

Figure S1: FCD data coverage in 20 cities

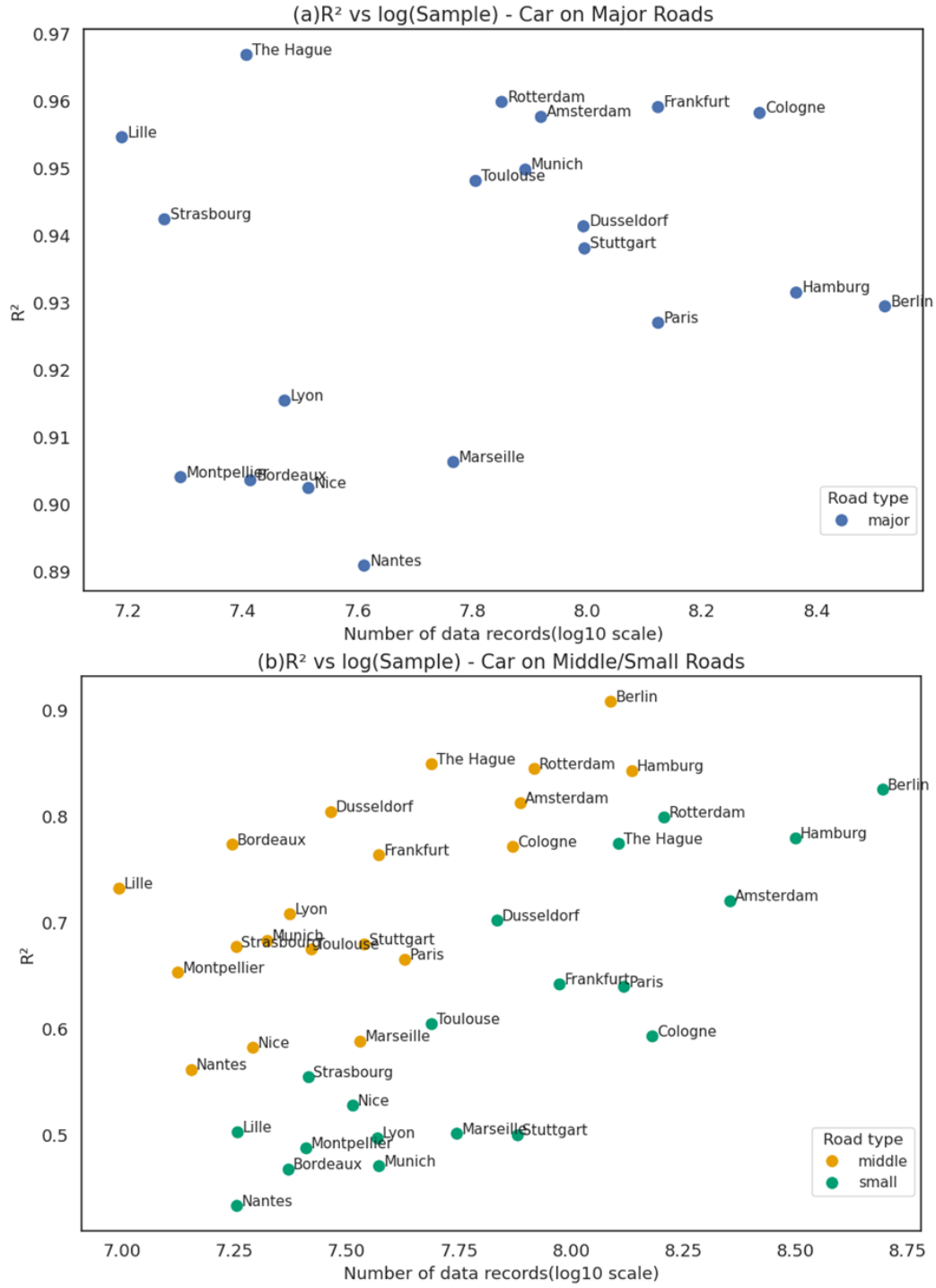


Figure S2: Training  $R^2$  of Car counts in 20 cities. (a) and (b) shows results in major roads and middle/small roads, respectively.

