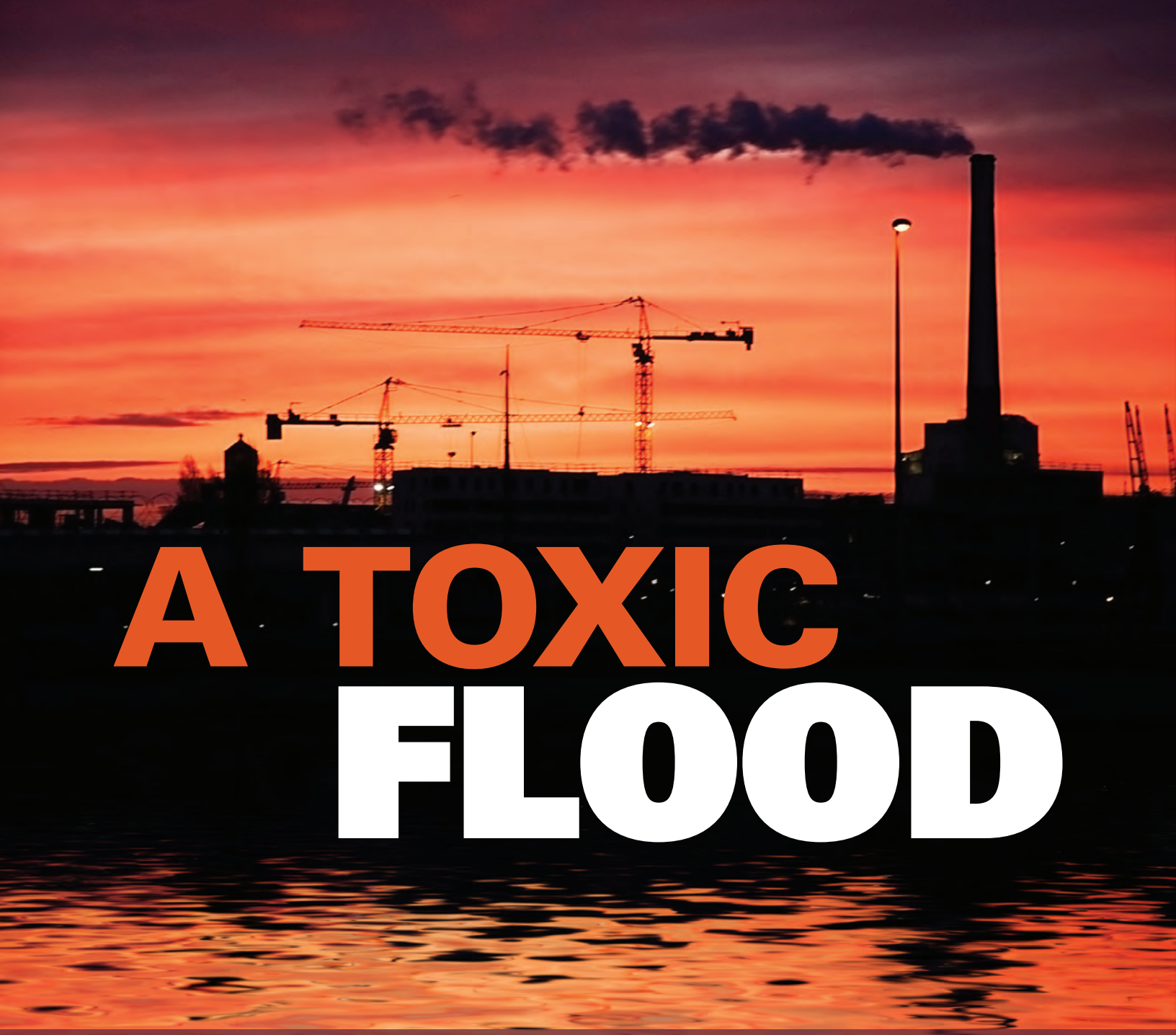

A TOXIC FLOOD

Why We Need Stronger Regulations to Protect Public Health From Industrial Water Pollution

POLITICAL ECONOMY RESEARCH INSTITUTE
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A TOXIC FLOOD

Why We Need Stronger Regulations to Protect Public Health From Industrial Water Pollution

Executive Summary

Industrial facilities across the United States released more than 200 million pounds of toxic chemicals into our nation's waterways in 2009. Many of these chemicals are known to increase the risk of cancer, reproductive and developmental problems, and a range of other health issues. In addition to chemicals known to be toxic, industry used and disposed of tens of thousands of other chemicals that have not been adequately evaluated and whose potential risks to human health are thus unknown.

The reality of this industrial water pollution indicates a serious problem with the effectiveness of federal environmental regulations that are supposed to protect public health. Industrial pollution is threatening the quality of our nation's water resources and the health of our communities.

The public has a right to know what chemicals they may be exposed to in daily life. Embodying this right to know, federal law does require most but not all industrial facilities to report releases into the environment of about 650 chemicals that are known to be toxic. Through the Toxics Release Inventory (TRI), the U.S. Environmental Protection Agency (EPA) provides public access to the resulting data on industrial chemical releases.

The EPA's Risk-Screening Environmental Indicators (RSEI) model is useful for adding meaning to the TRI data, making it possible to assess the risks to human health posed by facilities releasing toxic chemicals into the environment. Assessing such risks depends on the quantity of chemical released, the toxicity of the chemical and the likelihood of human exposure to the chemical or its byproducts. As a first step, a hazard score associated with the releases of toxic chemicals from a given facility can be calculated using the RSEI model; this is before factoring in the chance of actual human exposure to the hazard created by a release.

In this report, 2009 TRI data and the RSEI model are used to identify the entities most responsible for the total hazard from industrial water pollution in the United States. The report is based on research conducted at the Political Economy Research Institute of the University of

Massachusetts Amherst to compile a ranking of the Toxic 100 Water Polluters. The report shows that leading energy and chemical manufacturing companies are dumping massive amounts of toxic chemicals into surface waters, putting in danger the lives and wellbeing of those exposed to the resulting pollution.

Key Findings (based on 2009 TRI data)

The Most Hazardous Water Polluters

Based on the hazard associated with each polluter's total release of toxic chemicals into surface waters via direct discharges from facilities and releases following transfers to publicly owned water treatment facilities, the most hazardous polluters of U.S. waterways are:

- No. 1: Ohio Valley Electric Corporation, an energy company
- No. 2: Ferro Corporation, a producer of technology-based materials for manufacturers
- No. 3: American Electric Power, an energy company
- No. 4: U.S. Department of Defense
- No. 5: Southern Company, an energy company

Combined, the Ohio Valley Electric Corp. and Ferro Corp. were responsible for 30 percent of the total hazard from all industrial water pollution reported to the TRI in 2009. The 20 most hazardous polluters accounted for 80 percent of the total.

Industries With the Most Hazardous Water Pollution

- No. 1: Electrical utilities, primarily due to releases of arsenic
- No. 2: Chemical manufacturing, led by Dow Chemical Company

Leading Health Risk

- Cancer: Of the 10 most hazardous chemicals released into surface waters, more than half are implicated as causing cancer.

Most Hazardous Pollutant

- Arsenic: Accounts for over 60 percent of the total hazard from industrial water pollution.

The Most Threatened Regions in the United States

- No. 1 most-threatened state: Ohio
- No. 1 most-threatened metro area: New York City metropolitan area

Recommendations

Having a relatively small number of entities account for most of the hazard from industrial water pollution reported to the TRI means that regulators and policy-makers, by targeting monitoring and enforcement efforts to these polluters, can greatly improve the quality of U.S. waters, and therefore make great strides toward improving public health and the environment. To this end, the following steps should be taken:

- Congress should reform the 1976 Toxic Substances Control Act to shift the burden of ensuring the safety of chemicals from the government to industry. Reforms should, in the spirit of the precautionary principle, require industry to first prove that a chemical is safe, whether alone or in combination with other chemicals, before allowing the chemical to be released into the environment.
- Congress should amend the Emergency Planning and Community Right-to-Know Act to close loopholes that allow some industries, including the drilling and fracking industry, to avoid reporting releases of toxic chemicals.
- The most hazardous chemicals should be replaced with alternatives that pose significantly less risk to public health and the environment.
- The EPA should continue to improve the Toxics Release Inventory and integrative tools such as Risk-Screening Environmental Indicators to provide more user-friendly information to the public about the chemicals released into our environment.
- The EPA should strengthen enforcement of the Clean Water Act by requiring states to further restrict discharges of toxic chemicals, and by no longer accepting the notion that "dilution is the solution to pollution."
- The EPA should coordinate the oversight of industrial discharges into waterways with the regulation of drinking water to ensure that our drinking water supplies are adequately protected.
- Congress should create a dedicated source of federal funding to improve our drinking water systems and wastewater systems to update treatment and testing capabilities to meet current needs.

