

Plastics Pollution on the Rise

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**Growth of Houston-Area Plastics Industry
Threatens Air Quality and Public Safety**

EIP ENVIRONMENTAL
INTEGRITY PROJECT

ACKNOWLEDGEMENTS

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THE ENVIRONMENTAL INTEGRITY PROJECT

The Environmental Integrity Project (<http://www.environmentalintegrity.org>) is a nonpartisan, nonprofit organization established in March of 2002 by former EPA enforcement attorneys to advocate for effective enforcement of environmental laws. EIP has three goals: 1) to provide objective analyses of how the failure to enforce or implement environmental laws increases pollution and affects public health; 2) to hold federal and state agencies, as well as individual corporations, accountable for failing to enforce or comply with environmental laws; and 3) to help local communities obtain the protection of environmental laws.

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PHOTO CREDITS:

Cover Image: The ExxonMobil Baytown Olefin's plant fire sends a toxic brew of chemicals into the sky on July 31, 2019. Thirty-seven people experienced minor injuring from the explosion, which occurred at a part of the facility where plastics are made. Photo by the Associated Press, used with permission.

Page 1: Houston industrial district, Shutterstock. Page 4: Petrochemical complex, La Porte, Texas, by Roy Luck/Flickr. Page 8: Assessment units for the Wolfcamp Shale and Bone Spring Formation of the Delaware Basin, USGS.

Plastics Pollution on the Rise

Executive Summary

That the word ‘plastic’ means pliable or easily shaped is deceiving. Over the last 50 years plastic has developed a stranglehold over us, with no sign of loosening up. It is hard to imagine life without plastic: The versatile material is found in computers, phones, medical devices, packaging, and thousands of other products. Every year, about 300 million metric tons of plastic waste is created, nearly the equivalent weight of the entire human population.¹ This pollution clogs waterways, pervades beaches, and increasingly finds its way into food and water sources. Recently, a diver in the Mariana Trench, the deepest part of the Pacific Ocean, encountered a plastic bag seven miles underwater. The plastics industrial complex’s pervasive waste problem is frequently lamented, but rarely do we consider its origin.²

The Texas and Louisiana Gulf Coast is one world’s fastest-growing centers for the manufacture of plastics, and Houston is at the center of that region. This capital of the chemical industry is undergoing a plastics renaissance thanks to the proliferation of hydraulic fracturing and the availability of cheap natural gas, from which petrochemical plants derive the ingredients for plastic products. This rapid expansion, however, comes with serious side effects, including more hazardous air pollution and increased safety risks to workers and nearby residents.

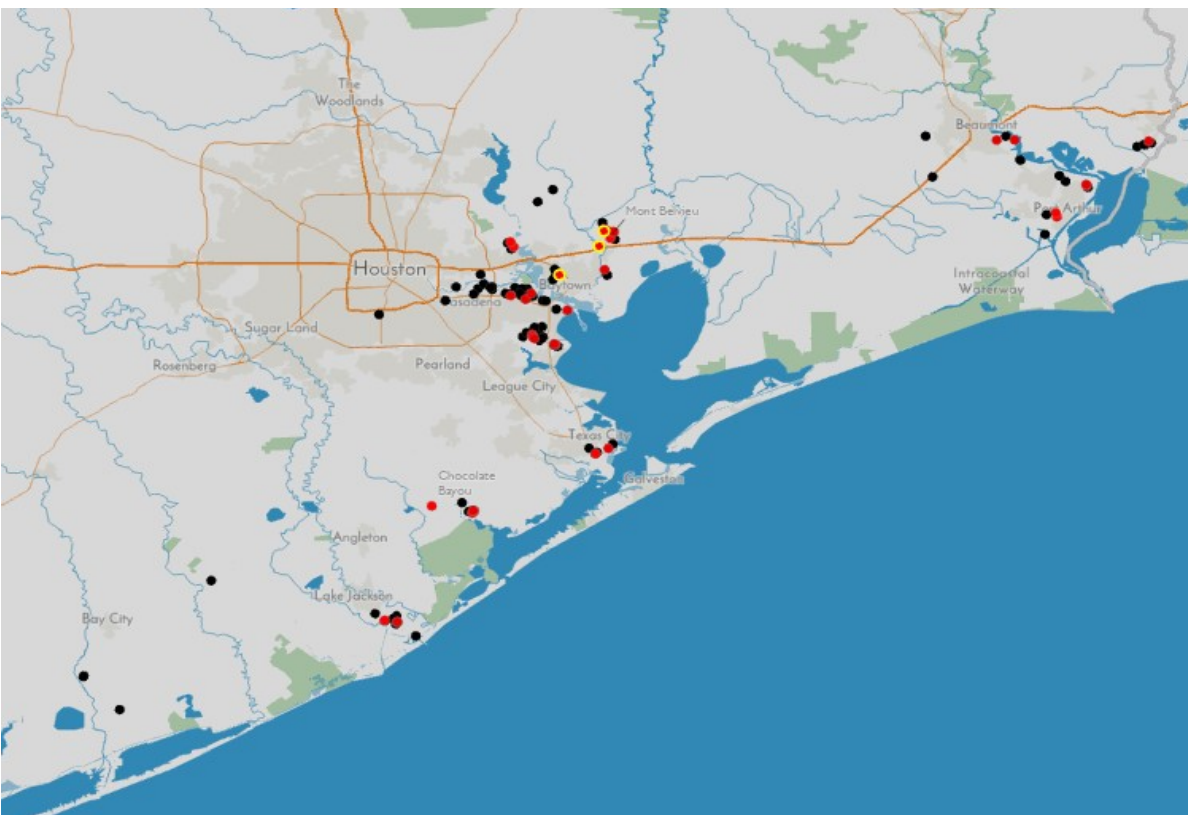
For instance, on July 31, a major fire erupted at the ExxonMobil Baytown petrochemical complex just east of Houston in a unit containing propylene, an extremely flammable material used in plastics.³ Thirty-seven people suffered injuries in the explosion,⁴ which released 14,103 pounds of benzene and 25,938 pounds of butadiene, 1-3, carcinogenic air pollutants with many negative health effects.⁵ It was the second major fire this year at the Baytown site, the largest petrochemical complex in the country. Harris County is suing ExxonMobil over both incidents for violating the state’s clean air laws.



The plastics industry in the Houston region already releases about 55,704 tons of health-damaging air pollution annually, or about 22 percent of the total from all industrial sources. Those numbers are expected to rise significantly with the planned expansion and construction of several new plastics plants.

In 2017—the most recent year for which complete emissions data are available—90 plastics-related⁶ facilities in the Houston/Port Arthur region released 55,704 tons of air pollution,⁷ according to state and industry-reported emissions data compiled by the Environmental Integrity Project (EIP).⁸ This accounted for almost a quarter (22 percent) of the region’s

PLASTICS-RELATED PLANTS IN HOUSTON/PORT ARTHUR REGION



As of 2017, there were 90 plastics-related plants in the Houston/Port Arthur area (shown in black dots). Three plant expansions were completed in 2018 (red dots with yellow circles), but the state has not yet publicly reported their emissions. Looking to the future, 40 additional plant expansions and 5 new plants are planned or permitted but not yet built (shown in red dots).

total air pollution from industrial sources. More specifically, 34 percent of the region’s industrial emissions of nitrogen oxides, a ground-level ozone (smog) precursor, came from these 90 plastics facilities, as did 30 percent of the region’s industrial emissions of Volatile Organic Compounds (VOCs), which also contribute to smog and risk of disease.

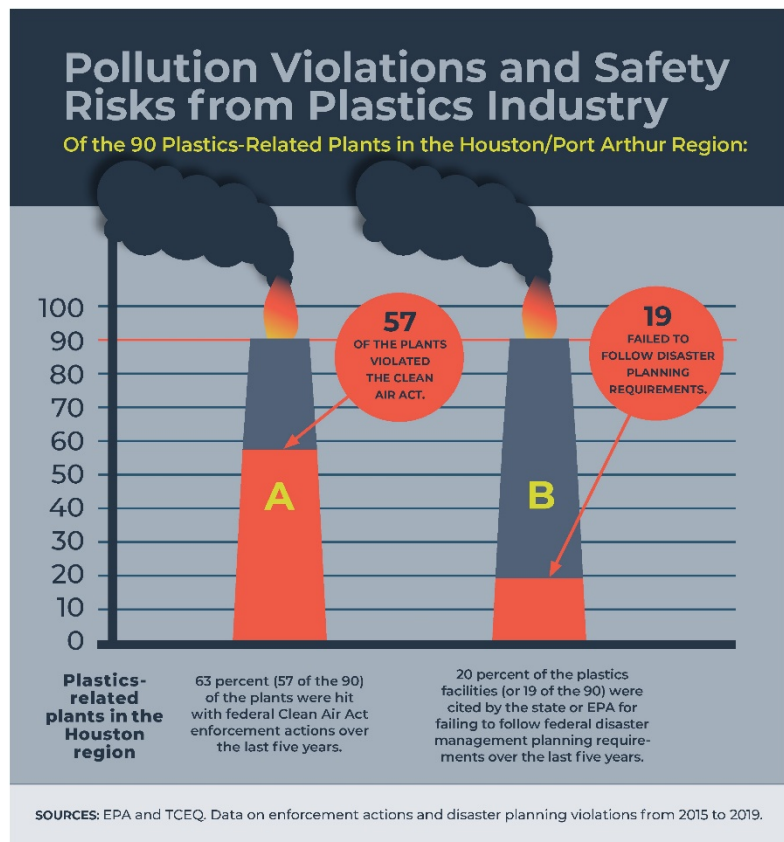
The plastics industry already contributes significantly to Houston’s poor air quality, and that impact is expected to grow as the industry expands. Looking to the future, an additional 48 plastics-related expansion projects or new plants have been permitted by the state or proposed by industry but are not yet built or publicly reporting their pollution, according to a review of an industry construction database, major Clean Air Act construction permits and permit applications, and news articles, as of August 5, 2019.

We do not know the total amount of pollution that will come from all of these new projects. However, permitting records are available for a third of the projects (16 of 48), and these

would authorize emissions of up to an additional 14,192 tons of pollution,⁹ according to a review of major Clean Air Act construction permits and pending permit applications on file with the state. (For methodology, see Appendix C. Comparing actual emissions to permitted emissions is difficult, because plants sometimes release more or less air pollution in reality than their permits allow on paper.)

Further pollution increases in the Houston area may be masked by permitting shenanigans by industry and state regulators that make it possible for manufacturers to add new processing equipment without obtaining new pollution-control permits. (For an example of this problem at the ExxonMobil Baytown Olefins plant, see page 27).

So the plastics industry is booming, but it is not always following the federal Clean Air Act. Nearly two thirds of the plastics plants examined for this report (57 of the 90) violated air pollution control laws and were subject to enforcement actions by the Texas Commission on Environmental Quality (TCEQ) or EPA over the last five years (a total of 222 violations).¹⁰ But that's just the tip of the iceberg. State records show that these 90 plants were actually responsible for far more unauthorized pollution releases that went unpenalized by the state. This is primarily due to a loophole that allows companies to argue they should not be penalized for much of the air pollution they release because it is attributable to malfunctions or unplanned maintenance (what regulators call "upset" emission events). From 2015 to 2017, Texas imposed penalties on only 7 percent (57 out of 872) of these unpermitted pollution releases from the Houston area plastics plants, according to state records. These 872 incidents released 11 million pounds of air pollution. However, the 57 fines totaled only \$665,172 – which means a penalty of only about 6 cents per pound of illegal pollution.



The small size and infrequency of these fines is a major problem. Operators are less likely to spend the money required to fix known issues when fines for illegal pollution are not severe enough to offset the economic benefit of delaying investment in plant upgrades.

Another problem facing the residents of the Houston area is the safety risks that these plants pose for the people working in them or living nearby. Chemical explosions and fires have become common, often resulting from malfunctions, errors, floods, and storms.

