Toxic-Free FUTURE

RESEARCH REPORT

PVC Poison Plastic

AN INVESTIGATION FOLLOWING THE OHIO TRAIN DERAILMENT OF WIDESPREAD VINYL CHLORIDE POLLUTION CAUSED BY PVC PRODUCTION

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On February 3, 2023, the disastrous derailment of a Norfolk Southern train in East Palestine, Ohio damaged six rail cars carrying the known human carcinogen vinyl chloride.[1, 2] The chemical leaked from the damaged cars into the surrounding community and was ultimately burned, unleashing a massive smoke plume almost certainly containing a cocktail of persistent toxic chemicals.

This devastating incident is a painful reminder of the inherent dangers of making, transporting, using, and disposing of vinyl chloride and other chemicals in plastics—especially polyvinyl chloride (PVC) plastic. Globally, approximately 99% of all vinyl chloride is used for the production of PVC and its copolymers.[3]

Every day, PVC production exposes communities around the country to vinyl chloride and other PVC chemicals, a result of the inadequate U.S. regulatory system that allows the use of the most hazardous chemicals and plastics.

This investigation uncovers the largest polluters of vinyl chloride in the U.S. and maps the communities regularly exposed to this dangerous chemical and its waste products.

To quantify and map the pollution from U.S. PVC production, we analyzed data submitted to the U.S. Environmental Protection Agency (EPA) under the Toxics Release Inventory (TRI) program for the year 2021.[4] We also analyzed the data companies submit to EPA under its Chemical Data Reporting program to learn the total quantities produced.[5] We used EPA's EJScreen tool to analyze the demographics of people living in communities closest to vinyl chloride and PVC chemical plants and disposal sites.[6] This data was compiled to create the map below.

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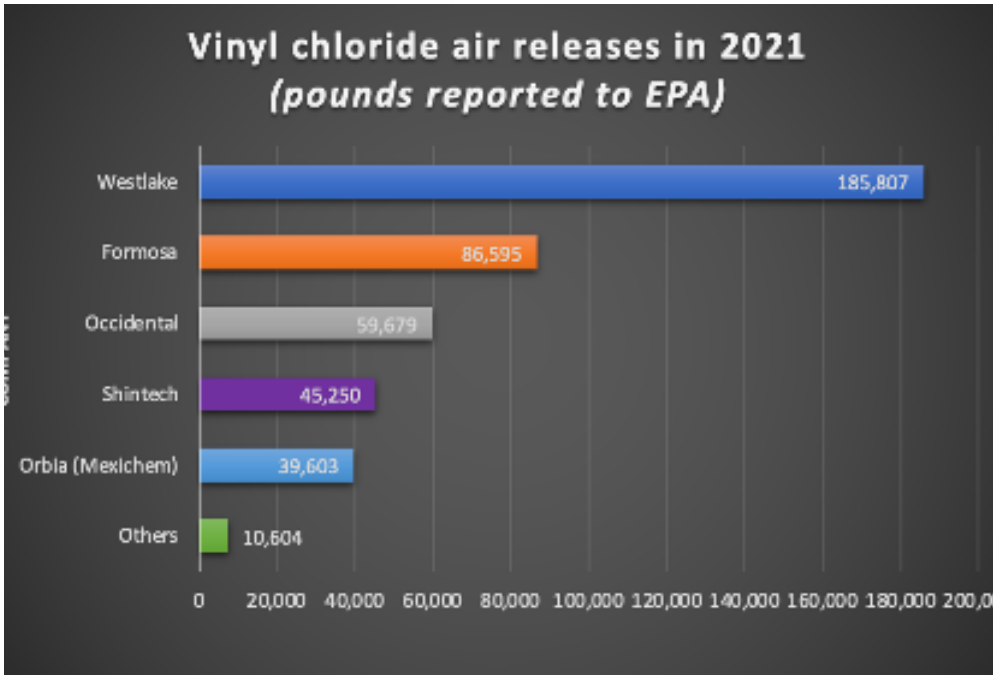
This investigation reveals that the production of PVC plastic releases hundreds of thousands of pounds of carcinogenic vinyl chloride into the air every year in the U.S. Vinyl chloride factories produce billions of pounds of vinyl chloride to make PVC plastics often in low-income communities and communities of color. We also found that vinyl chloride and PVC factories report transferring millions of pounds of hazardous chlorinated waste to incinerators, cement kilns, and landfills in the south-central U.S. Incinerators, cement kilns, and landfills are well-known sources of dioxin pollution.[7] Vinyl chloride and PVC factories also transferred dioxins to incinerators and landfills.

