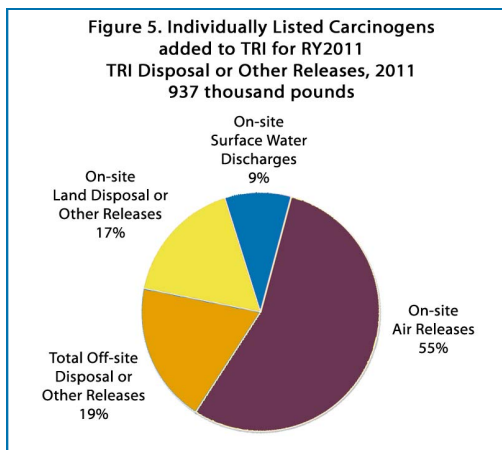
Many factors can affect trends in disposal or other releases, including changes in production, changes in management practices at facilities, changes in the composition in raw materials used at facilities and installation of control technologies. However, in the last few years increases in disposal or other releases have been driven mainly by increases in land disposal at metal mines, which typically handle large volumes of material. In this sector, even a small change in the chemical composition of the ore being mined can lead to big changes in the amount of toxic chemicals reported nationally. In recent years mines have cited increased production, waste rock disposal, and changes in the composition of waste rock as reasons for increased land disposal of TRI chemicals.

Decreases over time in disposal or other releases have been driven mainly by declining air releases, down 788 million pounds since 2003. Most of this decline was due to decreases in hazardous air pollutant (HAP) emissions, such as hydrochloric acid, at electric utilities. Likely reasons for the decreases include a shift from coal to other fuel sources and installation of control technologies at coal-fired power plants.

Newly Reported Chemicals for 2011

2011 is the first year that facilities are required to report on 16 new chemicals that have been classified as “reasonably anticipated to be a human carcinogen” by the [National Toxicology Program](#) (NTP). Twelve of these chemicals are individually-listed and four were added to the existing polycyclic aromatic compounds (PACs) category.

Reports were received for nine of the 12 new individually-listed chemicals. Tetrafluoroethylene comprised more than 50% of the total on-site and off-site disposal and other releases, while the most reports were received for isoprene. The majority of releases were on-site releases to air, as shown in Figure 5.



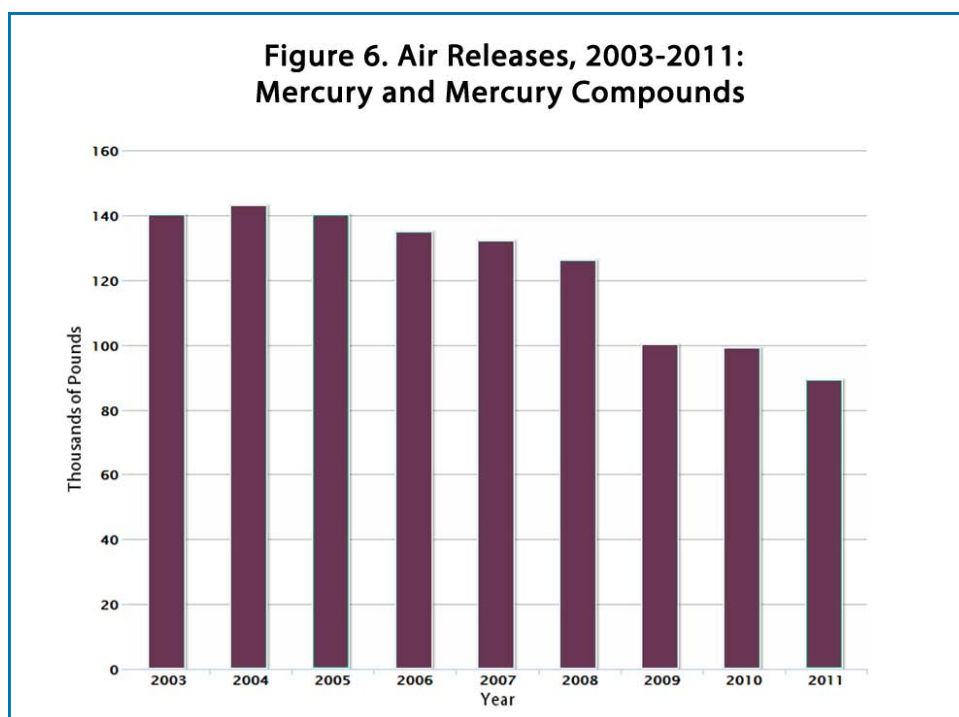
To learn more about these new chemicals added to TRI, go to www.epa.gov/tri/lawsandregs/ntp_chemicals/final.html.

