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# GIS Modeling of Air Toxics Releases from TRI-Reporting and Non-TRI-Reporting Facilities: Impacts for Environmental Justice

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Geographic Information Systems (GIS), Environmental Justice, Air Dispersion Modeling, Air Toxics, Toxics Release Inventory (TRI)

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**Abbreviations:**

CDF - Cumulative Distribution Function

EPA - U.S. Environmental Protection Agency

EPCRA - Emergency Planning and Community Right-to-Know Act

GIS - Geographic Information Systems

$g/(s\text{-}m^2)$ – grams per second meter squared

$\mu g/m^3$- micrograms per cubic meter

$ng/m^3$ - nanograms per cubic meter

NCDC - National Climatic Data Center

$km^2$ - square kilometers

SIC - Standard Industrial Classification

TRI - Toxics Release Inventory

UTM -Universal Transverse Mercator

ZCTAs - Zip Code Tabulation Areas

GIS Modeling of Air Toxics Releases

# GIS Modeling of Air Toxics Releases


## Abstract

The Toxics Release Inventory (TRI) requires facilities with 10 or more full time employees that process over 25,000 pounds in aggregate or use more than 10,000 pounds of any one TRI chemical to report releases annually. However, little is known about releases from non-TRI-reporting facilities; nor has attention been given to the very localized equity impacts associated with air toxics releases. Using Geographic Information Systems (GIS) and Industrial Source Complex dispersion modeling, we developed methods for characterizing air releases from TRI-reporting as well as non-TRI-reporting facilities at four levels of geographic resolution. We characterized the spatial distribution and concentration of air releases from one representative industry in Durham County, NC. Inclusive modeling of all facilities rather than modeling of TRI sites alone significantly alters the magnitude and spatial distribution of modeled air concentrations. Modeling exposure receptors at more refined levels of geographic resolution reveals localized, neighborhood-level exposure hotspots that are not apparent at coarser geographic scales. Multivariate analysis indicates that inclusive facility modeling at fine levels of geographic resolution reveals income and race exposure disparities. These new methods significantly enhance the ability to model air toxics and perform equity analysis and clarify conflicts in the literature regarding environmental justice findings. This work has substantial implications for how to structure TRI reporting requirements, as well as how and what types of analysis will successfully elucidate the spatial distribution of exposure potentials across geographic, income, and racial lines.