Toxic 100 Air Polluters Index
Technical Notes

TRI and RSEI Data

The Toxics Release Inventory (TRI), compiled by the U.S. Environmental Protection Agency (EPA) in accordance with the Emergency Planning and Community Right-to-Know Act of 1986, annually reports the weight (in pounds) of each of approximately 600 toxic chemicals released into the environment by major industrial facilities in the United States.

Our analysis uses 2021 releases of toxic chemicals into air nationwide. We combine fugitive and stack releases. We also include post-incineration releases.

The EPA Office of Pollution Prevention and Toxics processes the raw TRI reports to create the Risk Screening Environmental Indicators (U.S. EPA RSEI version 2.3.11). The EPA combines three variables to assess the human health risks posed by toxic releases:

- *fate and transport,* or how the chemical spreads from the point of release to the surrounding area;
- *toxicity,* or how dangerous the chemical is on a per-pound basis; and
- *population,* or how many people live in the affected areas.

Each release begins at a smokestack, leaking valve, open canister, or other source within the facility or at the stack of an off-site incineration facility. Using the AERMOD fate-and-transport model, EPA combines data on local wind patterns, temperature, and topography with information on the smokestack height and the exit velocity of released gasses and information about each chemical (molecular weight and rate of decay in sunlight and air) to determine the concentrations of releases in each 810 m by 810 m grid cell within 50 km around the release point. For incinerator releases, the model computes the fraction of the chemical that escapes incineration.

EPA matches each chemical to a toxicity weight that expresses the relative toxicity of the chemical per pound or per unit of concentration. Although all TRI chemicals are hazardous, their toxicities vary greatly. At the extremes, just one pound of dioxin is equivalent, in terms of inhalation toxicity, to 20 billion pounds of the chemical chlorodifluoromethane (HCFC-22). The enormous variation in toxicity limits the usefulness of comparisons on the basis of the simple mass (pounds) of chemicals released. By multiplying the mass of each toxic release by its toxicity weight, EPA can compare the toxic significance of releases of different chemicals.

The EPA's toxicity-weighting system is based on peer-reviewed toxicity databases including those of the EPA's Integrated Risk Information System (IRIS), the EPA's Office of Pesticide Programs (OPP) Reference Dose Tracking Reports, the U.S. Department of Health and Human Services Agency for Toxic Substances and Disease Registry (ATSDR), the California Environmental Protection Agency (CalEPA) Office of Environmental Health Hazard and Assessment (OEHHA), and the EPA's Health Effects Assessment Tables (HEAST). For some of the chemicals listed in the TRI, no consensus has been reached regarding the appropriate toxicity weight, and these chemicals are excluded from the analysis. In the TRI data for the year 2018, chemicals with toxicity weights account for 99 percent of the reported pounds for all on-site air

releases. Further details on the toxicity weights are available from the EPA.

After accounting for the quantity, dispersion, and toxicity of the release, EPA multiplies toxicity-weighted concentrations by the number of people living in each of the grid cells to measure the population health risk. (EPA slightly modifies the simple head count to account for differential uptake of chemicals depending on the age and sex composition of the exposed population.) A facility located in an urban area with high population density thus generates more risk than a facility with identical releases in a less populous rural area. To obtain the RSEI score for the facility, EPA aggregates the population-weighted, toxicity-weighted impacts for the entire area around the facility.

The Corporate Toxics Information Project of the Political Economy Research Institute at UMass Amherst updates the TRI data, when newer data are available, in cases where companies revise earlier TRI reporting. In the case of downward revisions of the mass released, RSEI scores are adjusted on the assumption of a linear relation between pounds released and that release's RSEI score. Upward revisions or new reports are noted but do not engender adjustments of the RSEI score.