Some of the chemicals on the TRI chemical list have been designated as persistent, bioaccumulative, and toxic (PBT) chemicals. 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, and they tend to build up, or bioaccumulate, in the tissue of organisms. Here we look more closely at several PBT chemicals: lead and lead compounds; mercury and mercury compounds; dioxin and dioxin-like compounds; and PCBs.

Lead and lead compounds accounted for the vast majority (98%) of the disposal or other releases of PBT chemicals in 2011 and tend to drive trends over time for PBTs. The quantities of lead and lead compounds disposed of or otherwise released rose and fell between 2003 and 2011, with a substantial increase occurring from 2009 to 2011 (102%); trends were primarily driven by changes in on-site land disposal or other releases from the metal mining sector.

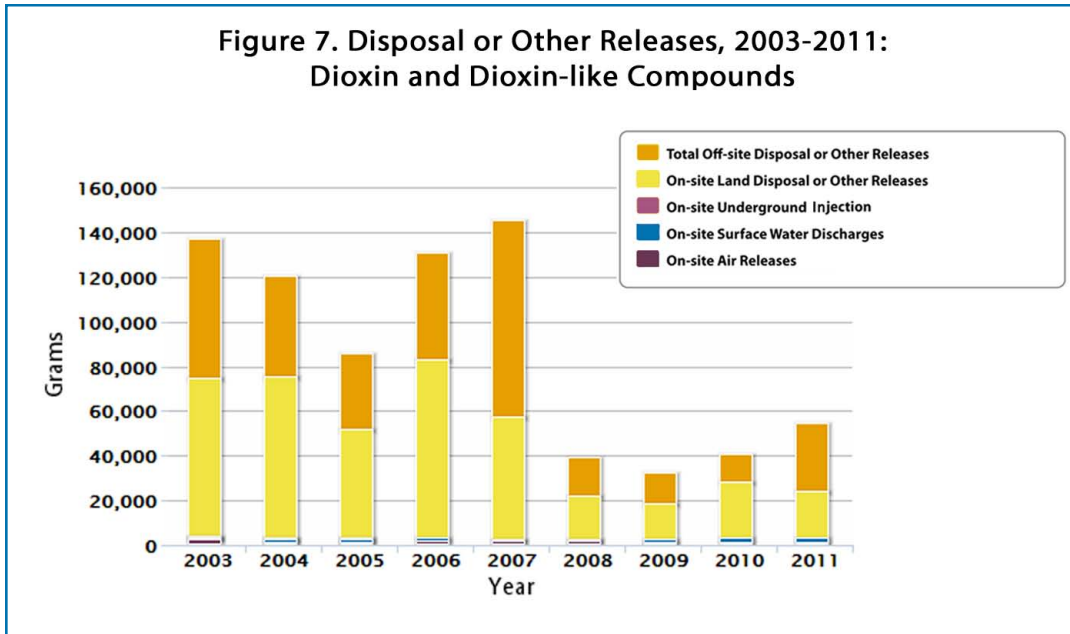
Mercury, another PBT chemical of concern, has traditionally been used to make products such as thermometers, switches, and some light bulbs. It is also found in many naturally occurring ores and minerals, including coal. The overall trend in disposal or other releases of mercury and mercury compounds is driven by metal mines, which accounted

for 97% of on-site land disposal of mercury in 2011. In the United States, coal-burning power plants are the largest source of mercury emissions to the air. Electric utilities, which include coal- and oil-fired power plants, accounted for 65% of the mercury and mercury compounds air emissions reported to TRI in 2011. Since 2003, air releases of mercury and mercury compounds decreased by 36%, including a 10% decrease from 2010 to 2011, as shown in Figure 6. Likely reasons for the decreases include a shift from coal to other fuel sources, and installation of control technologies at coal-fired power plants.

