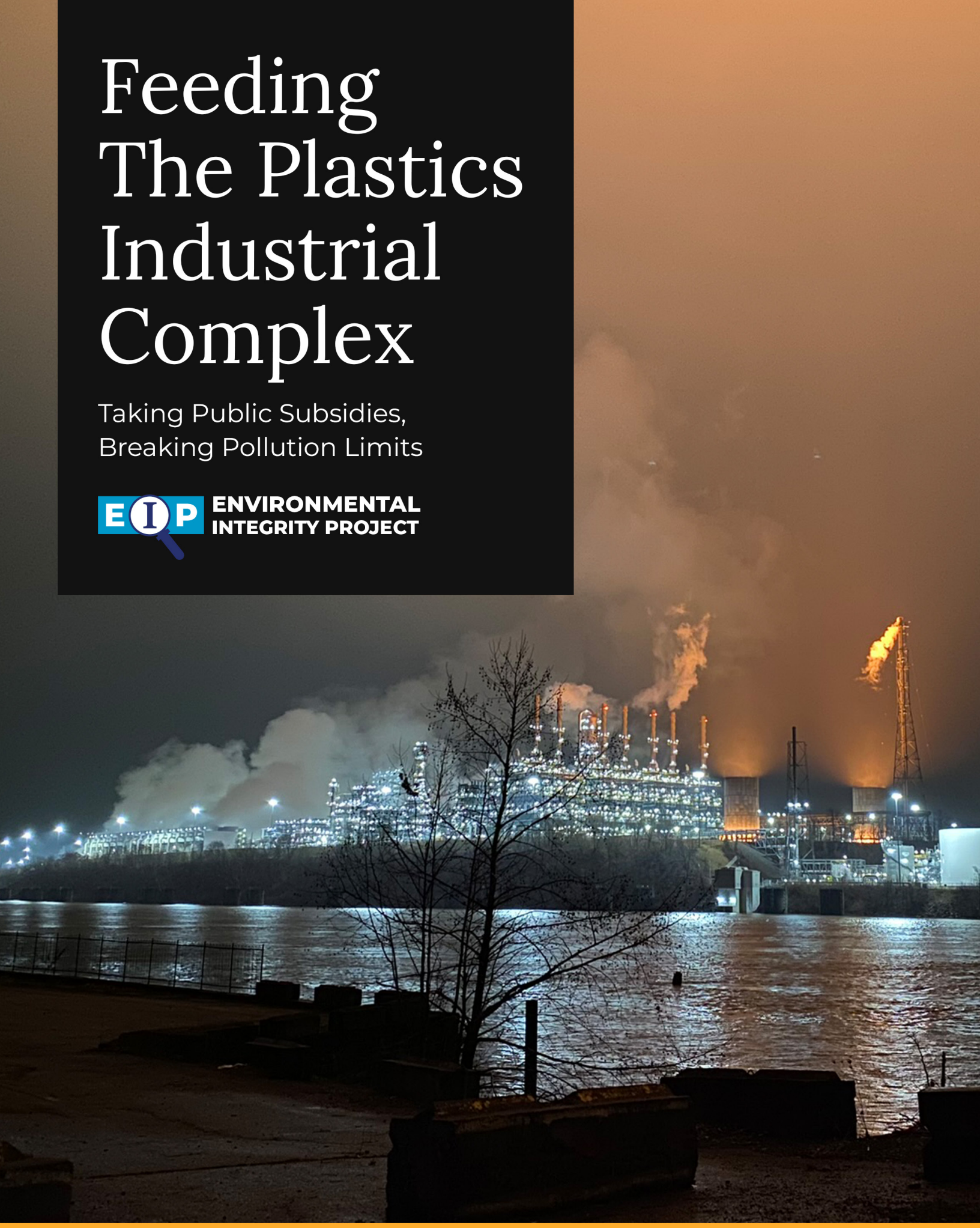
Feeding The Plastics Industrial Complex

Taking Public Subsidies, Breaking Pollution Limits

ENVIRONMENTAL INTEGRITY PROJECT



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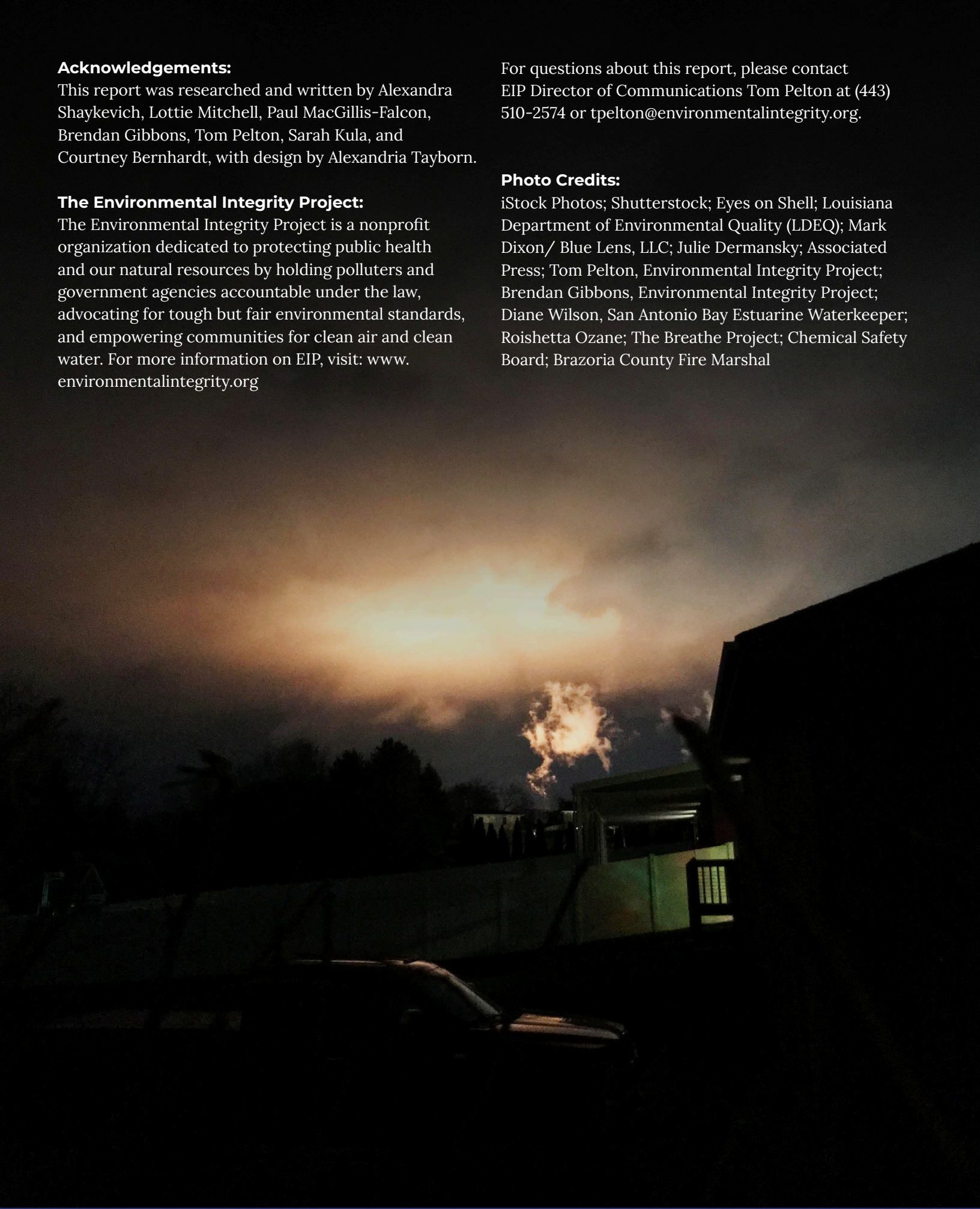


The orange glow in the sky over the flares and lights of the Shell Monaca plastics plant northwest of Pittsburgh, as seen from the back porch of a home in Aliquippa, PA. Photo from Eyes on Shell.

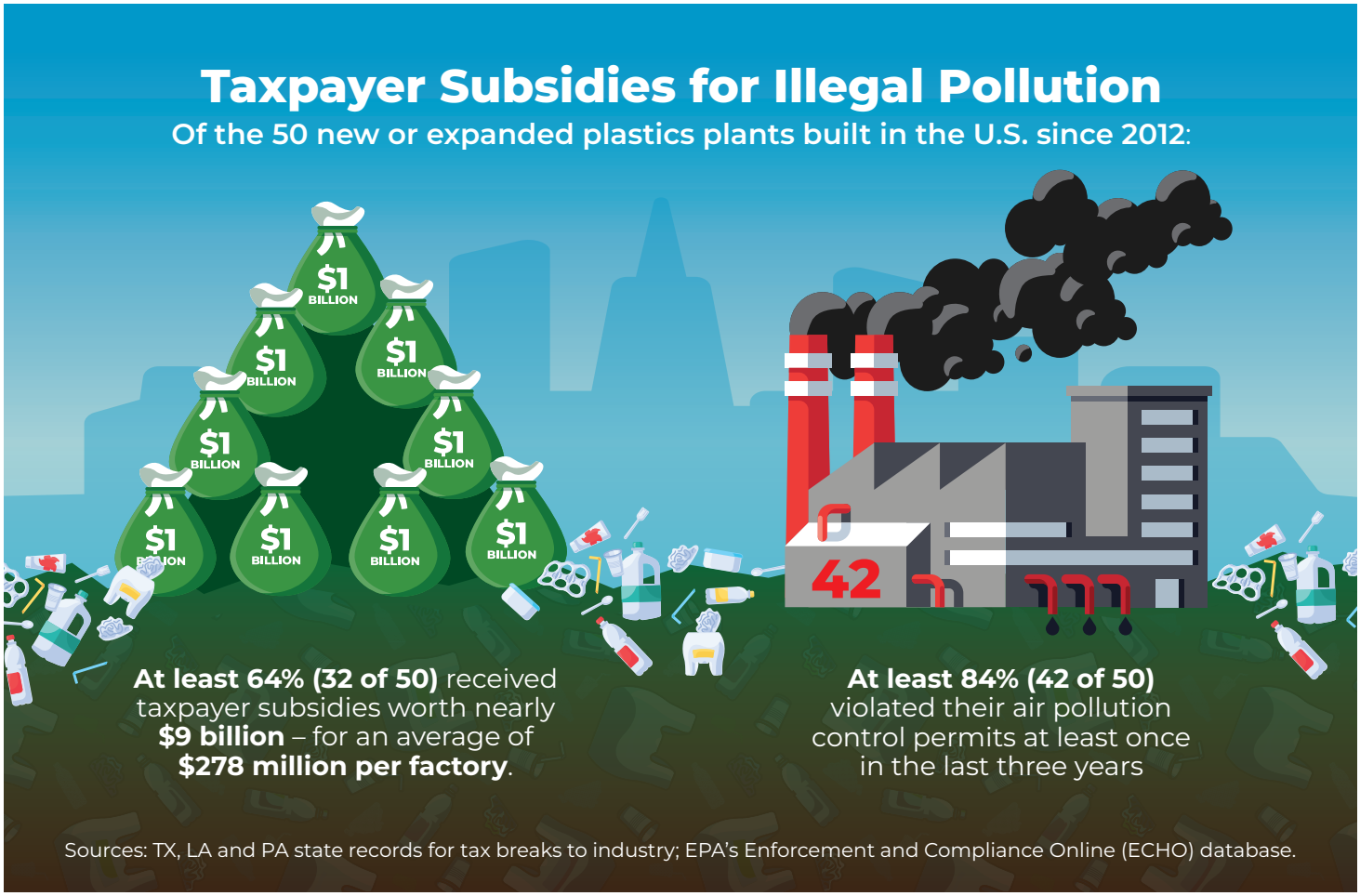
Feeding the Plastics Industrial Complex:

Taking Public Subsidies, Breaking Pollution Limits

EXECUTIVE SUMMARY

The rapidly growing plastics industry in the U.S. receives billions of dollars in government subsidies. Yet too many of these companies frequently violate their air pollution control permits, often releasing hazardous chemicals that risk the health and safety of nearby communities. More than 66 percent of the people living within three miles of the factories that manufacture the main ingredients in plastic products are people of color, living in communities[1] that are over-exposed to air pollution while schools and other public services are chronically underfunded. This report examines the 50 plastics plants built or expanded in the U.S. since 2012 and whether the public funds used to subsidize this industry are addressing these inequities or making the problem worse by depriving local communities of tax revenues while harming their quality of life. That question needs to be answered sooner rather than later, given plans to build 10 more new plastics manufacturing plants and expand the capacity of 17 more over the next five years, often with taxpayer subsidies.

A good example is in southwest Louisiana. There, in 2015, an international plastics company called Indorama – the world's largest producer of PET resins used to make soda bottles and single-use packaging – was drawn to the city of Westlake by the falling price of fracked natural gas, a primary ingredient in plastics.[2] Indorama, based in Thailand, struck a deal with Louisiana Governor Bobby Jindal's administration that the company would reopen a long-closed industrial site if the state would subsidize the project.[3] The company received a $1.5 million grant from Louisiana to renovate the former Equistar chemical plant, which separates – or "cracks" – the components of natural gas or petroleum into ethylene, which is used to make plastic.[4] But more importantly, Louisiana gave Indorama an



exemption from paying any local taxes for schools, roads, fire departments or anything else – a subsidy worth at least $73 million over a decade.[5] In exchange for the public support, Indorama promised that it was "committed to being a positive influence in southwest Louisiana," and pledged "to meet or exceed all environmental regulations."[6]

Indorama kept neither promise. Public records show the plant repeatedly violated its air pollution limits[7] – including by releasing, in the first five months of 2019, more than 90 times the amount of volatile organic compounds (VOCs) it was permitted to release in a year under the Clean Air Act.[8] VOCs contribute to smog and can irritate the lungs and eyes, and cause headaches, nausea, and other health problems.[9] An explosion and fire at the Indorama plant sent two workers to the hospital.[10] And in another accident, the release of potentially dangerous amounts of benzene, a type of VOC and carcinogen,[11] from the plant forced a state police HAZMAT team to shut down a nearby highway.[12] As the plant struggled to restart, a flare burned excess gases for weeks, releasing black smoke and making such a deafening roar that it shook the windows of homes.[13] "It was like a 300-foot flame, and it went on for weeks," recalled one local resident, James Hiatt, director of a Lake Charles nonprofit called For a Better Bayou.[14] "People couldn't sleep at night." The Louisiana Department of Environmental Quality issued 13 warning letters to Indorama for air pollution violations.[15] But instead of cracking down or penalizing the plant, the state agency approved changes to Indorama's pollution control permit four times between 2018 and 2023 that allowed the plant to release more air pollution – including a tripling of its permitted VOC emissions.[16]

"A toxic dragon is what it was -- just puffing toxic smoke and fire," **James Hiatt**, director of For a Better Bayou, said of the flare at the Indorama plastics plant in Westlake, Louisiana, that rattled the windows of local homes.

Indorama is not an outlier in the plastics industry. The Environmental Integrity Project (EIP) examined 50 plants that were built or expanded in the U.S. since 2012 and that manufacture plastics or their main ingredients. In addition to "cracking" plants that turn oil or natural gas into ethylene, propylene, and other plastic ingredients, our report includes facilities that manufacture polyethylene (the most common plastic in the world, used in plastic bags and food packages), polypropylene (a heat-resistant resin used in microwavable containers), polyvinyl chloride (or PVC, used in construction material), and PET (used for single-use water bottles and other containers).[17] (For a discussion of methodology and a list of all plants, see appendices A and C).

We found an alarming pattern when looking at these plastics plants. Companies like Indorama receive public subsidies and make promises to be "committed to protecting public safety, health, and the environment."[18] But once those subsidies and construction permits are in hand, the companies fail to keep their promises by repeatedly releasing illegal pollution during malfunctions, breakdowns, and industrial "upset" incidents. Plastics plants also threaten the health and quality of life of local residents with fires, explosions, and excessive flaring. Emissions are under reported because plastics manufacturing processes are prone to leaks, and pollution from leaks is poorly monitored and rarely reported.

Pollution released during malfunctions and related startups and shutdowns at plastics plants are often treated by state regulators as "unpreventable," which means violators escape penalty or pay token amounts. Routine violations of environmental law get a tap on the wrist. And if all else fails, companies sometimes get their emission limits increased by state regulators. The consequences of this behavior – including disruption and poor air quality – often fall disproportionately on communities of color.

This report details the recent and future growth of plastics manufacturing in the U.S.; how often it is subsidized by taxpayers; how much air pollution and greenhouse gases it releases; how often plants violate their Clean Air Act permits; and includes case studies of fires, explosions, and malfunctions at facilities. Among the conclusions of our research are the following:

- **TAXPAYER SUBSIDIES:** At least two thirds of the plastics plants we examined (32 of 50) that have been built or expanded over the last decade have received tax breaks or subsidies from state and local governments worth a total of nearly $9 billion.[19] (See Appendix C and this spreadsheet for specifics.) This total does not include federal tax breaks for oil and gas extraction, which supplies the primary ingredients of plastics.
- **STATE WATCHDOGS RECEIVE LESS:** On an annual basis, the subsidies cost almost twice as much as the combined budgets of two state agencies tasked with regulating the bulk of plastics plants in the U.S., along with all other polluters in their states: the Texas Commission on Environmental Quality and the Louisiana Department of Environmental Quality.[20]
- **PERMIT VIOLATIONS:** About 84 percent of the plastics plants – 42 of 50 – violated their air pollution control permits over the last three years, as evidenced by Clean Air Act enforcement actions taken by state or federal regulators.[21] Penalties are often small compared to corporate revenues and government subsidies.
- **POLLUTION:** Overall, in their routine operations, the 50 plastics plants reported releasing an estimated 63 million tons of greenhouse gases in 2021, equal to the emissions from more than 15 coal-fired power plants. They also reported releasing 471,744 pounds of benzene (a carcinogen), 27,923 tons of nitrogen oxide (which contributes to smog), and 20,182 tons of carbon monoxide (which can cause headaches and dizziness), among other pollutants.
- **ACCIDENTS AND EXPLOSIONS:** In addition to these routine emissions, almost all plastics plants reported chemical releases during explosions, fires, malfunctions, or other "upsets." Forty-seven of the 50 plants we studied reported a total of at least 1,242 incidents of various kinds over the last five years that released nearly 34 million pounds of air pollution. Although these "emission events" release more pollution (and sometimes a lot more) than allowed under their permits, petrochemical companies complain these emissions are "unpreventable" and rarely pay penalties or take serious action to fix the problem.
- **MOST HARM TO PEOPLE OF COLOR:** More than 591,000 people live within three miles of these 50 plants, 66 percent of whom are people of color.
- **STATES WEAKEN PERMITS:** For about a third of the plastics plants (15 of the 50), including the Indorama ethane cracker in Louisiana, state environmental agencies modified the plant's permit limits to allow more emissions of one or more pollutants after the initial permitting of the facility or expansion project.

94%

of plastics plants studied reported malfunctions, accidents, or other incidents that released air pollution.

