Mobility, Energy, and Electric Vehicle Typology for New York State

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Factors Influencing Mobility & Energy

Exploring multi-dimensional aspects of differences in technology adoption, travel, and vehicle ownership across settlement types can help inform energy efficient and affordable mobility system goals, and identify challenges and opportunities.

This work explores how a highly geographically resolved understanding of social, economic, techno-infrastructural, environmental and governance (SETEG) systems shapes variations in outcomes in diverse communities of New York State, in terms of:

1. electric vehicle (EV) adoption rates
2. alternative commute mode choices
3. vehicles per household
4. vehicle fuel economy

Data inputs

The 13 independent variables (at census block group scale) used to compare dependent variable outcomes are: population density[1], intersection density[2], employment access[2], age[1] (% >65), gender[1] (% female), race[1] (% white), education[1] (% bachelor's degree), household income[1], home tenure[1] (% homeowners), combined housing and transportation costs as % of income[2] (H+T Index), PM2.5 levels[3], cancer risk from air toxics[3] and respiratory hazard from air toxics[3].

Four dependent variables are: commute mode[1], vehicles per household[2], vehicle fuel economy[4], and prevalence of electric vehicles[4] (EVs, # battery and plug-in hybrid EVs per 1,000 vehicle registrations).

[1]American Community Survey 5-year data (2012-2016),
[2]Center for Neighborhood Technologies,
[3]EPA EJSCREEN (2017), [4]IHS Markit (2017)
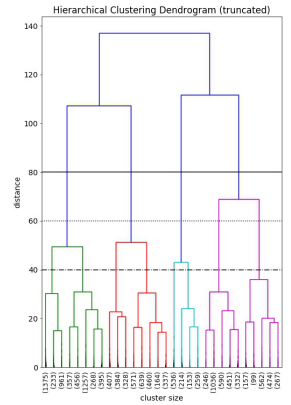
Factor analysis yielded 3 factors, which were grouped into 4 clusters by cutting the dendrogram at distance = 80

Independent Variables
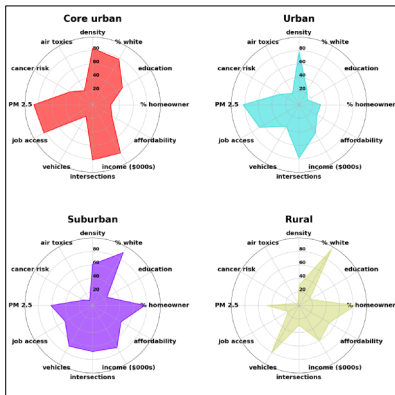
Spider plots showing SETEG indicators (ind. variables), in scaled relation to each other, for each of the four cluster settlement types

Urban (U) and Core urban (CU) typologies see higher air pollution and much lower home ownership than Suburban (S) and Rural (R) areas. Education level is highest in CU and similar in the other typologies. Ethnicity is <25% white in U but majority white everywhere else.

Household income disparities highlight socioeconomic segregation. However, both R and S populations spend more than half of income on housing plus transport, while those costs are more affordable for U and CU dwellers, at 39% and 44%.

Dependent Variables
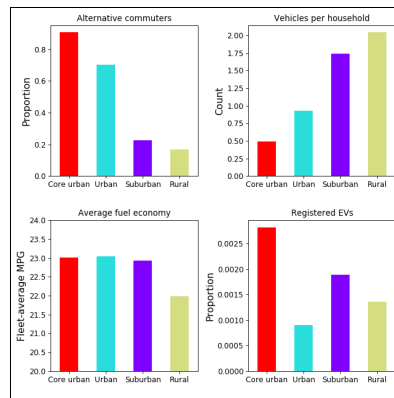
Mobility and energy outcomes by typology type for New York State.

CU has the highest rate of EVs, followed by S, R, and U. This order mirrors median income, suggesting EV adoption may be more correlated with income than urban form.

Alternative commuters comprised the largest share in CU, followed by U, S, and R areas. Similarly, vehicles owned per household increases from the CU to R. Average fuel economy holds fairly constant across typologies.

State-level typology mapping
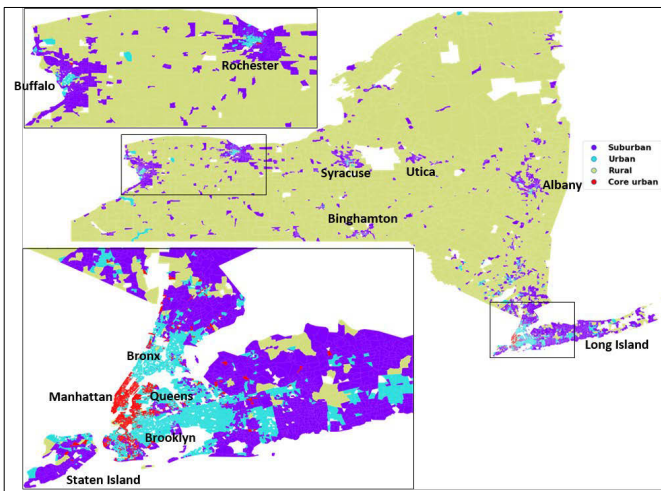
Map of New York State clustering results

Urban typology has the lowest incomes and highest nonwhite population, a socio-spatial pattern reflecting a history of unequal urban development, itself a result of decades housing policies that allowed white families to move to now-suburban (S) typologies, leaving concentrated poverty behind. Native American reservations are also categorized as U, often exhibiting similar concentrated poverty as inner cities. Our CU typology reflects a more recent trend: whiter, wealthier, more educated populations opting to live near the city center. These wealthier neighborhoods are often directly adjacent to less prosperous ones, which can ignite social tensions over issues of affordable housing and gentrification.

While other typology projects have used the city as a unit of comparison, our use of census block groups looks at sub-city level dynamics. Incentive programs from local government entities and other targeted initiatives may find this higher resolution data more useful. For example, the availability of second-hand electric vehicles may be key to EV adoption in Urban households.