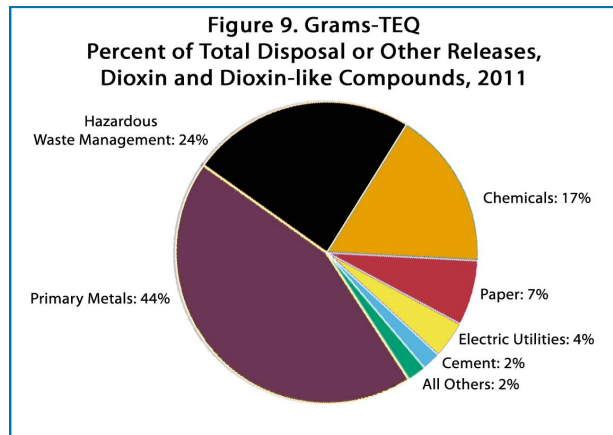
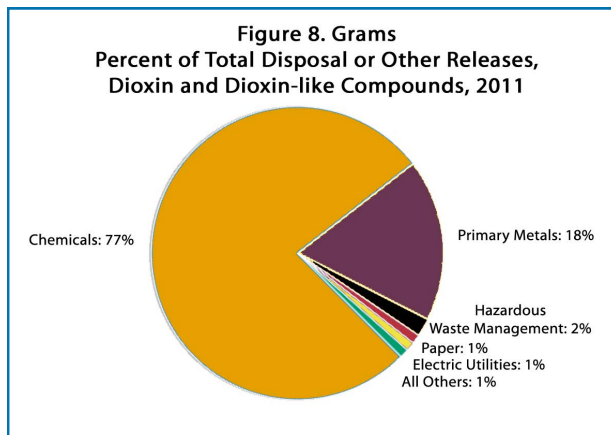


Dioxin and dioxin-like compounds (dioxins) are not only PBTs but are also characterized by EPA as probable human carcinogens. Dioxins are the unintentional by-products of most forms of combustion and several industrial chemical processes. Figure 7 shows the amount of dioxins disposed of or otherwise released in total grams. Disposal or other releases of dioxins increased 35% from 2010 to 2011 but decreased by 60% from 2003 to 2011. In 2011, most (80%) of this quantity was disposed of in on- and off-site RCRA subtitle C or other landfills. The figure also shows increased off-site transfers to disposal from 2010 to 2011, which are primarily due to transfers from one chemical manufacturing facility.

TRI requires facilities to report on 17 types of dioxin and dioxin-like compounds (or congeners). These congeners have a wide range of toxicities. The mix of dioxins from one source can have a very different level of toxicity than the same total amount, but different mix, from another source. These varying toxicities can be taken into account with Toxic Equivalency Factors (TEFs), which are based on each congener's toxicity data. The total grams of each congener can be multiplied by its TEF to obtain a toxicity weight. The results can then be summed for a total of grams in toxicity equivalents (TEQ).