Ethylene oxide effect

Ethylene oxide is a flammable colorless gas used in the manufacture of many products, including antifreeze, textiles, plastics, detergents and adhesives. It is also used to sterilize items that cannot be exposed to steam, such as some medical equipment. In 2016 the EPA Integrated Risk Information System (IRIS) published a revised evaluation of the inhalation carcinogenicity of ethylene oxide that greatly raised its unit risk estimate. Since IRIS data are preferentially used in the Risk-Screening Environmental Indicators (RSEI) model this resulted in a large increase in the toxicity weighting of ethylene oxide, significantly changing the list from previous versions by increasing the scores for companies whose facilities released ethylene oxide to the air.

Parent Company Matching

Using information on company ownership of facilities from the TRI reports, company websites, the CrocTail database of SEC filings, and news reports, we matched each facility to its parent company. Each facility was assigned either one or two parents as follows:

> If more than 50% of a facility was controlled by a single parent, that parent was assumed to have final control over the facility's operations, and was assigned full responsibility for the facility's pollution.
> If two companies each controlled 50% of a facility (i.e. it was a 50/50 joint venture), then its pollution was divided between the two companies.
> If a single company controlled 50% of a facility and no other single entity controlled the other 50%, that company was considered to be the parent of the facility.
> If no parent controlled 50% of a facility, the facility was considered to be its own parent.

In some cases we updated parent companies according to mergers, acquisitions, and corporate name changes that took place through mid 2023, under the principle that when one company acquires another, it takes responsibility for that company's past pollution. We also combined some U.S. subsidiaries of common foreign companies together.

We then aggregated the RSEI scores for air releases of toxics by the facilities owned by each parent company, and ranked companies on this basis. Facilities that were owned 50%/50% by two companies had half of their emissions assigned to each parent.

The Toxic 100 Air application also shows data from individual facilities owned by each parent company and from chemicals at each. For each parent company, the percentage of the company's total score that is from a single facility is displayed in the Toxic 100 Air list. This helps to identify companies whose overall chronic human health air risk is dominated by a single source.

Large Company lists

The Toxic 100 Air Polluters list reports the top polluters among the companies that appeared on any of the following lists of large US and foreign-owned corporations:

- Forbes Global 2000 for 2023
- Forbes America's Largest Private Companies, 2022 ranking
- Fortune 500 for 2023 (1000 companies)
- Fortune Global 500 for 2022
- S&P 500 as of 7/5/2023
- Russell 1000 as of 7/5/2023

Pollution data for the entire universe of companies that report toxic air emissions to EPA can be accessed via the searchable database that accompanies the Toxic 100 list.

Matches to other data

The detailed Toxic 100 Air application shows links to a company's Toxic 100 Water, Greenhouse 100, and Greenhouse Suppliers 100 pages if the company also has data in those databases. Individual facilities displayed in the detailed application have been linked to their Greenhouse 100 data if the same facility is in both datasets. Finally, Toxic 100 Air companies have been linked to data on dollar penalties for each company from Good Jobs First's Violation Tracker and local, state, and Federal subsidies for each company from Good Jobs First's Subsidy Tracker.

EJ Data

We calculate environmental justice (EJ) ratios using geographical microdata generated by the RSEI model, which report impacts in individual grid cells. We match the RSEI grid cells to U.S. Bureau of the Census geography (as is done in the RSEI model to obtain population density), and link data on race, ethnicity, and poverty from the 2015-2019 American Community Survey

5-Year Estimates (U.S. Bureau of the Census). 2015-2019 because RY 2021 RSEI data still use 2010 Census geography rather than 2020 Census geography.

The minority EJ ratio is the percentage share of racial and ethnic minorities in the total RSEI score of the facility or firm; in the advanced data display, this is disaggregated into specific minority groups. Similarly, the poverty EJ ratio is the percentage of people living below the Federal poverty line in the total RSEI score of the facility or firm, and near-poor refers to people living below double the Federal poverty line.

For comparison, in 2018 in the U.S., the share of people living in poverty was 12.3% and the share of the population that identified as Hispanic or nonwhite was 37%. Further details on our peer-reviewed method for calculating EJ ratios can be found in our report *Justice in the Air*, and in Michael Ash and James K. Boyce, "Measuring Corporate Environmental Justice Performance," *Corporate Social Responsibility and Environmental Management,* Vol. 18, No. 2, 2011.