Introduction

In the late 1960s, a series of environmental disasters, including the Cuyahoga River catching on fire,[1] increased awareness of the need to protect the country's waterways from industrial pollution.[2] In 1972, Congress passed a series of amendments to strengthen the Federal Water Pollution Control Act of 1948, and, with additional amendments in 1977, the resulting body of law became known as the Clean Water Act.[3] The Clean Water Act made it a national goal that "the discharge of pollutants into the navigable waters be eliminated by 1985," and a national policy that "the discharge of toxic pollutants in toxic amounts be prohibited."[4]

Now, decades later, these goals have not been met. As detailed below, industrial facilities continue to release hundreds of millions of pounds of toxic chemicals into our waterways each year. Some of these chemicals are known to cause cancer, while others negatively affect reproductive health and childhood development. Children and industrial workers are particularly vulnerable to chemical exposure from these releases.[5]

According to President Obama's Panel on Cancer, "Manufacturing and other industrial products and processes are responsible for a great many of the hazardous occupational and environmental exposures experienced by Americans."[6] Yet the U.S. Environmental Protection Agency does not have adequate information to ensure the safety of chemicals before they are regularly used.[7]

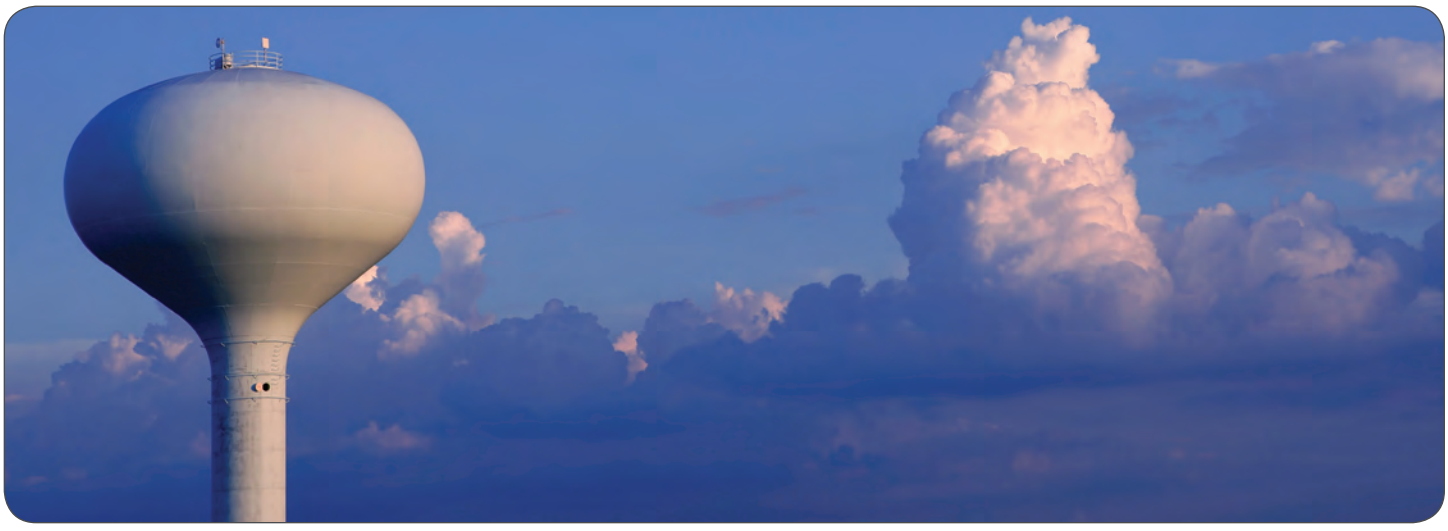
The chemical review process is time consuming and resource intensive, yet each year hundreds of new chemicals enter the market.[8] In 1976, when the EPA was ordered to begin reviewing chemicals under the Toxic Substances Control Act (TSCA), about 62,000 chemicals were already in commercial use.[9] Industry has registered more than 21,000 new chemicals since that time.[10]

The onus is currently on the public, represented by the EPA, to demonstrate when new chemicals may negatively impact public health and safety — not on industry to demonstrate that these new chemicals are safe.[11] In general, companies are not required to test new chemicals introduced into commerce each year for toxicity.[12] Before the EPA can require extensive toxicity testing for a specific chemical, the agency must first establish that the chemical presents an "unreasonable risk of injury to human health or the environment."[13] To date, the EPA has required additional toxicity testing on only 200 of the 21,000 chemicals registered since the TSCA was passed in 1976.[14]

The Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) requires that certain industrial facilities disclose to the public the amounts of toxic chemicals they release each year into the environment.[15] The EPA's Toxics Release Inventory (TRI) was established to facilitate this public disclosure.[16] The TRI contains data on the disposal of over 650 distinct toxic chemicals.[17]

Despite the large number of toxic chemicals being released into our surface waters — a primary source of drinking water — only 77 chemicals have a Maximum Contaminant Level (MCL), a legal limit set by the EPA under the Safe Drinking Water Act, on the allowable concentration level that can be present in drinking water.[18] Each MCL is determined not just according to human health risk, but also by considering the availability and affordability of technology to reduce a specific contaminant level.[19]

Of the 10 most hazardous industrial water pollutants compiled in this report, only two have relevant MCLs:



arsenic and the polycyclic aromatic hydrocarbon known as benzo(a)pyrene.[20] Drinking water treatment plants do not have to test for hundreds of chemicals known to be toxic and for thousands of other potentially toxic chemicals. As a consequence, when industrial chemicals are dumped upstream of drinking water supply facilities, industrial chemicals could simply pass through treatment facilities, ending up in our drinking water. Adding insult to injury, approximately half of the industrial wastewater reported to the EPA is sent to publicly owned wastewater treatment plants, so taxpayers are paying to treat the toxic wastewater produced by industry to a level that is supposed to be safe to discharge back into source water.

While the TRI makes it possible for local communities to know what is being released into their environment, it does not provide information about the extent of the hazard that these releases create. The EPA's Risk-Screening Environmental Indicators (RSEI) model can be used to address this need.[21] Drawing on 2009 TRI data and the RSEI model, *this report identifies the companies and industries responsible for the most hazardous industrial water pollution and the areas of the country facing the greatest threat.*