In Crosby, Texas, about 20 miles northeast of Houston, an explosion and fire at the KMCO specialty chemical manufacturing plant on April 2, 2019, led to the death of one employee and critical injuries to two others. The fire was ignited by a “sudden acute failure in a piping component” that released isobutylene, a flammable petrochemical product, according to a company statement.¹¹ This incident happened only 11 days after a massive fire on March 22 at a chemical facility owned by Intercontinental Terminals Co. also just outside of Houston. The proximity of these events led to calls for improved industry oversight and more focus on public health. In an editorial, *The Houston Chronicle* said, “tougher enforcement...might prevent similar events that endanger not just plant workers but entire communities near hazardous work sites.”¹²



Two thirds of the 90 plastics-related facilities in the Houston region violated air pollution control laws over the last five years and were subject to enforcement actions. But many more exceeded their permits and were not penalized, state records show.

Of the 90 plastics-related facilities examined in the EIP analysis, 19 were subject to enforcement actions over the last five years for failing to plan adequately for chemical disasters and fires, according to EPA records.¹³ The KMCO facility is one of the 19 facilities that had been fined for violating Clean Air Act disaster planning laws. On November 2, 2015, EPA signed a settlement agreement with KMCO requiring the company to pay a paltry \$5,200 for failing to plan for disasters as required by law.¹⁴ The violation reports for these

plastics facilities frequently mention failures to properly test and maintain piping, pumps, and other mechanical systems and controls. This suggests the danger of failures like the one at KMCO could be a common problem.

It should not take deadly accidents to catalyze better maintenance and disaster planning at petrochemical plants, which are often located close to minority or low-wealth communities. Without effective monitoring and oversight, plant operators can become neglectful in their approach to public health and safety concerns. In these times of rapid industry growth, it is especially important for authorities to pay close attention to safety measures, and to keep local residents as secure as possible when they live downwind and in harm's way.

Key Findings:

- The 90 plastics-related facilities in the Houston area already contribute 22 percent (55,704 tons per year) of the region’s total industrial air pollution, according to data for the most recent year (2017) for which complete emissions numbers are available.
- The industry is growing rapidly in the Houston region, with three plant expansions completed in 2018 for which the state has not yet publicly reported emissions. An additional 45 projects (40 expansions and 5 new plants) are planned for the future, according to a review of permit applications and an industry database.
- Although information is not available for all of these 48 new plastics projects in the Houston area, permitting documents are available for a third of them (16 of 48). These documents show these new plants would be authorized to emit up to 14,192 tons of additional air pollution per year.¹⁵
- Nearly two thirds of the existing facilities studied for this report (57 of the 90) were hit with Clean Air Act enforcement actions over the last five years, mostly for emissions violations. However, even more plants broke the law without suffering any penalties.
- From 2015 to 2017, Texas or EPA only imposed penalties on 7 percent (57 out of 872) of unpermitted pollution releases from the plastics industry in the Houston region during malfunctions or other industrial “upset” incidents. These 872 incidents released 11 million pounds of air pollution, but the fines were minimal, totaling only about 6 cents per pound of illegal pollution.
- Of the 90 facilities included in the EIP analysis, more than 20 percent (a total of 19) were cited by EPA for failing to follow federal disaster management planning requirements over the last five years. This should raise concerns because three of the plants erupted in flames in just the first seven months of 2019.
- Texas has been too lax in issuing and enforcing permits for industrial facilities, including plastics plants, allowing them to release more air pollution than they should. For example, TCEQ approved a permit for the ExxonMobil Baytown Olefins plant that improperly exempts the facility from federal requirements—called “New Source Review”—which mandate that companies install appropriate pollution control systems when they significantly upgrade or expand.

Recommendations:

- EPA and Texas should step up their enforcement of federal disaster planning requirements so that more plastics plants are prepared for fires, floods, hurricanes and other calamities and nearby communities are better protected. The agencies should increase their oversight of the creation of risk management plans by companies to prevent accidents, including from outdated or inadequate equipment.
- Texas should penalize polluters for the failure to properly maintain equipment or to conduct required inspections, even if these violations do not result in the release of illegal pollution. Poor maintenance and irregular inspections increase the risk of disasters and significant illegal releases. The state should focus on minimizing public health risks, rather than waiting to address disasters after they occur.

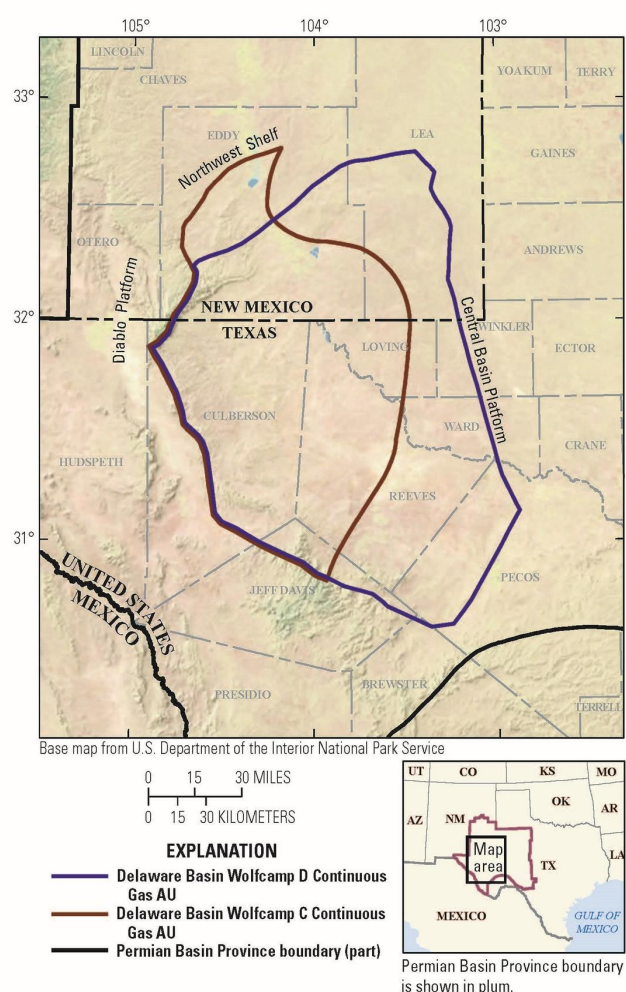
- If the same equipment at a plastics plant is the cause of repeat violations, the state should require that equipment to be replaced. Texas should also assess penalties of sufficient magnitude to provide the company with a real incentive to upgrade faulty equipment.
- Texas should be consistent when it issues penalties for pollution violations. TCEQ should require all facilities, but especially repeat violators, to pay penalties for emission events during malfunctions, startups, and shutdown that release substantial amounts of pollution into nearby communities.
- State and local agencies should establish a more effective system for quickly testing air quality after chemical disasters, and requiring industries to notify the public and local fire departments.
- Local governments across the region should create zoning policies to avoid building large chemical facilities in close proximity to residential neighborhoods. Zoning laws remain non-existent in the Houston area, even as the Houston area's population has nearly doubled over the last thirty years. This elevates risk and threatens the quality of life for many low-wealth and minority communities, which are usually the ones found closest to petrochemical plants.

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How Plastic Is Made

Like all things derived from fossil fuels, plastic has an origin story that begins underground. Texas is well endowed with underground reserves of oil and natural gas. The proliferation of hydraulic fracturing technology to blast oil and gas from shale formations in recent years has allowed vast increases in fuel production, including record-breaking production from the vast West Texas Permian Basin and Eagle Ford Shale formations. The Permian Basin alone accounts for about a third of U.S. crude oil production and a sixth of its natural gas supply. Extraction has more than doubled since 2016, and it is expected to continue to rise along with demand for export and manufacturing. Dozens of new pipelines are being built or planned to help transport these raw materials from Texas's inland oil and gas reserves to petrochemical hubs along the Gulf Coast.¹⁶



In November 2018, the U.S. Geological Survey released a new Permian Basin resource assessment showing the region to be one of the largest holders of oil and gas reserves on the planet. The map above shows a portion of the basin.

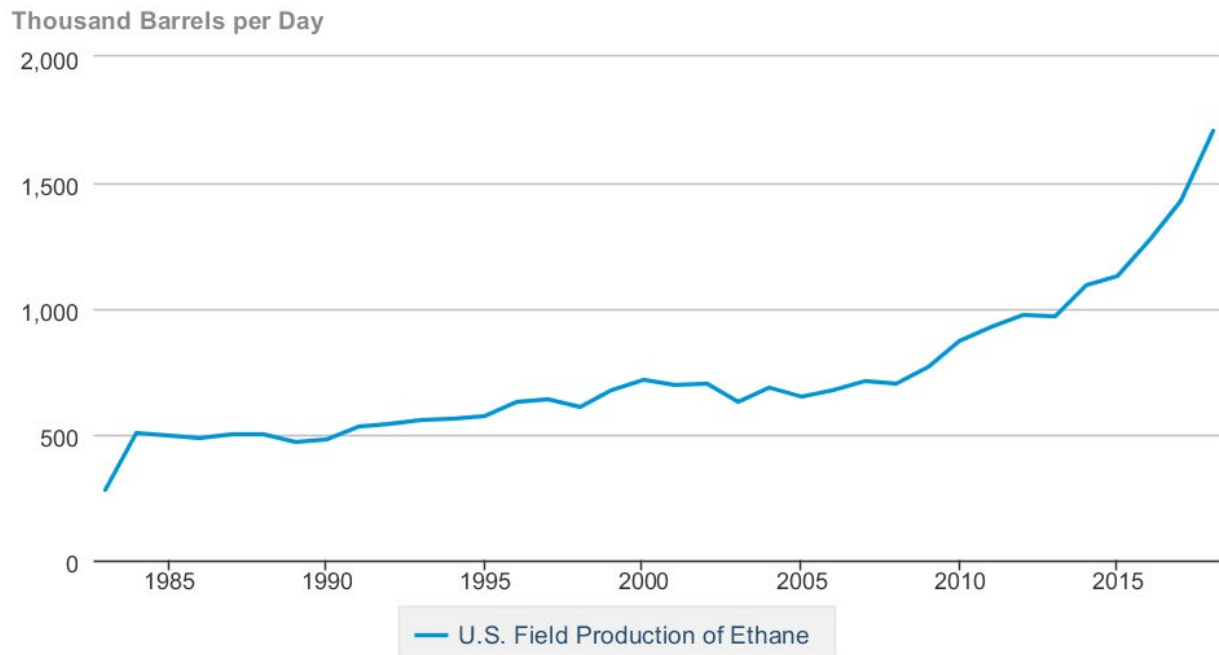
When drillers extract natural gas, the gas is considered either “wet” or “dry.” Dry natural gas, which is at least 85 percent methane, is what most people think of when they consider the fuel. It is used for heating, cooling, cooking and electricity generation. Wet natural gas includes methane and also other natural gas liquids, such as ethane, propane and butane.¹⁷ Since these liquids can be used for many different products, wet natural gas is more valuable than dry. Components of wet gas required for plastics manufacturing are separated from methane through a process called fractionation.

Once separated from the rest of the natural gas, ethane is processed into a gaseous form called ethylene by a chemical processing facility known as a cracker. Ethylene is the principal input into the production of polyethylene, one of the most widely produced plastics in the world, with an extremely large range of applications from ketchup bottles to industrial water pipes.¹⁸ The polyethylene is processed into pellets with a range of different properties, such as melting point, strength and flexibility, which ultimately determine their use.¹⁹ For example, low-density polyethylene is used to make products like packaging

film, trash and grocery bags, wire and cable insulation, and housewares.²⁰ High-density polyethylene is used for things like bottle caps, food storage containers, fuel tanks and folding chairs. The conversion of ethane to plastic pellets requires heat, which comes from the burning of natural gas. This means that cheap natural gas prices further lower the processing costs for plastics products.

These factors have led to a more than doubling of U.S. ethane production over the past decade, to well over 1.5 million barrels per day.