- **RAPID EXPANSION:** Across the U.S., 10 new plants that make plastics or their chemical ingredients have been proposed for construction over the next five years, as well as expansions at 17 existing plants.[22] These could add a significant amount of health-damaging air pollutants and at least 35.5 million tons of greenhouse gases a year.[23]

The poor environmental track record of these plastics plants is alarming because the industry is expanding rapidly, and more communities are being asked to consider public subsidies. Among the proposed new projects are a pair of ethane processors (called "crackers") in East Texas' Jefferson County. Outside Houston, ExxonMobil is planning to expand an ethane cracker at its Baytown plant. And in Louisiana, just down the road from the Indorama plant, South Korea's Lotte Chemical is proposing to grow its ethane cracker's capacity by 50 percent, or 500,000 metric tons a year.

What facilities did we study for this report?

To research this report, EIP examined state and federal records for 50 plants that manufacture the main chemical ingredients in plastics and that have been built or expanded in the U.S. since 2012. EIP also reviewed the permits and company announcements of proposed new plants and expansions. In terms of the scope of our review, we included in our report's definition of "plastics plants" the manufacturing of most of the major chemical ingredients in plastic products, but not the molding of final products, like plastic spoons or toys. We included facilities that make ethylene and propylene, which are base ingredients for a wide variety of plastics. We also examined plants that make polyethylene and polypropylene (used, for example, in plastic bags, milk bottles, food packaging and other containers), as well as PVC (polyvinyl chloride)[24] and PET (polyethylene terephthalate),[25] used in packaging and water bottles. On our list are 15 plants that manufacture plastics resins, 27 ethane "crackers" – most of which also manufacture other plastic feedstocks or resins – and eight plants that manufacture other key ingredients used to make plastics. For a more detailed discussion of our scope and methodology, see Appendix A. For a spreadsheet listing the plants we studied, click here.

The full scope of the plastic industry's impact on the public health of local residents is often unclear because many manufacturing plants are not required to adequately monitor pollution releases, including from upsets, leaks, and accidents. Most lack fenceline monitoring devices between the plants and local neighborhoods that could show the community's exposure to toxic chemicals. The lack of monitoring results in significant under-reporting of emissions. According to Environmental Protection Agency (EPA) documents,[26] air monitors at seven plastics plants examined in this study found that the levels of benzene at the fencelines between the plants and the community in 2020 and 2021 ranged from three times to more than 14 times higher than previously known, based on under-reporting by the companies and computer modeling. EPA is now proposing to tighten its regulations and require more fenceline monitoring, including at about half of the plastics plants we studied in this report. EPA should propose additional regulations so all plastics plants are required to perform fenceline monitoring.

When it comes to dangerous air pollution releases and malfunctions, ethane "cracker" plants, like the Indorama facility in Louisiana, which separate the components of natural gas into a primary ingredient in plastics, are often the worst offenders.

- **PENNSYLVANIA:** For example, northwest of Pittsburgh, the Shell Polymers Monaca plant received $1.65 billion in taxpayer subsidies before it opened in 2022.[27] Shell promised a "world class facility" that would "improve the local environment."[28] However, the plant malfunctioned at least 51 times between the beginning of its startup in January 2022 and June 2023,[29] repeatedly exceeding its air pollution limits. It was hit by a lawsuit from environmental groups[30] and then a $5 million state penalty[31] (See case study on page 38.)
- **SOUTH TEXAS:** North of Corpus Christi, Texas, an ethane cracker was built by a partnership of the Saudi Arabian government and ExxonMobil in 2021. Although the Saudi firm SABIC and Exxon are wealthy companies, they received $259 million in subsidies from the state and local school district – almost a half billion dollars in tax breaks that would have otherwise helped students in Texas.[32] The companies promised local parents that they would "follow through with our good neighbor commitments on health and safety, quality of life… and being good environmental stewards."[33] Then the plant had 63 environmental violations in less than two years[34] and released a half million pounds of air pollutants in numerous "upset" incidents[35] (See case study on page 36.)
- **EAST TEXAS:** The Bayport Polymers ethane cracker in Port Arthur, Texas, owned by the French energy giant TotalEnergies and partners, received $76 million in local and state tax breaks[36] before its troubled startup in 2021. The company promised "sustainable development…to contribute to the well-being of people."[37] Then the plant released more than 9.2 million pounds of air pollutants in a series of unpermitted "upset" incidents.[38] In this and many other cases, the monitoring and reporting of air pollutants in the local community was inadequate.

The plastics industry portrays itself as a clean and green pathway to improve the economy and health of local communities. For example, ExxonMobil claims on its website: "Plastics play a vital role in reducing greenhouse gas emissions and enabling modern life."[39] But neighbors of ethane crackers and other plastics plants can testify that they are harming their quality of life and threatening public health. (See case studies on pages 31-39 and in Appendix B.)

To address these problems, this report makes the following recommendations:

1. **STRICT PERMIT LIMITS AND DENIALS FOR SINGLE-USE PLASTICS:** State and federal regulators should deny permits for facilities that make primary ingredients used mostly in single-use, disposable plastics. These plants release dangerous air pollutants while essentially manufacturing pollution – bottles, bags, and other throw-away containers that litter our roadsides and waterways. Clean Air Act permits that are issued to plastics plants should impose strict and legally-required pollution limits that protect the public health of nearby communities, minimize climate pollution, and are based on an accurate accounting of emissions.
2. **BETTER MONITORING TO DETECT POLLUTION:** Plants that make plastics and their primary chemical ingredients release significant amounts of pollution from flaring, leaks, and other upset events that can increase concentrations of hazardous air pollutants in neighboring communities. Direct monitoring is not sufficient to detect these emissions, so they often go undetected or unreported. To capture the full scope of emissions, plastics plants should be required to measure fenceline concentrations of benzene and other toxic byproducts, and to reduce emissions of these toxins when those concentrations are unacceptably high. EPA has proposed standards under the Clean Air Act that would require fenceline monitoring for multiple carcinogens, including benzene, and corrective action at about half of the plastics plants studied in this report.[40] These standards should be strengthened, expanded to all plastics plants, and promptly implemented.
3. **ACCOUNTABILITY FOR BREAKING THE LAW:** Under the Clean Air Act, plants must comply with emission limits at all times, including during accidents, startups, and upset events.[41] But plastics plants frequently violate Clean Air Act permit limits. Plastics plants must be required to submit prompt, accurate reports of emissions, particularly from malfunction and upset events, which allow regulators and the public to detect whether a plant is complying with its permit and the law. EPA and state environmental agencies must then follow through and take meaningful enforcement action to hold polluters accountable.
4. **PUBLIC ACCESS TO POLLUTION DATA:** Fenceline monitoring and emission reporting requirements are only meaningful if communities near plastics plants have timely access to that information. Emissions data, including real-time fenceline monitoring results and malfunction reports, should be posted promptly to a public, online database that is easy to use. Communities should receive alerts of any accidents or threats relating to plastics plants.
5. **REJECT SUBSIDIES AND TAX BREAKS:** Public funds should be used to benefit projects that support and improve public health. Local entities should reject and revoke subsidies and tax exemptions for plastics plants that expose neighboring communities to harmful air pollution and are prone to accidents and upset events, especially if they violate their environmental permits. Public subsidies should be tied to environmental compliance.

Despite a poor record of obeying pollution control permits, the plastics industry is now seeking approvals and public subsidies to continue a rapid expansion, especially along the Gulf Coast. Communities and decision makers should know what to expect if the plastics industry moves in. If history is any indication, violations, unplanned pollution releases, and accidents will come with the promise of new jobs and compliance. Stronger requirements and vigorous enforcement are needed to make sure these plants prevent pollution and are held accountable for broken promises.

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CHAPTER 1

Growth of the Plastics Industry

Automatic filling machine pours water into plastic PET bottles at beverage plant. PET (or polyethylene terephthalate) is made from petroleum or natural gas.

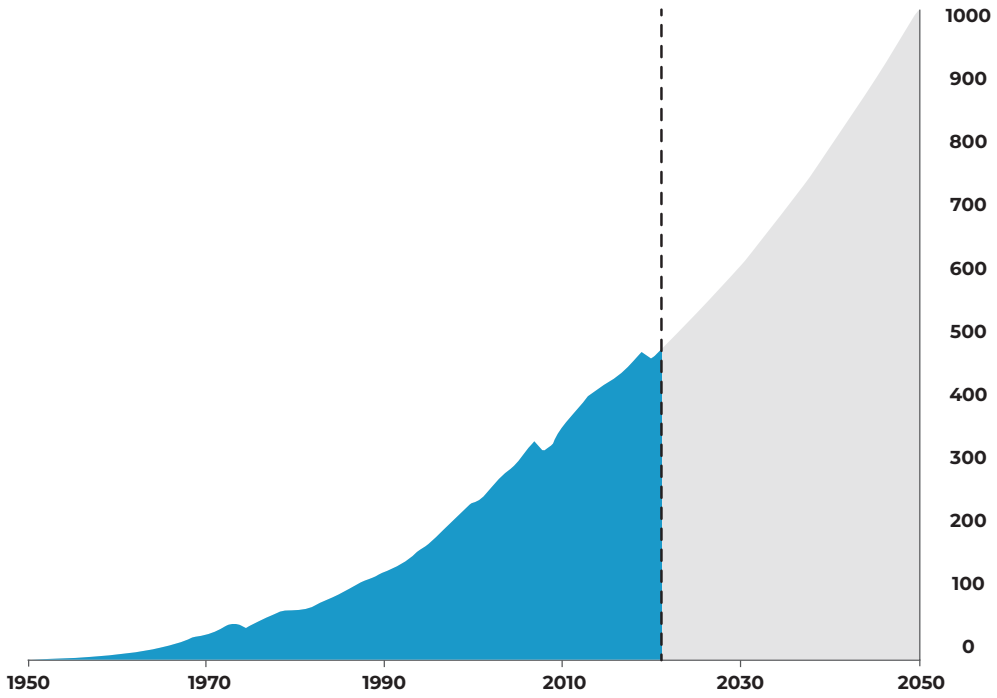
Growth of the Plastics Industry

Global plastics production has grown exponentially in recent decades. While plastics have some important uses – like medical equipment, insulation, and electronics – the sheer magnitude of plastics consumption has contributed to climate change, persistent pollution, and harm to wildlife and the natural environment.

Given the ubiquity of plastic in modern society, it is hard to believe that large-scale production dates back only to the 1950s. Between 1950 and today, humanity produced about 12 billion metric tons of virgin plastics—that's roughly the weight of 37,000 Empire State buildings.[42] Half of that was produced in just the past fifteen years.

According to the Organization for Economic Cooperation and Development (OECD), global plastics production has more than doubled in the past two decades, rising from 234 million metric tons in 2000 to 489 million metric tons in

Figure 2: Global Plastics Production, 1950 – 2050 (in million metric tons)



Source: OECD 2022; Note: Data from 2019 onward are projections.

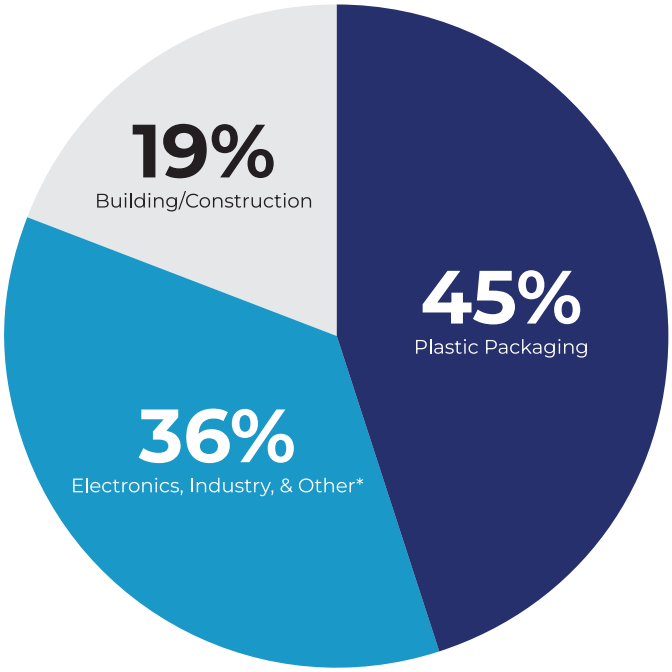
2023.[43] If this continues at the current pace, we could be on track to produce around 1 billion metric tons of plastic every year by midcentury.

While that figure is staggering, it is compounded by the fact that most plastics are produced to be thrown away, not reused. The vast majority of the roughly 20 billion metric tons of plastic that the world is on track to produce by 2050 would ultimately accumulate in the environment. Unlike other materials, plastic does not biodegrade and takes centuries to break down. One 2017 study estimated that about 80 percent of plastics globally end up being dumped into landfills or wind up as litter.[44] The rest was incinerated, and only 9 percent was recycled.[45]

In the United States, the recycling rate is even lower. A 2022 study found that the U.S. only recycles about 5 to 6

percent of its plastic waste.[46] That is because single-use plastics, which make up the majority of plastic waste, are notoriously difficult to recycle because they are difficult to sort and release hazardous chemicals when they are processed. Plastic packaging – from Coca-Cola bottles to the plastic wrap in Amazon parcels – is the single largest market for the plastics industry,[47] and it is a sector that is expanding rapidly as the global population increases and household incomes grow, driving new demand for plastics.

Figure 3: Share of Plastic Resin Production by Industrial Use Sector



*Consumer & Institutional Products (11.9 %), Transportation (6.7%), Electrical/Electronic (3.8%), Industrial Machinery (0.8%), Other (13.2%).
Source: Geyer et al., "Production, use, and fate of all plastics ever made."

The U.S. has continued to play a major role in the plastics industry. Not only is the U.S. the world's largest per capita consumer of plastics, it is also the second largest producer, after China.[48] The growth of the U.S. plastics industry has accelerated over the last 15 years, driven by the expansion of hydraulic fracturing and horizontal drilling for oil and gas.[49] These drilling techniques boosted the production of oil, gas, and natural gas liquids – which are hydrocarbon fluids extracted from both gas and oil that are used to manufacture plastics, including ethane (which is used to make ethylene) and propane (which is used to make propylene). The shale gas revolution and resulting low natural gas prices were game changers for the U.S. petrochemical and plastics industry, which now represents around 40 percent of global petrochemical production capacity.[50]

According to the U.S. Energy Information Administration (EIA), low natural gas prices will continue to propel the industry's growth. The EIA predicts that industry will account for more than 75 percent of the growth in U.S. natural gas consumption through 2050—largely fueled by plastics and chemical manufacturing, which is the largest industrial consumer of natural gas because it uses gas as a raw material as well as a fuel.[51]

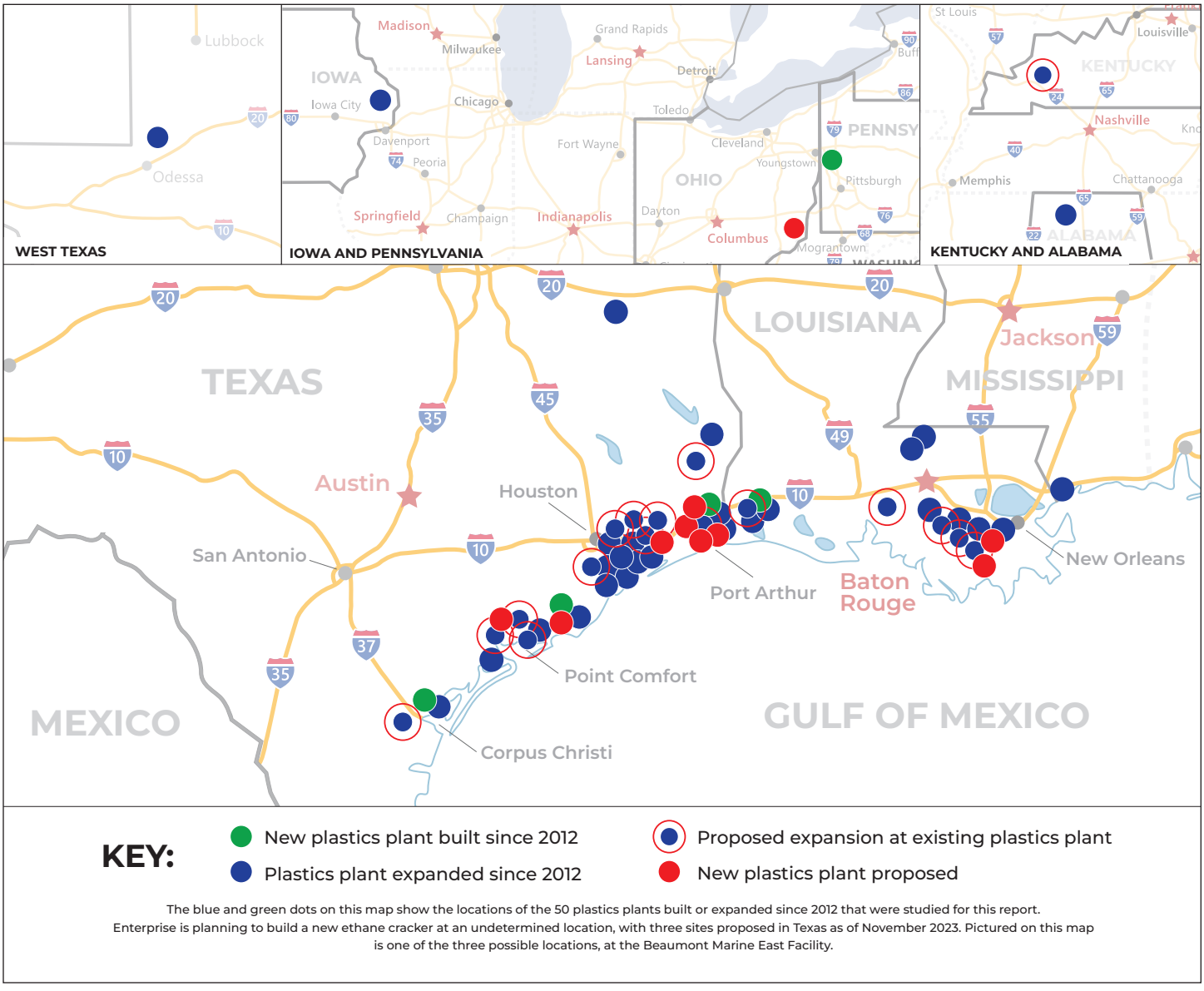
The pace of the industry's growth in the U.S. has been staggering. Over the last decade, three massive new ethylene plants have been built, two in Texas and one in Pennsylvania, and an idled ethylene plant in Westlake, Louisiana, was expanded and brought back online in 2018.[52] In addition to those four plants – which increased ethylene capacity by over 4.7 million metric tons per year and plastic resin manufacturing capacity by 4 million metric tons per year – at least 56 expansion projects at existing plastics plants have been completed over the past twelve years. Among other

products that have experienced increases, production of ethylene – a primary building block of plastics – has grown by 81 percent since 2015.[53] Much of the industry's growth has been concentrated along the Gulf Coast, but plastics plants have also expanded in Kentucky, Mississippi, Alabama, and Iowa.

