Modelling of Fine Particulate Matter in New York City

Objective: Estimation of the average annual concentration of fine particulate matter (PM$_{2.5}$) in New York City with a Land-Use-Regression (LUR) model.

Data: EPA air quality monitor data 2002 (n=15)

Methods: Since the length of major truck routes (MTR) and population density within 1000m from the monitor site are highly correlated to PM$_{2.5}$ concentrations, these variables were used to estimate PM$_{2.5}$ with a Land-Use-Regression (LUR). The model was calibrated using the EPA air monitor data. A PM$_{2.5}$ surface was interpolated utilizing Kriging which proved to be the interpolation method with the lowest mean-square error.

Results: The LUR Model was overall significant with an adjusted-$R^2$ of 0.87.

Land-Use-Regression Equation

PM$_{2.5} = 11.837829 + 0.000102 \times$ MTR$_{LEN} + 0.000085 \times$ POP$_{DENS}$

with:
PM$_{2.5}$ = simulated concentration of fine particulate matter
MTR$_{LEN}$ = length of major truck routes within 1000m
POP$_{DENS}$ = population density of census blocks within 1000m

Population Density, Major Truck Routes & Measured PM$_{2.5}$

% Deviation from NAAQS
- <0
- 0 - 5
- 5 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- >25

% Deviation of Predicted PM$_{2.5}$ from National Ambient Air Quality Standard (15ug/m$^3$)