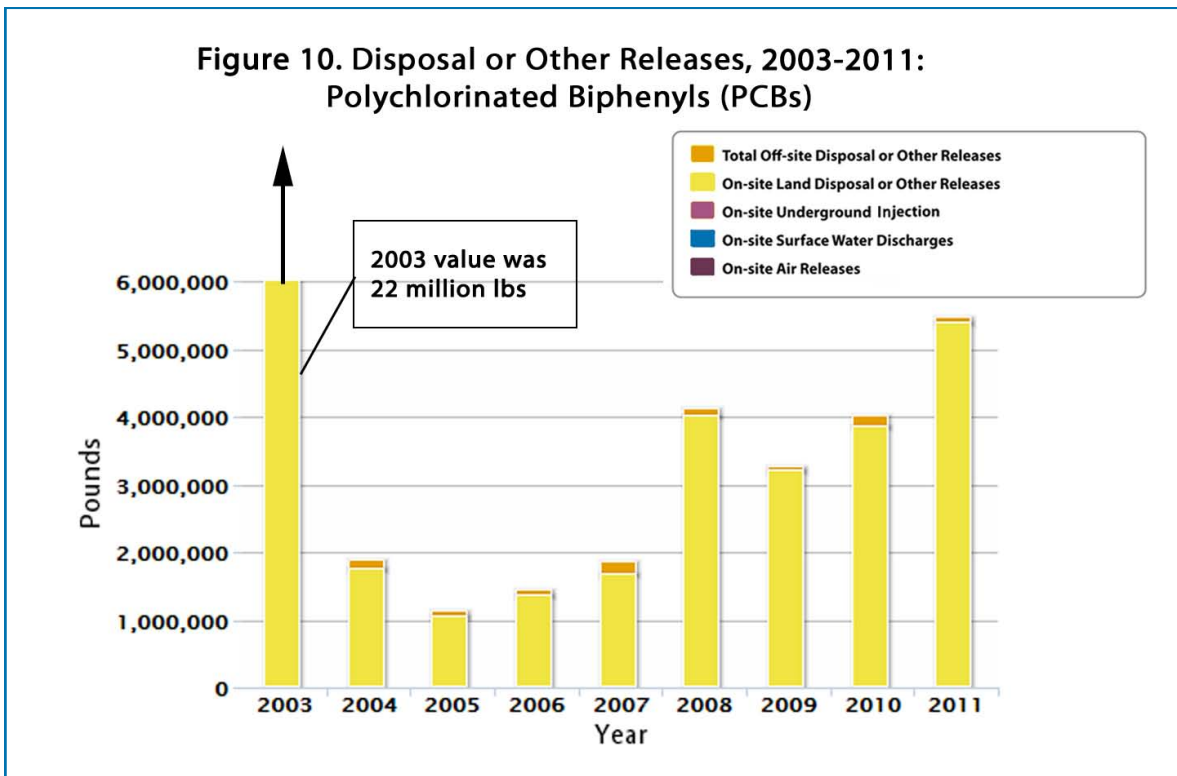


Analyzing dioxins in grams-TEQ is useful when comparing disposal or other releases of dioxin from different sources, or different time periods, where the mix of congeners may vary. EPA only recently began collecting comprehensive data on the individual dioxin congeners, so trends of TRI dioxin data in grams-TEQ are not possible at this time. Various industry sectors may dispose of or otherwise release very different mixes of dioxin congeners. Eight industry sectors accounted for most of both the grams and grams-TEQ of dioxin disposed of or otherwise released in 2011; however, their ranking in terms of percentage of the total is quite different for grams and grams-TEQ, as shown in Figures 8 and 9.