Looking to the future, the industry is planning to build 10 new plastics plants and at least 23 large expansion projects at 17 existing plastics plants over the next five years. Eighteen of these new and expanded plants are proposed for Texas, seven for Louisiana, and one each in Ohio and Kentucky.[54] Many of the new projects would produce ethylene and/or polyethylene, but the industry is also planning large expansions that would increase production of PET plastic, which is almost exclusively used for plastic packaging, and other ingredients. Most of these projects would be clustered along the Gulf Coast, where the plastics industry has been dominant for decades. For a full list of proposed plants and expansion projects, along with their locations and potential emissions, please see Appendix C.

All this growth could add even more health-harming air pollution to local communities. The expansion of the plastics industry – which relies on natural gas or petroleum as the source of many of its chemicals – will also add more greenhouse gases that will worsen climate change that is driving deadly heat waves, flooding, and wildfires. (For specifics, please see Chapter 3 on pollution impacts.)

Map 1: Locations of Existing and Proposed Plastics Plants



The blue and green dots on this map show the locations of the 50 plastics plants built or expanded since 2012 that were studied for this report. Enterprise is planning to build a new ethane cracker at an undetermined location, with three sites proposed in Texas as of November 2023. Pictured on this map is one of the three possible locations, at the Beaumont Marine East Facility.

CHAPTER 2

Subsidies for the Plastics Industry

Polymer that is formed into plastic pipes.

Subsidies for the Plastics Industry

As discussed in the previous chapter, there are several factors driving the expansion of the plastics industry, including the historically low price of natural gas.[55] Government subsidies are also encouraging the construction of more plastics plants in the U.S. EIP examined state records and found that at least two thirds of the plastics plants that were newly built or expanded since 2012 (32 of the 50) received tax breaks from state and local governments worth a total of nearly $9 billion over a decade.[56] On an annual basis, that's almost twice as much as the combined budgets of two state agencies tasked with regulating plastics plants along with all other sources of air and water pollution: the Texas Commission on Environmental Quality (TCEQ)[57] and the Louisiana Department of Environmental Quality (LDEQ).[58] (Note: this does not include any federal subsidies for the production of oil and gas, which are primary ingredients in plastics.[59])

More than half of the total value of the tax breaks went to a pair of enormous plastics projects. The largest was in Louisiana, where the South African-based Sasol chemical company and partners at LyondellBasell of Houston received $3.5 billion in local tax breaks from the state for its Lake Charles petrochemical complex.[60] The subsidy includes tax breaks from all local property taxes for a decade for a $20 billion series of expansion projects from 2013 through 2020, including for building a new ethane cracker and other improvements, according to state records.[61] The new facilities included seven new chemical production units designed to triple Sasol's U.S. production capacity, including an ethylene oxide and ethylene glycol unit. One of the units can produce up to 420,000 tons a year of polyethylene, a raw material used in making plastic bottles and cups, plastic bags, and shrink wrap, among other products.[62]

The biggest government subsidy:

$3.5 Billion

in tax breaks granted by Louisiana to Sasol of South Africa and LyondellBasell of Houston to expand their Lake Charles plastics plant

In Pennsylvania, Shell received $1.7 billion in subsidies and tax breaks from the state to build a $14 billion[63] ethylene and plastics plant northwest of Pittsburgh in Monaca, PA, on the bank of the Ohio River.[64] Pennsylvania decided to encourage the construction of the ethylene and plastics manufacturing plant by offering a taxpayer-backed premium for the company to use ethane extracted from natural gas drilling in that state.[65] The "Pennsylvania Resource Manufacturing Tax Credit" allows Shell to apply for a tax credit of $2.10 per barrel of ethane purchased from Pennsylvania companies.[66] In addition to approving this subsidy for use of the raw material, the state also gave Shell tax breaks through a 2013 expansion of a decades-old program called the Keystone Opportunity Expansion Zone, which was designed to attract industries to the state through an exemption to local real estate and sales taxes, and state corporate income taxes.[67] State officials also gave Shell a $10 million grant for site infrastructure through the Pennsylvania First Program.

In general, the state and local subsidies for the plastics manufacturers examined in this report came from a variety of different programs and in different forms. Examples include a Texas program that reduces the taxes that certain companies pay to local school districts;[68] and Louisiana's Industrial Tax Exemption Program, which eliminates or dramatically cuts the amount of all local taxes (for schools, roads, police, fire, parks, etc.) that approved manufacturers would otherwise have to pay over ten years.[69] The following is a list of the plastics plants included in this report that received the largest state and local subsidies between 2013 and 2022.

Seven of the 10 largest plastics industry recipients of tax breaks and subsidies from state or local governments in the U.S. were owned fully or in part by foreign companies, including firms based in Saudi Arabia, Japan, Germany, South Korea, and the United Kingdom. This means that tax revenues that could be flowing to help local people

Table 1: Top 10 U.S. Plastics Manufacturing Plant Recipients of Subsidies

State	County/ Parish	Parent Company	Based in	Plant Name	Product(s)	Subsidies Received Since 2013*
LA	Calcasieu	LyondellBasell/ Sasol	USA/South Africa	Lake Charles Complex	Ethylene, polyethylene, and others	$3,490,201,592
PA	Beaver	Shell	United Kingdom	Monaca	Ethylene, polyethylene	$1,650,000,000
LA	Iberville	Shintech	Japan	Plaquemine	Ethylene, PVC, and others	$533,450,151
LA	Calcasieu	Westlake/Lotte	USA/South Korea	Lake Charles	Ethylene, MEG	$497,698,725
TX	Brazoria	Dow	USA	Freeport	Ethylene, polyethylene, propylene, and others	$393,319,284
TX	San Patricio	ExxonMobil/ SABIC	USA/Saudi Arabia	Gulf Coast Growth Ventures	Ethylene, polyethylene	$249,035,698
LA	Iberville	Dow	USA	Plaquemine	Ethylene, polyethylene, propylene, and others	$229,867,900
TX	Chambers	Enterprise	USA	Mont Belvieu	Propylene	$176,343,112
LA	Ascension	BASF	Germany	Geismar	Ethylene oxide, ethylene glycol, others	$160,365,893
LA	Ascension	Shell	United Kingdom	Geismar	Ethylene oxide, ethylene glycol, others	$144,534,890

*The tax breaks included in this report are limited to subsidy agreements that were awarded for projects that began operating between 2013 and 2022. However, many of these subsidy agreements provide tax savings beyond 2022. For more information, please refer to the Methods section in Appendix A. **Sources:** Texas Comptroller; Louisiana Economic Development, Industrial Tax Exemption Program (ITEP); Pennsylvania Resource Manufacturing Tax Credit.

improve their schools and rebuild their roads and provide better police and fire protection, for example, are instead boosting the profits of overseas companies.

Some of the local and state subsidies, especially in Louisiana and Texas, ask that companies create a certain number of jobs at designated wage levels to qualify for tax breaks. But none of the state programs we examined require industries to follow the terms of their state pollution control permits as a condition of receiving the public subsidies. For example, Texas' "Chapter 313" program, which provided companies with 10-year discounts in their property tax bills for local school districts, required that companies employ at least 10 people in rural areas, or 25 in non-rural areas, and provide "certain healthcare benefits, offer the employees at least 1,600 hours of work per year and pay at least 110 percent of the average manufacturing wage for the county," according to the Texas Comptroller's Office.[70] But there is no mention of environmental compliance.

7 of 10

of the largest plastic plant recipients of tax breaks were owned wholly or in part by foreign companies.

Louisiana's Industrial Tax Exemption Program grants certain manufacturers two renewable five-year exemptions from paying 80 to 100 percent of all local taxes.[71] Companies that pledge to create or retain jobs are "favored" by the state's economic development agency in the evaluation of applications.[72] But the program does not actually require job creation or retention, or mandate that companies comply with state permits. Companies can be eligible for

state subsidies if they argue the taxpayer money will simply boost the efficiency of a plant or "prolong the life" of a company.[73] More than three decades ago, former Louisiana Governor Buddy Roemer attempted to tie tax breaks for industry to environmental permit compliance, but this provoked such a furious backlash from industry lobbyists that they helped drive him from office after a single term.[74] On February 21, 2024, current Governor Jeff Landry signed an executive order that reduced local government oversight and approval requirements for the tax breaks.

In Pennsylvania, Shell's use of "Keystone Opportunity Zone" tax breaks for 15 years require the company to create at least 400 new permanent full-time jobs and invest at least $1 billion.[75] But as is true in the other states, Pennsylvania does not tie the subsidies to environmental permit compliance.

When plastics companies are seeking tax breaks and public subsidies like these, they often make broad claims in press releases, on their websites, and at public meetings that they will be good corporate citizens and help their local communities. But pledges like this do not mean that the companies are required, in writing, to follow environmental laws as a condition for receiving their tax breaks or subsidies. For example, ExxonMobil and its Saudi business partners at SABIC, when they were seeking local school board and state approval of $249 million in tax breaks for their Gulf Coast Growth Ventures Complex north of Corpus Christi, promised on their website: "Company and regulatory programs will ensure operations are protective of public health, safety and the environment."[76] But when the companies finally signed their agreement with the Gregory Portland Independent School District on March 21, 2017, the document makes no mention of environmental requirements or the need to obey any state permits, as a condition of receiving the tax breaks.[77] The agreement requires that the company create 85 jobs and at average annual salaries of $59,408.[78] "The plant will manufacture polyethylene resin which is used

The Shell Monaca ethylene and plastics plant under construction northwest of Pittsburgh. Photo by Mark Dixon, Flickr.

in products such as film, plastic pipe, merchandise bags, milk jugs, food and beverage containers," the agreement states, without mentioning environmental permit compliance.[79]

This report does not attempt to quantify how many of the plastics companies that received subsidies actually hired the number of employees they promised to employ. But previous studies by other organizations have examined this issue and raised questions about the impact on local economies. For example, the Houston Chronicle published an investigation in 2021 called "Unfair Burden" that found that at least 30 companies in Texas had failed to fulfill job-creation promises they made to receive subsidies under the state's school district tax break program for corporations ("Chapter 313"), but faced no penalties or repercussions.[80] (Not all of these companies were plastics manufacturers, but included a variety of different industries.) Research by the Tulane University Environmental Law Clinic found that the promise of high-paying industrial jobs is often a false one for people of color.[81] The researchers found, for example, that in St. John the Baptist Parish in Louisiana, home to the third largest oil refinery in the nation and several chemical plants, people of color are about 70 percent of the working-age population but only 28 percent of the manufacturing workforce.[82]

A nonprofit organization, Together Louisiana, released a report in 2016 titled "Costly and Unusual" about the state's Industrial Tax Exemption Program that found its tax breaks cost local governments $16.7 billion in revenue over a decade.[83] Some jobs may have been created by the program, Together Louisiana concluded, but the costs were astronomical to taxpayers: $535,343 for each job. Overall, Together Louisiana found that the state was subsidizing corporations at five times the national average for states, which often compete against each other to attract new industrial facilities. Because of advocacy by Together Louisiana, Louisiana's program was reformed in 2016 so that companies after 2018 received only 80 percent reductions in their local tax bills, not 100 percent. In Texas, after protests by taxpayer groups, state lawmakers revised the school district tax break program in 2023, but they did not eliminate it.[84]

The cost to Louisiana taxpayers for job creation was

$535,343

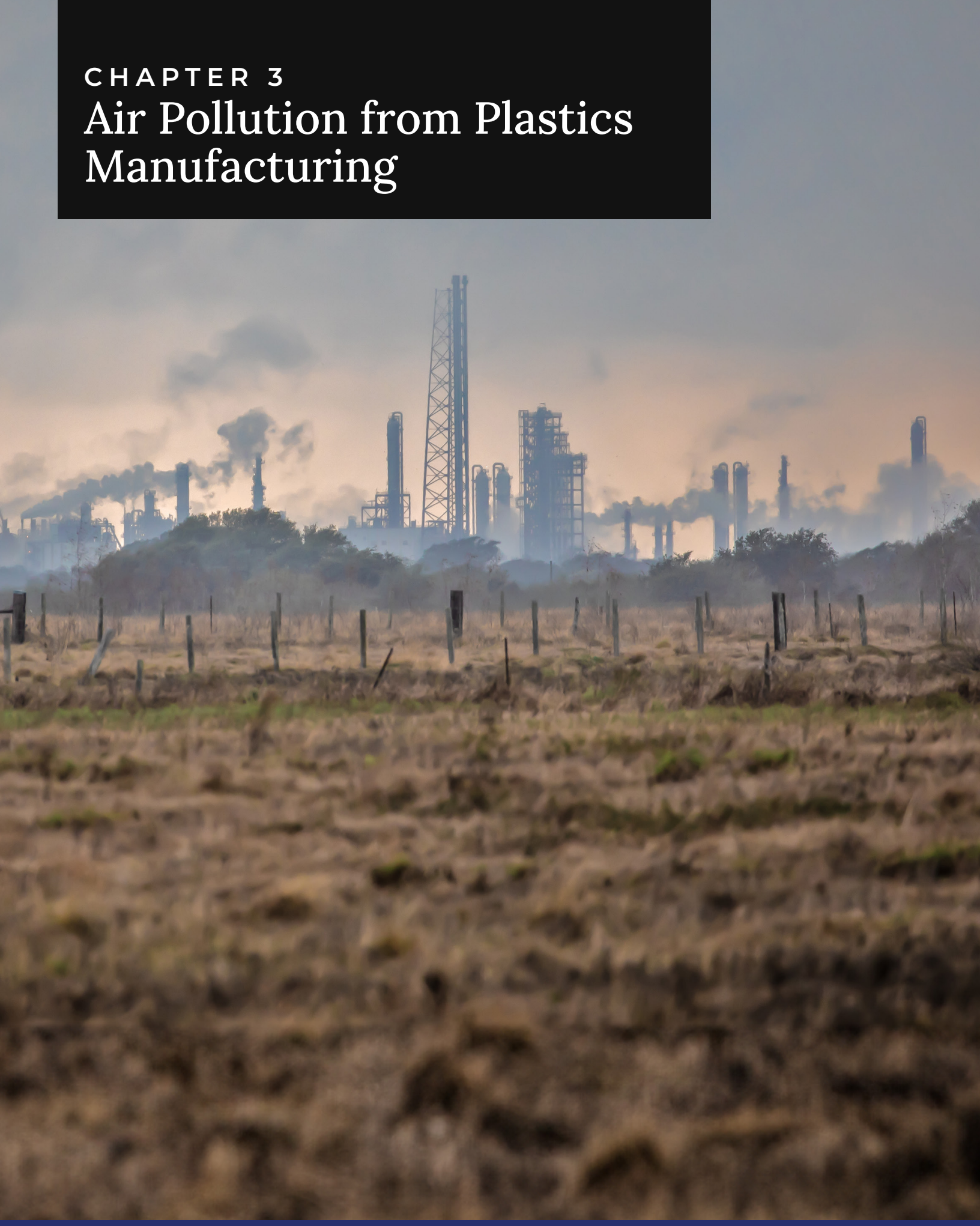
in public funds per job in the private sector. Meanwhile, public schools and local governments lost billions.

In Pennsylvania, the Ohio River Valley Institute, an environmental advocacy group, in June 2023 released a report titled, "A Cautionary Tale of Petrochemicals from Pennsylvania," about the Shell Monaca plastics plant northwest of Pittsburgh, which opened in 2022.[85] The study found that, despite the promises of Shell to uplift the local economy in Beaver County, the record shows that, since construction started on the plant: "Beaver County has seen a declining population, zero growth in GDP, zero growth in jobs, lackluster progress in reducing poverty, and zero growth in businesses—even when factoring in all the temporary construction workers at the site. In fact, the county has fallen behind both the state and the nation in nearly every measure of economic activity."

The fact that state and local governments are subsidizing multibillion-dollar corporations like Shell by surrendering local tax revenue makes some local residents all the more frustrated when the companies then fail to follow their state permits and foul the air, as discussed in the next chapters.

CHAPTER 3

Air Pollution from Plastics Manufacturing



Pollution rises from the smokestacks of the Formosa Plastics plant in Point Comfort, Texas. Photo by Julie Dermansky.

Air Pollution from Plastics Manufacturing

The petrochemical facilities covered in this report release significant air pollution every year. In 2021, companies reported emitting 27,923 tons of nitrogen oxides (NO_x), 17,988 tons of VOCs, 215,415 pounds of chlorine, 471,744 pounds of benzene, 510,863 pounds of 1,3-butadiene, and 212,924 pounds of vinyl chloride to state emission inventories (For pollution data on all plants, click here).[86] Companies also reported nearly 63 million tons of greenhouse gas emissions (as $CO2_e$) in 2021, about as much as 15 coal-fired power plants over the same period.[87]

These air pollutants are associated with various human health and environmental impacts. Nitrogen oxides are highly reactive. When they interact with VOCs in the atmosphere, ozone forms, which reduces regional visibility and may exacerbate lung problems like asthma and bronchitis.[88] VOCs, a class of organic chemicals that easily vaporize, include benzene, toluene, ethylbenzene, and xylene. Short-term exposure to these pollutants is associated with skin irritation, neurological symptoms like dizziness and headaches, and respiratory impacts. Prolonged exposure to benzene, a known carcinogen, can affect the kidneys and cause leukemia and other blood-related cancers.[89] Vinyl chloride is also a known human carcinogen and 1,3-butadiene is a probable carcinogen.[90, 91] Vinyl chloride is primarily used to produce PVC plastic and 1,3-butadiene is used to produce synthetic rubber.

The ten plastics plants that emitted the most benzene and 1,3-butadiene are listed in Tables 2 and 3. For lists of the top emitters of NO_x and chlorine, see Appendix D.

Table 2: Top Ten Emitters of Benzene in 2021

State	County/Parish	Parent Company	Plant Name	Benzene Emissions (lbs)
TX	San Patricio	ExxonMobil/SABIC	Gulf Coast Growth Ventures	45,983
KY	Marshall	Westlake	Calvert City*	40,824
LA	Calcasieu	LyondellBasell/Sasol	Lake Charles Complex	40,130
IA	Clinton	LyondellBasell	Clinton	39,422
TX	Harris	LyondellBasell	Channelview	29,879
TX	Brazoria	Dow	Freeport	29,612
TX	Orange	Dow	Orange	28,010
TX	Gregg	Eastman Chemical	Longview	24,120
TX	Nueces	LyondellBasell	Corpus Christi	22,614
TX	Jefferson	Motiva	Port Arthur	22,522

Source: State emission inventories; for more information, please see the methodology section in Appendix A. *Westlake owns three co-located plants in Calvert City: one produces PVC, one produces ethylene, and one produces chlor-alkali and vinyl chloride monomer. Emissions seen here are for the Ethylene and Vinyl plants.

