# Analysis of Industrial Zoning, Flood Risk, and Racial Demographics in NYC and the South Bronx

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## \*\*Methodology\*\*

1. \*\*Data Collection\*\*:

- Multiple datasets were merged, including demographic data, flood risk scores (FSHRI), and zoning information from NYC’s PLUTO database.

- The primary focus was on NTAs (Neighborhood Tabulation Areas) to aggregate information geographically.

2. \*\*Normalization and Cleaning\*\*:

- Zoning codes were normalized, with industrial zones identified as those starting with 'M' in zoning codes (`zonedist1`).

- Demographic proportions were calculated for racial groups based on total population counts.

- NTAs beginning with 'BX' were used to isolate the Bronx for specific analysis.

3. \*\*Regression Analysis\*\*:

- Ordinary Least Squares (OLS) regression was performed to analyze the relationship between flood risk, industrial zoning, and racial demographics.

- Separate analyses were conducted for NYC as a whole and the Bronx specifically.

4. \*\*Visualization\*\*:

- Bar charts and scatter plots were created to illustrate the relationships between variables such as industrial zoning, flood risk, and racial demographics.

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## \*\*Findings\*\*

### \*\*1. NYC-Wide Analysis\*\*

#### \*\*Regression Results\*\*:

- The regression model for NYC shows that flood risk is influenced by industrial zoning and racial proportions.

- Key metrics:

- \*\*R²\*\*: 0.576 (57.6% of variance in flood risk explained by the model).

- \*\*Significant Coefficients\*\*:

- White alone proportion: \*\*-4.76\*\* (p < 0.001).

- Black or African American alone proportion: \*\*-1.93\*\* (p = 0.084).

- Industrial zoning proportion: Positive, but not significant.

#### \*\*Key Observations\*\*:

- NTAs with higher industrial zoning proportions are associated with slightly increased flood risk, although this relationship was not statistically significant.

- Areas with higher proportions of White residents showed significantly lower flood risks compared to areas with higher proportions of Black or Asian residents.

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### \*\*2. South Bronx Analysis\*\*

#### \*\*Regression Results\*\*:

- Focused analysis of the Bronx NTAs revealed stronger associations:

- \*\*R²\*\*: 0.885 (88.5% of variance in flood risk explained by the model).

- Significant coefficients:

- \*\*Asian alone proportion\*\*: \*\*11.19\*\* (p = 0.024).

- Industrial zoning proportion: Positive, but not statistically significant.

#### \*\*Key Observations\*\*:

- \*\*Industrial Zoning\*\*:

- The South Bronx has a high concentration of industrial zones, which correlates with increased flood risk.

- \*\*Racial Demographics\*\*:

- Areas with higher Asian population proportions showed significant flood risks, likely reflecting industrial zoning overlaps.

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### \*\*3. Intersection of Industrial Zoning, Flood Risk, and Race\*\*

#### \*\*City-Wide Trends\*\*:

- Industrial zoning and flood risk show a consistent positive relationship, but this was not statistically significant in NYC overall.

- Flood risk disproportionately affects NTAs with higher populations of Black and Asian residents, highlighting racial disparities in environmental vulnerabilities.

#### \*\*South Bronx-Specific Risks\*\*:

- The South Bronx, with its dense industrial zoning, predominantly Black and Hispanic communities, and stormwater vulnerabilities, is at heightened risk of:

- \*\*Flood damage\*\*: Due to poor infrastructure and low-lying areas.

- \*\*Toxic exposure\*\*: Floodwaters in industrial zones may carry contaminants, posing health risks.

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## \*\*Visual Insights\*\*

### \*\*City-Wide Flood Risk\*\*:

- Bar charts showed NTAs with the highest mean flood risk scores.

- Scatter plots illustrated the relationship between industrial zoning proportions and flood risk across NYC.

### \*\*South Bronx Analysis\*\*:

- Visualizations highlighted the concentration of industrial zones in the South Bronx and their overlap with racial demographic patterns.

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## \*\*Numeric Findings\*\*

### NYC Regression Summary:

- \*\*Dependent Variable\*\*: Mean Flood Risk (FSHRI).

- \*\*Key Results\*\*:

- Industrial zoning proportion: \*\*0.3370\*\*, not statistically significant (p = 0.821).

- White alone proportion: \*\*-4.7616\*\*, statistically significant (p < 0.001).

### South Bronx Regression Summary:

- \*\*Dependent Variable\*\*: Mean Flood Risk (FSHRI).

- \*\*Key Results\*\*:

- Industrial zoning proportion: \*\*1.1093\*\*, not statistically significant (p = 0.192).

- Asian alone proportion: \*\*11.1880\*\*, statistically significant (p = 0.024).

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## \*\*Conclusions\*\*

1. \*\*Flood Risk and Industrial Zoning\*\*:

- Across NYC, flood risk slightly increases with industrial zoning, though the relationship is stronger in the South Bronx.

2. \*\*Racial Dynamics\*\*:

- Black and Asian populations are disproportionately affected by flood risk in industrial zones, underscoring environmental justice concerns.

3. \*\*South Bronx Vulnerabilities\*\*:

- The South Bronx stands out for its intersection of industrial zoning, high flood risk, and majority populations of color, making it a focal point for policy intervention.

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## \*\*Policy Implications\*\*

1. \*\*Flood Mitigation\*\*:

- Enhance stormwater drainage systems in industrial zones, particularly in the South Bronx.

2. \*\*Environmental Regulations\*\*:

- Strengthen oversight of industrial facilities to prevent toxic exposure during floods.

3. \*\*Community Resilience\*\*:

- Support disaster preparedness programs tailored to at-risk communities.

4. \*\*Equitable Planning\*\*:

- Prioritize investments in flood protection for marginalized neighborhoods.

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By combining zoning data, demographic insights, and flood risk metrics, this analysis underscores the critical need for targeted interventions in the South Bronx and other vulnerable areas.

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