The pollution resulting from the vinyl chloride train derailment is not an isolated incident.

- Nineteen vinyl chloride and PVC resin factories operate in the U.S. Some of the vinyl chloride made in the U.S. supports PVC resin production in Canada, Mexico, and Colombia.
- These PVC plastics plants reported releasing more than 400,000 pounds of vinyl chloride into the air in 2021, posing risks to downwind vulnerable communities.

Formosa's PVC plant in Point Comfort, Texas was the number two air polluter of vinyl chloride in the U.S. in 2021.

More than 97% of vinyl chloride released into the air in the U.S. comes from five chemical corporations that manufacture chemicals for PVC plastic building materials and consumer products: Westlake Chemical, Formosa Plastics, Occidental Chemical, Shintech, and Orbia (Mexichem). These companies, along with Ineos in Europe and several others in China, are the biggest producers of vinyl chloride globally.



According to data submitted to EPA, the number one air polluter of vinyl chloride in the United States is Westlake Chemical. The company reported releasing 185,807 pounds of vinyl chloride into the air from its chemical plants in Kentucky, Louisiana, and Mississippi in 2021. Westlake has repeatedly been fined for violating federal environmental, workplace safety, and railroad safety laws.

Occidental Chemical, which produced the vinyl chloride in three of the rail cars that derailed and were burned in East Palestine, Ohio, reported it released 59,679 pounds of vinyl chloride into the air at its chemical plants in Texas, New Jersey, and Niagara Falls (Canada) in 2021. Shintech, the producer of the PVC plastic in three other train cars that burned in the derailment, reported it released 45,250 pounds of vinyl chloride into the air at its plants in Louisiana and Texas in 2021. Both Occidental and Shintech have faced millions of dollars in fines for violating federal environmental laws, including for railroad safety violations.

The largest vinyl chloride polluters

- Vinyl chloride and PVC plants reported releasing 414,803 pounds of vinyl chloride into the air in the U.S. in 2021.

- The six largest vinyl chloride polluting plants include a total of three Westlake Chemical plants in Kentucky and Louisiana, a Formosa plant in Texas, and two Orbia (Mexichem) plants in New Jersey and Illinois.

In the United States, vinyl chloride and PVC plants are primarily concentrated in Texas, Kentucky, Louisiana, New Jersey, Illinois, and Mississippi. In 2021, vinyl chloride and PVC plants reported the following cumulative releases of vinyl chloride into the air:

- 138,577 pounds in Texas
- 117,526 pounds in Kentucky
- 110,399 pounds in Louisiana
- 24,407 pounds of in New Jersey
- 19,115 pounds of in Illinois
- 4,779 pounds of in Mississippi

Vinyl chloride and PVC plants that reported releasing vinyl chloride into the air

Vinyl chloride / PVC plant – Location	Pounds of vinyl chloride air releases (2021 TRI)
Westlake – Calvert City, KY	116,382
Formosa – Point Comfort, TX	68,346
Westlake – Westlake, LA	21,137
Orbia (Mexichem) – Pedricktown, NJ	20,478
Westlake – Geismar, LA	19,300
Orbia (Mexichem) – Henry, IL	19,115
Westlake – Plaquemine, LA	18,914
Formosa – Baton Rouge, LA	18,249
Shintech – Freeport, TX	17,721
Shintech – Plaquemine, LA	16,265
Occidental – Pasadena, TX	15,598
Occidental – Ingleside, TX	15,008
Occidental – Deer Park, TX	14,557
Shintech – Addis, LA	11,264
Occidental – La Porte, TX	7,347
Westlake – Westlake, LA	5,270
Westlake – Aberdeen, MS	4,779
Occidental – Pedricktown, NJ	3,929
Lubrizol – Louisville, KY	1,144