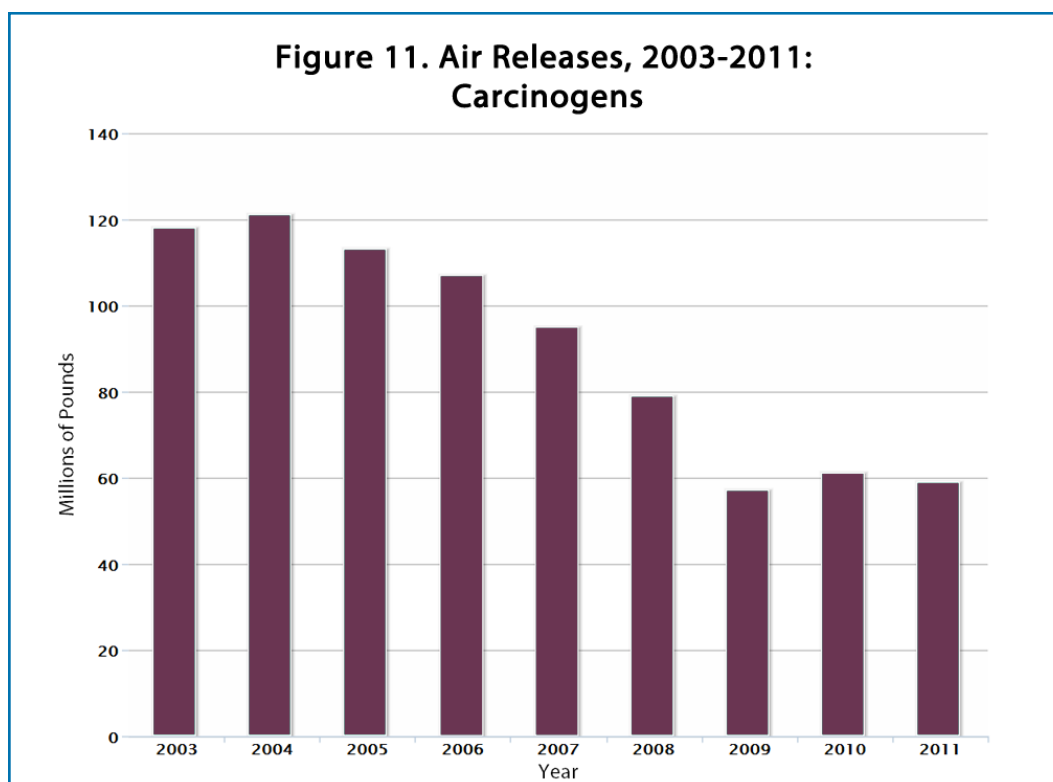


In 2011, the chemical manufacturing industry accounted for 77% of the total grams of dioxin and dioxin-like compounds disposed of or otherwise released, while the primary metals sector accounted for 18% of the total grams. However, when TEQs are applied, the primary metals sector accounted for 44% of the total grams-TEQ and the chemical manufacturing industry for 17% of the total grams-TEQ.

Polychlorinated biphenyls (PCBs), another PBT chemical category, are no longer manufactured or used in new products. Therefore, the disposal or other releases of PCBs are usually a result of cleanup efforts or capacitors and transformers being taken out of service and properly disposed of in facilities that minimize risk to human health and the environment. PCB disposal or other releases typically fluctuate from year to year, as shown in Figure 10, based on how many significant cleanup activities are underway or how many PCB transformers are removed from service. Almost 99% of disposal or other releases of PCBs are disposed of in RCRA (Resource Conservation and Recovery Act) Subtitle C landfills at hazardous waste management facilities. Note that in 2003, almost 22 million pounds of PCBs were disposed of in landfills, as shown in Figure 10 by the black arrow indicating the pounds reported that year exceed the scale of the figure. This 2003 spike in the trend was primarily due to one hazardous waste management facility disposing of PCBs in a RCRA subtitle C landfill.



Among the chemicals that are reported to TRI, there are about 180 known or suspected carcinogens, which EPA sometimes refers to as Occupational Safety & Health Administration (OSHA) carcinogens. Figure 11 shows that the air releases of these carcinogens decreased by 50% between 2003 and 2011, with a 3% (1.9 million pounds) decrease from 2010 to 2011.