Figure I: Ethane Production in the United States, 1983 – 2018



U.S. ethane production has more than doubled in the past decade. Source: U.S. Energy Information Administration.

Building Boom

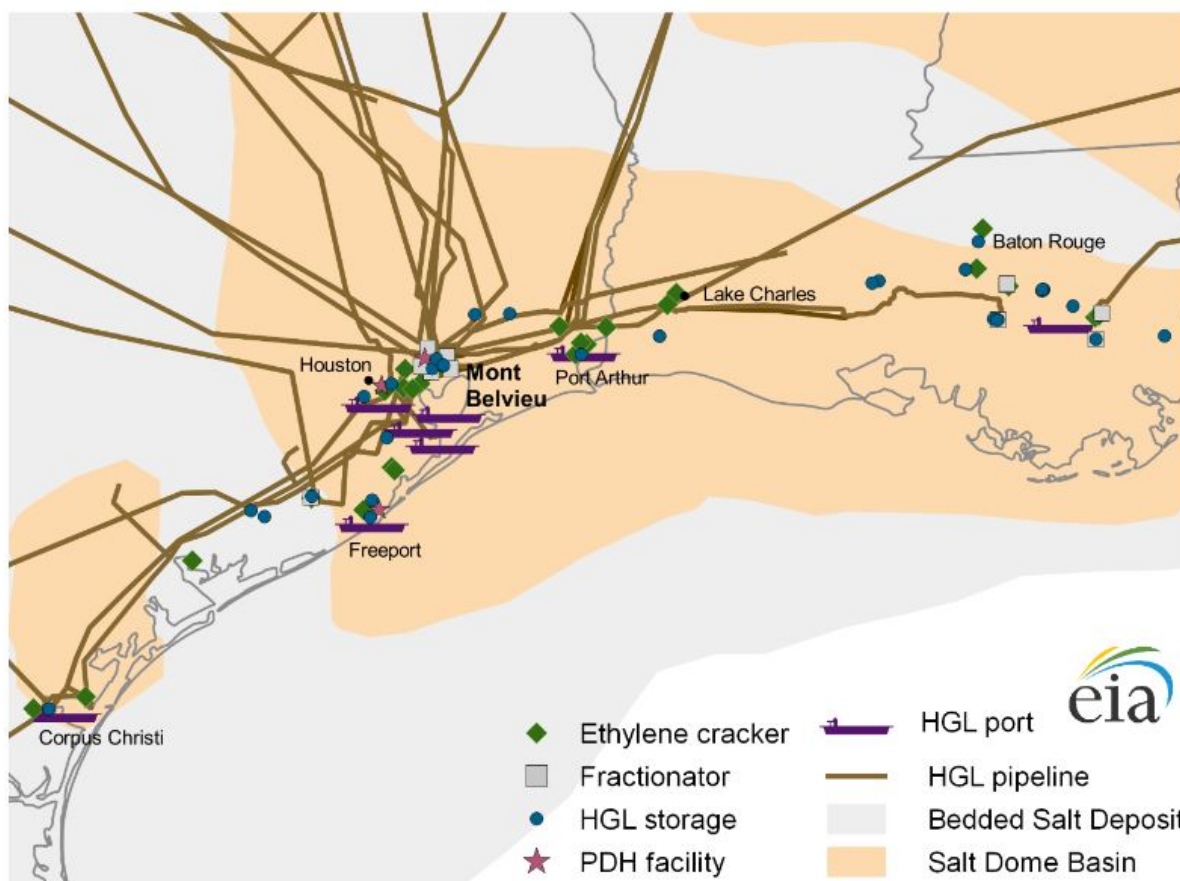
The production of plastics ingredients like ethylene is the most energy-intensive sub-sector of the chemical industry.²¹ It also dominates the petrochemical industry: In the United States, 70 percent of all petrochemicals become plastic resins, synthetic rubber, or other manufactured plastics derivatives.²² The growth in the manufacture of these products is fast, with ethylene production—for example—growing at around 6 million tons per year.²³ The Gulf Coast, from Corpus Christi to New Orleans, has been well positioned to capitalize on this demand thanks to the proximity of natural gas reserves and existing infrastructure. As recently as a decade or two ago, it looked like petrochemical plants would be shuttering across the country because gas prices were high and America's competitive advantage waned.²⁴ However, fracking rewrote that story, and now new or expanded industrial plants along the Gulf Coast are taking advantage of the cheap shale gas to manufacture plastics and plastics ingredients.²⁵ According to the American Chemistry Council, as of September

2018, 333 new or expanded petrochemical projects in the U.S. linked to fracked gas were worth over \$202 billion.²⁶ Many of these are plants produce products used in the plastics industry.

Mont Belvieu, east of Houston, is the site of the world’s largest natural gas liquids complex, operated by Enterprise Products Partners. Enterprise is currently building its tenth fractionator to process ethane on the site, which will add 150,000 barrels per day (bpd) in natural gas liquids processing capacity, bringing the total to 905,000 bpd when it begins operations in 2020.²⁷ Enterprise has a goal of achieving a 1.5 million bpd of natural gas liquids fractionation capacity.²⁸

Mont Belvieu itself is a small town, covering only about 14 square miles and home to fewer than 6,000 residents. But thanks to its underground salt dome storage facilities, which have made it a key transport link for the petrochemical industry since the 1950s, it has become the largest natural gas products hub in North America, with over 240 million barrels of underground storage capacity.²⁹

Figure 2: Mont Belvieu and Other Gulf Coast Natural Gas Products Plants



Mont Belvieu is the largest natural gas products hub in North America, with over 240 million barrels of underground storage capacity. Source: Department of Energy, November 2018.

In early 2018, Chevron Phillips Chemical completed a new ethane cracker at its Cedar Bayou facility in Baytown. With a capacity of 1.5 million metric tons of ethylene per year, it is one of the largest ethane crackers in the world.³⁰ Yet, the company is already looking at sites for a \$5.8 billion expansion of its chemical operations, including the addition of another ethane cracker. Baytown is an option, although the company foresees potential permitting limitations due to the proximity of existing crackers, including another one nearby owned by ExxonMobil.³¹

In July 2018, ExxonMobil started operating its 1.5 million ton-per-year ethane cracker at the company's Baytown chemical and refining complex, about a half hour east of Houston.³² The plant will provide ethylene to the company's nearby Mont Belvieu plastics plant. Completed in 2017, the facility's 1.3 million-tons-per-year capacity makes it one of the largest polyethylene plants in the world. ExxonMobil is also involved in a joint venture with Saudi Arabian petrochemical company SABIC to build a giant \$8-billion petrochemical complex near Corpus Christi that would include a massive ethane cracker and plastics (polyethylene) manufacturing plant.

Plastics Industry's Growing Emissions:

A. Planned and Permitted Expansions in the Houston Area

The petrochemical industry is currently pursuing at least 45 future plastics-related projects in the Houston-Port Arthur region.³³ Forty of these are expansions of existing plastics or plastics-ingredient plants, and five are new plants proposed for construction. On top of these 45 projects, three plant expansions were completed in 2018 – at the ExxonMobil Baytown, Chevron Cedar Bayou, and Enterprise Mont Belvieu plants mentioned above – but the state has not yet made the emissions data for these three projects publicly available.

None of these 48 new projects was yet online in 2017, the most recent year for which complete emissions data are available. These numbers come from EIP's review of an industry database called the Hydrocarbon Processing Construction Boxscore Database,³⁴ as well as major Clean Air Act construction permits and applications issued by or submitted to the TCEQ,³⁵ and news articles. This report examines "plastics related" facilities, by which we mean plants that manufacture plastic resins or other products, or the chemical ingredients of plastics. The new projects include plastic resin and ethylene plants, as well as the expansion of ethylene capacity, new propane dehydrogenation plants to create propylene, and new fractionators, and ethane export terminals.

We do not know the total amount of pollution that will come from all of these projects, but they could significantly increase the industry's contribution to emissions in the Houston area. EIP reviewed major Clean Air Act construction permits or permit applications for 16 of these new projects, including three that were completed in 2018 but have not yet publicly released data about their actual emissions. Pollution from just these 16 projects could increase criteria air pollutant emissions from the industry by up to 14,192 tons, according to the potential emissions documented in their permits and permit applications. (See table 1,

below).³⁶ In 2017, the most recent year for which information is available, the plastics-related industry in the Houston region released 55,704 tons of criteria air pollution.

It is important to note that new permits authorize maximum allowable emissions from new sources, and most new plastics plants are expected to operate at levels *well below* their permit limits. However, industry-reported data show that emissions can also be higher than the permitted levels because of unexpected accidents, malfunctions, poorly performing equipment, or unplanned maintenance, startups and shutdowns.

Table I: New and Future Plastics Projects and Potential Pollution Increases in the Houston area

Company- Plant (Location)	Project	Permit Status	Permitted or Pending Criteria Air Pollution Increases (tons per year)
Motiva Enterprises, LLC – Port Arthur Ethane Cracker (Jefferson County)	New ethylene plant	Pending	3,086
ExxonMobil Chemical Company— Baytown Olefins Plant (Harris County)	New ethylene plant	Issued*	1,646
TOTAL Petrochemicals & Refining USA/Borealis/Nova—Port Arthur Ethane Side Cracker (Jefferson County)	New ethylene plant	Issued	1,560
Motiva Enterprises, LLC- Port Arthur Polyethylene Manufacturing Complex (Jefferson County)	New polyethylene plant	Pending	1,251
Chevron Phillips Chemical Company— Cedar Bayou Plant (Harris County)	New ethylene plant	Issued*	1,044
LyondellBassell/Equistar Chemicals, LP—Channelview Chemical Complex North (Harris County)	Propylene oxide and tertiary butyl alcohol plant	Issued	813
Enterprise Products—Mont Belvieu Complex (Chambers County)	New propane dehydrogenation plant	Issued*	786

Company- Plant (Location)	Project	Permit Status	Permitted or Pending Criteria Air Pollution Increases (tons per year)
Praxair, Inc—Clear Lake Plant (Harris County)	New hydrogen- carbon monoxide plant	Issued	761
LyondellBassell/Equistar Chemicals, LP—Channelview Chemical Complex North (Harris County)	New propane dehydrogenation plant and new polypropylene plant	Pending	643
INEOS Olefins & Polymers USA— Chocolate Bayou Plant CBSG Station (Brazoria County)	New power plant to support INEOS Chocolate Bayou Plant	Issued	585
Enterprise Products Operating, LLC- Mont Belvieu Complex (Chambers County)	Additional propane dehydrogenation plant	Pending	560
C3 Petrochemicals- Chocolate Bayou Propane Dehydrogenation Plant (Brazoria County)	New propane dehydrogenation plant	Issued	535
Targa Midstream Services—Mont Belvieu Fractionation Plant (Chambers County)	Addition of 3 natural gas liquids fractionation plants	Issued	437
INEOS Olefins & Polymers USA— Chocolate Bayou Plant (Brazoria County)	New ethylene cracking furnace at an ethylene plant	Issued	165
INEOS Styrolution LLC—Texas City Chemical Plant (Galveston County)	New steam and power source for an ethylbenzene and styrene unit	Issued	162
Dow Chemical Company—Dow Texas Operations Freeport (Brazoria County)	Ethylene plant expansion	Issued	161
TOTAL (tons of criteria air pollutants)			14,192

The pollutants above are defined by EPA as “criteria” air pollutants: sulfur dioxide, nitrogen oxides, ozone, lead, carbon monoxide, and particulate matter. Source: Permits on file with TCEQ. See Appendix B for a list of permit numbers and the dates they were submitted or issued. Projects marked with an asterisk () were completed in 2018, but their reported actual emissions are not yet available. Note: The 16 listed above are plastics or plastics-related projects for which permits or permit applications are publicly available.*

Air Pollution

After taking the title of smoggiest U.S. city from Los Angeles at the end of the 1990s, Houston's air quality began to improve. The American Lung Association's most recent "State of the Air" report ranked Houston as having the ninth worst smog (also known as ground-level ozone) in 2019.³⁷ However, progress has stalled recently and hard-won gains are at risk of being lost.³⁸ The rapid growth of the plastics industry and other petrochemical plants, alongside increasingly hot weather brought on by climate change, threaten to send Houston's air quality backwards and worsen smog. Emissions of volatile organic compounds and nitrogen oxides from industrial facilities and vehicles create ground-level ozone, better known as smog, when exposed to sunlight.