More than 10 billion pounds of vinyl chloride are produced in the U.S. annually

- PVC plastics companies produced 10 to 20 billion pounds of vinyl chloride in the U.S. in 2019, according to the EPA.
- Two major companies, Westlake and Occidental Chemical, failed to disclose some of their production to EPA and the public.

Formosa Plastics, Shintech, and Westlake Chemical reported producing a total of more than 8 billion pounds of vinyl chloride in the United States in 2019. Occidental Chemical and other Westlake Chemical facilities withheld their production volumes as "confidential business information," so the public cannot get full information on production volumes. **Together, according to the EPA's Chemical Data Reporting tool, vinyl chloride and PVC chemical companies reported production of between 10 and 20 billion pounds of vinyl chloride in the U.S. in 2019.**

These carcinogenic chemicals are shipped on railroads across the country, posing risks to communities while crisscrossing the nation, as was seen in East Palestine, Ohio.

PVC plastic and environmental justice: vinyl plants release cancer-causing chemicals into low-income communities of color

- 373,262 U.S. residents live within three miles of a vinyl chloride, PVC manufacturing, or PVC waste disposal facility.
- Many vinyl plastics plants and disposal sites are located in low-income and communities of color, exposing vulnerable communities to dangerous chemicals.

People living in these communities are much younger, more diverse, and earn far less than the national per capita income. Among the people living within a three-mile radius of these plants, 63% are people of color, compared to 41% nationwide. Residents of these areas earn an average of $23,747 per capita, which is 37% below the national average of $37,638. Twenty-seven percent are children, compared to the national average of 22%. For more details, see the table below. This is concerning as infants and children are particularly vulnerable to exposure to toxic chemicals.[8]

And over the years, people in low-income communities of color have been forced to relocate due to vinyl chloride and contamination from vinyl/PVC plants in at least four different communities in Louisiana including Mossville, Reveilletown, Morrisonville, and Plaquemine.

Young residents of Mossville, Louisiana play near PVC plants. Many families have been forced to relocate due to contamination and the expansion of industry surrounding Mossville.

Communities within three miles of a vinyl chloride, PVC plastic, or disposal facility

Facility	Pop. Within 3 mi	% Pop. Under 18yr	People of Color %	Per Capita Income	Facility Type
Ash Grove – Foreman, AR	1,493	22%	36%	$25,493	Disposal*
Chemical Waste Management – Sulphur, LA	1,138	27%	3%	$32,507	Disposal
Clean Earth – Avalon, TX	594	25%	47%	$33,598	Disposal
Clean Harbors – Deer Park, TX	62,646	28%	59%	$24,848	Disposal
Clean Harbors – El Dorado, AR	12,753	24%	62%	$23,630	Disposal
Clean Harbors – La Porte, TX	8,536	26%	40%	$27,023	Disposal
Formosa – Baton Rouge, LA	35,168	25%	95%	$18,079	VCM**
Formosa – Point Comfort, TX	586	21%	47%	$33,032	VCM
Freedom Waste – Mayfield, KY	3,323	24%	13%	$24,761	Disposal
Lubrizol – Louisville, KY	73,664	29%	82%	$17,055	PVC***
Occidental – Deer Park, TX	37,080	26%	51%	$27,885	VCM
Occidental – Ingleside (Gregory), TX	6,690	31%	59%	$34,217	VCM
Occidental – La Porte, TX	4,624	25%	28%	$27,808	VCM
Occidental – Pasadena, TX	42,540	32%	76%	$20,520	PVC
Occidental – Pedricktown, NJ	4,722	17%	36%	$24,950	PVC
Orbia (Mexichem) – Henry, IL	2,595	23%	4%	$28,708	PVC
Orbia (Mexichem) – Pedricktown, NJ	4,294	17%	35%	$24,239	PVC
Republic Services (BFI) – Itasca, TX	1,660	28%	44%	$26,707	Disposal
Shintech – Addis, LA	7,176	28%	53%	$30,386	PVC
Shintech – Freeport, TX	11,219	32%	80%	$22,346	PVC
Shintech – Plaquemine, TX	2,350	23%	74%	$20,590	VCM
Veolia – Port Arthur/Beaumont, TX	47	25%	20%	$38,129	Disposal