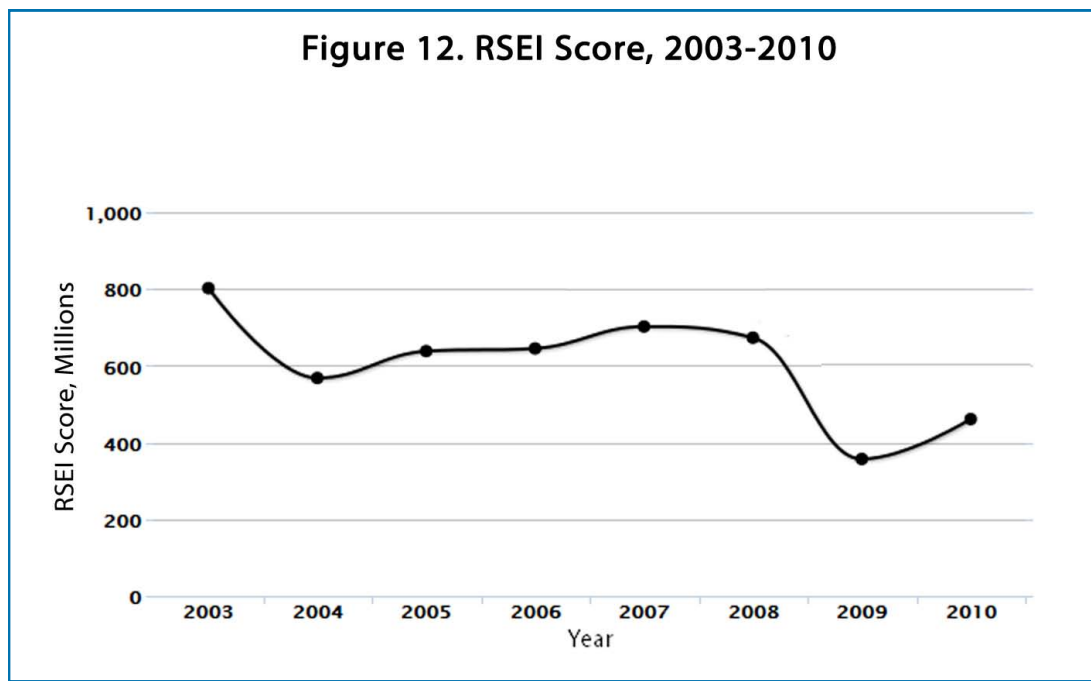


Trends in pounds of disposal or other releases do not account for potential risk of chemical releases. Risk can vary depending on chemical toxicity, how chemicals are released (e.g., to the air or water), where chemicals travel, and where human populations are located.

To provide information on the potential risk of disposal or other releases, the TRI program presents its data from a risk-related perspective using EPA's publicly-available Risk-Screening Environmental Indicators (RSEI) model. The model produces unitless "scores," which represent relative chronic human health risk and can be compared to RSEI-generated scores from other years or geographical regions.

RSEI scores are calculated using on-site releases to air and water, transfers to Publicly Owned Treatment Works (POTWs), and transfers for off-site incineration as reported to TRI. Note that other release pathways, such as land disposal, are not currently modeled in RSEI. The scores are calculated based on many factors including: the amount of chemical released, the location of the release, the chemical's toxicity, its fate and transport through the environment, and the route and extent of human exposure. Because modeling the exposure of TRI chemicals is time and resource intensive, RSEI data through 2010 are currently available, and updates through 2011 are scheduled to be available in the near future.

Figure 12 shows the trend in the RSEI score from 2003 to 2010. Over this time period, the RSEI score decreased by 43%, indicating that the relative risk of the TRI releases modeled through RSEI has declined considerably since 2003.



Note that RSEI is a screening-level model that uses simplifying assumptions to fill data gaps and reduce the complexity of calculations in order to quickly evaluate large amounts of data and produce a simple score. The model focuses on chronic human toxicity. It should be used for screening-level activities such as trend analyses that compare relative risk from year to year, or ranking and prioritizing chemicals and industry sectors for strategic planning. RSEI is not a formal risk assessment, which typically requires site-specific information on the toxicity of TRI chemicals and detailed population distributions to predict exposures for estimating potential health effects. Instead, RSEI is commonly used to quickly screen and highlight situations that may lead to potential chronic human health risks. More information about the model can be accessed at www.epa.gov/opptintr/rsei/. Analyses using RSEI data providing a quantitative relative estimate of risk posed by a facility can be generated in Envirofacts using the following link: www.epa.gov/enviro/facts/topicsearch.html#toxics.

Most disposal or other release practices are subject to a variety of regulatory requirements designed to limit environmental harm. To learn more about what EPA is doing to help limit the release of harmful chemicals to the environment see EPA's laws and regulations page at www.epa.gov/lawsregs/.