

Background

This study examines Birmingham's road network to identify mismatches between the environmental characteristics and usage of road segments, aiming to inform urban planning and enhance the city's sustainability.

Data and Methods

Network Data: Ordnance Survey's MasterMap RoadLink provides geometries of both major and minor road segments (including length and width).

Environment Data: 1) Ordnance Survey's AddressBase links road segments to building types, aiding in land use analysis; 2) Data on transportation hubs (bus, tram, rail) informs urban mobility; 3) OpenStreetMap (OSM) data on green and blue infrastructure.

Usage Data: 1) Waze data reveals traffic congestion hotspots; 2) AADF and ANPR data analyze vehicle flows; 3) Bus route and frequency data.

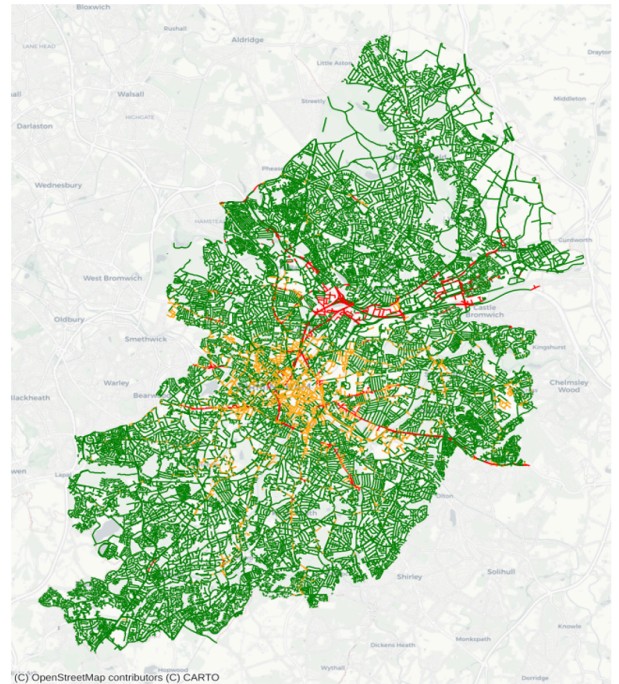


Figure 2: Birmingham's road segments interaction cluster map based on levels of compatibility (people vs traffic).

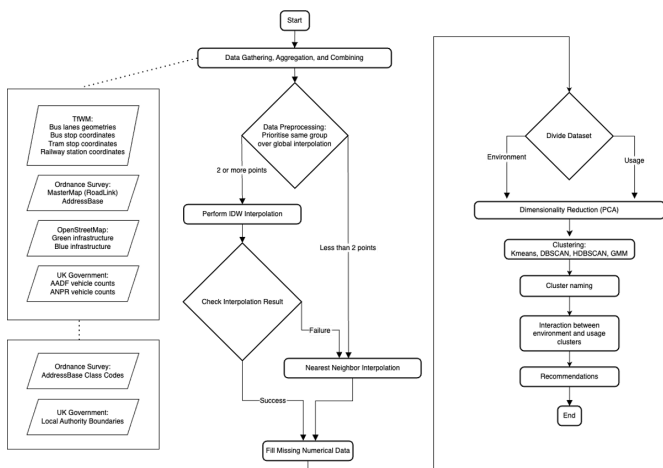


Figure 1: Methodology flow chart.

Key Findings

K-means performed best in both environment and usage subsets, resulting in 4 clusters each. Interaction matrix is made from combinations of each cluster in both environment and usage dataset indicating compatibility on road users' convenience. Greens mean highly compatible, oranges mean partially compatible, and reds mean not compatible. The interaction clusters map can be accessed [here](#).

	Usage cluster (U)	U1	U2	U3	U4	
Environ cluster (E)		Low Jams, Low Traffic, Low Irregularities	Moderate Jams, Moderate Traffic, Low Irregularities	Low Jams, High Traffic, Moderate Irregularities	High Jams, Moderate Traffic, High Irregularities	
E1	Green Residential Zone	E1U1 (4.81%)	E1U2 (2.28%)	E1U3 (0.35%)	E1U4 (0.08%)	7.5%
E2	Community Services Residential Zone	E2U1 (40.26%)	E2U2 (22.93%)	E2U3 (2.53%)	E2U4 (0.77%)	66.5%
E3	Mixed-Use Offices and HMO Zones	E3U1 (0.32%)	E3U2 (0.62%)	E3U3 (0.21%)	E3U4 (0.01%)	1.2%
E4	Commercial and Transport Hubs	E4U1 (10.35%)	E4U2 (10.14%)	E4U3 (2.46%)	E4U4 (1.89%)	24.8%
		55.7%	36.0%	5.5%	2.8%	100.0%

Table 1: interaction matrix based on environment and usage.

Value of the Research

This interaction matrix reveals alignments and mismatches between environmental and usage characteristics, offering valuable insights for urban planners and policymakers. Identifying "Not Compatible / Red" areas is particularly crucial, as it highlights road segments requiring urgent interventions. The findings from this project can also serve as a foundation for future research, such as developing more advanced traffic prediction models or classifiers for decarbonization potential in the area.