(Continued)

Waste Management – Alvin, TX	9,361	22%	39%	$32,116	Disposal
Westlake – Calvert City, KY	2,871	18%	3%	$33,025	VCM
Westlake – Aberdeen, MS	5,445	22%	72%	$26,339	PVC
Westlake – Geismar, LA	5,870	32%	33%	$37,244	VCM
Westlake (South Plant) – Lake Charles, LA	10,392	24%	20%	$35,309	VCM
Westlake – Plaquemine, LA	3,272	23%	74%	$21,478	VCM
Westlake (North Plant)- Lake Charles, LA	11,153	20%	18%	$32,964	VCM
Population weighted average of vinyl chloride-related facilities		27%	63%	$23,747	
National average		22%	41%	$37,638	

**Disposal denotes an incinerator, landfill, or cement kiln where wastes from vinyl chloride and/or PVC plants are sent for disposal*
*** VCM denotes a vinyl chloride monomer plant*
**** PVC denotes a PVC resin plant*
Data source for this table: EPA EJ Screen

Map: Where are the largest vinyl chloride producers and disposal sites located?

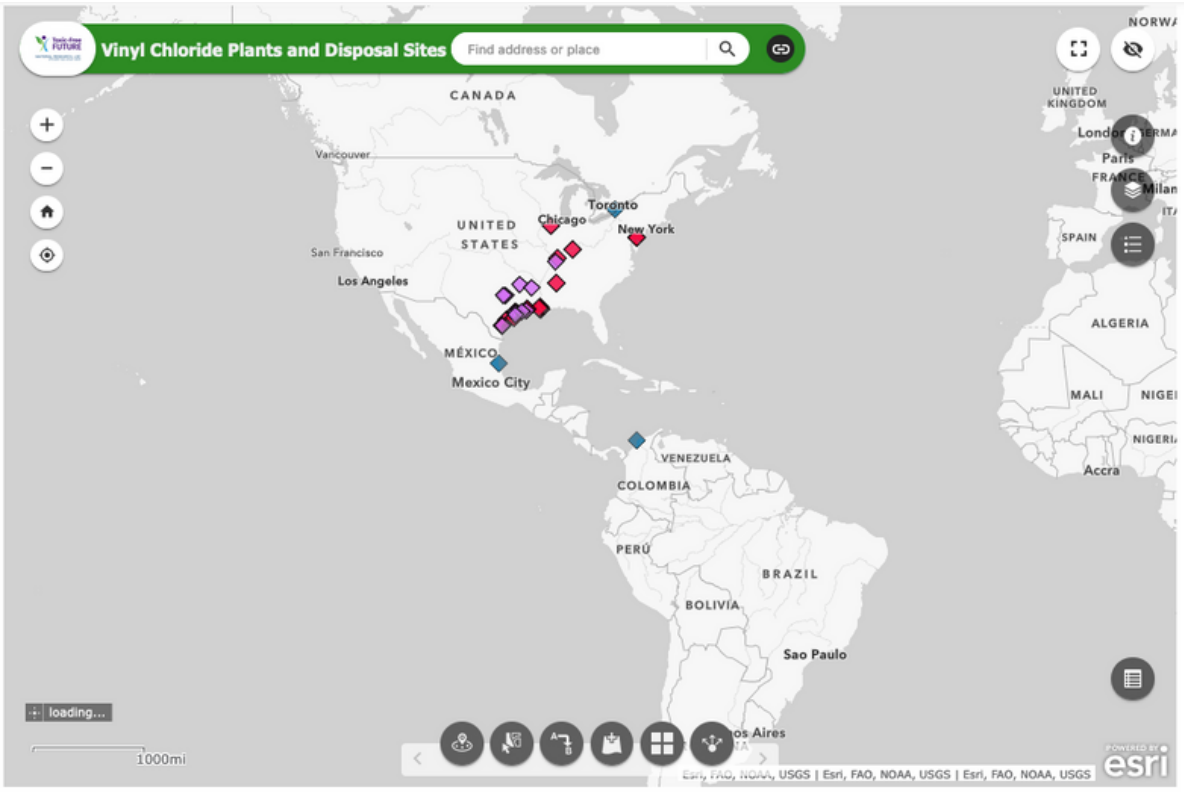
We have developed this map to highlight the locations of the largest vinyl chloride and PVC production plants in the United States and the facilities that receive the industry's chlorinated chemical waste.