The Most Hazardous Industrial Water Polluters in the United States

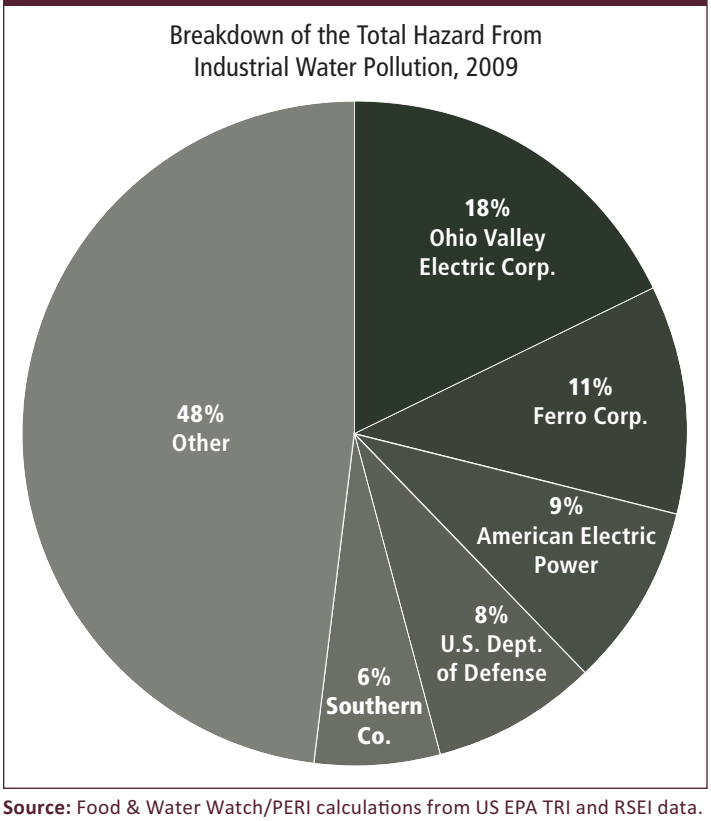
Industrial facilities released about 200 million pounds of toxic chemicals into U.S. surface waters in 2009.[22] The total hazard posed by this industrial water pollution is determined by looking at the respective amounts of the different toxic chemicals released and accounting for the different toxicities of these chemicals. Thus, the companies that released the largest amounts of water pollutants, measured in pounds, were not necessarily the most hazardous water polluters.

Each facility that reported a chemical release to the TRI has an associated hazard, based on the amounts of each chemical released over the course of 2009 and on the respective toxicities of these chemicals (see Appendix for details). Knowledge of these releases, and their associated hazards, makes it possible to determine how the total hazard from all industrial water pollution was distributed across different polluters, different pollutants, different industries and different geographical regions. For example, the "hazard share" for a specific company can be calculated by adding up the hazards of that company's reporting facilities, and then determining the fraction that the company contributed to the total hazard.

Companies were ranked according to the size of their hazard share. Researchers at the Political Economy Research Institute of the University of Massachusetts Amherst have compiled an expanded list called the Toxic 100 Water Polluters Index.[a] Just 20 water polluters were responsible for 83 percent of the total hazard posed by this industrial water pollution. (See Table 1 on page 10.) Just five polluters — Ohio Valley Electric Corporation, Ferro Corporation, American Electric Power, the U.S. Department of Defense and Southern Company — were responsible for 52 percent of the total hazard due to all industrial water pollution reported to TRI. (See Figure 1.) The top two of these polluters, Ohio Valley Electric Corp. and Ferro Corp., accounted for about 30 percent of the total.

The 100 most hazardous polluters were responsible for about 98 percent of the total hazard posed by industrial water pollution reported to the TRI, although these companies released only about one-third of total industrial water pollution when measured in pounds. (See Table 2

Fig. 1: Top 5 Polluters Account for Half the Threat



Source: Food & Water Watch/PERI calculations from US EPA TRI and RSEI data.

a The Toxic 100 Water Polluters, as well as details about the chemicals and facilities linked to each corporation, can be found online at www.peri.umass.edu/toxicwater.

on page 11.) Combined, the 20 most hazardous polluters accounted for about 15 percent of total industrial water pollution, again when measured in pounds, but these 20 polluters were responsible for over 83 percent of the total hazard. They released a *smaller amount* of chemicals into waterways than the next 80 polluters, but toxicities of the chemicals they did release were so high that their releases, collectively, were *over five times more hazardous.*

Among all industrial sectors of the U.S. economy, electric utilities produced the most hazardous water pollution. (See Table 3 on page 12.) They alone were responsible for more than half of the total hazard posed by industrial water pollution. The chemicals industry and the primary metals industry accounted for another 30 percent of the total hazard score from industrial water pollution. Note that the oil and natural gas extraction industry is not among the industrial sectors required to report releases to the TRI.[23]

The Most Hazardous Industrial Water Pollutants

The TRI includes more than 650 toxic chemicals,[24] exposures to which are known to increase the risk of various health problems — from reproductive problems to developmental problems to cancer.[25] Table 4 on page 12 lists the most hazardous industrial water pollutants, based on the quantity of each chemical released to surface waters and the respective toxicities of these chemicals. Almost all of the 10 most hazardous pollutants are known or suspected to cause cancer.

The 10 Most Hazardous Water Pollutants and Their Health Risks

(1) *Arsenic and arsenic compounds* accounted for almost 61 percent of the total hazard from industrial toxic releases into surface waters, five times the hazard share of any other toxic chemical. Arsenic occurs naturally and as a waste product from industrial and agricultural facilities.[49] The inorganic form of arsenic, largely from industrial facilities, is most toxic.[50] According to the International Agency for Research on Cancer (IARC) arsenic is a known human carcinogen.[51] In addition to increasing cancer risk, exposure to arsenic can damage skin and harm the circulatory system.[52] In 2009, coal-fired power plants accounted for a large portion of the arsenic released into surface waters. Arsenic was the most toxic chemical released by three of the five most hazardous polluters: Ohio Valley Electric Corp., American Electric Power and Southern Co.

(2) *Hydrazine compounds* are known carcinogens, according to the U.S. National Toxicology Program (NTP),[53] that can also cause liver, kidney and nervous system problems.[54] They are used to make pesticides and rocket fuel, to inhibit corrosion in industrial boilers, and in the pharmaceutical industry.[55] Hydrazine was the most hazardous chemical released into surface waters by Ferro Corp., the second most hazardous industrial polluter of surface waters.[b]

(3) *Nitroglycerin* exposure can cause an array of health problems including nausea and skin irritation.[56] It can impact the cardiovascular and central nervous system, and sudden withdrawal from exposure may result in heart attacks.[57] Nitroglycerin is used to make explosives, rocket propellants and medicines.[58] Nitroglycerin was the most hazardous water pollutant released by the U.S. Department of Defense.

(4) *Acrylamide* is used to manufacture plastics, adhesives and cosmetics, and is often used in the treatment of wastewater.[59] Classified as a "probable human carcinogen,"[60] acrylamide can also affect the nervous system and cause blood problems.[61] Acrylamide was the top hazardous chemical released into surface waters by BASF and by Evonik Industries AG.

(5) *Polycyclic Aromatic Hydrocarbon* releases occur as industrial byproducts of burning coal, fuel oils, garbage and other substances.[62] According to the U.S. Department of Health and Human Services, they are "reasonably anticipated to be human carcinogens."[63] There is also evidence that certain polycyclic aromatic hydrocarbons are endocrine disruptors,[64] and thus these compounds may negatively impact a person's development, immune system, metabolism and reproductive system, as well as potentially cause a range of diseases and illnesses.[65] Polycyclic aromatic hydrocarbons were the top hazardous chemical released by ExxonMobil.

(6) *Acetaldehyde* is classified by the NTP as a "reasonably anticipated" human carcinogen.[66] Acetaldehyde's health impacts can vary, and, according to the EPA, animal studies suggest that it may adversely impact a developing fetus.[67] It is used to produce numerous industrial

b The Environmental Health and Safety Manager of Ferro Corporation indicates that the company uses hydrazine hydrate rather than more toxic anhydrous hydrazine (personal communication, 9 May 2013). The TRI does not distinguish among hydrazine compounds, and hence the RSEI assigns a single toxicity weight to them. Public understanding of release hazards would be improved if TRI collected and reported data on specific hydrazine compounds.

compounds and manufacturing products,[68] and is even used as a food additive and in fragrances.[69] Acetaldehyde was the top hazardous water pollutant released by Celanese Corp.

(7) *Acrylonitrile* is classified by the NTP as a "reasonably anticipated" human carcinogen.[70] Most commonly, acrylonitrile releases come from certain industrial companies that manufacture acrylic and modacrylic fibers, but it can also be used to produce an array of goods ranging from certain plastics to pesticides.[71] The chemical does not occur naturally.[72]

(8) *4,4'-Methylenedianiline*, an industrial chemical, is "possibly carcinogenic to humans," according to the IARC.[73] Its uses include the manufacturing of glues, dyes, rubber and polyurethane foams.[74] Beyond being linked to cancer, 4,4'-methylenedianiline exposure may harm the skin, liver and thyroid, according to animal studies.[75] 4,4'-methylenedianiline was the top hazardous water pollutant released from Dow Chemical Co.

