ENVIRONMENTAL RESEARCH LETTERS

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Future flooding increases unequal exposure risks to relic industrial pollution

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The Nature of the Problem – Part 1 Environmental Transformations









EPA – Toxic Release Inventory
74 Billion lbs. of hazardous industrial waste released on-site, to land since 1988

The Nature of the Problem – Part 2 Ghost Busting – Finding Relic Contaminated Sites



Ghosts of Polluters Past

As new soil tests reveal the pervasiveness of lead contamination, one California barrio continues its long struggle for justice. By Yvette Cabrera

Empirical Solution – Part 1 Digitizing Historic Site Data, 1950s to Present



THE FLINTKOTE CO., 4500 N. Galvez St., MA: POB 3125, 70177.O. B. Wilday, Jr., Works Mgr., 1928. (2891) Adhesives. (2952)Asphalt roof coatings, protective coating, cements, and industrialemulsions. (3292) Vinyl asbestos floor tile.I/EPA R. W. SparkmanAC 504/945-4151



Probability of Site Contamination for Focal Industries of Investigation

| Primary Industry on Site | |
|---|-----|
| Plastics manufacturing, refining | .95 |
| Metal plating, chemical manuf., metal finishing, tool & dye | .90 |
| Heavy industrial manufacturing | .88 |
| Metal working and fabrication | .83 |
| Machine shops | .80 |
| Light industrial manufacturing | .75 |

Types of Hazardous Sequestered Chemicals, by Industry

| Major Industry Group | Chemicals | Petroleum | Plastics | Primary Metals |
|-------------------------|--|---|---|---|
| Product Class | Paint, varnish, lacquer, enamel, etc. | Petroleum refining | Fabricated rubber products, unclassified | Foundries |
| Associated Compounds | Aniline Zinc sulphide Ethyl benzene Benzene Mercury Titanium dioxide Tetrachlorethane Toluene Barium Amyl Acetate Ethyl acetate Barium sulphate Methanol Arsenic Benzol Phenol or carbolic acid Formaldehyde Antimony Formic acid Pyridine | Ethyl benzene Carbon disulphide Hydrochloric acid Petroleum Sulphuric acid Tar Lead | Carbanilide Carbon bisulphide Carbon tetrachloride Benzene Aniline Trichloethylene Amyl acetate Arsenic Chromium compounds Hydrochloric acid Naphtha Turpentine | Acrolein Aluminum e Antimony Arsenic Carbon Chromium Copper Lead Manganese Molybdenum Nickel Phosphorus Silicon Sulphur Tellurium Titanium Vanadium |
| L | ist truncated | | | |

Empirical Solution – Part 2 Attaching Address-Specific Flood Risk Projections (to 2050)



Questions

- 1. How many flood-prone relic sites are there (since the 1950s)?
- 2. Where are they located?
- 3. How many people live nearby?
- 4. Do they converge in more socially vulnerable areas?

How many flood-prone relics are there (since the 1950s)?



N= 6,920 relic sites

(GAO Report: 945 nationwide)

Where are these flood-prone relic sites located?



How many people live nearby?



Population Exposures

Flood-prone housing in exposed blocksAll housing in exposed blocksFlood-prone housing in exposed block groupsAll housing in exposed block groups

Do these sites tend to be in more socially vulnerable areas?

- Unit: Block Group
- Spatial multilevel models (pooled & city-specific)
- Y = Probability that a block group contains a flood-prone relic industrial site
- [X] = Social Vulnerability Theme
 - Socio-Economic Status (SES)
 - Minority Status
 - Housing Conditions
 - (net of land area, total pop)

Predicted Probability of a block group having a flood-prone relic, by SoVI Theme (Higher = More Vulnerable)



THE 2022 TEXAS TRIBUNE FESTIVAL

After cancer-causing chemicals were found in Fifth Ward soil, Houston mayor says cleanup plans are inadequate

The city's health department found dioxins in soil samples along the fence line of a Union Pacific rail yard. Mayor Sylvester Turner said during the 2022 Texas Tribune Festival that plans to clean up the contamination should now include relocating residents.





Houston Mayor Sylvester Turner speaks at a panel at The Texas Tribune Festival in Austin on Sept. 24, 2022. Azul Sordo/The Texas Tribune