Houston's ozone "season" runs from March 1 to November 30. In 2018, 35 days during this period were considered unsafe to breathe outdoors in the Houston area based on measured ozone levels.³⁹ These bad air days compel Houstonians to stay indoors, and kids can be forced to stay home from school. High smog levels increase the risk of asthma attacks and cardiac arrest, especially during extended exposure.⁴⁰

2017 is the last full year for which industry air pollution totals are available in Texas. This includes both routine emissions and "upset" emissions—that is, emissions resulting from equipment breakdowns, operator error, and maintenance activities.

The 90 plastics-related facilities in the Houston area contributed 22 percent (55,704 out of 253,288 tons) of the region's total reported industrial air pollution emissions in 2017. (Table 2). The plastics-related facilities contributed 34 percent (19,846 out of 58,383 tons) of the region's reported NO_x, a ground-level ozone (smog) precursor, and 30 percent (13,317 of 43,980 tons) of the region's reported Volatile Organic Compounds (VOCs), which can result into short-term and long-term health effects.

Routine emissions from the 90 plastics-related facilities accounted for 95 percent of all criteria air pollutant emissions from the 90 facilities in 2017 with upset emissions accounting for the remainder.

Table 2: Total Criteria Pollutant Emissions from 90 Houston-Area Plastics-Related Plants, 2017

Pollutant	Annual Routine Emissions (Tons)	Upset Event Emissions (Tons)	Total (Tons)	Percent of Total Industrial Emissions in Houston Area
CO	12,351	1,098	13,449	25%
NOx	19,575	271	19,846	34%
Lead	0.16	0	0.16	7%
PM ₁₀	3,490	29	3,519	24%
PM _{2.5}	2,737	28	2,765	23%
SO ₂	2,794	13	2,807	4%
VOC	12,162	1,155	13,317	30%
Total	53,110	2,594	55,704	22%

Note: "Upset" emissions are from accidents, startups, shutdowns, and maintenance. Numbers above are annual figures in tons per year of criteria air pollutants. Houston area is defined as TCEQ regions 10 and 12. Data from 2017 TCEQ Detailed Emission Inventory Summary and TCEQ STEERS database.

Criteria air pollutants are the common air pollutants for which the Clean Air Act requires EPA to set National Ambient Air Quality Standards because they are known to cause harm to public health and the environment.⁴¹

Table 3: Houston-Area Plastics-Related Plants Top 10 NOx Emitters, 2017

Rank	Site	Company	NOx (tons)
1	Invista Sarl Sabine River Site	Invista Sarl	2,196
2	Baytown Olefins Plant	ExxonMobil Chemical Company	1,889
3	Dow Texas Operations Freeport	Dow Chemical Company	1,472
4	Chocolate Bayou Plant	Ineos USA, LLC	1,412
5	Channelview Complex	Equistar Chemicals LP	1,089
6	Sweeny Old Ocean Facilities	Chevron Phillips Chemical Company LP	1,060
7	Enterprise Products Mont Belvieu Complex	Enterprise Products Operating, LLC	857
8	Sabine River Works	Performance Materials NA, INC	752
9	La Porte Complex	Equistar Chemicals LP	737
10	Beaumont Chemical Plant	ExxonMobil Oil Corporation	693

Data from 2017 TCEQ Detailed Emission Inventory.

Nitrogen oxides (NOx) are a group of gases that play a major role in the production of ground-level ozone (also known as smog) and low-oxygen "dead zones" in waterways.⁴² NO_x can be caused by burning fuel at high temperatures and can harm lung tissue and cause breathing and respiratory problems. In the Houston area, about two-thirds of NOx emissions can be attributed to mobile sources, such as car and trucks, while about a quarter are attributable to fixed industrial sources, such as refineries and chemical plants.⁴³

Table 4: Top Houston-Area Plastics-Related VOC Emitters, 2017

Rank	Site	Company	VOC (tons)
1	Baytown Chemical Plant	ExxonMobil Chemical Company	706
2	Sabine River Works	Performance Materials NA, INC	679
3	Dow Texas Operations Freeport	Dow Chemical Company	673
4	Channelview Complex	Equistar Chemicals LP	655
5	Orange Plant	Honeywell International, INC	622
6	Enterprise Products Mont Belvieu Complex	Enterprise Products Operating, LLC	584
7	Sweeny Old Ocean Facilities	Chevron Phillips Chemical Company LP	556
8	Chocolate Bayou Plant	Ineos USA, LLC	552
9	Pasadena Plastics Complex	Chevron Phillips Chemical Company LP	494
10	Baytown Olefins Plant	ExxonMobil Chemical Company	477

Numbers in tons per year. Data from 2017 TCEQ Detailed Emission Inventory Summary and TCEQ STEERS database.

Volatile Organic Compounds (VOCs) are a class of chemicals that includes many different hazardous air pollutants and known carcinogens, like benzene. According to the National Institutes of Health, “short-term exposure to volatile organic compounds can cause eye and respiratory tract irritation, headaches, dizziness, visual disorders, fatigue, loss of coordination, allergic skin reactions, nausea, and memory impairment,” while “long-term exposure to volatile organic compounds can cause damage to the liver, kidneys, and central nervous system.” VOCs are also a key component of smog. In the Houston area, about a quarter of VOC emissions can be attributed to mobile sources while around 60 percent come from area sources, which includes small-scale industrial, commercial, and residential sources that generate emissions but do not meet reporting requirements for larger point sources.⁴⁴

Air Pollution 2018

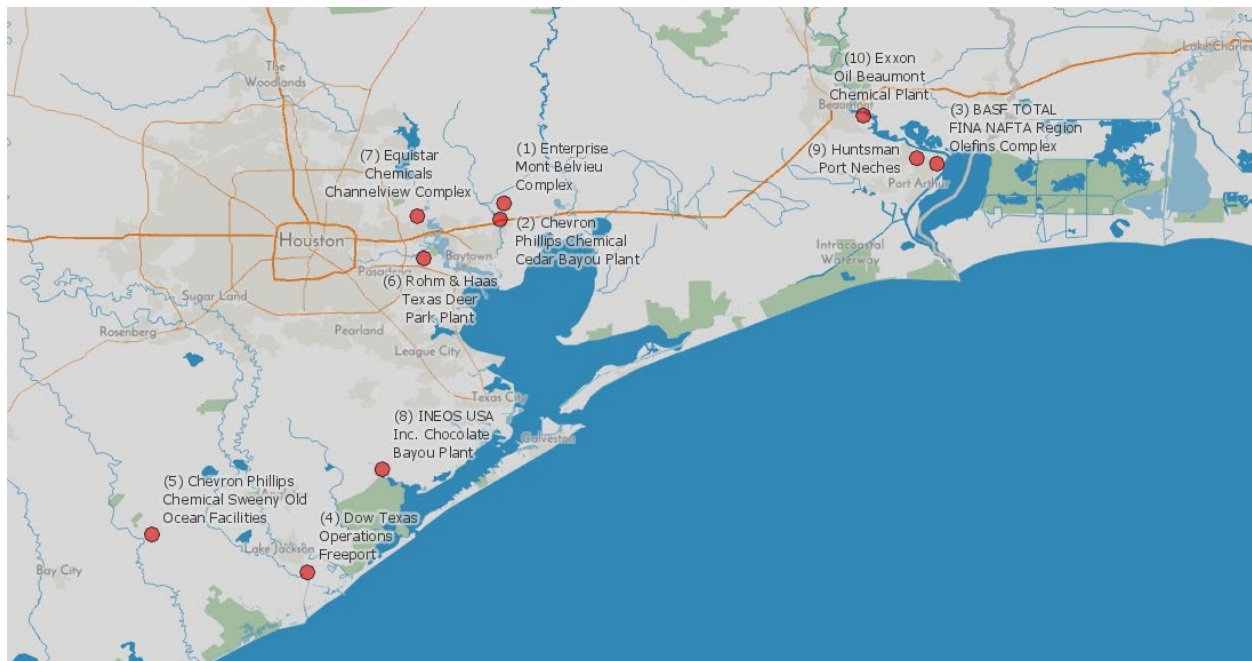
Routine emissions for the 90 plastics-related facilities in 2018 are not yet available. However, emissions from “upset” events (such as during accidents and maintenance) are available through the TCEQ and illustrate the industry’s continued growth and need for increased pollution oversight. Emissions from unpermitted “upset” emissions increased about 11 percent year-over-year from 2017 to 2018, from 2,594 tons to 2,876 tons. The latter figure accounts for about 5.6 percent of the total upset emissions reported by regulated industrial sources in the Houston/Port Arthur region in 2018.

Table 5: Top 10 Houston-Area Plastics-Related Plants Unpermitted “Upset” Emissions, 2018

Rank	Plant name	Number of “Upset” events	Total Emissions (lbs.)
1	Enterprise Mont Belvieu Complex	30	1,443,855
2	Chevron Phillips Chemical Cedar Bayou Plant	22	1,053,555
3	BASF Total Fina NAFTA Region Olefins Complex	4	773,187
4	Dow Texas Operations Freeport	35	616,730
5	Chevron Phillips Chemical Sweeny Old Ocean Facilities	20	348,796
6	Rohm and Haas Texas Deer Park Plant	4	296,434
7	Equistar Chemicals Channelview Complex	16	167,397
8	INEOS USA LLC Chocolate Bayou Plant	10	163,798
9	Huntsman Port Neches	9	146,913
10	ExxonMobil Oil Beaumont Chemical Plant	2	139,891

Emission inventory data from TCEQ STEERS databases obtained in response to public information requests.

Figure 3: Map of Top 10 Plastics-Related Plants that Reported Unpermitted “Upset” Emissions in 2018



B. Lack of Enforcement

Of the 90 plastics-related facilities included in this report, 57 received a combined total of 222 formal Clean Air Act enforcement actions from TCEQ and EPA over the last five years, but they committed far more unpermitted pollution releases that went unpenalized. This is primarily due to a loophole in permits allowing facilities to argue they should not be held responsible for much of the air pollution they release because it is attributable to industrial malfunction or maintenance (aka “upset” events).

Using the most recent available data that companies self-reported for these “upset” events EIP determined that from 2015 to 2017, only 7 percent (57 out of 872) of unpermitted pollution releases from the industry received penalties from the state or EPA. In 2018, there were 308 emissions events, but there is usually at least a year lag between emissions events and state imposed fines, so it’s too early to say for sure what percentage will receive a penalty.

These 872 incidents between 2015 and 2017 released 11,114,175 pounds of air pollution. However, the 57 fines only amounted to \$665,172—or about 6 cents per pound.

The small size and infrequency of these fines is a problem, because operators are less likely to spend the money required to fix known plant issues when fines for illegal pollution are not severe enough to offset the economic benefit of delaying investment in plant repairs and upgrades.

Table 6: Unpermitted “Upset” Emissions Events and Penalties, 2015 - 2018

Year	Total Emissions Events	Number of Penalties	Total Amount Fined	Total Pollution (lbs)
2015	322	19	\$346,424	3,293,439
2016	239	23	\$216,992	2,850,600
2017	311	15	\$101,756	4,970,136
2018	310	10	\$54,501	5,751,604

Note: penalties and fine totals for 2018 are not yet complete, because investigations often take a year or more to complete.