Table 3: Top Ten Emitters of 1,3-butadiene in 2021

State	County/Parish	Parent Company	Plant Name	1,3-butadiene Emissions (lbs)
TX	Harris	LyondellBasell	Channelview	164,585
TX	Brazoria	INEOS	Chocolate Bayou	80,441
TX	Calhoun	Formosa	Point Comfort	60,291
TX	Harris	ExxonMobil	Baytown Olefins	52,524
TX	Gregg	Eastman Chemical	Longview	29,796
TX	Harris	Chevron Phillips	Cedar Bayou	14,817
TX	Brazoria	Chevron Phillips	Sweeny Old Ocean	13,812
TX	Jefferson	BASF/TotalEnergies	Port Arthur	13,069
IA	Clinton	LyondellBasell	Clinton	12,648
LA	Calcasieu	LyondellBasell/Sasol	Lake Charles Complex	11,642

Source: State emission inventories; for more information, please see the methodology section in Appendix A.

These toxic emissions will increase significantly over the next five years. Ten new plants and 23 expansion projects at 17 existing plastics plants have been proposed and are due to be completed between 2024 and 2029. EIP's review of government records found that companies have applied for or received Clean Air Act pre-construction permits for 20 of these projects, which could cumulatively release up to 4,705 tons of NO_x, 8,199 tons of VOCs, 1,591 tons of fine particulate matter, and more than 35 million tons of greenhouse gases annually if all move forward, according to their permits or permit applications.[92] As of November 1, 2023, only six had begun construction, and another twelve had been given the green light to move forward with construction by state agencies (see Table 4 below).

Table 4: Emissions from Plastics Plants Built or Expanded Since 2012 and Proposed for Future

Plant Status	Greenhouse Gas Emissions (tons per year)	NO_x Emissions (tons per year)	VOC Emissions (tons per year)	PM2.5 Emissions (tons per year)
Operating *	**62,622,852**	**27,923**	**17,988**	**3,891**
Under Construction	**6,227,985**	**1,010**	**1,488**	**334**
Proposed (total)	**29,290,242**	**3,694**	**6,711**	**1,256**
→Proposed, with approved permits	19,008,312	2,108	4,105	699
→Proposed, but awaiting air permits	10,281,930	1,586	2,606	557

*Annual emissions totals for operating plants built or expanded since 2012 come from company-reported data submitted to state air emissions inventories or EPA's Greenhouse Gas Reporting Program for the 2021 calendar year. Note: Annual emissions totals for proposed projects and those that are under construction represent potential emissions estimates provided by companies in their Clean Air Act permits or permit applications, compiled as of November 1, 2023. Permitting data and emissions estimates were unavailable for 13 projects included in this analysis; emissions totals are likely to change over time as more companies apply for or obtain permits. For more information on methods and data sources, please see Appendix A.

Underreporting of emissions

While reported emissions are an essential starting point for evaluating the impact of these facilities on air quality and surrounding communities, actual emissions are often under-reported. EPA cites several common sources of error with company-reported data.[93] Companies may exclude non-routine emissions caused by equipment malfunctions or sudden shutdowns, or emissions from the chronic leakage that plagues petrochemical plants. For example, the 2021 Texas emission inventory indicates that the annual benzene emissions from LyondellBasell's Equistar plant in Corpus Christi, Texas totaled 22,614 pounds. But this did not include an additional 1,626 pounds that the plant emitted during startups, shutdowns, or "upset" emission events.[94] To make matters more complicated, companies sometimes report emitting different amounts of pollution to different government agencies. Equistar reported emitting 21,520 pounds of benzene to EPA's Toxics Release Inventory that same year, which was 2,990 pounds less than what showed up in the Texas emission inventory.[95] Companies may also make errors when modeling emissions impacts. For all of these reasons, better air pollution monitoring is needed.

The need for better monitoring of dangerous pollutants escaping from plastics plants into surrounding communities is well documented. An April 2023 EPA technology review for fenceline monitoring at petrochemical facilities indicated that emissions from these plants are consistently underestimated.[96] The review involved placing fenceline monitors at 11 facilities to gather data on ambient air concentrations of hazardous chemicals (benzene, 1,3-butadiene, chloroprene, ethylene dichloride, ethylene oxide, and vinyl chloride) and comparing these concentrations to the modeled fenceline concentrations based on reported emissions from facility units. Seven of the facilities included in EPA's review were plastics plants examined in this report. In every case except one, the modeled fenceline concentrations were lower than the monitored concentrations. For example, the air monitors in EPA's review found that the levels of benzene monitored at the fencelines ranged from three times to more than 14 times higher than previously known, based on computer modeling and under-reporting by the companies. This EPA review reveals potentially significant problems in current modeling practices, suggesting exposure risks to nearby communities are underestimated.

The levels of benzene, a carcinogen, monitored at the fencelines of plastics plants were up to

14 times higher

than previously known, due to under-reporting by companies and inaccurate computer modeling.

In 2023, the EPA proposed two significant rules that could improve emission reporting and significantly reduce emissions of hazardous pollutants (like benzene, 1,3-butadiene, and vinyl chloride) released by many of these plants. One is EPA's air emission reporting requirement revisions, which could include startup/shutdown and at least some malfunction emissions in annual emission inventories.[97] The other rule, emission standards for the chemical manufacturing industry[98] (which we discuss below), would apply to 24 of the 50 plants covered in this report. EPA is required by a consent decree to issue a final rule in spring 2024.[99]

One proven method of more accurately measuring air pollution that would be advanced by EPA's proposed rule for the chemical manufacturing industry is fenceline monitoring. Companies place monitors at the outside edges of a facility to measure the ambient air concentrations of specific chemicals. These measurements can be used to assess the reliability of reported emissions and ensure local communities are not being exposed to hazardous levels of certain air pollutants. While fenceline monitoring is required at all petroleum refineries in the U.S., it is not yet required by regulation at petrochemical and plastics facilities like those examined in this report. Only 16 of the 50

Air monitor used by local volunteers to measure emissions from the Shell Monaca plastics plant in Pennsylvania.

facilities included in this report are currently required to employ fenceline monitoring – and for these facilities, the monitoring is required not by regulation, but because of litigation and enforcement actions.[100] (For a list, see Appendix E.)

More fenceline monitoring would be required by EPA's April 2023 proposed revisions to the National Emission Standards for Hazardous Air Pollutants that apply to facilities that make hazardous organic chemicals, synthetic organic chemicals, or certain types of polymers and resins. One of these amendments would require fenceline monitoring for the hazardous chemicals benzene, 1,3-butadiene, chloroprene, ethylene dichloride, ethylene oxide, and vinyl chloride.[101] The rule would also require chemical plants to clean up emissions whenever fenceline concentrations of any of these pollutants exceeded certain action levels.

EPA's proposal is based on similar monitoring and cleanup standards for oil refineries, required by EPA since 2018, that have already helped to reduce benzene fenceline concentrations from these facilities by 30 percent since 2019.[102]

EPA estimates that its proposed new regulations would expand fenceline monitoring requirements to about half of the 50 plastic plants in this study within three years.[103] However, significant polluters could be exempt from the fenceline monitoring requirement, including the Indorama Westlake plant in Calcasieu Parish, Louisiana, which reported emitting 5,112 pounds of benzene in 2021. While requiring fenceline monitoring at some facilities is a step forward, EPA should take swift action to add to the proposed regulations so that the fenceline monitoring requirements apply to all the plastics plants not covered in its proposed rulemaking. These facilities release significant amounts of carcinogenic and hazardous air pollutants, and accurate assessment of those emissions is critical for enforcing emission limits designed to protect surrounding communities.

Residents of Lake Charles, Louisiana, a community surrounded by billion-dollar petrochemical plants, were forced out of their homes by flooding during Hurricane Delta in 2020. Photo by Associated Press

Impact on communities of color

Many of the neighborhoods around these plants are already overburdened with air pollution. Overall, more than 591,000 people live within three miles of the 50 operating plants in this study, and 66 percent of these residents are people of color. For example, nearly 37,000 people live within three miles of the Formosa Baton Rouge plant in Louisiana, and 95 percent of them are people of color. Sixty-two percent are low-income. Within three miles of this plant, the air toxics cancer risk, an EPA measure of cumulative cancer risk in an area, is higher than in 99 percent of the country, and the plant has been out of compliance with its Clean Air Act permit for the last three years, according to EPA's Enforcement and Compliance History Online (ECHO) database.[104]

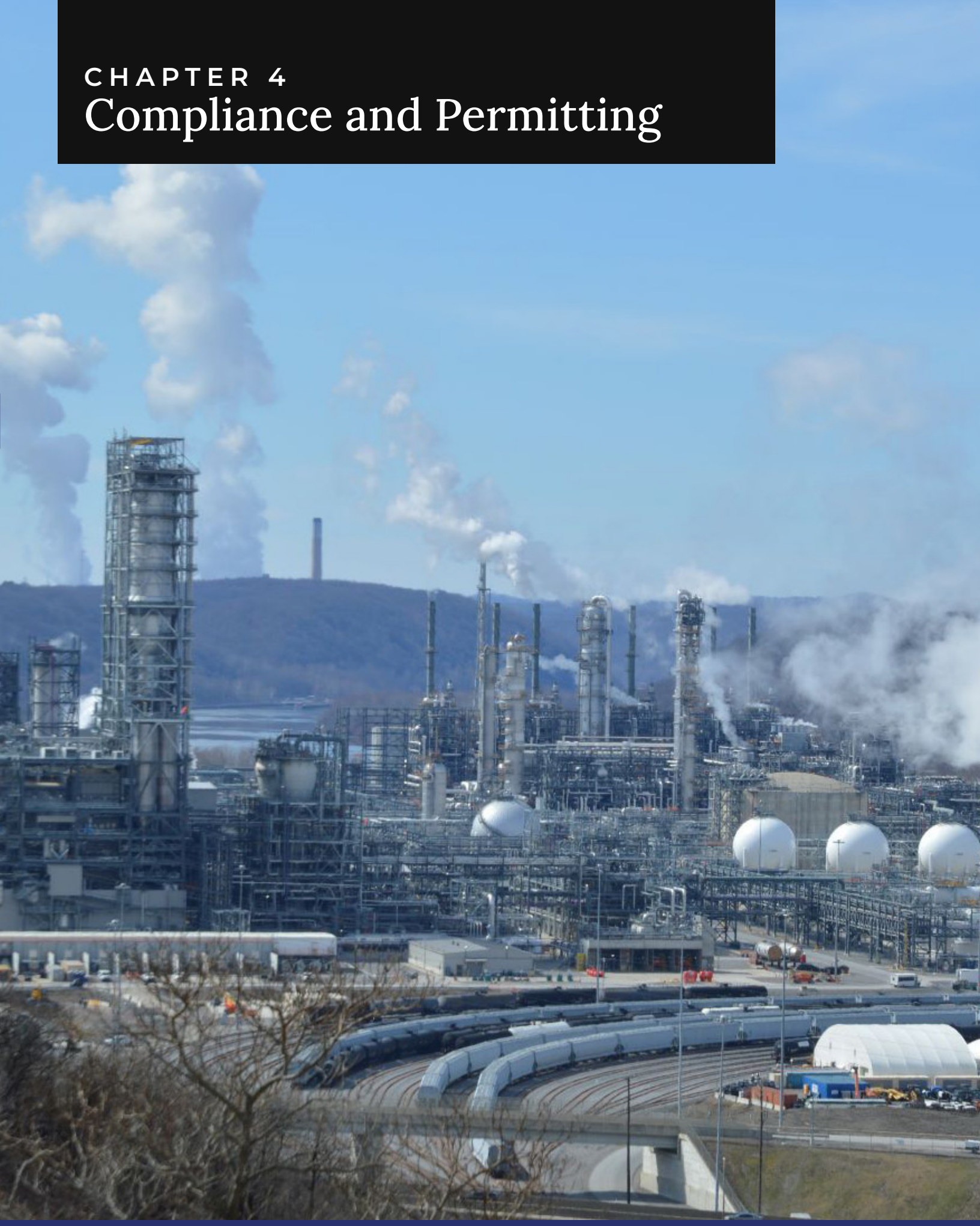
In many cases, communities impacted by the emissions from plastics plants overlap because the facilities are clustered together, especially along the Texas and Louisiana gulf coast, where 30 plants are located within three miles of one another. For example, in Louisiana's "cancer alley" along the Mississippi River, the residents within three miles of the Dow Plaquemine plant are disproportionately people of color and low-income when compared to the national average. The same is true for the residents living near two other petrochemical plants in Plaquemine, both owned by Shintech. Iberville Parish, where Plaquemine is located, has cancer rates that far exceed the national average (with 560 cases per 100,000 people in Iberville Parish vs. 403 cases per 100,000 people nationwide).[105, 106] According to EPA's March 2023 review, the Dow Plaquemine plant exceeded the proposed "action level," or level at which a root cause analysis and corrective action plan would be required, for ethylene oxide, a known carcinogen. The plant is currently under a consent decree that requires fenceline monitoring, but unlike Shintech, the Dow plant is not included in the universe of plants that EPA expects will be subject to the updated EPA rule.

66% of the **591,000** residents who live within three miles of these plants are people of color.

Some of the pollution harming these communities is legal and considered part of routine operations, within the permitted limits set by state and federal regulations. But some of the pollution is also illegal or the result of breakdowns or accidents, which will be discussed in the next two sections of this report.

CHAPTER 4

Compliance and Permitting



Smokestacks and emissions from the Shell Monaca plastics plant in Pennsylvania.

Compliance and Permitting

Despite the industry's lofty promises to operate safely and be good environmental stewards, EPA records indicate that many plastics plants have a dismal track record when it comes to complying with environmental laws. According to a review of EPA data available through its ECHO database, about a third (17 of 50) of the recently expanded or newly built plastics plants examined for this report were listed as having "high priority violations" of the Clean Air Act during the third quarter of 2023, which was the most recent data available at the time this report was researched.[107] Among these, more than two thirds (12 plants) were listed as being in noncompliance with the Clean Air Act every quarter for the last three years.

Data from ECHO also indicate that 84 percent (42 of 50) faced administrative orders or judicial actions between October 2020 and September 2023 because they failed to comply with the Clean Air Act. In fact, 14 plants faced more than three separate enforcement actions over this three-year period.[108] And one, the Enterprise Mont Belvieu plastics plant in Chambers County, Texas, was hit with seven enforcement actions for Clean Air Act violations during this time. In the same region, the LyondellBasell Channelview plant in Harris County, Texas, east of Houston, had six enforcement actions.

While data from EPA's ECHO database offer a glimpse of the compliance and enforcement history of these plants, the data are not always complete. For example, in Texas, regulators routinely decline to enforce numerous air pollution violations by industries, allowing companies to argue that many of their pollution releases should be excused because they are allegedly uncontrollable and unexpected and therefore can be shielded by a loophole called the "affirmative defense."[109] States – which have primary enforcement responsibilities under the Clean Air Act – do not always update or inform EPA's ECHO database about enforcement actions taken at the state level.

When enforcement actions are taken, penalties are relatively infrequent and small, especially in contrast to the multibillion-dollar revenues reported by plastics companies. For example, the LyondellBasell Channelview plant had to pay a total of $593,990 in penalties for six Clean Air Act formal enforcement actions from 2020 to 2023. This is a relatively small amount of money, considering LyondellBasell generated more than $50 billion in revenues in 2022 alone[110] and spends more than $800 million each year just on "goods and services purchases" at the Channelview plant, according to their website.[111] Enterprise's Mont Belview plant had to pay $247,563 in penalties for violations over the last three years, but that was less than half of one percent of the company's revenues in 2022 alone.[112]

Black smoke pours from a flare at the Formosa Point Comfort plastics plant on the Texas Gulf Coast.
Photo by Diane Wilson, San Antonio Bay Estuarine Waterkeeper.

Table 5: Top 10 Plastics Plants with the Most Clean Air Act Enforcement Actions (October 2020 – September 2023)

State	County/ Parish	Parent Company	Plant Name	No. of Clean Air Act Enforcement Actions	No. of Penalties	Penalty Amount ($)
TX	Chambers	Enterprise	Mont Belvieu	7	5	$247,563
TX	Harris	LyondellBasell	Channelview	6	6	$593,990
TX	Orange	Dow	Orange	6	5	$9,752,375
TX	Brazoria	Chevron Phillips	Sweeny Old Ocean	5	4	$507,265
TX	Gregg	Eastman Chemical	Longview	5	5	$364,634
TX	Harris	Chevron Phillips	Cedar Bayou	4	3	$3,555,626
TX	Calhoun	Formosa	Point Comfort	4	4	$3,210,827
LA	Iberville	Dow	Plaquemine	4	3	$3,158,500
LA	Calcasieu	Westlake	Sulphur (Petro 1 & 2)	4	3	$2,250,000
TX	Harris	INEOS	Battleground Complex	4	4	$1,266,255

Source: EPA's Enforcement and Compliance History Online database (ECHO), as of December 2023. Facilities are ranked by number of EPA or state formal enforcement actions between October 2020 and September 2023.

Common violations shared among the most penalized facilities in the EPA ECHO database include failure to properly operate industrial flares, failure to operate monitoring equipment, and releases of harmful air pollution. According to Clean Air Act violation case information in EPA's ECHO database, failure to operate industrial flares at these facilities often causes a release of excess emissions of VOC's, hazardous air pollutants, and greenhouse gases. Benzene – a dangerous carcinogen – is specifically mentioned in Clean Air Act cases listed in EPA's database for 8 of the 10 most penalized facilities.

Permit modifications to allow more pollution

Companies often request that state agencies or EPA amend or modify their Clean Air Act permits to account for design changes that may have taken place during construction of new facilities or large expansion projects. While it is reasonable to allow companies to update their permits to reflect "actual" construction and operating conditions – as long as those changes are not significant enough to require a new permit – these after-the-fact permit amendments often obscure a project's true environmental impact, especially when emission increases are approved in piecemeal fashion through a series of "minor" amendments that are very difficult to challenge and may be exempt from public review.

In some cases, for example with the Indorama plant in Louisiana, states have responded to violations by simply increasing emission limits. EIP's review of government records found that states modified the permits for at least 15 of the 50 recently built or expanded plastics plants examined in this study to allow higher emissions of one or more regulated pollutants. One additional facility, the Roehm America's Bay City MMA (methyl methacrylate) plant in Texas, which was initially permitted and is now under construction, has also already received state approval to increase emissions. Together, these after-the-fact permit amendments allow emissions of air pollutants to increase by nearly 3,000 tons per year—including 250 tons per year of nitrogen oxides and 530 tons per year of VOCs. For reference, 250 tons per year is the major source threshold for nitrogen oxides in ozone "attainment" areas, which are areas that are meeting the National Ambient Air Quality Standards. The threshold for Houston, which is in non-

attainment for ozone, is much lower.

One example is the Indorama Westlake ethylene plant, which experienced repeated air pollution violations, flaring incidents, and other problems that resulted in the LDEQ issuing 13 warning letters to the plant from 2019 through 2023.[113] But instead of taking formal enforcement action, four times the LDEQ approved changes to the plant's Clean Air Act permit that allowed the plant to release more air pollution, legally.[114] The changes allowed the plant to more than triple its allowable emissions of VOCs, with the levels permitted from the plant rising from 189 tons per year to 648 tons per year. The allowed emissions of carbon monoxide from the plant more than doubled, from 432 tons per year to 965.

