

Addressing Social Justice and Environmental Health Issues in the Construction Industry: Polymers, Toxins, and Philadelphia Energy Solutions



Kai Song (CAS '22) and Dr. Franca Trubiano (Weitzman School of Design)

THE PROBLEM

- The building industry and the general public remain poorly informed on the toxic accumulation of ubiquitous **highly synthetic building polymers** that originate in **carbon intensive fossil fuels**
- Under-resourced communities** have manufacturing plants, with their emissions and waste *in their backyard*, and hence are **susceptible to higher exposures and poorer human health**

THE PES STORY

- Philadelphia Energy Solutions (PES) Refinery has operated for ~160 years and consists of its Point Breeze and Girard Point locations
 - Shareholders and owners have been made up of Carlyle Group and Sunoco
 - responsible for 72 percent of toxic air emissions in Philadelphia
- June 21, 2019: PES Refinery's Girard Point location exploded due to a fire in alkylation unit and released 5,239 lbs of toxic hydrofluoric acid into the air
- Has since been resold to Hilco Redevelopment Partners, but remediation is being managed by subsidiary of Sunoco

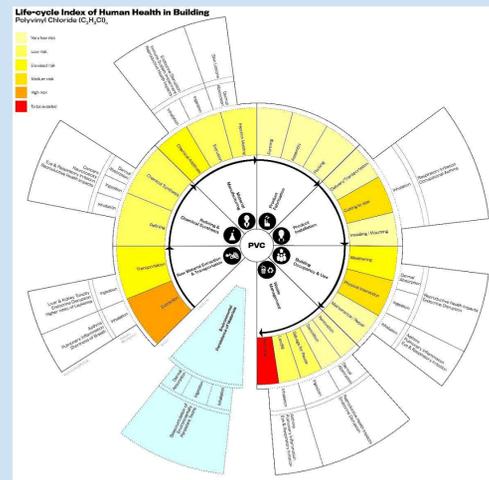
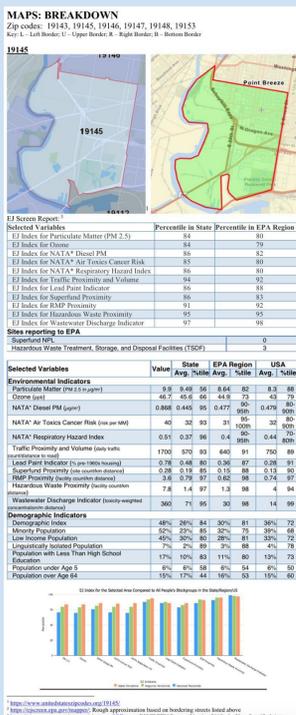


Image of PES Refinery Explosion courtesy of 6ABC Philadelphia News – June 28, 2019

INQUIRIES

- What are the lifecycle of risks associated with polymers in the built environment?
- What is the human health risk associated with polymers' lifecycle?
- Which communities are most impacted by these health risks?
- What has been the history of the PES Refinery site: how many times and over how long a time were there severe environmental impacts?
- What has been the community response?