Table 7: Top 10 Plastics-Related Facilities Total Pounds of Unpermitted “Upset” Emissions, 2015 - 2018

Rank	Entity Name	Number of Emissions Events	Total (lbs)
1	Dow Texas Operations Freeport	112	3,265,534
2	Chevron Phillips Chemical Cedar Bayou Plant	68	2,672,631
3	Enterprise Mont Belvieu Complex	118	2,193,806
4	Chocolate Bayou Plant	23	1,084,235
5	Flint Hills Resources Port Arthur Facility	46	1,038,285
6	Chevron Phillips Chemical Sweeny Old Ocean Facilities	65	569,285
7	BASF Total FINA NAFTA Region Olefins Complex	10	887,122
8	Huntsman Port Neches	47	692,952
9	ExxonMobil Oil Beaumont Chemical Plant	18	654,757
10	Ascend Performance Materials Chocolate Bayou Plant	25	513,044

Emission inventory data from TCEQ STEERS databases obtained in response to public information requests.

Safety Concerns:

A. History of Accidents

Petrochemicals are volatile materials and working with them is inherently hazardous. As a petrochemical hub, Houston has a long history of incidents, including the deadliest industrial accident in U.S. history, the Texas City Disaster.⁴⁵ On April 16, 1947, a fire on a vessel docked at the Port of Texas City in Galveston Bay led to the detonation of 2,300 tons of ammonium nitrate onboard. In one of the largest non-nuclear explosions in history, the blast leveled at least 1,000 buildings and claimed 571 lives. The disaster led to the first ever class action lawsuit against the United States government.

In another demonstration of the industry’s inherent dangers, four decades later in 1989, a series of fires and explosions at the Phillips Petroleum Co. plastics plant along the Houston Ship Channel killed 23 and injured 130.⁴⁶ The plant produced about 1.5 billion pounds of high-density polyethylene. The accident resulted from the release of extremely flammable gases during regular maintenance on one of the polyethylene reactors.⁴⁷ More than 85,000 pounds of the gases escaped through an open valve, meeting an ignition source within two minutes, and exploding with the force of 2.4 tons of TNT. An inspection by the

Occupational Safety and Health Administration showed that the company ignored audits that had identified unsafe conditions at the facilities.⁴⁸

In Mont Belvieu in the 1980s, about 200 families were bought out and relocated by the petrochemical industry due to extreme safety concerns relating to the industry's presence. Some of the salt caverns that store petrochemicals extend thousands of feet underground. In 1985, after two workers died in an accident, a resident of the town complained to the Associated Press that explosions were "becoming an annual event."⁴⁹

Three decades later, Mont Belvieu and nearby Baytown are at the epicenter of the latest petrochemical boom as plastics and other chemical plants crop up across the landscape, and public safety and disaster preparedness are growing concerns.⁵⁰

For instance, on Wednesday morning, July 31, 2019, a large smoke column rose from the ExxonMobil Olefins plant in Baytown. The plant, which opened in 1979, is one of the largest ethylene plants in the world and a new 1.5 million-tons-per-year ethane cracker recently opened at the complex.

According to the City of Baytown, the fire was located in a unit containing polypropylene, an extremely flammable material used in making plastics.⁵¹ The company's reports show that the fire released 14,103 pounds of benzene and 25,938 pounds of butadiene, 1-3, carcinogenic air pollutants with many negative health effects.⁵² According to ExxonMobil, 37 people suffered minor injuries in the explosion. The city issued a precautionary shelter-in-place order and residents were advised to close windows and turn off air conditioners and fans, and students remained indoors at school.⁵³

It was the second fire at the massive petrochemical complex so far in 2019. The first was on March 16, when a blaze released benzene and hydrogen sulfide air pollution. Harris County is suing ExxonMobil over both incidents for violating the state's clean air laws.

In the last five years, the plant has been fined twice for serious violations of the Clean Air Act, totaling nearly \$20,000.⁵⁴

B. Communities at Risk

Many of these plastics manufacturing facilities are located in low-wealth, working class and minority communities lacking the resources to confront industry and defend themselves against unhealthy emissions and avoidable accidents. In Crosby, Texas, where the KMCO facility is located, the estimated median household income in 2016 was \$37,481, compared to an average of \$56,565 for all of Texas.⁵⁵ Communities in the Baytown area are made up primarily of Latino and African American residents.⁵⁶

When disaster strikes, those living or working closest to these large manufacturing plants face the gravest danger. In many cases, the plants are surrounded by neighborhoods or other popular attractions. The KMCO plant in Crosby is near a sports complex, a restaurant, and a church.⁵⁷ Houston is notorious for its lax zoning laws, allowing growth to occur without planning and at a breakneck pace. This "Wild West" mentality towards urban development

can please business owners, but sometimes it can lead to risky situations, such as when hazardous chemical manufacturers are located next to homes or recreation areas.⁵⁸

The potential risks of this urban mishmash crystallized when Hurricane Harvey hit Houston in August 2017. Residents living in East Houston neighborhoods, in Pasadena, and Port Arthur, and other communities lined with industrial facilities, experienced the worst of the disaster in many ways. On top of the flooding, they were forced to breathe air polluted with a soupy chemical mix of petroleum vapors, soot, sulfur dioxide, benzene, and other chemicals.

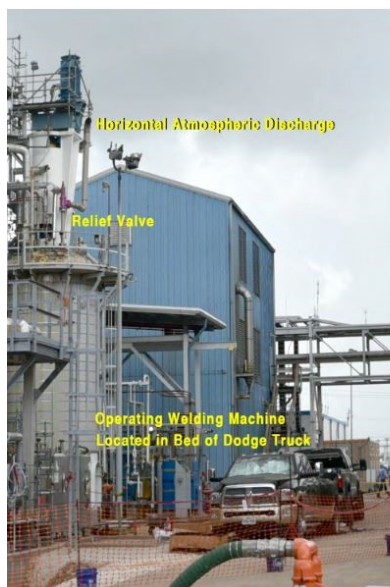
C. Explosive Fire at Plastics Plant Leaves 21 Injured

On the morning of May 19, 2018, an “explosion resulting in a fireball shooting into the sky” rocked a Houston-area plastics plant, according to court records.⁵⁹ Twenty-one workers Kuraray America plant in Pasadena were injured and all 266 employees on were on edge.

Owned and operated by Kuraray America, Inc., the facility is one of the world’s largest producers of ethylene vinyl alcohol, a key component in plastics food packaging. An ongoing investigation by the U.S. Chemical Safety Board determined the fire was caused by ethylene vapors released into the atmosphere by a pressure relief valve and then ignited by a nearby welding machine.⁶⁰ The resulting fire burned for less than three minutes, but its explosive heat was enough to injure many of the nearby workers who were welding, insulating, and painting. According to the Chemical Safety Board report, some workers suffered burns or were injured by jumping from heights to escape the fire. Others ran and fell.

The day after the accident, Houston attorney Anthony Buzbee filed a \$1 million lawsuit on behalf of Eduardo Rodriguez accusing Kuraray of gross negligence and failing to maintain a safe work environment.

The suit says Rodriguez, who was badly burned during the fire, had to leap 25 feet from scaffolding to the ground to avoid the blaze.⁶¹



The welding machine that was the source of ignition at the Kuraray plant, where 21 workers were injured. Credit: CSB.

An EPA Clean Air Act inspection from April 22 – 25, 2019, notes that Kuraray “failed to consistently inspect, and test process equipment as required by the recommended frequency” in its Emergency Response Plan. It also notes that Kuraray’s Emergency Response Plan:

- Lacked information on the medical treatment necessary in the event of human exposure.
- Lacked information on procedures and measures in the event of an accidental release of a regulated substance.
- Failed to note the procedure of updating, reviewing and sharing any changes to personnel as required.⁶²

The Kuraray plant has not been fined or otherwise penalized for violating the disaster-planning portion of the Clean Air Act in the last five years.

Opened in 1986, the plant is capable of producing 47,000 tons of ethylene vinyl alcohol a year, although an expansion to increase capacity to 58,000 tons a year is nearing completion.⁶³

D. Risk Management Plan Violations and Fines

Disaster Planning Requirements of the Clean Air Act, Section 112(r)

Section 112(r) of the Clean Air Act aims to prevent chemical accidents that can cause harm to the public and the environment. Failing to comply with the requirements of the law can endanger employees of the facility and nearby businesses, emergency responders, local residents, and the surrounding environment.

Section 112(r) was implemented as part of the 1990 Clean Air Act Amendments. The regulation requires companies using certain flammable and toxic substances to develop Risk Management Plans, including:

- Hazard assessments showing potential effects of an accidental release, a five-year accident history, and an evaluation of worst-case scenarios;
- Prevention programs including safety precautions, maintenance, monitoring, and training measures;
- Emergency response programs including procedures for informing the public and agencies should an accident occur.⁶⁴

EPA has Risk Management Plans from about 12,500 industrial and chemical facilities, many of which are located in low-wealth or minority communities.⁶⁵ Each year there are about 150 accidents at these facilities resulting in fatalities, injury, evacuation, and other harm to public health and the environment.⁶⁶

EPA Chemical Disaster Rule

In January 2017, during the final days of the Obama administration, the EPA finalized the Chemical Disaster Rule, meant to improve upon and modernize the Clean Air Act Accidental Release Prevention/Risk Management Plan Rule (section 112(r)).⁶⁷ The Chemical Disaster Rule was initiated after a 2013 explosion at West Fertilizer Company's facility in Texas killed 15 people. In developing the rule, the EPA determined that earlier protections had failed to prevent more than 2,200 chemical accidents around the country from 2004 – 2013, involving thousands of injuries and dozens of deaths.⁶⁸

The Chemical Disaster Rule aims to improve emergency preparedness by advancing safety technology, instituting third-party audits, and creating stricter emergency preparedness, among other things. EPA determined some of the “social benefits” of the new rule to include: reduced fatalities, injuries, and property damage, fewer evacuations, and avoided emergency response costs and environmental impacts.⁶⁹

In June 2017, the Trump Administration EPA, then led by Scott Pruitt, put the rule's implementation on hold for nearly two years, until February 2019. In August 2018, the U.S. Court of Appeals for D.C. ordered the Trump administration to immediately implement the rule, calling EPA's action to delay it “arbitrary and capricious.”⁷⁰ The additional protections provided by the Chemical Disaster Rule are now back in effect, although it will take several years for them to be fully implemented.

Dr. Hans Pansman, an expert in industrial safety and chemical risk management and research professor at Texas A&M's Mary Kay O'Connor Process Safety Center, said the updated Risk Management Plan rule adds important training requirements for regulated facilities and local emergency responders. Additional field and tabletop exercises will help build public trust in companies and provide valuable input for future protective measures and evacuation plans, according to Pansman. He said adding gaming elements to exercises can motivate participants, and that incident simulations can be made very lively and realistic with modern software.

Similar to how companies are always looking to improve the quality of their product, they must also always be looking to improve the safety of their operation.

“Plant leadership must foster a culture of safety and fulfill not only the regulatory requirements but pro-actively pursue safety,” Pansman said. “Effective communication from the work floor to the management is a must.” He said inspections and audits should consider behavior and work culture in their assessments.

Pansman said EPA inspections must happen on an “adequate level” otherwise discipline will decrease over time. He singled out aging plants and crowded storage facilities as needing the most attention.

He attributed past safety problems at plastics and other industrial facilities subject to the Risk Management Plan rule not to the rule itself, but to a failure of operators to follow it “with the right intentions,” and a lack of available funds to boost emergency response preparedness and the activity of Local Emergency Planning Committees.

“There will always be tension and some conflict of interest between industry and society,” Pansman said. “As long as industry is not hiding serious defects or pretending things are better than they are, compromises will be found.”