(9) *Ethylene oxide* is a known carcinogen, according to the IARC,[76] and it is also linked to pregnancy miscarriage and nervous system problems.[77] The chemical is used to make a variety of industrial products, including solvents, antifreeze, textiles, detergents and adhesives.[78]

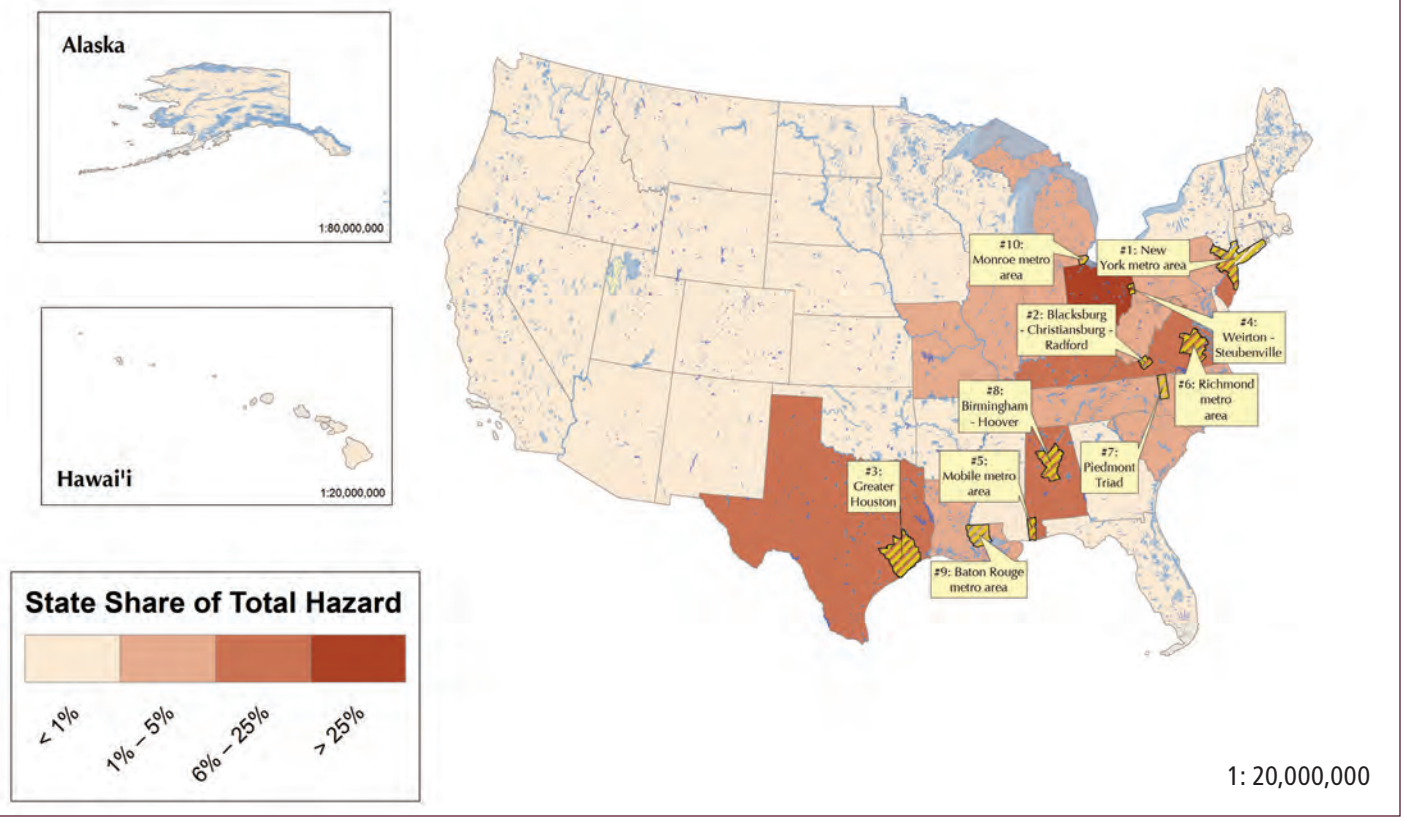
(10) *1,4-Dioxane* is classified by the NTP as a "reasonably anticipated" human carcinogen.[79] The chemical is used as a solvent, and small amounts may be present in cosmetics, shampoos and detergents.[80] Exposure to 1,4-dioxane can cause kidney and liver problems, and even result in death.[81]

Where's the Risk? The Most Threatened States and Metro Areas

The threat from industrial water pollution looms much more seriously in certain areas of the country. (See Figure 2.) Just five states — Ohio, Virginia, New Jersey, Alabama and Texas — faced two-thirds of the total industrial water pollution hazard in 2009. (See Table 5 on page 13.)

Ohio was the most threatened state, with its residents experiencing a quarter of the total hazard from industrial water pollution. The worst industrial water polluters in Ohio were two power plants — one owned by Ohio Valley Electric Corp. and the other by American Electric Power. The second most threatened state was Virginia, due largely to a Department of Defense facility and a

Fig. 2: Most Threatened States and Metropolitan Areas



Source: Food & Water Watch/PERI calculations from US EPA TRI and RSEI data.

Dominion Resources power plant. Hazardous releases of hydrazine via transfers to a publicly owned water treatment facility from a chemical plant in South Plainfield owned by Ferro Corp. explain in part how New Jersey rounded out the top three most threatened states.

Among all metropolitan statistical areas, the New York City metro area accounted for the largest share of the total hazard from all industrial water pollution in 2009. (See Table 6 on page 13.) Residents of the five top metropolitan areas experienced about a third of the total hazard from industrial water pollution in the country in 2009.

Every state has facilities that release toxic chemicals to surface waters. Table 7 (see page 14) shows the two facilities that released the most hazardous industrial water pollution in each state. For each facility, the table includes the parent company that owns the facility, the top hazardous chemical released at the facility and the share that the listed facility contributes to the state's total hazard score. In most but not all states, just two facilities were responsible for more than half of the state's total water pollution hazard. (See Figure 3.)