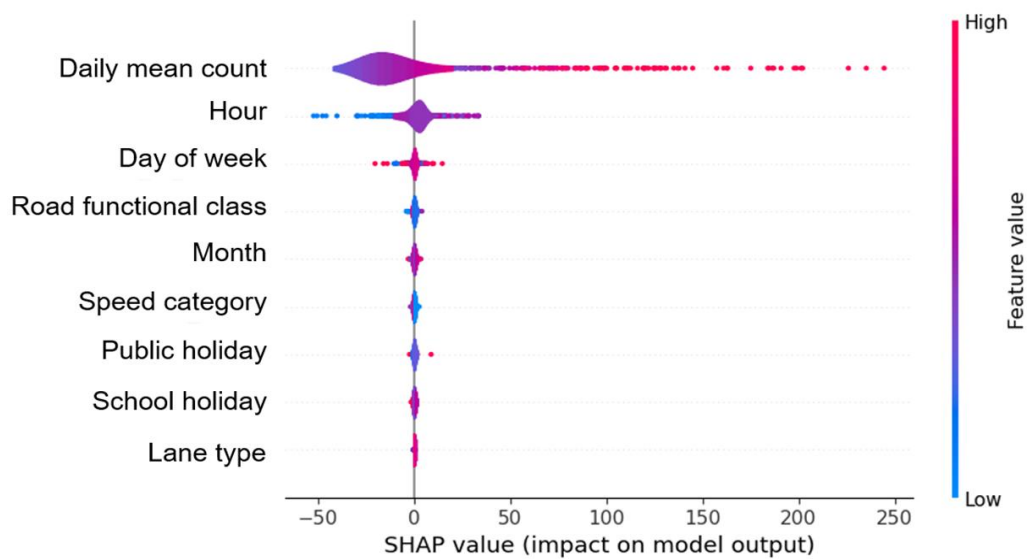


Figure S3: SHAP summary plot

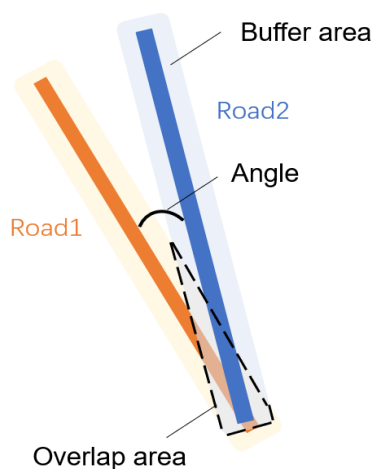
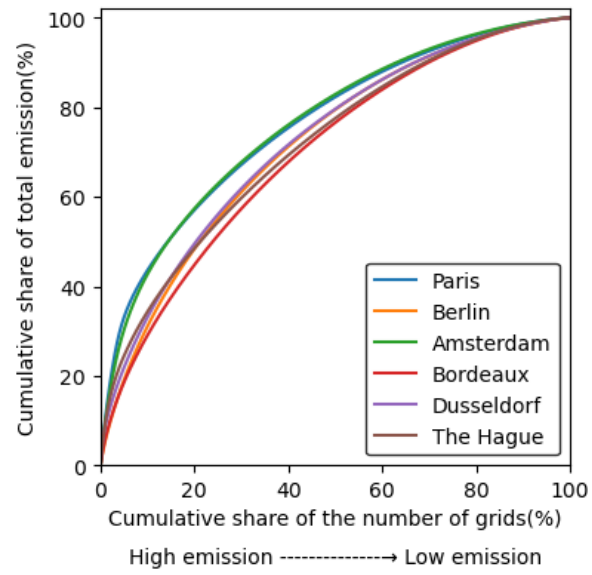
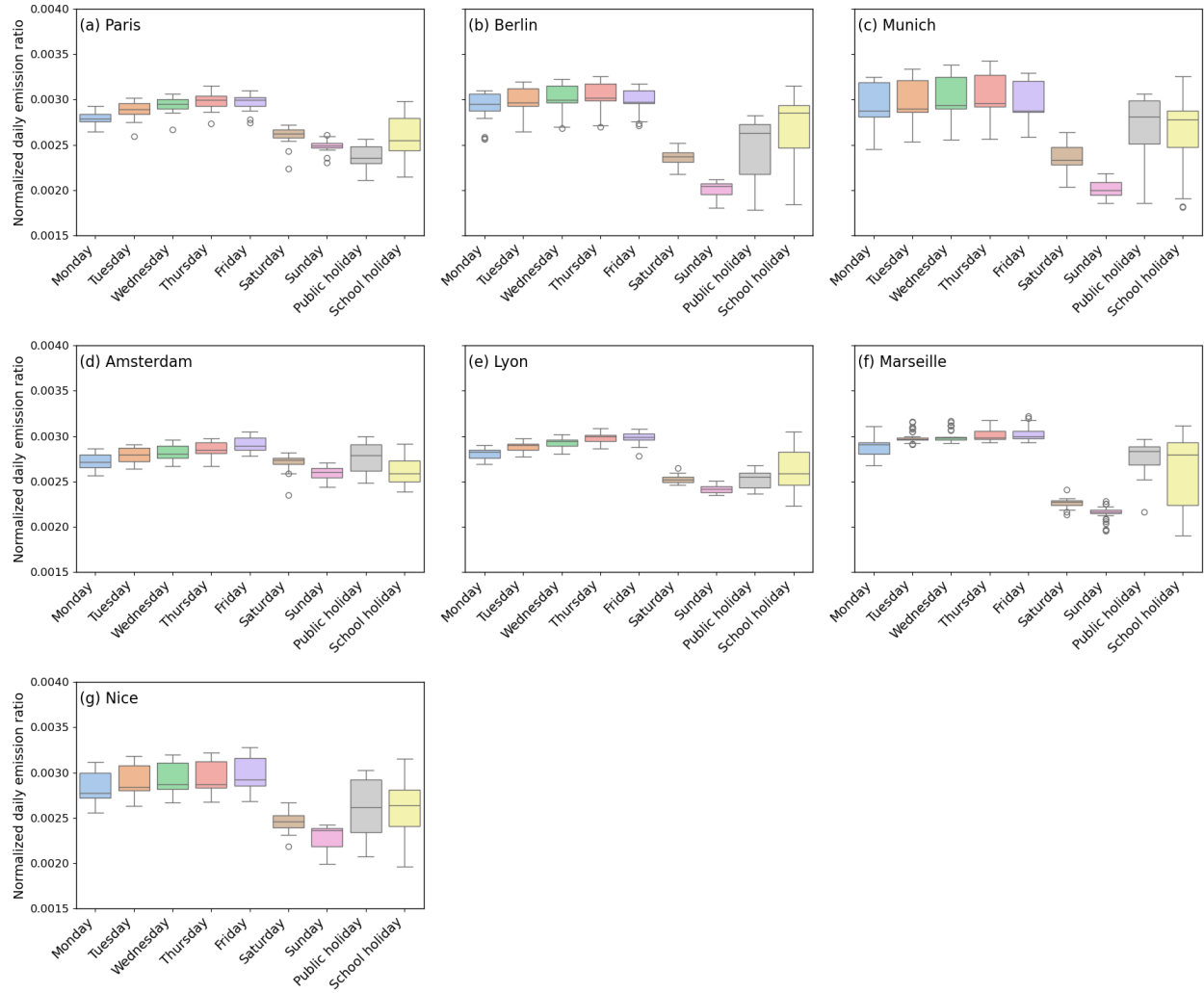