E. Risk Management Plan Enforcement

Of the 90 plastics industry facilities in the Houston/Port Arthur region examined by EIP, 19 faced enforcement actions relating to the Clean Air Act’s Risk Management Plan rule over the last five years, according to EPA data. Among them was the KMCO facility mentioned earlier. As was the case with the KMCO facility, many of these fines were for relatively insubstantial sums. Only four were for over \$100,000, and only one was over \$400,000. When the total costs of the enforcement, including Supplemental Environmental Projects⁷¹ and compliance action costs are factored in, the numbers rise slightly, with seven penalty/cost totals surpassing \$100,000. See table below:

Table 8: Houston-Area Plastics Plants Risk Management Plan Violations and Penalties, 2014 – 2019

Site	Company	Total Penalties/Costs Including Compliance Actions
La Porte Plant	E.I. du Pont de Nemours & Co (DuPont)	\$3,100,000
Enterprise Products Mont Belvieu Complex	Enterprise Products Operating, LLC	\$402,215
Dow Texas Operations Freeport	Dow Chemical Company	\$292,849
Invista Sarl Sabine River Site	Invista Sarl	\$180,000
BASF Total NAFTA Region Olefins Complex	BASF Total Petrochemicals, LLC	\$161,950
Bay City Plant	Celanese Ltd.	\$118,063
Hexion Deer Park	Hexion Inc.	\$104,714
Noltex La Port EVOH Plant	Noltex, LLC	\$70,000
Port Arthur Plant	Chevron Phillips Chemical Company LP	\$65,000
Ascend Performance Materials Chocolate Bayou Plant	Ascend Performance Materials Operations, LLC	\$60,000
Cedar Bayou Plant	Chevron Phillips Chemical Company LP	\$60,000
Arkema Houston Plant	Arkema	\$55,000
Port Neches Operations C4 Plant	TPC Group, LLC	\$46,650
Port Neches Plant	Huntsman Petrochemical, LLC	\$45,000

Site	Company	Total Penalties/Costs Including Compliance Actions
Sweeny Old Ocean Facilities	Chevron Phillips Chemical Company LP	\$40,000
Shintech Freeport Plant	Shintech Inc.	\$33,000
Crosby Facility	KMCO, LLC	\$5,200
Jacintoport Plant	Monument Chemical Houston, LLC	\$3,000
La Porte VCM Plant	Oxy Vinyls LP	\$2,700

Data from EPA's ECHO (Enforcement and Compliance History Online), Civil Enforcement Case Reports, June 18, 2019. Violations listed above are all of the federal Clean Air Act's section 112 (r) which requires risk management plans to help avoid fires and accidents.

Example Cases

E.I. Du Pont de Nemours and Company, La Porte Plant

In July 2018, EPA and the U.S. Department of Justice handed DuPont a \$3.1 million civil penalty in response to a November 15, 2014, incident at a La Porte chemical manufacturing facility, outside of Houston, that led to the death of four people.⁷² Nearly 24,000 pounds of methyl mercaptan, which is used in animal feed and in the production of pesticides, fungicides, and plastics,⁷³ was released from a Lannate⁷⁴ unit at the facility where insecticide is manufactured. The four DuPont employees died from a combination of asphyxia and acute exposure to methyl mercaptan. The Lannate unit was shut down after the incident, and DuPont announced it was closing the facility in March 2016.⁷⁵

The Complaint against DuPont alleged 22 separate violations of the Clean Air Act's Risk Management Program, including:

- Failure to develop and implement written operating procedures
- Failure to adequately implement management of change procedures
- Failure to implement safe work practices
- Mechanical integrity violations

Enterprise Products Operating, LLC, Mont Belvieu Complex

On April 6, 2015, EPA issued a Consent Agreement and Final Order to Enterprise Products Operating LLC at its Mont Belvieu plant. The order required Enterprise to pay a penalty of \$378,215 and to complete a Supplemental Environmental Project entailing the purchase of emergency response equipment for the local fire department, estimated to cost \$22,000.⁷⁶ On the same date, EPA issued the Enterprise plant an Administrative Order on Consent in response to Clean Air Act violations requiring Enterprise to address overdue mechanical integrity inspections.⁷⁷ According to the federal order, Enterprise had failed to timely inspect and/or test certain equipment, including pressure vessels and storage tanks; piping systems; relief and vent systems and devices; emergency shutdown systems; controls and pumps. The

compliance schedule required Enterprise to complete 263 different internal inspections by December 31, 2018.⁷⁸

Dow Chemical Company, Dow Texas Operations Freeport

In March 2019, EPA issued a Consent Agreement and Final Order to Dow Texas Operations in Freeport, Texas, with a penalty of \$260,349. The violations entailed six counts, including failure to conduct appropriate trainings, failure to conduct mechanical integrity inspections and inadequate employee participation in health and safety programs.⁷⁹ The order notes how around August 20, 2016, a pipe in a hydrocarbon processing unit leaked for 10.5 hours, releasing a number of potentially hazardous substances, including 8.77 pounds of butane, 49.09 pounds of propane, 66.21 pounds of propylene, 105.61 pounds of 1,3-butadiene, and others.

F. Clean Air Act Enforcement Actions

Including the Clean Air Act Risk Management Plan enforcement actions, the facilities reviewed for this report were subject to a combined total of 222 formal Clean Air Act enforcement actions over the last five years, according to EPA data. Nearly two-thirds of the facilities (57 of the 90) had at least one formal enforcement action over this time period, about 90 percent of which were for emissions violations.

Table 9: Top 10 Houston-Area Plastics Plants With Most Clean Air Act Enforcement Actions Over Last Five Years

Rank	Site	Company	Enforcement Actions
1	Hexion Deer Park	Hexion Inc.	27
2	Port Arthur Chemicals	Flint Hills Resources Port Arthur, LLC	11
3	La Porte Complex	Equistar Chemicals LP	9
4	Dow Texas Operations Freeport	Dow Chemical Company	9
5	Invista Sarl Sabine River Site	Invista Sarl	7
6	Port Neches Plant	Huntsman Petrochemical, LLC	7
7	BASF Total NAFTA Region Olefins	BASF Total Petrochemicals, LLC	7
8	Enterprise Products Mont Belvieu	Enterprise Products Operating, LLC	7
9	Port Neches Operations C4 Plant	TPC Group, LLC.	7
10	Port Arthur Plant	Chevron Phillips Chemical Company	6

Note: These are formal enforcement actions. Data from EPA's ECHO (Enforcement and Compliance History Online), June 18, 2019.

Permitting Problems:

ExxonMobil, Baytown Olefins Plant: A Case Study in Clean Air Act Circumvention

In the years leading up to the July 31 fire at the ExxonMobil Baytown Olefins Plant, TCEQ and EPA gave the company preferential treatment through a series of transactions to help the company avoid pollution control requirements triggered by pollution increases.

ExxonMobil is currently in violation of the plant-wide limits on volatile organic compounds in its air pollution control permit, according to TCEQ data.⁸⁰ This should trigger a section of the federal Clean Air Act called “New Source Review,” which requires companies to install additional pollution control systems whenever they significantly expand. However, TCEQ has not taken action to require those upgrades at the Baytown Olefins plant.⁸¹

TCEQ, moreover, has improperly allowed ExxonMobil to continue to operate under what is called a major source “flexible” permit, despite the company’s promise to obtain a more stringent permit required by federal law, and despite the fact that the TCEQ has required ExxonMobil’s competitors to abandon their major source flexible permits.⁸² In 2014, the TCEQ took a one-of-a-kind action to increase a permit limit in ExxonMobil’s flexible permit to allow the company to circumvent major New Source Review requirements triggered by its recent expansion project.⁸³ And in 2018, EPA entered a consent decree with ExxonMobil for major New Source Review violations at eight of the company’s plastics plants in Texas and Louisiana, including the Baytown Olefins Plant. Despite the seriousness of these violations, which were estimated to have caused at least 7,000 tons of illegal pollution *per year* since 2013, the federal government imposed penalties totaling less than three million dollars and allowed the company to claim credit for pollution control equipment that had already been installed for other reasons to resolve the violations.⁸⁴

Conclusion

The Houston metropolitan area has a population of around seven million, a number that is expected to reach 10 million by 2040. These residents coexist not only with each other, but also with the booming petrochemical industry, long drawn to the Houston region for its access to resources, infrastructure and experienced personnel.

The plastics-related industry is experiencing a heyday across the Houston region thanks to the abundance of cheap natural gas and demand for exports. The 90 plastics-related facilities in the Houston/Port Arthur region contributed 22 percent (55,704 tons) of the region's total reported industrial criteria air pollution emissions in 2017, the last year for which complete emissions data is available. Forty-five new or expanded plants are slated to come online in the near future, adding significantly to the industry's emissions footprint.

If the state and federal governments do not hold these facilities accountable through strong permits and enforcement, the growing plastics industry will add significantly to the challenges the Houston area faces in meeting health and environmental standards. The economic benefits the industry brings to communities through jobs need to be balanced with proper safety and health protocols, with an extra emphasis on assisting fenceline communities, which often endure most of the negative effects. Houston's notoriously lax zoning laws contribute to this unequal burden borne by these lower-wealth and minority neighborhoods.

With climate change increasing the chances of extreme weather, it is even more important for Texas and federal regulators to prioritize public and environmental health in low-lying Houston. As 2017's Hurricane Harvey demonstrated, long and powerful storms can result in large toxic air and water releases surrounding refineries, chemical plants, and other industrial facilities. When operators know they will not face severe penalties for cutting corners, it is less likely they will be prepared for potentially catastrophic events, let alone the challenges of day-to-day operations.

It should not take deadly accidents to catalyze better maintenance and disaster planning at plastics-related plants. Without effective monitoring and oversight, plant operators can become undisciplined or neglectful in their approach to public health and safety concerns. In these times of rapid industry growth, it is especially important for authorities to pay close attention to safety measures, and to keep those in harms way—who are often already exposed to higher health risks through nearby air and water pollution—as secure as possible.

Recommendations:

- EPA and Texas should step up their enforcement of federal disaster planning requirements so that more plastics plants are prepared for fires, floods, hurricanes and other calamities and nearby communities are better protected. The agencies should increase their oversight of the creation of risk management plans by companies to prevent accidents, including from outdated or inadequate equipment.
- Texas should penalize polluters for the failure to properly maintain equipment or to conduct required inspections, even if these violations do not result in the release of

illegal pollution. Poor maintenance and irregular inspections increase the risk of disasters and significant illegal releases. The state should focus on minimizing public health risks, rather than waiting to address disasters after they occur.

- If the same equipment at a plastics plant is the cause of repeat violations, the state should require that equipment to be replaced. Texas should also assess penalties of sufficient magnitude to provide the company with a real incentive to upgrade faulty equipment.
- Texas should be consistent when it issues penalties for pollution violations. TCEQ should require all facilities, but especially repeat violators, to pay penalties for emission events during malfunctions, startups, and shutdown that release substantial amounts of pollution into nearby communities. State and local agencies should establish a more effective system for quickly testing air quality after chemical disasters, and requiring industries to notify the public and local fire departments. These kinds of location-based alert systems already exist for extreme weather and missing children.
- Local governments across the region should create zoning policies to avoid building large chemical facilities in close proximity to residential neighborhoods. Zoning laws remain non-existent in the Houston area, even as the Houston area's population has nearly doubled over the last thirty years. This elevates risk and threatens the quality of life for many low-wealth and minority communities, which are usually the ones found closest to petrochemical plants.