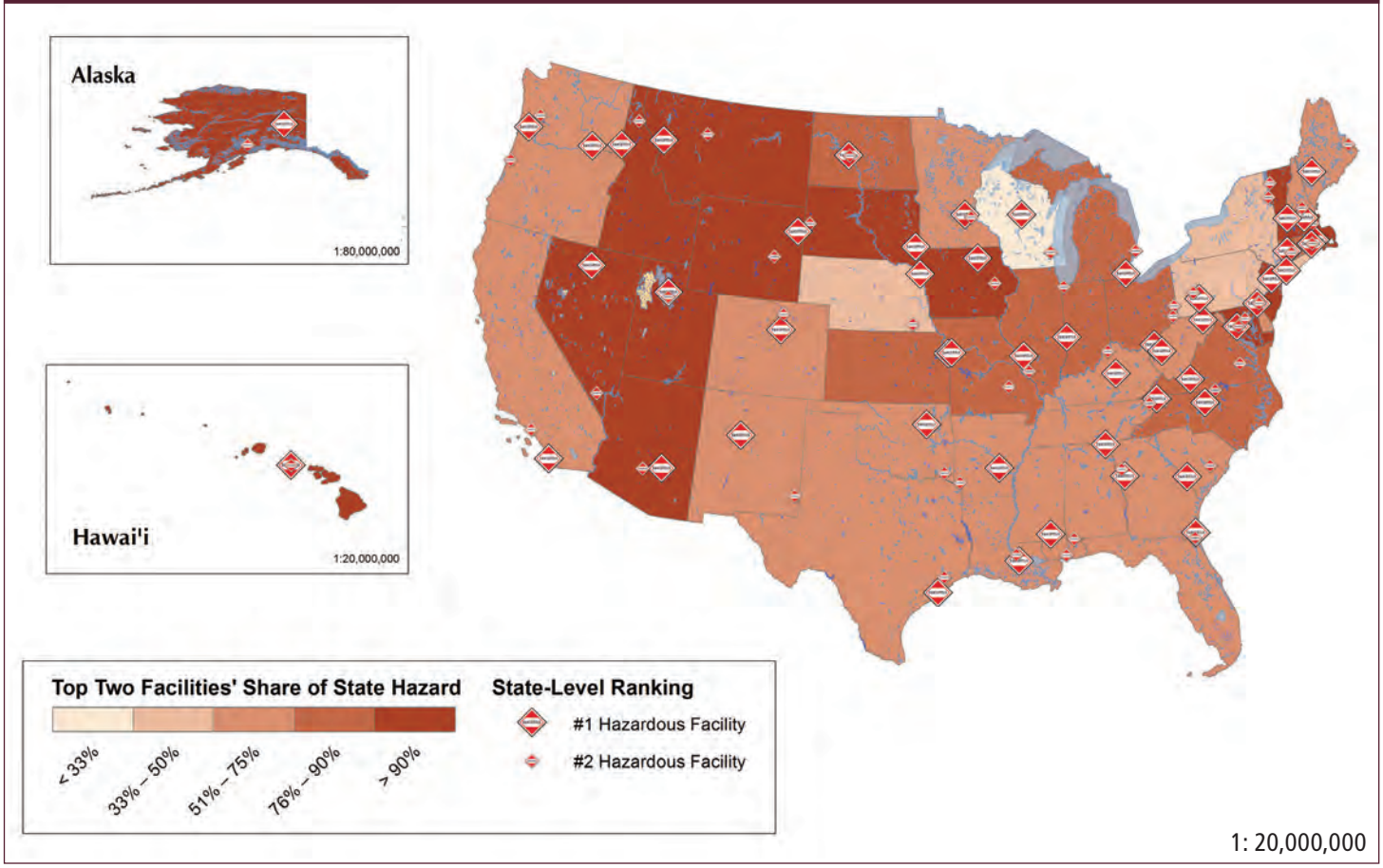
Conclusion and Recommendations

The Toxics Release Inventory reveals the large quantities of toxic industrial chemicals released into our waterways each year. We reported how these releases translate to environmental hazard, and identified how this hazard breaks down by polluter, by industry, by pollutant and by geography. Many of the chemical releases from industrial facilities into U.S. waterways occur at locations that are upstream of public drinking water systems. These releases therefore put the people who rely on these drinking water systems at risk.

Policy can and must protect our nation's waterways and public health. Specifically, the following steps should be taken to safeguard our nation's water resources:

- **The EPA should strengthen enforcement of the Clean Water Act by requiring states to further restrict discharges of toxic chemicals.** The most effective way to improve the quality of our surface waters is to keep toxic chemicals from entering them in the first place. States should establish more-stringent limitations on chemical discharges.

Fig. 3: Two Most Hazardous Facilities in Each State



Source: Food & Water Watch/PERI calculations from US EPA TRI and RSEI data.

Currently, EPA regulations allow states to authorize "mixing zones" in their state water quality standards,[82] a regulatory approach based on the notion that "dilution is the solution to pollution."[83] This approach, however, does not adequately protect water supplies. Many chemicals are persistent in the environment and build up in river sediment and within the aquatic food chain, harming entire ecosystems. These chemicals cannot simply be diluted away. States should not be permitted to use "mixing zones" as a way to regulate toxic discharges.

- **Congress should reform the Toxic Substances Control Act (TSCA) and amend the Emergency Planning and Community Right-to-Know Act (EPCRA).** TSCA should require companies to provide adequate toxicity data to the EPA for chemicals being used, and make it easier for the EPA to require more toxicity information from industry if needed. Reforms should also give the EPA authority to prioritize chemicals of concern, based upon exposure level and chemical hazard information, and to require that the most-toxic chemicals manufactured be phased out and replaced with new, safer alternatives.[84] EPCRA should be amended to eliminate loopholes that allow selected industries, such as the oil and gas drilling and fracking industry, to avoid TRI reporting requirements.

- **The EPA should require industry to prove that toxic chemicals pose no harm to human health, whether in isolation or in combination with other chemicals, before approving of their use.** The EPA should take a precautionary approach to the approval of chemicals rather than the current approach in which the onus is placed on the government to prove that a chemical is harmful to human health before it can be removed from industrial use. The European Union adopted such legislation in 2006.
- **The EPA should continue to strengthen the Toxics Release Inventory to provide more information to the public.** The EPA should continue to improve the quality of the TRI data and the speed at which these data are made available. The recent announcement that TRI data will be made available online more quickly than in the past, and the EPA's recent decision to add 16 new chemicals to the TRI reporting requirements, are steps in the right direction. Such transparency is important not just for community awareness, but for how this awareness in turn motivates companies to change polluting practices.
- **The EPA should better protect source waters by tightening pollution limitations on point source industrial discharges.** Given the vast array of toxic chemicals being released into U.S. waterways, and given that these surface waters serve as vital drinking water supplies, the agency should eliminate gaps in drinking water standards by increasing the number of regulated contaminants. To expedite the process of regulating new chemicals, the EPA should move beyond addressing contaminants one at a time and set standards for groups of chemicals.
- **Congress should create a dedicated source of federal funding to improve our drinking water systems and wastewater treatment systems.** Our nation's drinking water infrastructure is aging and in need of fundamental improvements, yet it is severely underfunded. Additional funding is also needed to enable municipalities to update treatment and testing methods to address new chemical contaminants, and to act on improved understanding of the hazards associated with longstanding contaminants.

Now is the time to make these changes, and to renew America's water.

Appendix A

Table 1. The 20 Most Hazardous Water Polluters in the United States, 2009

Rank	Polluter	Description	Hazard Share (% of Total)	Most Hazardous Facility	Facility Location	Most Hazardous Chemical Released
1	Ohio Valley Electric Corp.	Electricity generation in the Ohio River Valley	18.37	Kyger Creek Station	Cheshire, OH	Arsenic and arsenic compounds
2	Ferro Corp.	Supplies materials used in electronics, telecommunications, appliances, automotive, pharmaceuticals, etc.	10.95	Ferro Corp.	South Plainfield, NJ	Hydrazine
3	American Electric Power	Electricity generation	8.59	American Electric Power Cardinal Plant	Brilliant, OH	Arsenic and arsenic compounds
4	U.S. Department of Defense	U.S. Department of Defense	8.01	U.S. Army Radford Army Ammunition Plant	Radford, VA	Nitroglycerin
5	Southern Co.	Electricity generation in southeast U.S.	6.40	Barry Steam Plant	Bucks, AL	Arsenic and arsenic compounds
6	U.S. Tennessee Valley Authority	Electricity generation in 7 southeastern states (Owned by U.S. Government)	5.00	U.S. TVA, Windows Creek Fossil Plant	Stevenson, AL	Arsenic and arsenic compounds
7	PPL Corp.	Electricity generation	4.72	Kentucky Utilities Co., E.W. Brown Station	Harrodsburg, KY	Arsenic and arsenic compounds
8	Dominion Resources Inc.	Electricity generation and transmission; natural gas pipelines	2.97	Chesterfield Power Station	Chester, VA	Arsenic and arsenic compounds
9	Dow Chemical Co.	Chemical company	2.95	Dow Chemical Co. Freeport Facility	Freeport, TX	4,4'-Methylenedianiline
10	Evonik Industries	Multinational specialty chemicals company; makes plastics, solvents, adhesives, lubricants, etc.	2.80	Ashland Inc.	Greensboro, NC	Acrylamide
11	Dynegy Inc.	Electricity generation in the Midwest, Northeast and West Coast	1.85	Dynegy Wood River Power Station	Alton, IL	Arsenic and arsenic compounds
12	DTE Energy	Electricity generation and transmission; natural gas pipelines	1.73	Detroit Edison Monroe Power Plant	Monroe, MI	Arsenic and arsenic compounds
13	Duke Energy	Energy generation	1.48	Wabash River Generating Station	West Terre Haute, IN	Arsenic and arsenic compounds
14	BASF	Chemical company	1.30	CIBA Corp	Suffolk, VA	Acrylamide