You can click on the diamond symbols to read more information on each of these specific plants regarding air emissions of vinyl chloride, demographics, and chlorinated waste transfers to and from landfills, incinerators, and other sites.

Navigate this map by zooming in and out on certain facilities, using the search bar on the top right to find a specific location or the symbol in the near me icon located on the bottom of the map to find your current location.

The red symbol represents a vinyl chloride or PVC production plant in the U.S., the blue symbol represents a PVC production plant outside of the U.S., and the purple symbol represents an incinerator, landfill, or another waste-receiving facility.

Interactive Map: https://toxicfreefuture.org/research/pvc-poison-plastic/map-where-are-the-largest-vinyl-chloride-producers-and-disposal-sites-located



Vinyl chloride production creates millions of pounds of toxic waste

- Vinyl chloride and PVC plastic plants sent more than 20 million pounds of chlorinated waste, as well as dioxins, to incinerators in Arkansas, Louisiana, and Texas in 2021.
- Westlake Chemical's plants in Kentucky and Louisiana were the top two sources of dioxin sent to landfills and incinerators.

After the Ohio train derailment, communities nationwide sounded the alarm that contaminated soil and other wastes from the vinyl chloride fire would be burned or dumped in landfills in their communities.[9-12] Our research reveals that vinyl chloride and PVC plastic plants report sending more than 20 million pounds of chlorinated waste to incinerators in Arkansas, Louisiana, and Texas in 2021. Westlake Chemical's plants in Kentucky and Louisiana were the top two sources of dioxin waste sent to landfills and incinerators. For more details, see the spreadsheet here which includes detailed information on chlorinated waste transfers sent from vinyl chloride and PVC plants to incinerators, landfills, and other disposal facilities.

Huge volumes of waste flow from vinyl chloride plants to incinerators east of Houston. The hazardous waste incinerator, Clean Harbors in Deer Park, Texas, burned more than four million pounds of chlorinated waste from vinyl chloride producers as far away as Kentucky in 2021.

Here's why this matters. The incineration of chlorinated chemicals and materials can lead to the formation and release of dioxins[13-17] —a family of chemicals that are extremely persistent, bioaccumulative, and toxic. Dioxins are also released during accidental building and landfill fires involving PVC plastic.[18] Because dioxins are endocrine disruptors, they can be hazardous at incredibly low levels of exposure. Dioxins are carcinogens and cause other harmful effects on our reproductive, developmental, and immune systems. They can also lead to chloracne, a rare skin eruption.[19] Dioxins are of such great concern that they have been targeted for global phase-out under the international United Nations POPS treaty.[20] They are notorious for being the primary contaminant in Agent Orange and at other environmental tragedies like Love Canal and Times Beach.

The dangers of transporting vinyl chloride and chlorinated wastes

Dairy cattle graze in front of a PVC production site in Geismar, Louisiana. The production and disposal of PVC releases dioxins, persistent bioaccumluative toxic (PBT) chemicals that build up in the food chain.