Appendix A: 90 Houston-Area Plastics Plants

County	Company	Site/Facility	Clean Air Act Violations
Harris	Akzo Nobel Chemicals LLC	Battleground Site	3
Harris	Akzo Nobel Chemicals LLC	Azko Nobel Pasadena Site	3
Harris	Albemarle Corporation	Albemarle Corp	3
Harris	American Acryl LP	American Acryl Pasadena	0
Harris	Arkema Inc	Arkema Houston Plant	1
Harris	Arkema Inc	Clear Lake Operations	0
Harris	Arkema Inc	Crosby Facility	1
Brazoria	Ascend Performance Materials Operations LLC	Ascend Performance Materials Chocolate Bayou Plant	4
Brazoria	BASF Corporation	Freeport Site	3
Jefferson	BASF Total Petrochemicals LLC	BASF Total Nafta Region Olefins Complex	7
Harris	Bayport Chemicals LLC	Bayport Polymers - HDPE plant	0
Brazoria	Blue Cube Operations LLC	Blue Cube Operations Freeport	1
Galveston	BP Amoco Chemical Company	Texas City Chemical Plant	2
Harris	Braskem America INC	La Porte Plant	0
Brazoria	Braskem America INC	Braskem America	1
Harris	Celanese LTD	Clear Lake Plant	0
Matagorda	Celanese LTD	Bay City Plant	3
Harris	Chevron Phillips Chemical Company LP	Pasadena Plastics Complex	0
Brazoria	Chevron Phillips Chemical Company LP	Sweeny Old Ocean Facilities	5
Jefferson	Chevron Phillips Chemical Company LP	Port Arthur Plant	6
Harris	Chevron Phillips Chemical Company LP	Cedar Bayou Plant	5
Orange	Chevron Phillips Chemical Company LP	Orange Plant	3
Chambers	Covestro LLC	Covestro Industrial Park Baytown	0
Harris	Dixie Chemical Company Inc	Bayport Facility	1
Brazoria	Dow Chemical Company	Dow Texas Operations Freeport	9
Jefferson	Dow Chemical Company	Dow Beaumont Aniline	0
Harris	Dow Chemical Company	La Porte Plant	2
Jefferson	Dow Chemical	Beaumont Aniline Facility	3
Harris	E R Carpenter LP	Roger W Powell Plant	3
Galveston	Eastman Chemical Texas City Inc	Texas City Operations	1
Harris	El Dupont de Nemours & Co	La Porte Plant	4

Chambers	Enterprise Products Operating LLC	East Storage/Splitter III Facility	5
Chambers	Enterprise Products Operating LLC	Mont Belvieu Complex	7
Harris	Enterprise Products Operating LLC	Morgans Point Complex	3
Harris	Equistar Chemicals LP	Channelview Complex	0
Harris	Equistar Chemicals LP	La Porte Complex	9
Brazoria	Equistar Chemicals LP	Chocolate Bayou Polymers	1
Harris	Equistar Chemicals LP	Bayport Polymers	3
Matagorda	Equistar Chemicals LP	Matagorda Plant	0
Harris	Equistar Chemicals LP	Bayport Underwood Plant	2
Harris	ExxonMobil Chemical Company	Baytown Olefins Plant	3
Harris	ExxonMobil Chemical Company	Baytown Chemical Plant	1
Chambers	ExxonMobil Chemical Company	Mont Belvieu Plastics Plant	0
Jefferson	ExxonMobil Oil Corp	Polyethylene Plant	1
Jefferson	ExxonMobil Oil Corp	Beaumont Chemical Plant	5
Harris	Flint Hills Resources Houston Chemical LLC	Flint Hills Resources Houston Chemical	0
Jefferson	Flint Hills Resources Port Arthur LLC	Port Arthur Chemicals	11
Harris	Geo Specialty Chemicals INC	Geo Specialty Chemical Deer Park	0
Angelina	Georgia-Pacific Chemicals LLC	Lufkin Resin Plant	0
Harris	Hexion Inc	Hexion Deer Park	27
Orange	Honeywell International Inc	Orange Plant	1
Brazoria	Huntsman Ethyleneamines LLC	Huntsman Ethyleneamines	0
Jefferson	Huntsman Petrochemical LLC	Port Neches Plant	7
Harris	Ineos Americas LLC	Pasadena Plant	0
Harris	Ineos Styrolution America LLC	Bayport Plant	1
Galveston	Ineos Styrolution America LLC	Texas City Plant	0
Brazoria	Ineos USA LLC	Chocolate Bayou Plant	5
Harris	Ineos USA LLC	Polyethylene Plant	1
Harris	Ineos USA LLC	Polypropylene Plant	0
Harris	Ineos USA LLC	La Porte PAO Facility	0
Orange	Invista S A R L	Invista Sarl Sabine River Site	7
Harris	Kaneka North America LLC	Kaneka Pasadena Side	0
Harris	KMCO LLC	Crosby Facility	2
Harris	Kuraray America Inc	Kuraray America EVAL	3
Harris	Kuraray America Inc	La Porte Plant	0
Harris	Kuraray America Inc	PVA Plant	0
Chambers	Lanxess Corporation	Baytown Plant	0

Jefferson	Lucite International Inc	Beaumont Plant	3
Harris	Lyondell Chemical Company	Channelview Plant	6
Harris	Lyondell Chemical Company	Bayport Choate Plant	1
Harris	LyondellBasell Acetyls LLC	LyondellBasell Acetyls	2
Harris	Noltex LLC	Noltex La Porte EVOH Plant	5
Matagorda	Oxea Corporation	Bay City Plant	0
Harris	Oxy Vinyls LP	Deer Park VCM Plant	0
Harris	Oxy Vinyls LP	Pasadena PVC Plant	0
Harris	Oxy Vinyls LP	La Porte VCM Plant	2
Orange	Performance Materials NA INC	Sabine River Works	4
Harris	Polynt Composites USA Inc	Holmes Plant	0
Harris	Rohm and Haas Texas Incorporated	Deer Part Plant	4
Harris	Sekisui Specialty Chemicals America LLC	Pasadena Plant	0
Brazoria	Shintech Incorporated	Freeport Plant	2
Harris	SI Group Inc	Baytown Terminal	0
Orange	Solvay Specialty Polymers USA LLC	Halar Terpolymer Powder	3
Harris	Texmark Chemicals Inc	Texmark Chemicals	1
Jefferson	Total Petrochemicals & Refining USA Inc	Total Cray Valley Beaumont	0
Harris	Total Petrochemicals & Refining USA Inc	La Porte Plant	0
Harris	Trecora Resources	Pasadena Plant	0
Galveston	Union Carbide Corporation	UCC Texas City Plant	3
Brazoria	Vencorex US Inc	Freeport Plant	0

Violations listed are over the last five years. Data is EPA's ECHO (Enforcement and Compliance History Online), as of June 18, 2019.

Appendix B: Permit Details for 16 Expansion Projects

Plant (Location)	New or Expansion?	Project Description	Sector	Type(s)	Permit Status	Permit Information	NOX (TPY)	VOC (TPY)	SO2 (TPY)	Total Criteria Air Pollution (TPY)
Motiva Enterprises, LLC- Port Arthur Ethane Cracker Unit (Jefferson County)	New	Construction of a new ethylene plant next to Motiva's Port Arthur Refinery.	Petrochemical	Ethylene Plant	Application Pending	GHGPSDTX186, PSDTX1546, 153673 (9/20/2018)	409.00	486.42	106.22	3,085.75
ExxonMobil Chemical Company-Baytown Olefins Plant (Harris County)	Expansion	Construction of 8 ethylene steam cracking furnaces and associated equipment at an existing petrochemical manufacturing facility.	Petrochemical	Ethylene Plant	Final/Exempt	PSD-TX-102982-GHG (GHGPSDTX24) (11/25/2013)(GHG language rescinded in 2016), TCEQ Permit 102982 (2/19/2014, amended 11/9/2016)	232.27	219.40	22.44	1,645.92
Bayport Polymers (TOTAL Petrochemicals & Refining USA Inc./Borealis/Nova)-Port Arthur Ethane Side Cracker (Jefferson County)	Expansion	Construction of a new ethylene plant at the Port Arthur Refinery.	Petrochemical	Ethylene Plant	Final Permit	GHGPSDTX114 (issued 7/22/2016)	220.76	232.47	8.70	1,559.91
Motiva Enterprises, LLC- Polyethylene Manufacturing Complex (Jefferson County)	New	Construction of a 500 kta HPDE plant, a single 650 kta LLDPE/HDPE unit, and a dual 1300 kta LLDPE/HDPE unit.	Plastic Resin	Plastic resin manufacturing plant	Application Pending	GHGPSDTX195, PSDTX1564, 156571 (4/18/2019)	115.18	630.66	68.91	1,250.87

Chevron Phillips Chemical Company, LP- Cedar Bayou Plant (Harris County)	Expansion	Addition of a new ethylene production unit (Unit 1594) that will increase ethylene production at the plant by 1.5 million metric tons/yr and also produce fuel gas, mixed C3 and C4 hydrocarbons, and lower-output hydrocarbons.	Petrochemical	Ethylene Plant	Final Permit	PSD-TX-748-GHG (GHGPSDTX9) (1/17/2013), PSDTX748M1 (8/6/2013)	165.64	104.58	16.55	1,043.89
Equistar Chemicals, LP (LyondellBasell)-Channelview Chemical Complex North (Harris County)	Expansion	Construction of a new production unit that will manufacture propylene oxide (PO) and tertiary butyl alcohol (TBA), along with other gaseous and liquid byproducts that will be used by the Channelview Complex as fuel.	Petrochemical	Chemical	Final Permit	GHGPSDTX149, GHGPSDTX150, PSDTX1480 (6/29/2017)	107.46	168.37	12.80	812.69
Enterprise Products-Mont Belview Complex (Chambers County)	Expansion	Construction of a new 1.6 billion lb/yr propane dehydrogenation (propylene) unit at an existing oil and gas production facility.	Petrochemical	Propylene Plant, Gas Plant, Chemical Plant	Final Permit	PSD-TX-1336-GHG (4/16/2014), PSDTX1336 (3/13/2014)	115.60	71.05	135.20	786.05
Praxair, Inc.- Praxair Clear Lake Plant (Harris County)	Expansion	Construction of a new hydrogen-carbon monoxide plant within the Celanese Complex. The plant will produce 83 MMscf/d of hydrogen to Praxair's hydrogen pipeline and provide steam and 35 MMscf/d of carbon monoxide to Celanese.	Petrochemical	Chemical	Final Permit	GHGPSDTX164, PSDTX1512 (10/20/2017)	24.13	9.98	0.62	760.90

Equistar Chemicals, LP (LyondellBasell)-Channelview Chemical Complex North (Harris County)	Expansion	Addition of a propane dehydrogenation (propylene) and polypropylene plant.	Plastic Resin	Propylene Plant, Plastic Resin Manufacturing Plant	Application Pending	GHGPSDTX182, GHGPSDTX183, PSDTX1542, PSDTX1540, 152181, N264, 152184, N266 (5/1/2018)	48.99	229.05	17.05	642.83
INEOS Olefins & Polymers U.S.A.-Chocolate Bayou Plant - CBSG Station (Brazoria County)	New	Construction of a new power plant to provide steam and electricity to the INEOS Chocolate Bayou chemical plant.	Petrochemical	Chemical	Final Permit	GHGPSDTX135, PSDTX1460 (2/10/2017)	(84.14)	16.23	1.24	584.79
Enterprise Products Operating LLC-Mont Belvieu Complex (Chambers County)	Expansion	Construction of a Propane Dehydrogenation Unit Number II (PDH II) located at the existing Enterprise Mont Belvieu Complex	Petrochemical	Propylene Plant	Application Pending	GHGPSDTX193, PSDTX1558, 156320, N272 (3/28/2019)	79.06	79.35	33.17	559.52
C3 Petrochemicals-Chocolate Bayou PDH Plant (Brazoria County)	Expansion	Construction of a new propane dehydrogenation (propylene) plant at an existing petrochemical facility. Propylene is used to manufacture polypropylene resin.	Petrochemical	Propylene Plant	Final Permit	PSD-TX-1342-GHG (GHGPSDTX42) (6/12/2014), PSDTX1342 (4/21/2014)	53.20	20.10	4.00	535.00
Targa Midstream Services- Mont Belvieu Fractionation Plant (Chambers County)	Expansion	Addition of one 100,000 bpd and three 120,000 bpd natural gas liquids fractionation trains (Trains 5-9) at an existing fractionation plant.	Natural Gas	Gas Processing Plant	Final Permit	GHGPSDTX26M1, PSDTX696M2, 101616, N214M1 (10/3/2018); PSD-TX-101616-GHG (12/30/2013) (GHG language rescinded in 2016)	35.58	63.89	4.20	436.97