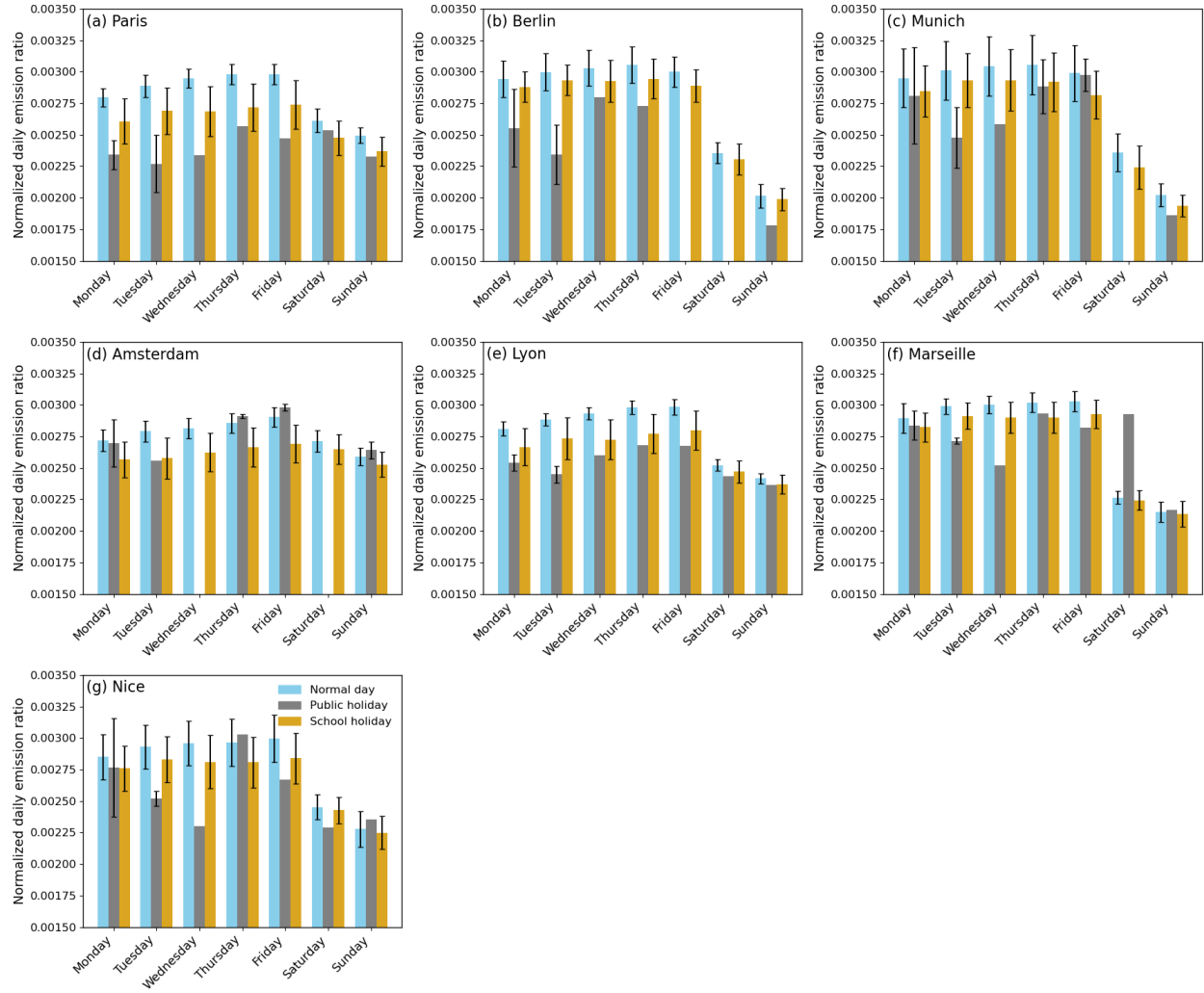
Figure S4: Schematic of matching roads between Opendata and FCD in Paris