Communities impacted by the vinyl chloride/PVC supply chain include those along the transportation routes for its dangerous chemicals and toxic wastes. While chlorinated wastes from the production of vinyl chloride and PVC are sent to landfills, cement kilns, and incinerators in the south-central U.S., producers distribute vinyl chloride by rail and barge to PVC factories farther to the north and east. The transportation of vinyl chloride/PVC is inherently dangerous, as made clear when derailments occurred in East Palestine, Ohio and Paulsboro, New Jersey.

Explosions and fires at other vinyl chloride plants

East Palestine is not the only community that has been impacted by major fires and disasters associated with vinyl chloride and PVC production. A recent analysis by Material Research for Coming Clean found that since 2010, there have been at least 40 chemical incidents worldwide involving vinyl chloride and PVC. These have occurred at 29 facilities worldwide, including a dozen chemical factories in the U.S. Fires, leaks, and explosions killed at least 71 people and injured 637 people in the 40 incidents globally.

A new approach: safer solutions

A new approach for protecting individuals and communities from the harmful effects of toxic chemicals and plastics is urgently needed. Governments and companies should adopt comprehensive safer chemicals policies to reduce and eliminate the production, use, and disposal of toxic chemicals like vinyl chloride and plastics like PVC and advance the use of safer chemicals and materials. To do this, there needs to be:

- **Full transparency and disclosure**: disclose the presence, quantity, and hazards of chemicals and plastics produced and used throughout global supply chains.
- **A phase-out of the use and production of the most dangerous chemicals and plastics**: chemicals and plastics made from chemicals that are persistent bioaccumulative toxic (PBT) or that can cause cancer and other serious health impacts must be phased out.
- **Investments in the safest chemicals and materials**: ensure substitutes to the most hazardous chemicals and plastics are safer, using tools to assess chemical and material hazards such as GreenScreen(™) and ChemFORWARD.
- **Corporate accountability and environmental justice**: hold polluters accountable for cleaning up contamination, restoring community health, and providing safe and clean jobs.

In the near term, urgent action is needed to reduce, eliminate, and safely substitute the most toxic plastics such as PVC. PVC plastics and chemicals produced at industrial plants are primarily used to make plastic building materials such as piping, siding, flooring, and other materials like single-use packaging and children's toys.

These products are used and sold at major retailers like The Home Depot, Lowe's, Lumber Liquidators, and Walmart. The Home Depot is the United States' and the world's largest home improvement chain that has a chemical strategy. The Home Depot already restricts vinyl chloride in carpets and rugs, is reducing PVC in packaging, and has banned phthalates in PVC flooring but has not set restrictions on most of the other PVC products it sells. Retailers like The Home Depot can help prevent another major vinyl chloride disaster and pollution by phasing out the sale of products and packaging containing PVC and transitioning to safer solutions, such as bio-based linoleum flooring.

Governments, from cities and states to the federal government, should adopt bans as well as environmentally preferable purchasing (EPP) and green building policies that phase out PVC building materials, packaging, and other PVC products in favor of known safer solutions. Other institutions like hospitals, schools, universities, and affordable housing developers should too.

Methodology

This investigation is primarily based on an analysis of data vinyl chloride and PVC companies self-report to the U.S. EPA through the federal 2021 Toxic Release Inventory (TRI) and 2020 Chemical Data Reporting (CDR) programs. We obtained and analyzed TRI data on vinyl chloride emissions from vinyl chloride and PVC plants as well as their transfer of dioxins and other chlorinated wastes to disposal facilities such as incinerators, landfills, and cement kilns. Demographic data were obtained from EPA's EJScreen tool. All of the primary data collected and analyzed in this investigation has been compiled into a spreadsheet available for viewing and download here.

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Data Analysis and Mapping:
The investigation was based on data analysis by the team at Material Research. ArcGIS maps were created by Selena Sillari of Material Research.

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