(continued on next page)

Table 1. The 20 Most Hazardous Water Polluters in the United States, 2009 – continued

Rank	Polluter	Description	Hazard Share (% of Total)	Most Hazardous Facility	Facility Location	Most Hazardous Chemical Released
15	Emerald Performance Materials LLC	Manufacturer of specialty chemicals for food additives, rubber, adhesives, fragrances, air fresheners, pharmaceuticals, other products	1.27	Emerald Polymer Additives LLC	Akron, OH	Acrylonitrile
16	NewPage	Coated paper manufacturer for use in magazines, books, catalogs, coupons, etc.	1.14	Luke Paper Co.	Luke, MD	Arsenic and arsenic compounds
17	Progress Energy Inc.	Electricity generation in North Carolina, South Carolina and Florida	1.05	Carolina Power & Light Co., Roxboro Steam Electric Plant	Semora, NC	Arsenic and arsenic compounds
18	Honeywell International	Chemical manufacturing company	0.97	Honeywell International Inc., Geismas Plant	Carville, LA	Arsenic and arsenic compounds
19	ExxonMobil	Oil and natural gas extraction, refining and processing, including petrochemicals	0.93	ExxonMobil Chemical, Baton Rouge Chemical Plant	Baton Rouge, LA	Polycyclic aromatic compounds
20	Celanese Corp.	Producer of specialty and intermediate chemical products	0.92	Celanese LTD, Clear Lake Plant	Pasadena, TX	Acetaldehyde

Source: Food & Water Watch/PERI analysis of data from the US EPA Toxics Release Inventory and Risk Screening Environmental Indicators.

Table 2. Hazard Share Versus Amount of Toxic Chemicals Released to Surface Waters, 2009

Companies	Hazard Share (% of Total)	Amount of Toxic Chemicals* (% of total weight)
Top 20	83.4	33 million pounds (15.3%)
Next 80	14.9	41 million pounds (18.7%)
Top 100	98.3	74 million pounds (33.9%)

Source: Food & Water Watch/PERI analysis of data from the US EPA Toxics Release Inventory and Risk Screening Environmental Indicators.

***** *Amount of chemicals released to surface waters directly, combined with RSEI-based estimate of the amount of "transferred chemicals" that are released to surface waters indirectly after having passed through publicly owned treatment works (POTWs). See Appendix B for more information.*

Table 3. The Industrial Sectors with the Most Hazardous Water Pollution

Rank	Industrial Sector*	Total Number of Facilities	Hazard Share (% of Total)	Amount of Chemicals Released to Surface Water (pounds)	Amount of Chemicals Transferred to POTWs** (pounds)
1	Electric Utilities	370	55.81	2,622,902	6,756
2	Chemicals	1267	17.37	29,014,457	87,113,726
3	Primary Metals	763	12.21	28,001,950	12,104,662
4	National Security	51	8.01	15,176,990	75,496
5	Paper	247	3.05	17,864,769	24,020,189
6	Petroleum	179	1.34	21,039,437	3,551,759
7	Wood Products	99	0.62	30,868	46,194
8	Metal Mining	34	0.3	486,766	6,847
9	Electrical Equipment	227	0.29	5,089	1,295,405
10	Fabricated Metals	1029	0.21	1,463,015	12,079,890

Source: Food & Water Watch/PERI analysis of data from the US EPA Toxics Release Inventory and Risk Screening Environmental Indicators.

***** *As classified under the North American Industry Classification System (NAICS)*
*** Publicly owned treatment works*

Table 4. The Top Hazardous Industrial Water Pollutants, 2009

Rank	Pollutant	Hazard Share (%)	Health Risks	Industrial Sources
1	Arsenic and arsenic compounds	60.60	Cancer[26]	Waste product from glass and electronics manufacturing and from electricity generation[27]
2	Hydrazine compounds	11.69	Cancer[28]	Pesticides, rocket fuel, boiler water treatments, pharmaceuticals[29]
3	Nitroglycerin	7.97	Harm to cardiovascular and central nervous system[30]	Explosives, rocket fuels and medicines[31]
4	Acrylamide	4.85	Cancer[32]; nervous system and blood problems[33]	Used in plastics, adhesives and cosmetics[34]
5	Polycyclic aromatic compounds	2.62	Cancer[35]; disruption of endocrine system[36]	Tire manufacturing, paper mills, electricity generation and oil refineries[37]
6	Acetaldehyde	2.15	Cancer[38]	Manufacturing of many food additives[39]
7	Acrylonitrile	2.05	Cancer[40]	Manufacturing of acrylic/modacrylic fibers and some other products (i.e., plastics)[41]
8	4,4'-Methylene-dianiline	1.38	Cancer[42]	Chemical used to make polyurethane foams and other industrial products[43]
9	Ethylene oxide	1.09	Cancer[44]	Manufacturing of a variety of industrial products (i.e., solvents)[45]
10	Dioxane	1.07	Cancer[46]; liver and kidney damage[47]	Solvent in chemical manufacturing[48]

Source: Food & Water Watch/PERI analysis of data from the US EPA Toxics Release Inventory and Risk Screening Environmental Indicators.

Table 5. The 10 Most Threatened States from Industrial Water Pollution

Rank	State	Facilities	Hazard Share (% of Total)	Amount Released to Surface Water (pounds)	Amount Transferred to POTWs* (pounds)
1	Ohio	512	26.50	6,138,486	16,586,271
2	Virginia	148	12.16	18,572,616	17,471,203
3	New Jersey	125	11.30	5,829,664	11,762,218
4	Alabama	207	9.97	9,068,652	2,635,592
5	Texas	470	6.35	12,562,201	27,944,452
6	Kentucky	183	6.06	4,940,506	8,396,710
7	North Carolina	232	4.07	11,510,539	2,186,616
8	West Virginia	79	3.12	1,500,597	1,574,330
9	Louisiana	126	2.53	11,801,020	350,090
10	Illinois	387	2.44	10,223,373	5,531,305

Source: Food & Water Watch/PERI analysis of data from the US EPA Toxics Release Inventory and Risk Screening Environmental Indicators.

***** *Publicly owned treatment works*

Table 6. The 10 Metro Areas with the Largest Share of Hazardous Industrial Water Pollution

Rank	Metro Area	Facilities	Hazard Share (% of Total)	Amount Released to Surface Water (pounds)	Amount Transferred to POTWs** (pounds)
1	New York City–Northern New Jersey–Long Island, NY–NJ–PA	120	11.03	2,007,624	11,489,056
2	Blacksburg-Christiansburg-Radford, VA	9	7.97	12,071,401	1,132
3	Houston-Sugar Land-Baytown, TX	173	5.78	5,948,672	25,656,214
4	Weirton–Steubenville, WV–OH	11	5.20	339,716	0
5	Mobile, AL	18	3.00	293,256	395,141
6	Richmond, VA	27	2.86	589,463	15,537,484
7	Greensboro–High Point, NC	28	2.80	1,018	662,873
8	Birmingham–Hoover, AL	41	1.94	1,789,386	6,809
9	Baton Rouge, LA	38	1.89	7,251,099	0
10	Monroe, MI	7	1.63	32,383	91,993

Source: Food & Water Watch/PERI analysis of data from the US EPA Toxics Release Inventory and Risk Screening Environmental Indicators.

