Spatial Distribution of EV Infrastructure and Associations with Rent Affordability in Philadelphia Metropolitan Area

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Introduction

This study examines the spatial distribution of electric vehicle (EV) charging stations and their relationship with changes in rent prices across block groups in the Washington, DC metropolitan area and Philadelphia, PA, from 2017 to 2022. We used point data on EV charging stations to aggregate the number of stations within each block group and created a binary variable indicating whether a block group is located within a one-mile buffer of a charging station. We incorporate demographic and housing data from the Census American Community Survey (ACS) and built environment data from the US Environmental Protection Agency(EPA)'s SmartLocation Database to control for key contextual factors influencing rent dynamics on the scale of census block groups.

Research Objectives

Spatial location Analysis: Map the location of EV charging stations in the Washington, DC and Philadelphia metropolitan regions.

Housing Price Impact: Determine the association between EV charging station proximity and rent price adjustments.

Demographic Contextualization: Investigate how demographic variables influence the impact of EV infrastructure on home affordability.

Built Environment Interaction: Evaluate how population density, transportation proximity, and walkability affect the economic impact of EV infrastructure.

Equity and policy implications: Provide insights for more equitable urban sustainability and infrastructure deployment methods.

Data and Methodology

Unit of analysis: census block group; **Research period:** 2017-2022

EV charging station point data from 2017 to 2024
- Aggregated number of stations per census block group
- Binary variable of whether a census block group is within the 1-mile buffer of the charging station

Built Environment characteristics: US Environmental Protection Agency (EPA) Smart Location Database

Sociodemographic & housing variables from Census American Community Survey from 2017 each year to 2023:
- **Race & Ethnici**ty: %Black; %Hispanic; %White
- Socioeconomic status: Median household income
- **Education:** % with a High School Diploma; % with a Bachelor's Degree;
- **Housing:** % renters households; Median rent price

Preliminary Takeaways

- Our preliminary results indicate that areas with greater accessibility to EV charging infrastructure tend to experience rent increases.

- We also see that these relationships are conditioned by both built environment features and demographic characteristics. This analysis highlights the correlation between EV infrastructure and the consequences of potential spatial inequalities in housing costs.

- The findings of this work underscore the need for equitable planning strategies in urban sustainability initiatives.
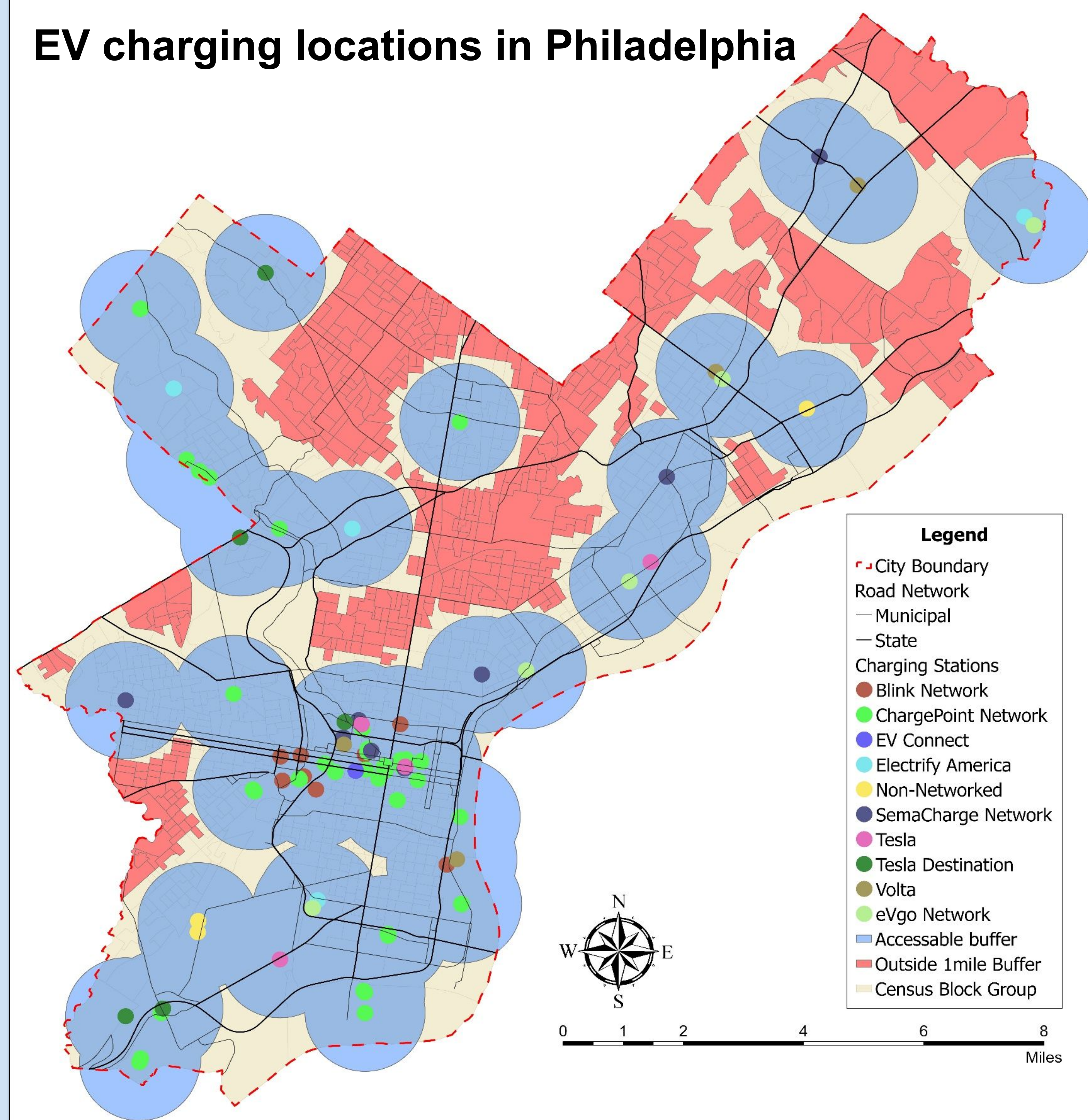
EV charging locations in Philadelphia