METHODS



	19143	19145	19146	19147	19148	19153	PA STATE	PHL COUNTY
ECONOMIC CHARACTERISTICS								
EMPLOYMENT STATUS								
Unemployment Rate	13.80%	11.10%	7.80%	5.60%	8.00%	8.40%	5.80%	10.20%
COMMITTING TO WORK								
Public Transportation (excluding taxicab)	42.50%	32.00%	34.00%	31.30%	31.20%	38.20%	38.20%	31.00%
Walked	6.50%	6.60%	22.70%	18.90%	18.90%	1.30%	8.60%	8.60%
Average travel time to work (min)	34.9	29.2	29.2	28.9	29.2	31	29.5	33.4
OCCUPATION								
Service occupations	24.60%	21.60%	18.60%	14.60%	22.60%	20.20%	17.60%	22.60%
Natural resources, construction, and maintenance occupations	4.00%	6.00%	3.00%	2.60%	7.60%	2.60%	8.20%	5.60%
Production, transportation, and material moving occupations	12.80%	16.40%	5.20%	5.50%	13.40%	10.10%	14.50%	12.20%
INDUSTRY								
Manufacturing	4.70%	6.80%	3.80%	6.80%	9.30%	6.10%	11.80%	6.40%
Transportation and warehousing, and utilities	8.80%	7.20%	4.20%	2.40%	4.00%	12.20%	5.20%	6.20%
Educational services, and health care and social assistance	34.90%	22.40%	31.50%	28.90%	19.00%	28.70%	25.80%	30.60%
EARNINGS								
Total household earnings less than \$10,000	14.80%	11.80%	10.20%	4.00%	9.20%	10%	6.20%	12.80%
Total household earnings less than \$20,000	82.00%	82.20%	80%	65.40%	79.60%	84.60%	74.80%	79.90%
Mean household income (in \$)	48,131	63,142	97,837	115,948	67,345	56,512	83,540	60,920
Total family annual earnings less than \$10,000	9.20%	9.00%	4.40%	3.20%	7.60%	7.60%	3.80%	8.60%
Total family annual earnings less than \$20,000	85.40%	79%	55.40%	40.70%	75%	79.50%	64.50%	75.70%
Mean family income (in \$)	98,120	173,381	121,350	138,940	74,234	65,132	97,963	76,413
HEALTH INSURANCE COVERAGE								
Health insurance coverage								
With private health insurance	46.80%	56.00%	70.20%	75.80%	56.00%	62.40%	73.30%	57.00%
With public coverage	18.20%	44.60%	32.60%	28.20%	41.60%	39.20%	44.10%	44.10%
No health insurance coverage	35.00%	9.40%	9.80%	8.40%	11.90%	7.50%	8.20%	9.90%
Unemployed								
With private health insurance	13.50%	28.80%	34.50%	51.00%	33.00%	21.20%	44.30%	29.70%
With public coverage	62.10%	48.70%	49.10%	25.60%	45.40%	39.00%	35.70%	46.00%
No health insurance coverage	24.40%	22.50%	16.40%	23.40%	21.70%	39.80%	20.00%	24.30%
Not in Labor Force								
With private health insurance	30.70%	31.50%	46.00%	52.10%	29.80%	37.40%	53.90%	37.40%
HOUSING CHARACTERISTICS								
YEAR STRUCTURE BUILT								
Built 2010 or later	0.30%	0.20%	2.30%	2.30%	0.20%	0.80%	0.80%	0.80%
Built 1990 or later	61.50%	50.50%	60.20%	58.60%	65.20%	15.60%	26.30%	41.60%
Built between 2000 to present (combined %)	3.80%	5.20%	13.70%	13.20%	2.40%	4.30%	10.80%	5.20%
Built in the year 00 (year combined %)	8.90%	14.70%	3.90%	28.90%	9.90%	41.10%	41.10%	41.10%
HOUSING TENURE								
Owner-occupied	48.10%	60.50%	54.20%	54.50%	50.80%	55.40%	69.00%	53.00%
Renter-occupied	51.90%	39.50%	45.80%	45.50%	49.20%	44.60%	31.00%	47.00%
VEHICLES AVAILABLE								
No vehicles available	43.70%	82.80%	86.00%	80.40%	82.80%	28.10%	11.00%	30.30%
HOUSE HEATING FUEL								
Utility Gas	78.20%	80.40%	73.50%	77.20%	81.00%	75.30%	81.40%	74.80%
Electricity	13.80%	13.50%	20.50%	17.70%	13.10%	22.60%	22.70%	19.00%
VALUE (OWNERS OCCUPIED UNITS)								
Value of less than \$100,000 (combined %)	71.70%	88.80%	28.30%	5.80%	30.40%	38.80%	47.10%	47.10%
\$100,000 to \$999,999	9.30%	1.90%	20.90%	32.60%	6.90%	6.10%	1.90%	4.40%
SELECTED MONTHLY OWNER COSTS (UNITS WITH A MORTGAGE)								
2020 to 2099	44.20%	26.40%	12.50%	6.30%	20.80%	20.80%	19.80%	24.30%
\$1,000 to \$1,499	28.70%	40.00%	20.70%	19.60%	43.80%	54.80%	50.40%	34.90%
GROSS RENT AS A PERCENTAGE OF HOUSEHOLD INCOME (GRAP)								
5.00 to 9.99	47.80%	35.60%	28.40%	21.30%	40.30%	33.30%	41.80%	38.10%
\$1,000 to \$1,499	30.20%	35.10%	29.20%	39.80%	41.50%	57.60%	28.60%	33.60%
DEMOGRAPHICS								
RACE								
Black or African American	79.80%	31.30%	42.80%	9.10%	5.30%	79.80%	13.10%	42.30%
Hispanic or Latino (of any race)	3.00%	6.20%	4.60%	9.30%	14.30%	7.60%	7.20%	14.50%
Other race	16.20%	13.60%	4.60%	12.60%	20.60%	13.20%	3.90%	7.20%
American Indian and Alaska Native	0.40%	0.30%	0.30%	0.30%	0.30%	0.30%	0.30%	0.40%
SEX								
Male	63.30%	45.60%	46.00%	48.10%	47.70%	44.20%	48.30%	45.90%
Female	36.70%	54.40%	54.00%	51.90%	52.30%	55.80%	51.70%	54.10%

- Approached with an interdisciplinary mindset to account for both the scientific and human impact, research was conducted through a variety of methods ranging from:
 - EPA Web server extraction (rough zipcode approximation by hand)
 - Life Cycle analysis
 - American Community Survey census data (Economic, Housing, Demographic)
 - Outreach via interviews with local organizations and Penn faculty
 - Online Research (articles, information accumulation)

"It was a mild fire, so they say. But what is it going to take?" ... "Let us live, let us breathe fresh air. We don't need to be any sicker than we already are." – Kilynn Johnson, Grays Ferry Resident

"We have built a base of resident leadership that is challenging the status of fossil fuels in Philadelphia... If you're paying attention, you can see the tide turning." – Alexa Ross, Philly Thrive

RESULTS

- Notable pollutants of concern: benzene, hydrofluoric acid, lead
- The communities impacted are disproportionately Black and low income
- Health risks ranged from:
 - Asthma rates 4x the national average
 - Patterns of cancer (particularly more unique cases ie. gallbladder)
 - Birth defects, liver and skin disorders
- Community testimonials have been published online since 2016, although there had been fires in years prior
- Traced active community efforts in protest of PES Refinery by Philly Thrive, Clean Air Council, and Action UNITED

DISCUSSIONS

- While PES Refinery closure has been a win for the community, the remediation process has already failed to substantively include the community in the discussion
- Conversations around environmental racism and the climate crisis have been reinvigorated by recent BLM uprisings
- Potential avenues for policy via
 - Nat'l: The Breathe Act, Green New Deal
 - Local: Office of Sustainability's "Clean Energy Vision for Philadelphia," City of Philadelphia Refinery Advisory Group

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