***** *Metropolitan area rankings exclude facilities located outside metro areas.*

****** *Publicly owned treatment works*

Table 7. Top Two Hazards from Industrial Facilities in Each State

State or Territory, Rank		Facility	Owner	Most Hazardous Chemical Released	Share of Total State Hazard (% of Total)
Alabama	1	U.S. TVA Widows Creek Fossil Plant	U.S. Tennessee Valley Authority	Arsenic and arsenic compounds	37%
	2	Barry Steam Plant	Southern Co.	Arsenic and arsenic compounds	30%
Alaska	1	Pogo Mine	Teck Cominco American Inc.	Arsenic and arsenic compounds	65%
	2	Tesoro Alaska Kenai Refinery	Tesoro Corp.	Polycyclic aromatic compounds	30%
Arizona	1	Freeport-McMoRan Miami Inc.	Freeport-McMoRan Copper & Gold	Arsenic and arsenic compounds	76%
	2	Intel Corp.	Intel Corp.	Glycol ethers	17%
Arkansas	1	Evergreen Packaging	Rank Group Investments	Acetaldehyde	27%
	2	Domtar A.W. LLC Ashdown Mill	Domtar Corp.	Acetaldehyde	27%
California	1	Koch Membrane Systems	Koch Industries	Dioxane	49%
	2	Chevron Products Co. Div. of Chevron USA Inc.	Chevron Corp.	Polycyclic aromatic compounds	8%
Colorado	1	Suncor Energy Commerce City Refinery	Suncor Energy Inc.	Polycyclic aromatic compounds	40%
	2	Kodak Colorado Div.	Eastman Kodak Co.	Glycol ethers	13%
Connecticut	1	Phoenix Soil LLC	Phoenix Soil LLC	Polycyclic aromatic compounds	63%
	2	Cytec Industries Inc.	Cytec Industries Inc.	Acrylamide	18%
Delaware	1	Ciba Corp.	BASF	p-Chloroaniline	38%
	2	DuPont Edge Moor	E.I. du Pont de Nemours	Arsenic and arsenic compounds	36%
District of Columbia	1	U.S. Army Corps of Engineers Dalecarlia WTP	U.S. Department of Defense	Manganese and manganese compounds	62%
	2	U.S. Army Corps of Engineers McMillan WTP Washington Aqueduct	U.S. Department of Defense	Chlorine	37%
Florida	1	Smurfit-Stone Container Enterprises Inc.	Smurfit-Stone Container	Acetaldehyde	29%
	2	St. Johns River Power Park/Northside Generating Station	JEA	Arsenic and arsenic compounds	27%
Georgia	1	Yates Steam Electric Generating Plant	Southern Co.	Arsenic and arsenic compounds	36%
	2	Wansley Steam Electric Generating Plant	Southern Co.	Arsenic and arsenic compounds	27%

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Table 7. Top Two Hazards from Industrial Facilities in Each State – continued

State or Territory, Rank		Facility	Owner	Most Hazardous Chemical Released	Share of Total State Hazard (% of Total)
Hawaii	1	Chevron Products Co. Hawaii Refinery	Chevron Corp.	Polycyclic aromatic compounds	100%
	2	Aloha Petroleum Barbers Point Terminal	Aloha Petroleum Barbers Point Terminal	Benzene	0%
Idaho	1	Clearwater Paper Corp.	Potlatch Corp	Acetaldehyde	89%
	2	U.S. EPA Fund-Lead Superfund Site/ Bunker Hill CTP	U.S. Environmental Protection Agency	Lead and lead compounds	3%
Illinois	1	Dynegy Wood River Power Station	Dynegy Inc.	Arsenic and arsenic compounds	39%
	2	Dynegy Midwest Generation Inc. Baldwin Energy Complex	Dynegy Inc.	Arsenic and arsenic compounds	36%
Indiana	1	Wabash River Generating Station	Duke Energy	Arsenic and arsenic compounds	81%
	2	USS Gary Works	USS Gary Works (U.S. Steel/ ArcelorMittal)	Arsenic and arsenic compounds	7%
Iowa	1	Cambrex Charles City Inc.	Cambrex Corp.	Arsenic and arsenic compounds	72%
	2	Penford Products Co.	Penford Corp.	Acetaldehyde	18%
Kansas	1	Harcros Chemicals Inc.	Harcros Chemicals Inc.	Ethylene oxide	67%
	2	Pentair Water Kansas City Operation	Pentair Inc.	Copper and copper compounds	17%
Kentucky	1	Kentucky Utilities Co. E.W. Brown Station	E.ON	Arsenic and arsenic compounds	43%
	2	Kentucky Utilities Co. Ghent Station	E.ON	Arsenic and arsenic compounds	24%
Louisiana	1	Honeywell International Inc. Geismar Plant	Honeywell International	Arsenic and arsenic compounds	38%
	2	ExxonMobil Chemical Baton Rouge Chemical Plant	ExxonMobil	Polycyclic aromatic compounds	23%
Maine	1	Verso Paper Holdings LLC	Apollo Advisors	Acetaldehyde	61%
	2	Domtar Maine LLC	Domtar Corp.	Acetaldehyde	14%
Maryland	1	Luke Paper Co.	NewPage	Arsenic and arsenic compounds	96%
	2	Brandon Shores & Wagner Complex	Constellation Energy	Arsenic and arsenic compounds	3%

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Table 7. Top Two Hazards from Industrial Facilities in Each State – continued

State or Territory, Rank		Facility	Owner	Most Hazardous Chemical Released	Share of Total State Hazard (% of Total)
Massachusetts	1	Dominion Energy Brayton Point LLC	Dominion Resources Inc.	Arsenic and arsenic compounds	80%
	2	ExxonMobil Corp Everett Terminal	ExxonMobil	Polycyclic aromatic compounds	10%
Michigan	1	Detroit Edison Monroe Power Plant	DTE Energy	Arsenic and arsenic compounds	84%
	2	Detroit Edison Belle River Power Plant (Part)	DTE Energy	Arsenic and arsenic compounds	3%
Minnesota	1	GE Osmonics Inc.	General Electric Co.	Dioxane	38%
	2	Flint Hills Resources LP	Koch Industries	Benzene	28%
Mississippi	1	Southern Wood Preserving of Hattiesburg Inc.	Southern Wood Preserving of Hattiesburg Inc.	Arsenic and arsenic compounds	42%
	2	Chevron Products Co. Pascagoula Refinery	Chevron Corp.	Polycyclic aromatic compounds	14%
Missouri	1	Bayer Cropscience	Bayer Group	Hydrazine	75%
	2	Buick Resource Recycling Facility LLC	Renco Group	Arsenic and arsenic compounds	13%
Montana	1	Smurfit-Stone Container Enterprises Inc. Missoula Mill	Smurfit-Stone Container	Lead and lead compounds	55%
	2	Montana Refining Co. Inc.	Connacher Oil & Gas Ltd.	Benzene	38%
Nebraska	1	Beef Products Inc. (SSC)	Beef Products Inc.	Peroxyacetic acid	26%
	2	Koch Nitrogen LLC	Koch Industries	Lead and lead compounds	20%
Nevada	1	Newmont Mining Corp. Twin Creeks Mine	Newmont Mining Corp.	Arsenic and arsenic compounds	91%
	2	Ergon Asphalt Products Inc. Las Vegas	Ergon	Polycyclic aromatic compounds	8%
New Hampshire	1	Amphenol APC Inc.	Kohlberg Kravis Roberts (KKR)	Lead and lead compounds	43%
	2	Merrimack Station	Northeast Utilities	Lead and lead compounds	11%
New Jersey	1	Ferro Corp.	Ferro Corp.	Hydrazine	96%
	2	DuPont Chambers Works	E.I. du Pont de Nemours	Alachlor	2%
New Mexico	1	Intel Corp.	Intel Corp.	Glycol ethers	37%
	2	Lovington Refinery	Holly Corp.	Benzene	27%

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Table 7. Top Two Hazards from Industrial Facilities in Each State – continued