Three plastics plants located along the Texas Gulf Coast (in Brazoria, Calhoun, and Nueces counties) were responsible for over 1,200 tons per year in allowable air pollution[115] increases from retroactive design and permit changes. These three plants also added over 645,000 tons of permitted greenhouse gas emissions since their projects were first authorized by state agencies.[116]

Texas and Louisiana modified the permits for 15 plants, allowing them to emit

3,000 tons

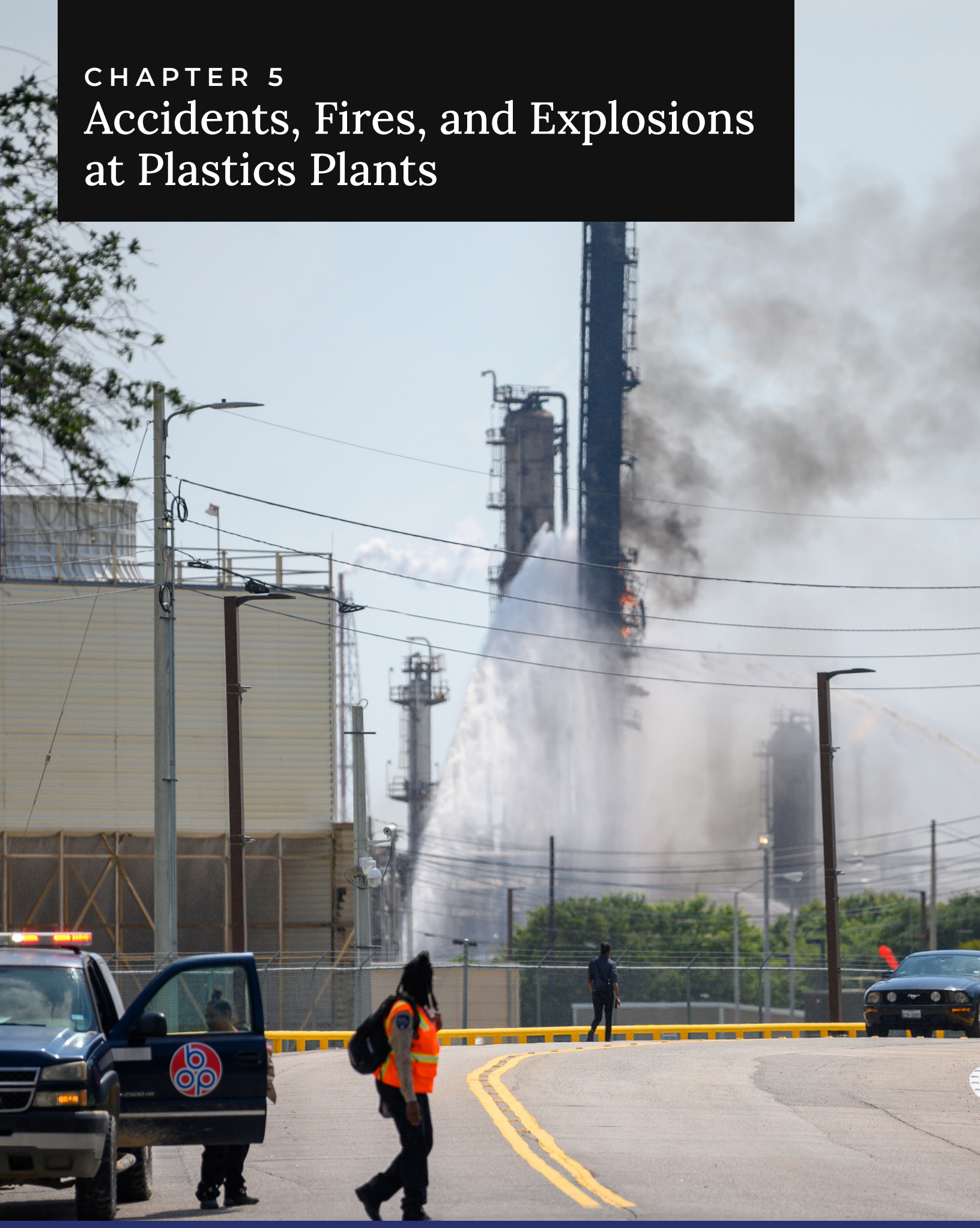
per year more air pollution.

South of Houston, at the Chevron Phillips Sweeny Old Ocean Facility in Brazoria County, the TCEQ approved a revision of the plant's air pollution control permit in 2020 that authorized construction of a new polyethylene plant and allowed the facility to legally release seven times more carbon monoxide (increasing its annual permitted limit to 459 tons per year) and seven times more nitrogen oxides (raising the limit to 100 tons per year).[117] At the Formosa Point Comfort plant in Calhoun County, TCEQ in 2020 approved a permit revision that authorized construction of a new ethane cracker and propylene plant, and allowed the facility to release 13 times more sulfur dioxide (which can harm lung function and trigger asthma attacks[118]), raising the legal limit to 118 tons per year.[119] At the LyondellBasell Corpus Christi Complex in Nueces County, the state agency in 2021 changed the plant's permit to allow 15 percent more VOCs, raising the limit to 138 tons per year, in order to accommodate a previously approved 810 million pound per year ethylene capacity increase.[120]

All of these permit changes allowed more air pollution during the plant's routine, daily operations. The next section of this report looks at pollution released in more dangerous situations, including breakdowns, malfunctions, fires, and accidents. Unfortunately, these incidents happen so frequently for the plastics industry – especially during start-ups – that they are the norm.

CHAPTER 5

Accidents, Fires, and Explosions at Plastics Plants



On July 31, 2019, an explosion and fire at the ExxonMobil Baytown Olefins plant injured dozens of workers. Photo by Shutterstock.

Accidents, Fires, and Explosions at Plastics Plants

Nearly all of the new or expanded plastics plants that we studied reported accidents, malfunctions, or industrial "upsets" over the last five years. Forty-seven of the fifty plants had a total of at least 1,242 emissions incidents of various kinds that released nearly 34 million pounds of air pollution from 2018 through 2023, according to self-reporting by industry to state environmental agencies.[121] These included several explosions, fires, and equipment failures that released dangerous chemicals and illegal air pollution, sometimes injuring or killing workers and frightening local residents with window-rattling blasts and plumes of black smoke or flames (see the examples and details later in this section and in Appendix B).

Each state has different reporting requirements for these unauthorized discharges of air pollution. In Texas, companies are required to disclose unauthorized pollution above certain threshold levels to the State of Texas Electronic Emissions Reporting System (STEERS). In Louisiana, unauthorized pollution that constitutes an "emergency condition" must be reported to the Louisiana State Police, regardless of how much pollution is released or if permit limits are exceeded. For more information on how these events are defined and quantified in this report, as well as data sources and caveats, please see the methodology section in Appendix A. For information about the number of incidents at the plants included in this report, see Appendix C.

Although these industrial emission events release more pollution (and sometimes a lot more) than allowed under their permits, petrochemical companies often claim these emissions events are "unpreventable" and so rarely must pay substantial penalties or take serious action to fix the problem. This is especially true in Texas, where companies often use a loophole called the "affirmative defense" to claim they should not be penalized for unpermitted air pollution releases so long as they are unpreventable and reported to the TCEQ.[122] Similar emission events happen frequently in neighboring Louisiana, which also has a large plastics industry. But Louisiana and Texas define industrial "emissions events" or "air incidents" differently, and so it is difficult to directly compare the number of emission events reported by Texas facilities to the air incidents reported by those in Louisiana.

Flames blowing in the wind from a flare at the Shell Monaca plastics plant in Pennsylvania. Photo from Eyes on Shell.

Texas law requires prompt online disclosure of emissions, along with public reporting of the quantity of each pollutant released, the duration of those "emission events" and a brief explanation of what caused them, among other information.[123] EPA should require other states, including Louisiana, to adopt these online disclosure requirements. However, while the public reporting of accidental releases in Texas is required, the state almost never takes any meaningful action in response to these disclosures, no matter how much air pollution is released. A 2017 report found that TCEQ penalizes only about three percent of unexpected emissions events each year.[124] Even in the rare cases in which TCEQ brings an enforcement action, the penalties it imposes are uniformly far below the state-law maximum rate, which itself is significantly lower than the maximum rate under the federal Clean Air Act.[125] Below is a list of the Texas facilities with the most reported "upset" emissions incidents, and how much pollution they reported releasing during these events. (The totals do not include how much pollution the facilities released during "normal" operations.)

Table 6: Top 10 Most Reported "Upset" Emission Events by Plastics Plants in TX, 2018-2023

County/ Parish	Parent Company	Plant Name	Emission events reported	Pounds of Pollution Released During Events
Brazoria	Dow	Freeport	147	1,851,871
Chambers	Enterprise	Mont Belvieu	139	1,551,984
Harris	Chevron Phillips	Cedar Bayou	91	4,472,483
Calhoun	Formosa	Point Comfort	75	2,269,614
Harris	LyondellBasell	Channelview	68	744,862
Brazoria	Chevron Phillips	Sweeny Old Ocean	59	799,981
Jefferson	Motiva	Port Arthur	58	1,175,914
Brazoria	INEOS	Chocolate Bayou	54	2,987,759
Gregg	Eastman Chemical	Longview	49	488,416
Harris	ExxonMobil	Baytown Olefins	47	1,281,847

Source: TCEQ Air Emission Event Report Database (January 2018 – June 2023)

These incidents include unpermitted releases of pollutants like sulfur dioxide and VOCs during the startup or shutdown of plants, or during maintenance activities. Sometimes, the incidents are dramatic, including explosions and fires that release dangerous chemicals that require the emergency closure of local roadways or shelter-in-place advisories for local communities.

What follows are case studies with examples of fires, explosions, chemical releases and other emergency incidents at plastic plants and the harm they caused to local residents.

CHAPTER 6

Local Examples

How a Plastics Company Based in Thailand Tainted the Air in Louisiana and Avoided Taxes

Roishetta Ozane, who lives near the Indorama plastics plant in Westlake, Louisiana, founded a nonprofit group called The Vessel Project to aid fellow victims of climate disasters like the flooding that destroyed her home. Photo by Roishetta Ozane.

WESTLAKE, LOUISIANA - Roishetta Ozane, a mother of six who lives in southwest Louisiana, was working as a teacher's assistant with Calcasieu Parish Public Schools, struggling to pay her bills on $17,000 per year.

Then Hurricane Laura struck in August 2020, knocking a tree onto the roof of her Section 8 rental house, and blowing in her back door and part of her back wall. Six weeks later, this was followed by flooding from Hurricane Delta, which forced her and her six kids to take shelter in a three-bedroom FEMA (Federal Emergency Management Agency) trailer for two years.

In the aftermath of the storms, she noticed that the chemical plants and oil refineries all around her kept expanding, but the money never seemed to trickle down into her battered neighborhood or her children's

The entrance to Indorama's plastics manufacturing facility in Westlake, Louisiana.

classrooms.
"We live in a community that is surrounded by billion-dollar industries, and you would think that these communities would have everything you need if a disaster came," said Ozane, who today runs a nonprofit called the Vessel Project that helps victims of climate-related calamities.[126] "But the truth of the matter is we don't benefit from these industries. They don't hire local people. And they don't pay taxes."

As an example, Louisiana approved at least $73 million in tax breaks to just one of these companies – the Thailand-based Indorama chemical company – to re-open a long-closed plastics plant not far from Ozane's home.[127]

The plant had been operating under different names, including Equistar and Occidental Chemicals, on Highway 108 in Westlake for decades but closed in 2001. The new owner, Indorama Ventures Olefins LLC, renovated and re-opened the long-dormant plant between 2016 and 2021.[128] In other states, the owners of the 250-acre industrial complex would have paid millions of dollars a year in taxes to the local government, including for schools, police and fire protection, roads, and parks.

But from 2016 to 2022, Louisiana Economic Development and later the Calcasieu Parish Public Schools approved three tax breaks for the Indorama plant through the state's Industrial Tax Exemption program.[129] The $73 million in tax breaks include about $18 million in lost revenue for local schools over a decade, as well as slightly under $15 million lost for local law enforcement, and $41 million lost for roads and other local services, according to state records.[130] These tax breaks were awarded despite the fact that, because of inadequate funds, Calcasieu Parish public schools already suffer from shortages of teachers and bus drivers and the air conditioners often do not work in hot weather, Ozane and other local parents complain.

Louisiana granted tax breaks for all 14 of the plastics plants examined for this report. These subsidies are worth at least $5.6 billion in lost local revenues over a decade, including $1.8 billion lost for classrooms and school children, $1.1 billion lost for law enforcement, and $2.7 billion lost for other local services, such as roads, according to state records and calculations by Together Louisiana.

"I was very upset" about the subsidies for the industry, said Ozane.

Indorama argued that it deserved subsidies from local taxpayers because of the good that it would do for local people, including by hiring 136 employees.[131] "The company is committed to being a positive influence in Southwest Louisiana," Indorama said in one brochure passed out at a public meeting.[132] "The company plans to meet or exceed all environmental regulations."

> **"Think about it:** if we made them pay even a portion of the tax breaks they are getting, our kids could have everything they need. Our roads could be better, our drinking water could be cleaner."
>
> - Roishetta Ozane

But public records show Indorama did not comply with the pollution limits in its state-issued permit, and it did not hire all the workers it promised to hire, according to EPA and state records.[133]

During the facility's start up, the plant experienced repeated mechanical failures that led to emergency flaring of

A billboard asking about industrial cancer risk rising above the smokestacks of the Indorama plastics plant and other industries in Westlake, Louisiana.

gases beyond legal limits set in the plant's Clean Air Act permit. The plant's flare was permitted to release six tons of VOCs a year. But during the first five months in 2019 it released more than 90 times that much – 555 tons, according to a letter from the company to the LDEQ.[134]

According to the company, the plant "experienced complications regarding start-up… There were several upset events that necessitated use of the flare. This use has resulted in Flare No. 1 exceeding the permitted tons per year emissions limit for various pollutants."[135]

The renovation of the plant was completed in 2018, but it was shut down several times because of repeated mechanical problems before starting back up in 2021. After one emergency shutdown in 2019, Indorama reported 15 emergency incidents that released nearly 61,000 pounds of air pollution between February 2020 and January 2023, according to state records.[136] The pollution included 1,600 pounds of a known carcinogen, 1,3-butadiene, and 650 pounds of benzene, also a carcinogen, as well as 41,280 pounds of ethylene and 15,438 pounds of propylene, chemicals that can cause dizziness and headaches.

On August 1, 2020, there was a buildup of gases at the plant. Lightning struck a piece of machinery, causing an explosion and fire that injured two employees, with one suffering first degree burns to his neck and ears, state records show.[137] Black smoke poured into the air and surrounding community, along with more than 14,000 pounds of ethylene and propylene.

James Hiatt, director of For a Better Bayou, a local nonprofit, remembers seeing the flaring and smoke from miles

away: “A toxic dragon is what it was, just puffing toxic smoke and fire.”[138]
In another incident, on June 10, 2022, faulty equipment caused the release of nearly 140 pounds of benzene gas, a carcinogen. Air quality monitoring conducted after the incident showed benzene at potentially dangerous levels, forcing state police HAZMAT teams to shut down nearby Highway 108 for three hours.[139]

Neighbors of the plant complained repeatedly to regulators about these incidents and the loud flaring from the facility, state records show. The Indorama plant does not have fenceline air monitoring devices installed that could alert local residents and regulators to potentially dangerous chemical releases.[140]

“It shook the windows of our house. It was grumbling, roaring sound – very loud,” recalled Victoria Gobert, a resident who lives nearby in Sulfur.[141] “The windows would shake, and I was really scared.”

Pastor Allan Upton, who runs a church not far from the Indorama plant, said he noticed an increase in throat irritations and upper respiratory tract infections among his congregants after the Indorama plant started up. “I’ve been living here for 35 years, and I’ve never witnessed the amount of upper respiratory infections and sinus infections since that plant reopened,” Upton said.[142] “It’s just constant sinus and respiratory distress. I can feel it in my throat right now. And it’s not normal.”

Chemical tanks at the Indorama plastics plant in Westlake, Louisiana.

In response to frequent permit violations and other problems at the plant, neither EPA nor the LDEQ imposed any penalties. Instead, the state agency issued 13 warning letters to Indorama, according to EPA’s ECHO database.[143]

Rather than taking formal enforcement action, four times between August 3, 2016, and March 1, 2023, the LDEQ approved changes to Indorama’s permit that allowed the plant to release more air pollution, legally, according to state records.[144] Local people were outraged by the permit increases, and protested in emails and letters to state regulators – but were largely ignored.

“The way they have just blatantly ignored the rules and laws for years is not acceptable,” Lake Charles resident Nikki Lafuria wrote in an email to LDEQ.[145] “Our disease rates are already the highest in the nation, we can‘t afford allowing a company that continues to pay to pollute to continue operating.”

Startup of Texas Plastics Plant Followed by Wave of Pollution Violations

Ground flare at the Exxon SABIC Gulf Coast Growth Ventures petrochemical plant in Gregory, Texas on Dec, 6, 2021. Photo by Julie Dermansky.

GREGORY, TEXAS – Nearly two years after one of the largest plastics plants ever built in the U.S. began operations in this Gulf Coast town, some residents say they have seen none of the promised benefits from the plant, which is jointly owned by ExxonMobil and the Saudi Arabian government.

However, neighbors have seen the Gulf Coast Growth Ventures Complex consume vast amounts of water in a drought-stricken region, suck up a half billion dollars in local tax breaks, and commit 63 air and water pollution violations, according to state records.[146]

"The residents aren't getting anything," local resident Genoveva Garcia Labeaga complained.

The plant looms north of Corpus Christi, on the outskirts of Portland, in the tiny town of Gregory, which has a population of 1,740 that is 90 percent Latino. Taking up 1,350 acres, the plant looks like a small city plunked down in the middle of cotton fields and wind farms, its lights clearly visible from all over town at night. Sometimes, the plant's flares fill the night sky with an orange glow.

The facility takes ethane from natural gas and, via a process called steam cracking, transforms it into up to 1.8 million metric tons per year of ethylene, one of the building blocks of plastics. The plant also has the capacity to produce up to 1.3 million metric tons per year of polyethylene and 1.1 million metric tons per year of monoethylene glycol, two other plastics building blocks. These products end up being used in packaging, construction materials, clothing and automotive coolants, among other things.[147]

In March 2017, the Gregory-Portland Independent School District approved $249 million in property tax breaks for Gulf Coast Growth Ventures facility over a 10-year period from 2022 through 2032.[148]
The tax incentives benefit ExxonMobil, the world's largest non-government-owned energy company, which made

Gulf Coast Growth Venture's ethane cracker furnaces used for ethylene production on the right, distillation towers center, and to the left, the facility's monoethylene glycol (MEG) unit.

$55.7 billion in profits in 2022.[149] The other investor in the project, Saudi Arabia's Basic Industries Corporation, or SABIC, is majority-owned by Saudi Aramco, which is arguably the world's most profitable business.[150]

Encarnacion "Chon" Cerna, a Portland resident and retired chemical engineer, said the school board was "stupid" for giving the tax breaks to such massive companies.