INEOS Olefins & Polymers U.S.A.- Chocolate Bayou Plant (Brazoria County)	Expansion	Construction of a new cracking furnace and decoke/cyclone drum at the No. 2 Olefins unit. The project expands ethylene capacity by 150 million lbs/yr.	Petrochemical	Ethylene Plant	Final/Exempt	PSD-TX-97769-GHG (issued 10/5/2012) (GHG language rescinded in 2015), 97769 (9/26/2012)	21.68	15.53	1.69	164.72
INEOS Styrolution LLC- Texas City Chemical Plant (Galveston County)	Expansion	Addition of 3 gas-fired boilers to provide steam for a production unit that produces ethylbenzene and styrene.	Plastic Resin	Plastic Resin Manufacturing Plant	Final Permit	GHGPSDTX175, PSDTX1528, 148643 (2/8/2019)	24.48	12.66	1.35	161.53
Dow Chemical Company- Dow Texas Operations- Freeport Light Hydrocarbons Plant No. 9 (Brazoria County)	Expansion	Subsequent expansion of an ethylene cracker	Petrochemical	Ethylene Plant	Final Permit	GHGPSDTX38M1, PSDTX1328M2, 107153, N260 (6/13/2018)	49.07	10.74	2.58	160.62

Appendix C: Data and Methods

2017 Emissions

EIP received a spreadsheet containing detailed 2017 emission inventory data from the Texas Commission on Environmental Quality (TCEQ) on March 8, 2019. The spreadsheet we received contained unit-level criteria pollutant emissions (VOCs, PM10, PM2.5, NOX, SO2, CO, and Pb) categorized into three types—routine; maintenance, startup, and shutdown; and emission events. Routine emissions occur during normal, day-to-day operations. Maintenance, startup, and shutdown emissions occur during maintenance events or facility or process startups or shutdowns. Emission event emissions occur as a result of an accident, malfunction, or other unpermitted event. For this report, we considered the total emissions reported across all three categories.

We aggregated unit-level emissions to the facility and pollutant class level and selected facilities located in TCEQ regions 10 (Beaumont) and 12 (Houston). In total, 646 regulated facilities in the Houston-Beaumont area reported releasing 253,288 tons of criteria air pollutants in 2017.

We then narrowed the list of facilities in regions 10 and 12 to those that identified with standard industry classification (SIC) codes associated with plastics and plastics ingredient manufacturing. Those included SIC 2821, plastics materials, synthetic resins, and nonvulcanizable elastomers; SIC 2869, industrial organic chemicals, not elsewhere classified; and SIC 2865, cyclic organic crudes and intermediates, and organic dyes and pigments. While using these three industry codes captured a large swath of facilities and emissions from the plastics manufacturing, it is not representative of the entire plastics lifecycle. Narrowing our analyses to these facilities yields a conservative estimate of the total emissions footprint of production, but it omits sources like import and export terminals, gas processing plants that do not have on-site fractionation, and petroleum refineries that also play a role in plastics manufacturing.

To verify that facilities produced plastics or ingredients used to manufacture plastics, we conducted internet searches of company websites and public records made available on the TCEQ website to catalog the materials manufactured at each facility. We narrowed our list to 90 facilities that clearly manufactured products that were used to make plastics. The 90 facilities include fractionation plants that separate natural gas liquids into ethane, propane, and other chemicals; ethylene crackers; propane dehydrogenation plants that process propane into propylene; plastic resin manufacturers that make polyethylene, polypropylene, or other plastic materials; and petrochemical manufacturers that produce products that are used to manufacture plastics, including catalysts and other key ingredients like monoethylene glycol and ethylene oxide. They reported releasing a total of 55,704 tons of criteria air pollutants in 2017, or 22 percent of the 253,288 tons reported by facilities in the Houston-Beaumont region.

Expansions and New Facilities

EIP maintains a public database of new and expanded oil, gas, and petrochemical infrastructure projects at <http://www.environmentalintegrity.org/oil-gas-infrastructure-emissions/>. We used the information from this database and permits and permit applications acquired from TCEQ to estimate permitted emission increases from three new and 13 expanded facilities that manufacture products related to plastics manufacturing.

The emissions we cataloged from permits and applications reflect net potential emission changes that could result from the routine operation of a new facility or expansion project. The net changes in emissions are provided by companies in their permit applications and are subject to revision by TCEQ. We considered a facility “new” if it will not be within the footprint of an existing regulated entity. We reviewed company websites and news articles to determine whether projects were under construction or when they were completed. Thirteen of the 16 projects had not started construction or were under construction as of July 2019, while three were completed in 2018. We excluded projects that were completed during or before 2017 to avoid double-counting emissions.

Potential emission increases documented in permit applications and issued permits are the only estimates of potential air emissions available to the public for a facility that has not yet started operating and reporting emissions to regulatory agencies. They should always be viewed with some degree of uncertainty. In reality, once operating, a facility could release more or less pollution than their permits and applications state on paper. For this reason, we did not make a direct comparison between permitted emission increases and 2017 actual emissions, as the numbers, in this instance, speak for themselves.

In addition to the 16 permits and applications we reviewed, we identified 4 additional major PSD permits or applications in TCEQ’s NSR permit tracking database for plastics-related projects in the Houston-Beaumont area.

We also identified 28 new and proposed plastics-related construction projects cataloged in Hydrocarbon Processing’s Construction Boxscore Database (www.constructionboxscore.com). This is a proprietary industry database that tracks corporate announcements about new production facilities and expansion projects.

2018 Emission Events

Our analysis of 2018 emission events is based on emission data that regulated facilities reported to TCEQ. We obtained a copy of TCEQ’s Air Emission Event Report Database (available at <https://www2.tceq.texas.gov/oce/eer/>) through an open records request on May 8, 2019. Before analyzing the data, we standardized contaminant names and removed duplicate events (defined as those with identical identification numbers or those that did not have identical identification numbers but stated elsewhere in the report that the same event was reported more than once). Where possible, we estimated VOC emissions based on reports of natural gas releases if the facility reported a detailed emission estimation method. We filtered the data to reports from facilities located in TCEQ regions 10 and 12 (Beaumont and Houston) and the 90 plants we identified in our analysis of 2017 emissions. We then calculated the number of events and total emissions by regulated entity.

Enforcement/Compliance

This report's review of state and federal enforcement orders and penalties relies on publicly available data. We reviewed Clean Air Act enforcement actions from TCEQ and EPA using EPA's Enforcement and Compliance History Online (ECHO) database and TCEQ's Commission Issued Orders (CIO) database in May, June and July 2019.

We considered Formal Enforcement Actions and EPA Cases over the last five years (the duration of time maintained on the ECHO database). We cross-referenced ECHO formal enforcement actions with TCEQ's CIO database to determine the nature of the action and whether it related to an emissions violation. We also used the CIO database to determine the penalty for any upset emissions violations.

To determine the number of disaster management planning violations, we reviewed ECHO data for violations relating to Clean Air Act section 112(r). Implemented as part of the 1990 Clean Air Act Amendments, the regulation requires companies using certain flammable and toxic substances to develop Risk Management Plans.

Publicly available enforcement and inspection reports, used to find further information on disaster management planning violations, were accessed through EPA's database "Compliance Assurance and Enforcement Documents for Texas" (<https://www.epa.gov/tx/compliance-assurance-and-enforcement-documents-texas>).

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⁶⁸ “Defending Community Safety Protections From Chemical Disasters,” EarthJustice.

<https://earthjustice.org/cases/2017/defending-community-safety-protections-from-chemical-disasters>

⁶⁹ Jacy T Rock, Brian Nelson, Ivan London & Suzanne Crespo, “Clean Air Risk Management Plan Issues and Enforcement,” Air Quality Issues Affecting Oil, Gas, and Mining Development and Operations 12-1 (Rocky Mt. Min. L Fdn. 2018).

⁷⁰ “U.S. court orders Trump administration to enforce chemical safety rule,” Timothy Gardner, Reuters, 08/17/2018. <https://www.reuters.com/article/us-usa-court-chemicals-safety/u-s-court-orders-trump-administration-to-enforce-chemical-safety-rule-idUSKBN1L222W>

⁷¹ A Supplemental Environmental Project is part of a settlement agreement in which which the alleged violator undertakes a project to provide an environmental or public health benefit to the affected community or environment. The project relates to the violation being resolved, but goes further than is required by law.

⁷² “EPA and Justice Department Reach \$3.1 Million Settlement with DuPont for Alleged Chemical Accident Prevention Violations,” News Releases from Region 06, 07/26/2018.

<https://www.epa.gov/newsreleases/epa-and-justice-department-reach-31-million-settlement-dupont-alleged-chemical-accident>

⁷³ ChemicalSafetyFacts.org, Methyl Mercaptan. <https://www.chemicalsafetyfacts.org/methyl-mercaptan/>

⁷⁴ DuPont™ Lannate® LV† Insecticide. Corteva Agriscience. <https://www.corteva.us/products-and-solutions/crop-protection/lannate-lv.html>

⁷⁵ ECHO (Enforcement and Compliance History Online), Civil Enforcement Case Report. Case Number: 06-2017-3400. <https://echo.epa.gov/enforcement-case-report?id=06-2017-3400>

⁷⁶ ECHO (Enforcement and Compliance History Online), Civil Enforcement Case Report. Case Number: 06-2015-3315. <https://echo.epa.gov/enforcement-case-report?id=06-2015-3315>

⁷⁷ ECHO (Enforcement and Compliance History Online), Civil Enforcement Case Report. Case Number: 06-2015-3316. <https://echo.epa.gov/enforcement-case-report?id=06-2016-3332>

⁷⁸ CAA Administrative Order on Consent, U.S. Environmental Protection Agency, Region 6. 04/06/2016. Docket NO. CAA 06-2015-3316.

⁷⁹ CAA-06-2018-3317 Consent Agreement and Final Order. , U.S. Environmental Protection Agency, Region 6. 03/04/2019.

⁸⁰ Data on VOC emission from TCEQ emissions inventory.

⁸¹ The VOC flexible/PAL cap in Permit No. 3452 is 435.77 tons per year. In 2017, the most recent year for which the data is available, ExxonMobil reported 436 tons of VOC pollution. An exceedance of a PAL cap, no matter how small, triggers major New Source Review requirements. ExxonMobil’s flexible permit provides that “[p]hysical changes and changes in the method of operation of this site are exempt from federal New Source Review (NSR) . . . as long as site emissions do not exceed the PAL caps.” Permit No. 3452, Special Condition 6.

⁸² ExxonMobil took the initial step of filing a “de-flex” application in June 2012, but that application has been on “management hold” since September 2012. In the meantime, ExxonMobil has filed an application to renew its flexible permit and another one to establish a new major source flexible permit for its Mont Belvieu plastics plant. Of the sources covered by this report, ExxonMobil’s Baytown Olefins Plant is the only one currently operating under a major source flexible permit. Dow’s flexible permit for the Freeport Chemical Plant was converted to a federally approved major source permit in 2013. Enterprise Products flexible permit for the Mont Belvieu Complex was converted into a federally approved major source permit in 2011. Ineos Olefins & Polymers U.S.A.’s flexible permit for the Chocolate Bayou Plant was converted into a federally approved major source permit in 2013.

⁸³ Environmental Integrity Project, Air Alliance Houston, an Sierra Club’s Reply to Responses to Our Motion to Overturn, TCEQ Docket No. 2014-0965-AIR, available electronically at:

https://www14.tceq.texas.gov/epic/eCID/index.cfm?fuseaction=main.download&doc_id=870389202014220

⁸⁴ Comments by Environmental Integrity Project, Sierra Club, Public Citizen, Louisiana Bucket Brigade and Louisiana Environmental Action Network concerning *United States and Louisiana Department of Environmental Quality v. ExxonMobil Corp. and ExxonMobil Oil Corp.*, D.J. Ref. No. 90-5-2-1-10128 (December 7, 2017).