State or Territory, Rank		Facility	Owner	Most Hazardous Chemical Released	Share of Total State Hazard (% of Total)
New York	1	Nycomed US Inc.	Nycomed US Inc.	Propylene oxide	25%
	2	International Paper Co.	International Paper Co.	Acetaldehyde	20%
North Carolina	1	Ashland Inc.	Ashland Inc.	Acrylamide	69%
	2	Carolina Power & Light Co. Roxboro Steam Electric Plant	Progress Energy Inc.	Arsenic and arsenic compounds	14%
North Dakota	1	Great River Energy Stanton Station	Great River Energy	Copper and copper compounds	65%
	2	Basin Electric Leland Olds Station	Basin Electric Leland Olds Station	Arsenic and arsenic compounds	21%
Ohio	1	Kyger Creek Station	Ohio Valley Electric Corp.	Arsenic and arsenic compounds	69%
	2	American Electric Power Cardinal Plant	American Electric Power	Arsenic and arsenic compounds	18%
Oklahoma	1	Holly Refining & Marketing Tulsa LLC	Sinclair Oil	Lead and lead compounds	41%
	2	International Paper Co.	International Paper Co.	Acetaldehyde	30%
Oregon	1	Georgia Pacific Consumer Products LP Wauna Mill	Koch Industries	Acetaldehyde	34%
	2	Georgia-Pacific Toledo LLC	Koch Industries	Lead and lead compounds	33%
Pennsylvania	1	RRI Energy Inc. Conemaugh Power Plant	RRI Energy (Reliant Energy)	Arsenic and arsenic compounds	34%
	2	RRI Energy Inc. Keystone Power Plant	RRI Energy (Reliant Energy)	Arsenic and arsenic compounds	15%
Puerto Rico	1	PREPA San Juan Steam Plant	Puerto Rico Electric Power Authority	Polycyclic aromatic compounds	57%
	2	PREPA Aguirre Power Generation Complex	Puerto Rico Electric Power Authority	Lead and lead compounds	26%
Rhode Island	1	BB&S Treated Lumber of New England	BB&S Treated Lumber Co.	Arsenic and arsenic compounds	88%
	2	Toray Plastics (America) Inc.	Toray Holding (USA) Inc.	Acetaldehyde	6%
South Carolina	1	Clariant Corp. Martin Plant	Clariant Corp.	Acrylamide	38%
	2	Cross Generating Station	South Carolina Public Service Authority	Arsenic and arsenic compounds	24%

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Table 7. Top Two Hazards from Industrial Facilities in Each State – continued

State or Territory, Rank		Facility	Owner	Most Hazardous Chemical Released	Share of Total State Hazard (% of Total)
South Dakota	1	John Morrell & Co.	Smithfield Foods	Mercury and mercury compounds	99%
	2	U.S. EPA Fund Superfund Sites Gilt Edge Mine Superfund Site	U.S. Environmental Protection Agency	Copper and copper compounds	0.1%
Tennessee	1	Eastman Chemical Co. Tennessee Operations	Eastman Chemical Co.	Arsenic and arsenic compounds	34%
	2	U.S. TVA John Sevier Fossil Plant	U.S. Tennessee Valley Authority	Arsenic and arsenic compounds	19%
Texas	1	Dow Chemical Co. Freeport Facility	Dow Chemical Co.	4,4'-Methylenedianiline	44%
	2	Celanese Ltd. Clear Lake Plant	Celanese Corp.	Acetaldehyde	14%
Utah	1	Kennecott Utah Copper Smelter & Refinery	Rio Tinto PLC	Arsenic and arsenic compounds	73%
	2	Kennecott Utah Copper Mine Concentrators & Power Plant	Rio Tinto PLC	Arsenic and arsenic compounds	25%
Vermont	1	Vermont Circuits Inc.	Vermont Circuits Inc.	Copper and copper compounds	62%
	2	IBM Corp.	IBM Corp.	Nitrate compounds	34%
Virginia	1	U.S. Army Radford Army Ammunition Plant	U.S. Department of Defense	Nitroglycerin	66%
	2	Chesterfield Power Station	Dominion Resources Inc.	Arsenic and arsenic compounds	23%
Washington	1	Boise Cascade LLC	Boise Cascade	Acetaldehyde	38%
	2	Transalta Centralia Generation/Mining	Transalta Centralia Generation/Mining	Arsenic and arsenic compounds	15%
West Virginia	1	American Electric Power Amos Plant	American Electric Power	Arsenic and arsenic compounds	44%
	2	American Electric Power Kammer/ Mitchell Plants	American Electric Power	Arsenic and arsenic compounds	27%
Wisconsin	1	Wausau Paper Mills LLC	Wausau Paper Corp	Acetaldehyde	20%
	2	Hercules Inc.	Hercules Inc.	Epichlorohydrin	13%
Wyoming	1	Black Hills Corp. Osage Power Plant	Black Hills Corp.	Lead and lead compounds	67%
	2	Pacificorp Dave Johnston Plant	Berkshire Hathaway	Copper and copper compounds	23%

Source: Food & Water Watch /PERI analysis of data from the U.S. EPA Toxics Release Inventory and Risk Screening Environmental Indicators.

Appendix B

Toxics Release Inventory (TRI) and Risk-Screening Environmental Indicators (RSEI)

As required by the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA),[85] the EPA compiles data on how much of each of the specific toxic chemicals are discharged by regulated facilities each year. The agency then makes the resulting TRI available to the public.

While the TRI provides the best available data on the quantities of industrial toxic chemicals released, the toxicities of individual chemicals vary. Quantifying the potential risks to public health and the environment from these toxic chemical releases is a complex endeavor. Some chemicals are far more toxic to ingest than others, and this needs to be accounted for to evaluate potential environmental health effects. Some chemicals are more persistent in the environment than others, or more readily dissolve in water than others, and this also needs to be accounted for when evaluating the health risks associated with a specific release of a specific chemical.

The EPA launched the Risk-Screening Environmental Indicators (RSEI) project in the 1990s to build on TRI data and ultimately quantify the risks to human health posed by exposure to environmental releases of toxic chemicals. Starting with the quantities of different chemicals released as reported to the TRI, the EPA's RSEI model incorporates additional factors that define the risk to human health.[86]

The RSEI project defines "hazard" as the quantity of chemicals released multiplied by the toxicity weight of each chemical. The toxicity weight represents how toxic the chemical is to humans, relative to other chemicals. The hazard as defined by the EPA's RSEI project is the basis of the analysis presented in this report.

Toxicity

All of the chemicals in the TRI are toxic, but the health risk from oral ingestion can vary by many orders of magnitude. To express the total hazard for releases of multiple chemicals with different toxicities, the EPA assigns a toxicity weight to each chemical based on toxicological studies. Weights range from 0.02 to 500,000,000, with vinyl acetate (and aluminum dust) given a weight of 1.0. The toxicity weight for orally ingesting zinc is about 3.0 while the toxicity weight for ingesting mercury is 10,000, given that mercury is roughly 3,000 times more potentially harmful to ingest than the same amount of zinc.

The EPA has not yet assigned oral toxicity weights to all chemicals in the TRI database, and those chemicals without toxicity weights are not included in RSEI Hazard calculations. About 99 percent of releases have toxicity weights. Dioxin is one noteworthy toxic that lacks an assigned toxicity weight.

Hazard

Hazard expresses the danger to human health by combining company-reported release data, peer-reviewed toxicity information and, in the case of transfers to publicly owned treatment works (see below), estimates of how much of the chemical passes untreated through these facilities. The hazard posed by a release gives the best picture of the toxic environmental burden that facilities create at the point of release.

Missing from the calculation of a hazard are estimates of downstream population exposures. The RSEI also attempts to assess human exposures resulting from drinking water and fish consumption, but this requires assumptions regarding consumption parameters whose magnitude is uncertain. Moreover, releases of toxic chemicals into surface waters can have adverse environmental impacts apart from these human ingestion pathways. For these reasons, this study simply reports the RSEI Hazard scores.

Transfers

The TRI records releases of toxic chemicals directly into surface water and transfers of toxic chemicals to publicly operated treatment works (POTWs), usually through pipes running directly from the facility to the treatment system. POTWs remove some but not all of the transferred toxic chemicals, and those chemicals not removed are released into surface water.

The EPA's Risk-Screening Environmental Indicators (RSEI) project assists public interpretation of the TRI data in several important ways. Some of what is counted as a "transfer" in the TRI slips past treatment, ending up in surface water. The TRI reports the amount transferred, and the RSEI estimates how much of the transfers to POTWs slip through treatment, joining direct releases into surface water. The resulting portrait of industrial toxic releases into our nation's waterways includes both direct releases into surface water and the EPA's estimate of post-treatment releases.

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