"The independent school district needs to be dedicating the time to educate children and bring up the ratings of our schools instead of dealing in things they don't understand," Cerna said.[151] "Who from the kingdom of Saudi Arabia needs tax breaks from Texas?"

The decision to grant the tax break came after fierce debate at local school board meetings that drew hundreds of angry residents.

In an email to residents ahead of the school board vote, project leader Robert Tully said ExxonMobil and SABIC "will follow through with our Good Neighbor Commitments on health and safety, quality of life, education and workforce development, and being good environmental stewards."[152]

The plastics plant asserted on its website: "Health, safety and environmental protection are core values for Gulf Coast Growth Ventures… Company and regulatory programs will ensure operations are protective of public health, safety and the environment."[153]

But public records show that between the plant's startup process began in December 2021 and April 2023, the facility experienced 10 unpermitted (meaning illegal) emission incidents that released 560,802 pounds of air pollutants.[154] These included equipment failures, emergency flaring, and unplanned shutdowns. One of these incidents, between Aug. 30 and Sept. 1, 2022, sent over 280,000 pounds of harmful chemicals into the air, including 97,000 pounds of nitrogen oxides, which contribute to smog and acid rain. News reports state that emergency flares at the facility burned for two days and could be seen from 20 miles away.[155]

The plant does not currently have a fenceline monitoring system that could notify the community and regulators about high levels of pollutants escaping into the neighborhood. However, if EPA moves ahead with proposed new regulations, the plant would be required to install fenceline monitors.

Increased monitoring would be helpful because the potential threat to local residents is clear. The plant already has racked up 63 environmental violations in less than two years, according to TCEQ records. These include failure to comply with limits for pollutants such as nitrogen oxide and carbon monoxide, failure to properly sample and analyze discharges of stormwater from the site, and failing to properly operate and monitor its flares.[156]

Repeated Air Pollution Violations at Taxpayer-Subsidized Shell Plant in Pennsylvania

A flare at the Shell Monaca plastics plant in Pennsylvania. Photo by The Breathe Project.

POTTER TOWNSHIP, PENNSYLVANIA - After receiving $1.65 billion in tax incentives and subsidies from the state of Pennsylvania, Royal Dutch Shell constructed a sprawling ethane cracker on the banks of the Ohio River in Monaca, Pennsylvania, about 30 miles northwest of Pittsburgh.[157]

The Shell Monaca plant, built between 2017 and 2022, processes ethane from natural gas into polyethylene pellets called nurdles, a raw material used to make various plastic products.[158]

"Building this world-class facility is a fantastic achievement," Huibert Vigeveno, Shell Downstream Director, boasted in a press release.[159] "In delivering this facility we've had a strong and innovative safety focus; invested in the community through employment and education; and helped repair and improve the local environment by remediating a brownfield site."

But between January 2022, when the startup process for the plant began, and the end of June 2023, the facility suffered at least 51 malfunctions and was hit with 16 state air pollution violation notices, according to state records.[160, 161]

One notable equipment failure reported by Shell was caused by a device used to separate ethane and ethylene called a "C2" splitter. As startup processes were underway, the C2 splitter malfunctioned several times, leading to a shutdown of the Ethane Cracking Unit and emissions from the malfunction event during a 17 day stretch in October 2022, according to state records.[162] The event released close to 90 tons of carbon monoxide, 52 tons of VOCs, and 20 tons of nitrogen oxides.

A failure at the plant's wastewater treatment facility in November 2022 released more than 4,000 pounds of benzene, a carcinogen.[163] Shell then reported an additional 444 pounds of excess benzene emissions from the

wastewater plant between April 11 and April 20, 2023.[164]

Local residents complained about excessive flaring from the plant that lit up the clouds with an orange glow that looked like a bomb blast lingering in the night sky over western Pennsylvania. Others reported deafening roaring sounds, like an airplane taking off, and foam from the plant floating down the Ohio River.

The Pennsylvania Department of Environmental Protection then stepped in and imposed a $5 million penalty on May 24, 2023, and required Shell to spend another $5 million on local environmental projects.[165]

Because the plant repeatedly exceeded its permitted air pollution limits, including for VOCs and nitrogen oxides, the Clean Air Council and Environmental Integrity Project sued the plant on May 11, 2023 and then on December 12, 2023, documented additional violations.[166]

“Shell’s persistent law-breaking must end,” said Joseph Minott, then the Executive Director of the Clean Air Council.[167] “The community will not tolerate dangerous pollution events that risk the health of families across Beaver County and beyond.”

The smokestacks of the Shell Monaca ethylene plant in Pennsylvania.

CHAPTER 7

Conclusion and Recommendations

Conclusion and Recommendations

Global plastics production has more than doubled in the past two decades, reaching 489 million metric tons in 2023, and we are on track to produce around 1 billion metric tons of plastic every year by 2050.[168] The U.S. is the world's second-largest producer of plastics, and the industry is rapidly expanding, with several new plants or large expansion projects planned in the U.S. over the next five years. The rapid growth of this industry has been fed by the price of natural gas and natural gas liquids, which have been driven downward by the spread of hydraulic fracturing and horizontal drilling. But also contributing are millions of dollars in public subsidies. Of the 50 plants examined in this report, at least two thirds (32) received state and local government subsidies worth a total of nearly $9 billion – which averages to about $273 million in taxpayer dollars per plant.[169]

Once subsidized and permitted, plastics plants burden nearby communities with substantial volumes of harmful pollution. In 2021 alone, these 50 plants reported releasing 27,923 tons of NO_x, 17,988 tons of VOCs, and 471,744 pounds of benzene, as well as nearly 63 million tons of greenhouse gases.[170] New plants and proposed expansions could add another 35.5 million tons of greenhouse gases, 4,705 tons of NO_x, and 8,199 tons of VOCs each year by 2029, along with more hazardous air pollutants.[171] These emissions are self-reported by the industry and likely do not reflect the full scope of pollution actually released, including from upsets, leaks, and accidents. Absent an accurate accounting of emissions, the exposure risks to communities near plastics plants can only be partially known.

Plastics plants routinely violate air pollution control permit limits. In the last three years, 84 percent of the plants we reviewed (42) violated their air pollution control permits, as evidenced by state or federal enforcement actions that often include small penalties.[172] The Shell Monaca plant near Pittsburgh reported 51 malfunction events that released excess emissions of nitrogen oxide, VOCs, and carbon monoxide, among other pollutants, and received 16 air quality violation notices between January 1, 2022, and June 30, 2023.[173] The Formosa Point Comfort plant on the Texas Gulf Coast released more than 2.2 million pounds of unpermitted air pollutants between January 2018 and June 2023.[174] In less than two years, the Exxon/SABIC Gulf Coast Growth Ventures plant near Corpus Christi, Texas, racked up 63 environmental violations.[175]

Reforms are needed. The plastics industry is growing rapidly, with the world on pace to produce

1 Billion

metric tons of plastic every year by 2050.

Despite their magnitude, the violations seldom translate to deterrent penalties or meaningful enforcement action – in part because companies and state regulators often treat emissions during malfunctions and related startup and shutdown periods as "unpreventable."[176] Penalties tend to be a tiny fraction of the total revenue the companies generate.

After receiving an initial permit, plastics plants often succeed in requesting state agencies to relax their limits, allowing them to legally release even more pollution. Since 2012, state environmental agencies allowed about a third of these plants (15) to relax their permit limits.[177]

Together, these after-the-fact permit changes collectively increased annual emissions by 3,000 tons of pollutants – including over 530 tons of VOCs and 250 tons of nitrogen oxides – above these plants' initial permit limits. Because of the frequency of such changes, communities and state agencies are likely unaware of a project's true impact when they are asked to approve a new or expanding plastics plant.

Plastics plants routinely report accidents – including chemical releases, fires, explosions, and excessive flaring

– that threaten the health and quality of life of local residents. In the last five years, almost all of the plants we examined (at least 47 of 50) reported incidents, malfunctions, or "upsets" that discharged nearly 34 million pounds of dangerous air pollutants.[178] A leak of chlorine gas at the Formosa Point Comfort plant in October 2016 hospitalized six individuals, and 15 workers showed symptoms of chlorine gas inhalation.[179] And a flash fire at the Kuraray Pasadena plant in May 2018 injured 23 workers, two of whom required air transport to hospitals.[180]

Overall, the rapidly expanding plastics industry imposes serious risks to human health and the environment, despite its pledges to be climate-friendly and worthy of public support and subsidies. The full scope of these risks is likely unaccounted for, because of inadequate monitoring, and the industry faces lax enforcement from regulators. Ultimately, these risks fall disproportionately on communities of color, many of which are already overburdened with air pollution.

To solve this problem, we recommend the following policy steps:

1. **STRICT PERMIT LIMITS AND DENIALS FOR SINGLE-USE PLASTICS:** The U.S. already has more than enough plastic feedstock and resin capacity operating or under construction to meet demand for critical products. State and federal regulators should deny permits for facilities that make ingredients primarily for single-use, disposable plastics. These plants release dangerous air pollutants while essentially manufacturing pollution – bottles, bags, and other throw-away containers that litter our roadsides and waterways. Clean Air Act permits that are issued to plants should impose strict and legally required pollution limits that protect the health of nearby communities, minimize climate pollution, and are based on an accurate accounting of emissions.
2. **BETTER MONITORING TO DETECT POLLUTION:** Plants that make plastics and their primary chemical ingredients release significant amounts of pollution from flaring, leaks, and other upset events that can increase concentrations of hazardous air pollutants in neighboring communities. The pollution that these plants self-report likely reflects only a portion of what they actually emit. A recent EPA study found that levels of benzene emitted from seven of the plastics plants in this report were actually between three to over 14 times higher than what had been previously known, based on the companies self-reporting and computer modeling.[181] EPA's study used data from fenceline monitoring systems, which are currently required at all U.S. petroleum refineries, and are used to assess the reliability of self-reported emissions, detect under-counting, and more accurately measure community exposure to harmful pollution. At present, only 16 of the 50 plants included in this report are required to employ fenceline monitoring for benzene.[182] In April 2023, EPA proposed federal standards, known as the HON SOCMI rule, that would require fenceline monitoring and corrective action at about half of these 50 plants for up to six carcinogens, including benzene.[183] To account for the full scope of harmful pollutants emitted, all plastic and related chemical plants should be required to install and operate fenceline monitoring systems and other continuous monitoring systems, and to immediately respond to evidence of high concentrations. EPA should propose additional regulations so the fenceline monitoring requirement covers all plastics plants, and then promptly implement the new rules.
3. **ACCOUNTABILITY FOR BREAKING THE LAW:** Under the Clean Air Act, plants must comply with emission limits at all times, including during accidents, startups, and upset events. Plastics plants must be required to submit prompt, accurate reports of emissions, particularly from malfunction and upset events, which allow regulators and the public to detect whether a plant is complying with its permit and the Clean Air Act. Further, EPA and state environmental agencies must follow through and take meaningful enforcement action to hold polluters accountable.
4. **PUBLIC ACCESS TO POLLUTION DATA:** Fenceline monitoring and emission reporting requirements are only meaningful if communities near plastics plants have timely access to that information. Over 591,000 people live within three miles of these 50 plants, of which 66 percent are people of color.[184] Emissions data,

including real-time fenceline monitoring results and malfunction reports, should be posted promptly to a public, online database that is easy to use. Communities should receive alerts of any accidents or threats relating to plastics plants.

5. **REJECT SUBSIDIES AND TAX BREAKS:** Public funds should be used to benefit projects that support and improve public health. None of the nearly $9 billion in taxpayer subsidies for plastics plants we document in this report was conditioned on compliance with environmental laws or permits.[185] Local entities should reject and revoke subsidies and tax exemptions for plastics plants that expose neighboring communities to harmful air pollution and are prone to accidents and upset events, especially if they violate their environmental permits. Public subsidies should be contingent upon environmental compliance.

As the growing plastics industry makes more promises to local communities and state agencies in exchange for subsidies and permits, the 50 operating plants examined in this report are a warning of the harmful pollution, malfunctions, violations, and other broken promises to come if those requests are approved. Tools of accountability – including meaningful enforcement action, fenceline monitoring, and public reporting of emissions data – must be strengthened and employed to hold existing plants accountable to the law and to protect public health and the environment from the serious health and safety risks posed by this industry.

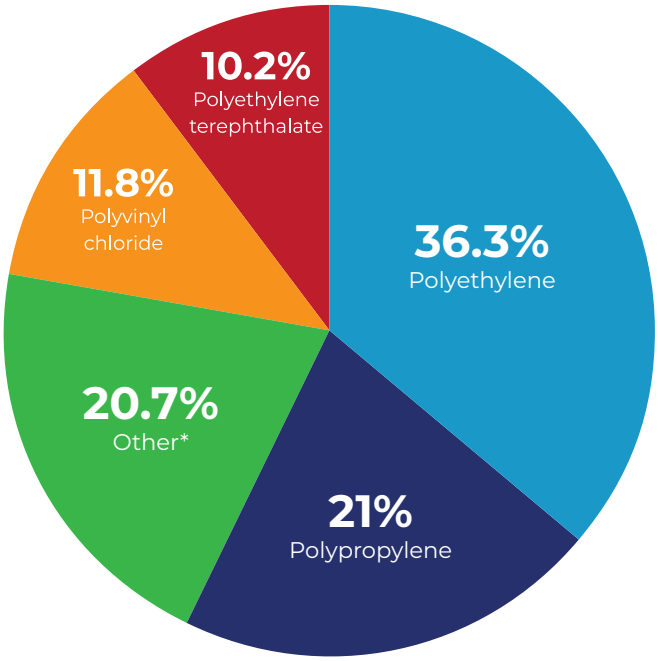
Appendix A: Methods

The plastics supply chain is complex. It encompasses many types of plastics made from diverse feedstocks and includes polymer resins, synthetic fibers, and thousands of additives and catalysts. For this report, EIP limited the scope to only include facilities that manufacture the key ingredients found in the most common types of plastics.

Most plastics begin with the building blocks ethane and propane—organic compounds that are derived from oil or natural gas. While crude oil is a common raw material, or "feedstock," used for plastics production globally, in the United States most plastics are produced from natural gas.[186] These building blocks are chemically combined to create long chain molecules, or polymers, in a process called polymerization. Often, they are also mixed with additives, like plasticizers, that enhance performance or give products desired characteristics, like color or flexibility. Finally, they are cooled and shredded into plastic beads called nurdles, which are then formed into final products like bottles, bags, and utensils. It is important to note that our report excludes injection molding facilities, or facilities that shape plastic nurdles into final end-use products, like toys, pipes, or packaging.

About 80 percent of all plastic produced is made up of just four polymer resins.[187] In addition to "cracking" plants that turn oil or natural gas into ethylene, propylene, and other feedstocks – including butadiene and the aromatic hydrocarbons benzene, toluene, and xylene – our report includes plants that manufacture the following:

Figure 4: Share of Plastic Resin Production by Type



*Polystyrene (7.6%), polyurethane (8.2%), and polyester, polyamide, and acrylic fibers (4.9%).
Source: Geyer et al., "Production, use, and fate of all plastics ever made."

- Polyethylene (36%) is the most common plastic in the world. It is classified into three types, depending on its strength and application: high-density (HDPE), low-density (LDPE), and linear low-density (LLDPE). In general, HDPE is the most robust of the three and is used to make strong packaging materials like shampoo, milk, and detergent bottles. LDPE is more flexible and is used to make bags, trays, and containers. LLDPE is

the most flexible and is used to make films and products like cling wrap.[188] About a fifth of all polyethylene is used to make packaging.[189]

- Polypropylene (21%) is one of the most durable types of plastic and is more heat resistant than some others. It is used to make microwavable containers, bottle caps, straws, and disposable diapers.[190]
- Polyvinyl chloride (12%), or PVC, is primarily used as a building and construction material. It can be found in pipes and fittings, flooring and roofing systems, and window frames. In this report, we also include plants that manufacture the ingredients used to make PVC: chlorine, ethylene dichloride (EDC), and vinyl chloride monomer (VCM). An estimated 54 percent of chlorine manufactured in the U.S. is used to make PVC.[191]
- Polyethylene terephthalate (10%), or PET, is almost exclusively used for plastic packaging and is found in most single-use plastic water bottles and soft drink bottles. Our report also includes plants that manufacture the ingredients used to make PET: xylene, ethylene oxide, ethylene glycol (also known as monoethylene glycol, or MEG), and purified terephthalic acid (PTA).[192] In addition to PET, some of these precursors are also used to make polyester fibers and other products, like antifreeze.[193]

EIP identified operating plastics plants using a combination of data compiled in the Energy Information Administration's Energy Atlas,[194] EPA's Enforcement and Compliance History Online (ECHO) database, and independent research. While there are at least 108 plastics plants currently operating across the U.S., EIP limited the scope of this report to only include plants that were built or expanded production capacity since 2012.

Capacity information was compiled using government records, company websites, fact sheets, press releases, investor presentations, filings made to the U.S. Securities and Exchange Commission (SEC), and industry trade press – including ICIS, Oil & Gas Journal, and S&P – among other sources. For a full list of data sources, please see the accompanying Excel spreadsheet, available for download at this link.[195] Capacity figures are presented in metric tons per year. In terms of the names of companies and plants in the report, we used the parent company's common name (such as Shell or ExxonMobil) and the location of the facility (such as Geismar or Baton Rouge), unless the facility is commonly identified by a different name (such as the Battleground Complex or Gulf Coast Growth Ventures Complex), in which case this name was used.

Many plastics plants, including some of those featured in this report, also manufacture specialty polymers or chemical derivatives, in addition to one or more of the feedstocks or resins listed above. While these products are not the focus of our report, we provide capacity data, where available. Some plastics plants are located next to or nestled within refineries that also make plastic resins or feedstocks, like benzene, xylene, and toluene. These refineries are considered as separate and distinct facilities for the purposes of this report, and any plastic resin or feedstock they produce has been omitted from facility-wide capacity estimates.

Information about proposed projects and those that are under construction comes from state permit documents, company press releases, and news sources compiled on the Oil and Gas Watch database as of November 1, 2023.[196] Where available, we use potential greenhouse gas and criteria air pollutant emissions estimates provided by companies in their Clean Air Act New Source Review permits or permit applications. At expanding plants, these estimates reflect potential allowable emission increases over current permitted levels. At new plants, these estimates reflect the potential allowable emissions. More information about the "potential to emit" is available from the EPA and state environmental agencies.[197]

Reported Emissions

Criteria air pollutant emission data are from state air emission inventories and reflect emissions reported for the 2021 calendar year.[198] Criteria pollutant emissions data were available for 47 of the 50 plants reviewed for this report.