Figure 1: The above figure represents the location of charging stations along with the EV providers in Philadelphia area. The buffer is considered as 1 mile which can be represented as the accessible buffer range. The red portions are the census block groups which doesn't fall under the 1 mile radius of the EV charging stations
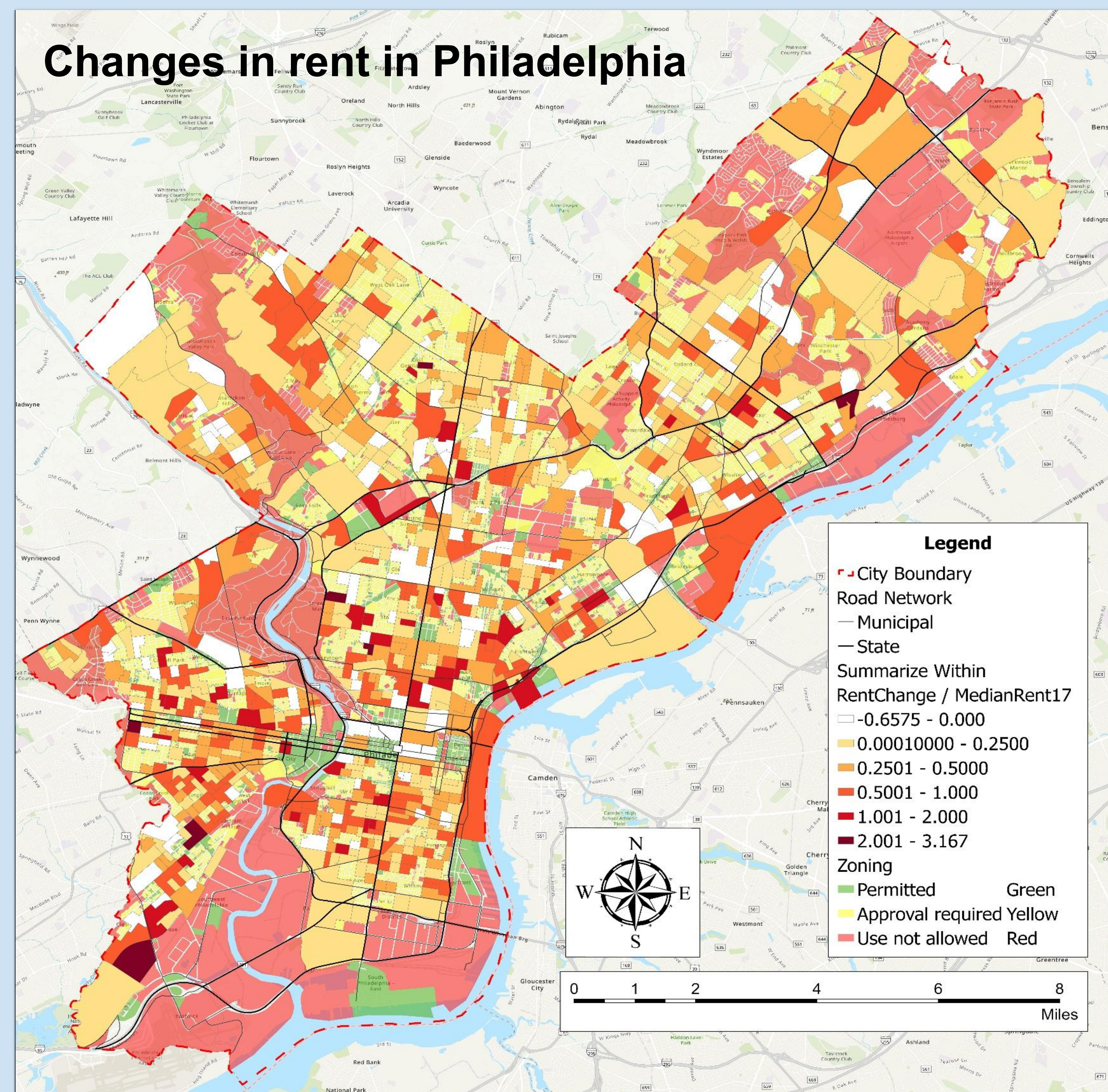
Changes in rent in Philadelphia

Figure 2: The above figure shows the areas affected by the change in rent with potential correlation with the EV infrastructure in Philadelphia area. Few areas doesn't fall in the category as the zoning doesn't permit to develop, which might be environmentally sensitive areas, industrial areas.

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