Three plants – the EQUATE MEGlobal Oyster Creek facility in Brazoria County, TX, the Indorama Decatur facility in Morgan County, AL, and the REXtac Odessa facility in Ector County, Texas – are classified as minor sources of air emissions and were not required to report annual emissions totals to state agencies.[199]

Hazardous air pollutants (HAPs) data for all four HAPs examined in this report (benzene, 1,3-butadiene, vinyl chloride, and chlorine) were available for only eight facilities. Benzene emissions were not reported for 14 facilities; 1,3-butadiene emissions were not reported for 17 facilities; vinyl chloride emissions were not reported for 26 facilities; and chlorine emissions were not reported for 19 facilities. HAPs emissions data are from 2021 state emission inventories. For the complete data set, see the accompanying excel document.

Greenhouse gas emission data are from EPA's Greenhouse Gas Reporting Program (GHGRP) and reflect emissions reported under Subpart X (petrochemical production), Subpart C (stationary combustion), and Subpart W (petroleum and natural gas systems).[200] Emissions are presented as carbon dioxide equivalents and the global warming potentials used by the greenhouse gas reporting program.[201] We adjusted metric tons to short tons.

Six facilities included in this report did not individually report to the GHGRP in 2021: the ExxonMobil Baytown Chemical Plant, the ExxonMobil Baton Rouge plant, the ExxonMobil Beaumont plant, the Pinnacle Polymers Garyville plant, the RexTac Odessa plant, and the Kuraray Pasadena plant. Emissions for the ExxonMobil Baytown Chemical plant were reported together with the ExxonMobil Baytown Olefins plant. Emissions for the ExxonMobil Baton Rouge plant and the ExxonMobil Beaumont plant were reported together with co-located refineries and therefore excluded from this report in order to avoid overcounting. The other three plants did not report to the GHGRP.

Because emission reporting programs define facilities differently, emissions information in this report may include emissions from processes or portions of a facility that are not involved in making plastic or the key ingredients we identified. Even though this may result in over-counting, actual emissions are almost always under-reported (i.e. they often exclude leaks, undetected releases, and even emissions from startup, shutdowns, and malfunctions, and they may be based on uncertain or outdated emission factors), and facility processes are often inter-related.

Enforcement and Compliance

Enforcement and compliance data were sourced from the EPA's Enforcement and Compliance History Online database (ECHO). ECHO provides access to compliance information for major and minor sources of pollution regulated under the Clean Air Act (CAA), Clean Water Act (CWA), and other major environmental laws. This ECHO analysis is limited to Clean Air Act information as of December 4, 2023. Clean Air Act compliance and enforcement information was available for 48 of the 50 facilities that are currently operating. No data were available for the EQUATE MEGlobal Oyster Creek plant in Brazoria County, TX, or the REXtac Odessa plant in Ector County, TX. Compliance status, formal enforcement actions, and penalty information was sourced from detailed facility reports. Each report contains quarterly compliance status dating back three years. In this report, quarter one runs from October 2020 to December 2020, and quarter 12 runs from July 2023 to September 2023. Formal enforcement actions and associated federal and state penalty data collected for this report follow the same timespan as compliance status data, October 2020 to September 2023.[202] Errors may exist in ECHO. EIP made a good faith effort to identify potential errors and report issues to EPA.

Subsidies

Data on Louisiana facilities that were issued tax breaks were available through Louisiana Economic Development's

FASTLANE website.[203] We included tax breaks issued through the Industrial Tax Exemption Program (ITEP) in our analysis. All tax breaks for projects that began operating between 2013 and 2022 were included. The value of each subsidy was calculated using the parish millage rate and the investment amount covered by each subsidy. We used a 20 year depreciation schedule to adjust the investment value over time. Research support was provided by Erin Hansen of Together Louisiana.

Data on Texas facilities that were issued tax breaks were available through the Texas Comptroller's Chapter 313 School Value Limitation Agreement webpage. Texas tax break data recorded in this report are limited to Chapter 313 tax value limitation agreements executed between 2013 and 2023. Tax break values were obtained from the "2022 School District Cost Data" reports for each facility.[204]

Tax break information pertaining to the Shell Monaca facility was sourced from an Associated Press article titled, "After years of construction, Shell ethane cracker starts up," written on November 15, 2022.[205] Information on tax subsidies issued to the Westlake Calvert City facilities in Marshall County, KY was obtained from Kentucky's Financial Incentives Database.[206]

The facilities and projects included in this report may have received additional incentives from other taxpayer-funded government programs.

Emission Events

Each state has different reporting requirements for unauthorized discharges of air pollution known as "upsets," "emission events," or "air incidents." Because of this, event counts and event-related emissions should not be compared between facilities in different states or between states.

In Texas, companies must disclose unauthorized pollution above certain threshold levels to the State of Texas Electronic Emissions Reporting System (STEERS).[207] For this analysis, we examined reports that companies filed with STEERS between January 2018 and June 2023. This database includes reports that companies are required to file when their plants release air pollution during malfunctions; unplanned maintenance, startups and shutdowns (MSS); and planned MSS events that result in unauthorized emissions.

In Louisiana, unauthorized pollution that constitutes an "emergency condition" must be reported to the Louisiana State Police, regardless of how much pollution is released or if permit limits are exceeded. The state defines an emergency condition as one that could reasonably be expected to endanger the health and safety of the public, cause significant adverse impact to the environment, or cause severe damage to property.[208] For this analysis, we examined PDF copies of emergency air incident reports available through the state's Electronic Document Management System (EDMS) for incidents that occurred between January 2018 and April 2023.[209] Amounts of released pollutants were recorded and summed for each emergency air incident. It is important to note that some companies did not report emissions totals if the discharge did not exceed a reportable quantity,[210] so emissions totals are likely underestimates. We also did not include emissions included in reports related to non-emergency incidents, according to EDMS. Incident reports could be miscategorized in EDMS. We made a good-faith effort to identify and correct these errors.

In Kentucky, like Texas, companies must report air pollution over threshold levels to the appropriate Kentucky Energy and Environment Cabinet (EEC) regional office. Air incident data was obtained via a public information request to the EEC. We examined all reports of incidents that occurred between January 2018 and June 2023. One event reported to the Kentucky EEC was ultimately determined not to have violated permit conditions, so this incident was excluded from our analysis.

In Alabama, pollution releases that result in a violation of a facility's Title V operating permit must be reported to the Alabama Department of Environmental Management Air Division. Air incident data was obtained through the Alabama Department of Environmental Management e-File Search.[211] Indorama reported only one emission event between January 2018 and June 2023 for its Decatur facility, the only facility in Alabama included in our analysis. The quantity of pollutants released was not included in the publicly available report.

In Pennsylvania, Shell's Clean Air Act permit requires Shell to submit regular emissions reports to the Pennsylvania Department of Environmental Protection (DEP).[212] In accordance with a May 24, 2023, Consent Order and Agreement with DEP, Shell is required to submit the reports on a monthly basis.[213] EIP reviewed emissions reports available on the PA DEP website[214] that were submitted between January 2022, when the Shell Monaca plant was first commissioned, and June 2023. We included three malfunctions in our total for which a report was not submitted and/or required, but which resulted in smoke or visible emissions.[215] We excluded greenhouse gases from our excess emissions totals to better align with reporting requirements in other states.

Our analysis excludes excess emissions data for LyondellBasell's Clinton plant in Clinton County, Iowa. Companies reported zero excess emissions events at Shintech's Addis plant in Iberville and West Baton Rouge parishes, Louisiana, and REXtac's Odessa plant in Ector County, Texas.

Demographic Estimates

EIP estimated demographics around facilities using data from EPA's Environmental Justice Screening Tool (EJSCREEN) version 2.2 and facility coordinates obtained from government records or EPA's ECHO database. Where needed, coordinates were adjusted to represent the center of a facility. Demographic information for individual facilities came directly from EJSCREEN's Application Program Interface (API). EJSCREEN relies on census block group data from the U.S. Census Bureau's American Community Survey (ACS) five-year estimates covering 2017 through 2021.

The EJSCREEN API allows users to extract demographic data for individual facilities, but because facilities are often located near each other, a different analysis was necessary to estimate the total number of people living within three miles of any facility and to estimate the demographic composition of that population. To do this, EIP mapped facility locations using ArcGIS Pro 3.0.2 and generated a three-mile buffer for each facility. For facilities without overlapping buffers—i.e. those that are not within three miles of another facility, based on buffer boundaries—demographic estimates were pulled directly from EPA's EJSCREEN 2.2. For facilities with overlapping three-mile buffers—i.e. those that are within three miles of one or more facilities—EIP generated a dissolved buffer for each grouping of facilities. EIP generated a shapefile for each grouping and uploaded the shapefile to EJSCREEN to generate demographic estimates.

Appendix B: Additional Examples of Accidents and Fires at Plastics Plants

Fire in the Sky over Dow Plaquemine

Aerial view of the expansive 1500-acre Dow Plaquemine Petrochemical facility from the east side of the Mississippi River. Photo by Associated Press.

IBERVILLE PARISH, LOUISIANA — On the evening of July 14, 2023, residents of this area near the Mississippi River west of New Orleans were shocked by a series of explosions at the Dow Plaquemine Facility that could be felt more than 10 miles away. Eyewitness accounts describe hearing several explosions and seeing the night sky turned orange with fire and smoke.[216]

Dow Plaquemine is a 1,500-acre plant that manufactures petrochemicals, like ethylene oxide and propylene, that go on to serve as raw materials for plastics, such as PET resins. The facility has received $230 million in local tax breaks since 2013 under Louisiana's Industrial Tax Exemption program.[217] But it is no stranger to releases of dangerous chemicals into the local community.

Since August 2018, Dow Plaquemine has emitted at least 57,000 pounds unpermitted, toxic chemicals in 10 emergency incidents, according to state records.[218]

A fire on July 14, 2023, began at about 9:30 pm and continued to burn for a day and a half.[219] It started at the facility's Glycol 2 Unit (a production unit that makes ethylene oxide) releasing ethylene oxide and ethyl chloride. Ethylene oxide is highly flammable and carcinogenic. State officials said that air monitoring did not detect any of this dangerous gas at high concentrations outside of the facility.[220] But water used to extinguish the fire was contaminated with ethylene oxide and released into the Mississippi River when a containment area overflowed.[221]

The July 2023 explosion at the Glycol 2 Unit was dramatic, but hardly unique. Several emergency incidents have grown from problems at the Glycol 2 Unit, including a November 2022 chemical release of more than 10,000 pounds each of ethylene and methane, state records show.[222] That 2022 incident was the result of a power outage caused by a tripped electrical breaker with a design error.[223]

23 Workers Injured in Fireball Blast at Kuraray Plastics Plant

Flames and smoke rise from the May 19, 2018, fire at the Kuraray America Pasadena plant. Photo by Chemical Safety Board.

PASADENA, TEXAS — Kuraray is a Tokyo-based petrochemical manufacturer with U.S. headquarters in Houston, Texas. The company's Pasadena petrochemical plant east of Houston makes ethylene vinyl alcohol, a petrochemical-based plastic resin used to manufacture food packaging, plastic storage tanks, and pipes.[224] On May 19, 2018, a flash fire erupted at the Kuraray plant, injuring 23 workers, two of which required air-transport to hospitals. The accident raised questions about the facility's safety precautions.[225]

The fire was caused by a release of ethylene vapor from an emergency pressure relief system after internal pressures of a chemical reactor reached excessive levels. At around 10:20 am, the emergency pressure release valve opened and released 2,347 pounds of ethylene vapor in three minutes. A later investigation by the Chemical Safety Board found that Kuraray's pressure relief system functioned as it was meant to, but that its design was not well thought out. Rather than discharging flammable vapors safely upwards into the air, the pressure relief system directed vapors horizontally, towards employees. Some employees were performing welding tasks, which sparked a fireball when the ethylene cloud contacted the welding tools.[226]

Workers fled as flammable vapor spread around them. Some were injured while trying to escape from the second or third stories of structures. Altogether, 21 employees required off-site medical attention. Two were flown to medical centers, and one was in critical condition for several days, suffering life-threatening burns.[227]

“Nurdle” Pollution and Air Emissions from Formosa Point Comfort

A flare at the Formosa Point Comfort plastic plant on the Texas Gulf Coast.
Photo by Diane Wilson, San Antonio Bay Estuarine Waterkeeper.

POINT COMFORT, TEXAS — First opened in 1983, the Formosa Point Comfort complex in Calhoun County, TX, produces a variety of petrochemicals used for manufacturing plastics. Initially, the facility produced vinyl chloride monomer and polyvinyl chloride, commonly known as PVC.

After billion-dollar expansions in the 1990s and early 2000s the site now sprawls over nearly 2,500 acres and has expanded production to include olefins, linear low-density polyethylene (LLDPE), high-density polyethylene (HDPE), polypropylene (PP), chlor-alkali (CA), ethylene dichloride (ED), and ethylene glycol (EG).[228]

Formosa Point Comfort, which received at least $69 million in state and local school district tax breaks, has made headlines for numerous environmental violations and even deadly accidents over the last decade.

Back in 2017, Formosa paid a $121,875 fine for polluting Cox Creek and Lavaca Bay with two tons of plastics pellets known as nurdles, which are melted down to create a variety of plastic products.[229]

In September 2021, the company paid an additional $2.85 million in fines for a string of air permit violations related to chemical releases from 2013 to 2016.[230] In an October 2016 accident, a leak of chlorine gas hospitalized six individuals, one of whom was a plant employee and five of whom were contractors. In all, 15 workers showed symptoms of chlorine gas inhalation, which can cause blurred vision, coughing, a build of fluid in the lungs, and skin injuries comparable to frostbite.[231]

In July 2023, a 31-year-old subcontractor fell and died at the facility. Rescue workers found the man unresponsive, and administered CPR, but he could not be revived.[232]

Unintentional chemical releases are common at Formosa Point Comfort and often go unnoticed by the public eye.

Between January 2018 and June 2023, 75 unpermitted emission incidents – often related to equipment failures – released approximately 834,400 pounds of carbon monoxide, 104,000 pounds of methane, and nearly 6,000 pounds of the carcinogen benzene, according to state records. The total amount of unpermitted air pollution released from January 2018 to June 2023 exceeded 2.2 million pounds.[233]

Formosa Point Comfort does not have fenceline air pollution monitors that could detect and warn local residents about dangerous pollutants escaping into the community.

Despite all this, the company regularly issues press releases touting the plant's positive impact on the local community and environment. A press release on August 25, 2022, boasted that the plant's "commitment to reducing the environmental impact of their operations and reducing their carbon footprint has been at the forefront of their business planning."[234]

Malfunctions During the Startup of Bayport Port Arthur Ethane Cracker

Petrochemical production towers at the Baystar Bayport Port Arthur ethane cracker in Texas.

PORT ARTHUR, TEXAS — The Bayport Polymers ethane cracker facility in Port Arthur, TX, is a joint venture known as Baystar, whose partners are the French-based TotalEnergies and the Austrian chemical company Borealis. Baystar formed in 2018 and began building its $2 billion ethane cracker within the already established TotalEnergies Port Arthur refinery complex. The ethane cracker is one of the largest of its kind in the world, capable of producing over one million tons of ethylene per year. Its product, ethylene, supplies a Baystar polyethylene plant located about 80 miles west in Pasadena, TX.

The project received $76 million in tax breaks from the state of Texas and the local school district, according to state records.[235] In its press release about the ethane cracker, TotalEnergies suggested that their project would be good for the environment and community. "TotalEnergies puts sustainable development in all its dimensions at the heart of its projects and operations to contribute to the well-being of people," the company said.[236]

However, Bayport Port Arthur's startup process in September 2021 was plagued by equipment problems, shutdowns, and restarts that contributed to unpermitted chemical releases.[237]

On September 3, 2021, Bayport Port Arthur's startup attempt was halted by a malfunction, forcing a shutdown. About 2.1 million pounds of chemical emissions were released from this single incident, more than half of which was carbon monoxide. Additionally, the plant emitted about 416,000 pounds of nitrogen oxides – a greenhouse gas – 32,000 pounds of VOCs, nearly 13,000 pounds of 1,3-Butadiene, and 6,000 pounds of benzene.[238]

Another startup attempt in April 2022 released 4.9 million pounds of air pollution. This included 3.8 million pounds of carbon monoxide and 972,000 pounds of nitrogen oxides, along with substantial amounts of benzene, 1,3-Butadiene, and other VOCs. Once again, the ethane cracker shut down temporarily.[239]

Following the April 2022 startup attempt, three additional emission incidents happened in September 2022, January 2023, and May 2023.[240]

Prior to the plant's opening, the companies estimated the ethane cracker's startup processes would emit about 3.5 million pounds of air pollutants.[241] But the true numbers turned out to be nearly three times higher. Between September 2021 and May 2023, five startup incidents released more than 9.2 million pounds of air pollutants.[242] The plant does not have fenceline monitors that could alert the nearby community about releases of potentially dangerous chemicals.

Fire and Chemical Releases from Ineos Chocolate Bayou

On July 13, a pipeline connected to the Ineous Chocolate Bayou Plant exploded in Alvin, Texas, releasing 23,000 pounds of air pollutants. Photo by the Brazoria County Fire Marshal.

ALVIN, TEXAS — The Ineos Chocolate Bayou chemical plant specializes in producing chemicals used for plastic manufacturing, such as butadiene, ethylene, propylene, and polypropylene. The plant is one the largest ethane crackers in the United States, occupying an area of approximately 2,400 acres in Alvin, Texas, about 40 miles south of Houston.[243]

As of September 2023, the facility has been in violation of the Clean Air Act for four consecutive quarters, dating back to October 2022, according to EPA's ECHO database. During this time, the facility has received two formal enforcement actions, each with state penalties of less than $60,000 combined.[244] Since October 2020, this facility has allowed 22 emission incidents that released more than 1.9 million pounds of air pollution.[245]

Between November 3 and November 6, 2021, an emissions incident released approximately 219,600 pounds of air pollution due to an equipment failure related to low pressure in a process compressor and loose wires, according to state records. The facility was forced to shut down two olefins units and reroute emissions to flares. Major pollutants released during this incident include 82,600 pounds of carbon monoxide, 71,700 pounds of ethylene, and 16,200 pounds of nitrogen oxides.[246]

More recently, in July 2023, a fire at a valve station along a pipeline connected to Ineos Chocolate Bayou violently erupted with flames for roughly six hours. The section of pipeline was isolated and temporary flares were installed to burn off harmful chemicals, like ethylene and propylene.[247] Nearly 23,000 pounds of air pollutants were released during this six-hour span.[248]

Appendix C: List 1 - New and Expanded U.S. Plastics Plants Since 2012

State	County/ Parish	Parent Company	Plant Name	New or Expanded	Product(s)	Subsidies Received Since 2013	Greenhouse Gas Emissions in 2021 (short tons)	Benzene Emissions in 2021 (lbs)	Clean Air Act Enforcement Actions (Oct. 2020 – Sept. 2023)	Clean Air Act Penalties (Oct. 2020 – Sept. 2023)	No. of Pollution Releases during accidents, upsets or other "emission events" (Jan. 2018 – June 2023)*
AL	Morgan	Indorama	Decatur	Expansion	PET, p-xylene, PTA	N/A	303,242	Unknown	0	$0	1
IA	Clinton	LyondellBasell	Clinton	Expansion	ethylene, polyethylene	$98,000	552,064	39,422	1	$3,400,000	Unknown
KY	Marshall	Westlake	Calvert City	Expansion	ethylene, chlor-alkali, VCM	N/A	544,803	40,824	3	$2,187,500	5
LA	Ascension	Nova Chemicals	Geismar	Expansion	ethylene, propylene	$141,917,364	643,878	Unknown	1	$15,000	12
LA	Ascension	Westlake	Geismar	Expansion	PVC, EDC, VCM, chlorine, caustic soda	$138,520,218	270,192	320	0	$0	13
LA	Ascension	BASF	Geismar	Expansion	ethylene oxide, ethylene glycol, other petrochemicals (MDI, acetylene, amines, polyol, formic acid, TDI, others)	$160,365,893	978,761	4,849	2	$0	16
LA	Ascension	Shell	Geismar	Expansion	ethylene oxide, ethylene glycol, MEG, alpha olefins, other petrochemicals	$144,534,890	1,154,026	11	2	$23,500	13
LA	Calcasieu	Westlake/Lotte	Lake Charles	Expansion	ethylene, MEG	$497,698,725	769,037	1,513	1	$0	3
LA	Calcasieu	Westlake	Sulphur (Petro I & II)	Expansion	ethylene, styrene, other petrochemicals	$136,708,432	178,260	8,195	4	$2,250,000	12
LA	Calcasieu	Indorama	Westlake	New/ Restart	ethylene, propylene	$73,454,212	178,763	5,112	2	$0	15
LA	Calcasieu	LyondellBasell/ Sasol	Lake Charles Complex	Expansion	ethylene, polyethylene, ethylene oxide, MEG, alcohols, glycols, other petrochemicals	$3,490,201,582	2,161,342	40,130	1	$2,500	17
LA	East Baton Rouge	ExxonMobil	Baton Rouge	Expansion	ethylene, polyethylene, polypropylene	$8,968,352	Unknown	Unknown	0	$0	6
LA	East Baton Rouge	Formosa	Baton Rouge	Expansion	VCM, PVC	$7,003,005	365,165	1,387	1	$0	6
LA	Garyville	Pinnacle Polymers	Garyville	Expansion	polypropylene	$76,075	Unknown	20	1	$300	2
LA	Iberville	Dow	Plaquemine	Expansion	ethylene, polyethylene, propylene, ethylene oxide, MEG, benzene, styrene	$229,867,900	2,268,795	13,098	4	$3,158,500	9
LA	Iberville	Shintech	Plaquemine	Expansion	ethylene, PVC, VCM, chlorine	$533,450,151	996,332	1,434	4	$80,346	11
LA	Iberville, West Baton Rouge	Shintech	Addis	Expansion	PVC	$19,509,215	65,693	Unknown	2	$95,978	0
MS	Hancock	Alpek Polyester	Pearl River	Expansion	PET	N/A	62,643	Unknown	0	$0	3
PA	Beaver	Shell	Monaca	New	ethylene, polyethylene	$1,650,000,000	16,419	15	2	$4,939,336	52
TX	Brazoria	Olin	Freeport	Expansion	VCM, EDC, caustic soda, chlorine, hydrochloric acid, salt, sulfuric acid, bleach	N/A	2,177,378	206	2	$95,113	31

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State	County/ Parish	Parent Company	Plant Name	New or Expanded	Product(s)	Subsidies Received Since 2013	Greenhouse Gas Emissions in 2021 (short tons)	Benzene Emissions in 2021 (lbs)	Clean Air Act Enforcement Actions (Oct. 2020 – Sept. 2023)	Clean Air Act Penalties (Oct. 2020 – Sept. 2023)	No. of Pollution Releases during accidents, upsets or other "emission events" (Jan. 2018 – June 2023)*
TX	Brazoria	INEOS	Chocolate Bayou	Expansion	ethylene, polypropylene, propylene, alpha olefins, ethylene oxide	N/A	2,873,726	10,175	2	$56,518	54
TX	Brazoria	Chevron Phillips	Sweeny Old Ocean	Expansion	ethylene, polyethylene	$99,330,111	1,398,307	14,172	5	$507,265	59
TX	Brazoria	Dow	Freeport	Expansion	ethylene, polyethylene, propylene, ethylene glycol, chlorine, caustic soda	$393,319,284	5,412,665	29,612	2	$3,004,875	147
TX	Brazoria	EQUATE	MEGlobal Oyster Creek	New	MEG	N/A	255,192	Unknown	Unknown	Unknown	1
TX	Calhoun	Dow	Seadrift	Expansion	polyethylene, ethylene oxide	N/A	833,266	29	3	$55,475	10
TX	Calhoun	Formosa	Point Comfort	Expansion	ethylene, polyethylene, polypropylene, propylene, ethylene oxide, MEG, PVC, VCM, chlorine	$68,847,999	5,495,592	16,783	4	$3,210,827	75
TX	Chambers	ExxonMobil	Mont Belvieu	Expansion	polyethylene	$48,636,123	92,295	Unknown	1	$7,500	1
TX	Chambers	Enterprise	Mont Belvieu	Expansion	propylene	$176,343,112	2,645,345	239	7	$247,563	139
TX	Ector	REXtac	Odessa	Expansion	propylene, polypropylene	N/A	Unknown	Unknown	Unknown	Unknown	0
TX	Gregg	Eastman Chemical	Longview	Expansion	ethylene, propylene, ethylene oxide	N/A	2,376,970	24,120	5	$364,634	49
TX	Harris	INEOS	Battleground Complex	Expansion	polyethylene, polypropylene	$23,377,039	160,030	Unknown	4	$1,266,255	3
TX	Harris	LyondellBasell	Bayport Complex	Expansion	polypropylene	N/A	93,290	0	2	$34,987	3
TX	Harris	Kuraray	Pasadena	Expansion	ethylene vinyl alcohol monomer	N/A	Unknown	Unknown	2	$134,647	4
TX	Harris	TotalEnergies	Bayport Pasadena	Expansion	polyethylene	$46,915,869	41,633	0	1	$70,801	5
TX	Harris	ExxonMobil	Baytown Chemical	Expansion	polypropylene, alpha olefins, p-xylene	N/A	Unknown	18,527	3	$22,388	7
TX	Harris	Koch INVISTA	Houston	Expansion	propylene	N/A	778,580	1,877	3	$65,252	12
TX	Harris	Indorama	Clear Lake	Expansion	ethylene oxide, MEG, acetic acid, VAM	N/A	850,323	127	4	$82,780	17
TX	Harris	Braskem	La Porte	Expansion	polypropylene, polyethylene	N/A	46,896	Unknown	4	$149,535	28
TX	Harris	LyondellBasell	La Porte	Expansion	ethylene, polypropylene, polyethylene, acetic acid, VAM	$56,802,349	1,342,018	1,976	3	$3,443,627	33
TX	Harris	ExxonMobil	Baytown Olefins	Expansion	ethylene, propylene	$105,106,304	11,035,958	17,653	3	$22,388	47

Appendix C: List 1 - New and Expanded U.S. Plastics Plants Since 2012

State	County/ Parish	Parent Company	Plant Name	New or Expanded	Product(s)	Subsidies Received Since 2013	Greenhouse Gas Emissions in 2021 (short tons)	Benzene Emissions in 2021 (lbs)	Clean Air Act Enforcement Actions (Oct. 2020 – Sept. 2023)	Clean Air Act Penalties (Oct. 2020 – Sept. 2023)	No. of Pollution Releases during accidents, upsets or other "emission events" (Jan. 2018 – June 2023)*
TX	Harris	LyondellBasell	Channelview	Expansion	ethylene, propylene, butadiene, benzene, propylene oxide, styrene monomer	$11,177,684	2,283,369	29,879	6	$593,990	68
TX	Harris	Chevron Phillips	Cedar Bayou	Expansion	ethylene, polyethylene, propylene, 1-hexene, alpha olefins	$119,130,681	2,573,742	13,265	4	$3,555,626	91
TX	Jefferson	ExxonMobil	Beaumont	Expansion	polyethylene	$55,670,700	Unknown	0.8	0	$0	1
TX	Jefferson	TotalEnergies/ Borealis	Bayport Port Arthur	New	ethylene	$76,190,087	628,665	Unknown	0	$0	10
TX	Jefferson	BASF/ TotalEnergies	Port Arthur	Expansion	ethylene, propylene	N/A	2,271,881	15,897	1	$26,250	21
TX	Jefferson	Motiva	Port Arthur	Expansion	ethylene, propylene	N/A	1,109,184	22,522	4	$88,887	58
TX	Nueces	LyondellBasell	Corpus Christi	Expansion	ethylene, propylene, fuel products	$34,536,331	1,317,755	22,614	3	$3,408,175	19
TX	Orange	Dow	Orange	Expansion	ethylene, polyethylene	N/A	793,170	28,010	6	$9,752,375	26
TX	San Patricio	ExxonMobil/SABIC	Gulf Coast Growth Ventures Complex	New	ethylene, polyethylene	$249,035,698	254,064	45,983	1	$9,327	10
TX	San Patricio	Occidental/ Mexichem	Ingleside	Expansion	ethylene, VCM, chlorine, caustic soda, EDC	$84,823,649	1,972,145	1,745	1	$0	17

*Totals for Louisiana represent emergency air incidents reported between Jan. 2018 and April 2023. For more information, please refer to the Methods section in Appendix A.

Appendix C: List 2 - Proposed Future New Plants and Expansions

State	County/ Parish	Parent Company	Plant Name	Product(s)	New or Expansion	Status	Expected Completion Year	Potential Greenhouse Gas Emissions (short tons per year)	Potential NO_x Emissions (short tons per year)	Potential VOC Emissions (short tons per year)
KY	Marshall	Westlake	Calvert City	ethylene, PVC, VCM	Expansion	Under Construction	2023/2024	890,113	137.9	60.2
LA	Ascension	Shell	Geismar	MEG	Expansion	Proposed	2024	782,905	100.8	28.3
LA	Ascension	Mitsubishi	Geismar	MMA	New	Proposed	2026	787,133	129.4	79.3
LA	Ascension	Westlake	Geismar	EDC	Expansion	Proposed	2024	Unknown	-51.5	7.7
LA	Ascension	Westlake	Geismar	PVC, VCM, vinyl chloride	Expansion	Proposed	2025	Unknown	Unknown	Unknown
LA	Calcasieu	Westlake/Lotte	Lake Charles	ethylene	Expansion	Proposed	2026	309,530	-6.1	263.5
LA	Calcasieu	Westlake/Lotte	Lake Charles	MEG, ethylene	Expansion	Proposed	2023	120,279	36.0	5.5
LA	Iberville	Shintech	Plaquemine	ethylene	Expansion	Proposed	2027	1,062,954	121.7	137.8
LA	Iberville	Shintech	Plaquemine	VCM	Expansion	Proposed	2027	711,769	68.4	40.4
LA	St. James	Formosa	Sunshine	ethylene, ethylene glycol, propylene, polyethylene, polypropylene	New	On Hold	2024/2029	13,628,091	1,242.5	1,667.9
LA	West Baton Rouge, Iberville	Shintech	Addis	PVC	Expansion	Proposed	2023	Unknown	Unknown	Unknown
OH	Belmont	PTTGCA	Ohio Petrochemical Complex	ethylene, polyethylene	New	On Hold	2025	1,785,000	162.0	382.0
TX	Brazoria	Dow	Freeport	polyethylene	Expansion	Proposed	2025	70,349	16.4	53.8
TX	Brazoria	Petrologistics	Alvin PDH	propylene	New	Proposed	2024	Unknown	48.3	45.8
TX	Brazoria	Chevron Phillips	Sweeny Old Ocean	ethylene	Expansion	Proposed	2025	523,028	30.6	19.4
TX	Calhoun	Formosa	Point Comfort	VCM, EDC	Expansion	Proposed	2023	Unknown	Unknown	Unknown
TX	Chambers	Enterprise	Mont Belvieu	propylene	Expansion	Proposed	2027	Unknown	Unknown	Unknown
TX	Chambers	Enterprise	Mont Belvieu	propylene	Expansion	Proposed	2024	Unknown	Unknown	Unknown
TX	Harris	Chevron Phillips	Cedar Bayou	propylene	Expansion	Under Construction	2023	Unknown	Unknown	Unknown
TX	Harris	ExxonMobil	Baytown Chemical	polypropylene	Expansion	Under Construction	2023	Unknown	Unknown	Unknown
TX	Harris	ExxonMobil	Baytown Olefins	ethylene	Expansion	Proposed	2024	Unknown	23.6	10.7
TX	Harris	ExxonMobil	Baytown Olefins	hydrogen fuel for olefins production	Expansion	Proposed	2028	Unknown	Unknown	Unknown
TX	Harris	LyondellBasell	Channelview	ethylene	Expansion	Proposed	Unknown	Unknown	Unknown	Unknown

Appendix C: List 2 - Proposed Future New Plants and Expansions

State	County/ Parish	Parent Company	Plant Name	Product(s)	New or Expansion	Status	Expected Completion Year	Potential Greenhouse Gas Emissions (short tons per year)	Potential NO_x Emissions (short tons per year)	Potential VOC Emissions (short tons per year)
TX	Harris	LyondellBasell	Channelview	propylene	Expansion	Proposed	2028	Unknown	Unknown	Unknown
TX	Harris	Kuraray	Pasadena	ethylene vinyl alcohol monomer	Expansion	Proposed	2024	Unknown	Unknown	Unknown
TX	Jefferson	Motiva	Port Arthur	polyethylene	Expansion	On Hold	2024	1,095,295	275.2	1,867.9
TX	Jefferson	Motiva	Port Arthur Ethane Cracker	ethylene	New	On Hold	2025	3,311,393	365.0	425.0
TX	Jefferson	Energy Transfer	Nederland	ethylene	New	Proposed	2026	5,102,516	1,132.0	1,676.0
TX	Chambers, Jefferson, or Orange	Enterprise*	Mont Belvieu, Beaumont, or Vidor	ethylene	New	Proposed	2027	Unknown	Unknown	Unknown
TX	Matagorda	Roehm	Bay City	MMA	New	Under construction	2024	281,297	136.3	136.0
TX	Nueces	Indorama/Alpek/Far East New Century	Corpus Christi Polymers	PET, PTA	New	Under construction	2025	1,164,633	136.3	202.2
TX	Nueces	LyondellBasell	Corpus Christi	polyethylene	Expansion	Proposed	2028	Unknown	Unknown	Unknown
TX	Orange	Chevron Phillips	Golden Triangle Polymers	ethylene, polyethylene	New	Under construction	2026	3,891,942	599.9	1,089.8

Data comes from state permit documents, company press releases, and news sources compiled on oilandgaswatch.org as of November 1, 2023. For more information, please refer to the Methods section in Appendix A.

*Enterprise is planning to build a new ethane cracker at an undetermined location, with three sites proposed in Texas as of November 2023: the Mont Belvieu Complex in Chambers County, the Beaumont Marine West Complex in Jefferson County, and the Beaumont Marine East Facility in Orange County.

Acronym	Meaning
EDC	ethylene dichloride
MDI	methylene diphenyl diisocyanate
MEG	monoethylene glycol
MMA	methyl methacrylate
PET	polyethylene terephthalate
PTA	purified terephthalic acid
PVC	polyvinyl chloride
TDI	toluene diisocyanate
VAM	vinyl acetate monomer
VCM	vinyl chloride monomer

Appendix D: Additional Pollution Data

Table 7: Top Ten Emitters of NO_x in 2021

State	County/ Parish	Parent Company	Plant Name	NO_x Emissions (tons)
TX	Calhoun	Formosa	Point Comfort	3,048
LA	Iberville	Dow	Plaquemine	2,494
TX	Harris	ExxonMobil	Baytown Olefins	2,258
LA	Calcasieu	LyondellBasell/Sasol	Lake Charles Complex	1,557
TX	Brazoria	Dow	Freeport	1,509
TX	Gregg	Eastman Chemical	Longview	1,504
TX	Brazoria	Chevron Phillips	Sweeny Old Ocean	1,130
TX	Harris	LyondellBasell	Channelview	1,109
TX	Brazoria	INEOS	Chocolate Bayou	991
LA	Ascension	BASF	Geismar	970

Source: State emission inventories; for more information, please see the methodology section in Appendix A.

Table 8: Top Ten Emitters of Chlorine in 2021

State	County/Parish	Parent Company	Plant Name	Chlorine Emissions (lbs)
LA	East Baton Rouge	Formosa	Baton Rouge	77,675
LA	Iberville	Shintech	Plaquemine	58,887
LA	Calcasieu	LyondellBasell/Sasol	Lake Charles Complex	28,117
TX	Brazoria	Olin	Freeport	17,540
TX	Calhoun	Formosa	Point Comfort	6,926
TX	Gregg	Eastman Chemical	Longview	5,574
KY	Marshall	Westlake	Calvert City*	4,839
TX	Brazoria	Dow	Freeport	4,574
LA	Iberville	Dow	Plaquemine	3,731
TX	San Patricio	Occidental/Mexichem	Ingleside	2,506

Source: State emission inventories; for more information, please see the methodology section in Appendix A.
*Westlake owns three co-located plants in Calvert City. One produces PVC, one produces ethylene, and one produces chlor-alkali and vinyl chloride monomer. We include the ethylene and vinyl plants here as one facility.

Appendix E: Current Fenceline Monitoring at Plastics Plants

The following are the 16 plastics plants, out of the 50 studied for this report, that have fenceline monitoring required by consent decrees imposed after lawsuits. More specifics can be found here: https://storymaps.arcgis.com/stories/9cc8aa37cb34444dbb053a097c22ba07.

Table 9: Plastics Plants with Consent Decrees that Require Fenceline Monitoring

State	County/Parish	Parent Company	Plant Name
TX	Harris	Chevron Phillips	Cedar Bayou
TX	Brazoria	Chevron Phillips	Sweeny Old Ocean
LA	Iberville	Dow	Plaquemine
TX	Brazoria	Dow	Freeport
TX	Orange	Dow	Orange
TX	Harris	LyondellBasell	Channelview
TX	Nueces	LyondellBasell	Corpus Christi
TX	Harris	LyondellBasell	La Porte
LA	East Baton Rouge	ExxonMobil	Baton Rouge
TX	Harris	ExxonMobil	Baytown Olefins
TX	Jefferson	ExxonMobil	Beaumont
TX	Harris	ExxonMobil	Baytown Chemical
IA	Clinton	LyondellBasell	Clinton
PA	Beaver	Shell	Monaca
KY	Marshall	Westlake	Calvert City
LA	Calcasieu	Westlake	Sulphur (Petro I & II)

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(e.g., a penalty) or injunctive relief for the identified finding of violation, obtain compliance or abate the endangerment, or use to resolve liability (e.g., FIFRA Notices of Warning, Federal Facility Compliance Agreement), and (e) For self-disclosures where there is a finding of violation, includes notice that the discloser has certified that the violation has been corrected (e.g., electronic Notice of Determination.)" Link: https://www.epa.gov/system/files/documents/2023-01/newdefinitionsforkeyterms-epaenforcementprogramtools.pdf

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