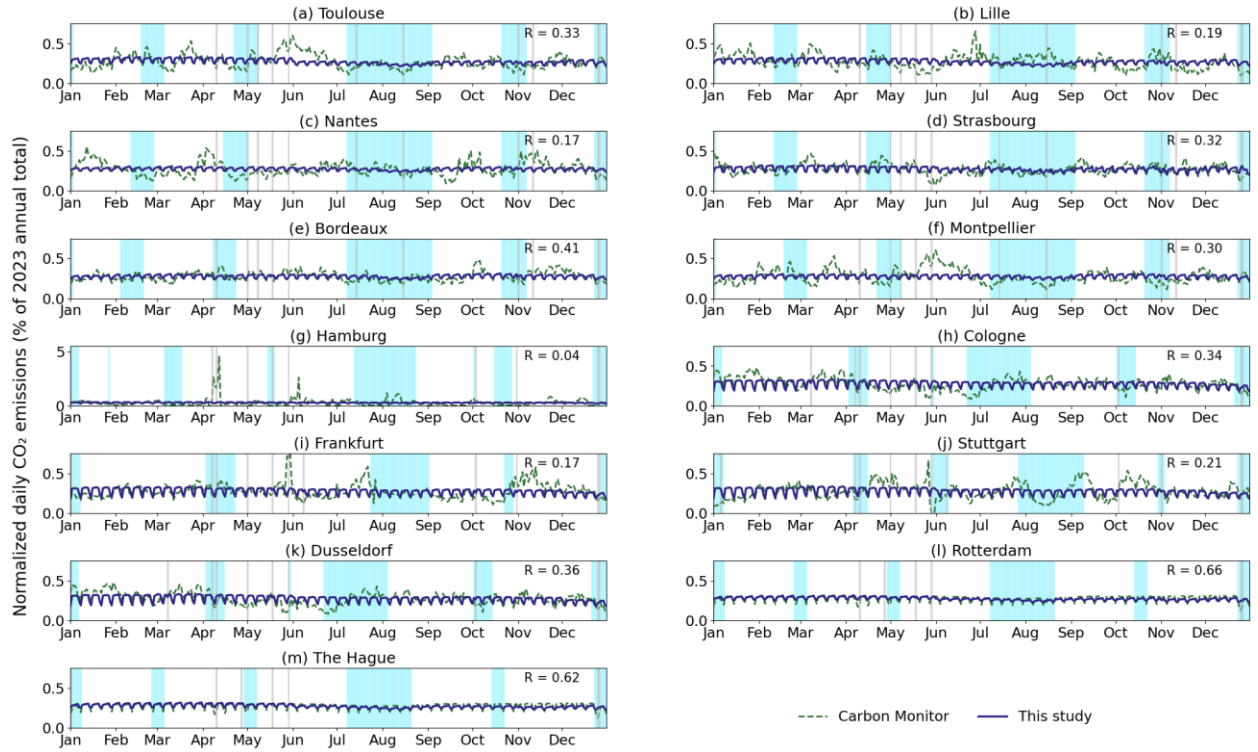
**Figure S5: Cumulative curve of grids' emissions in six cities**



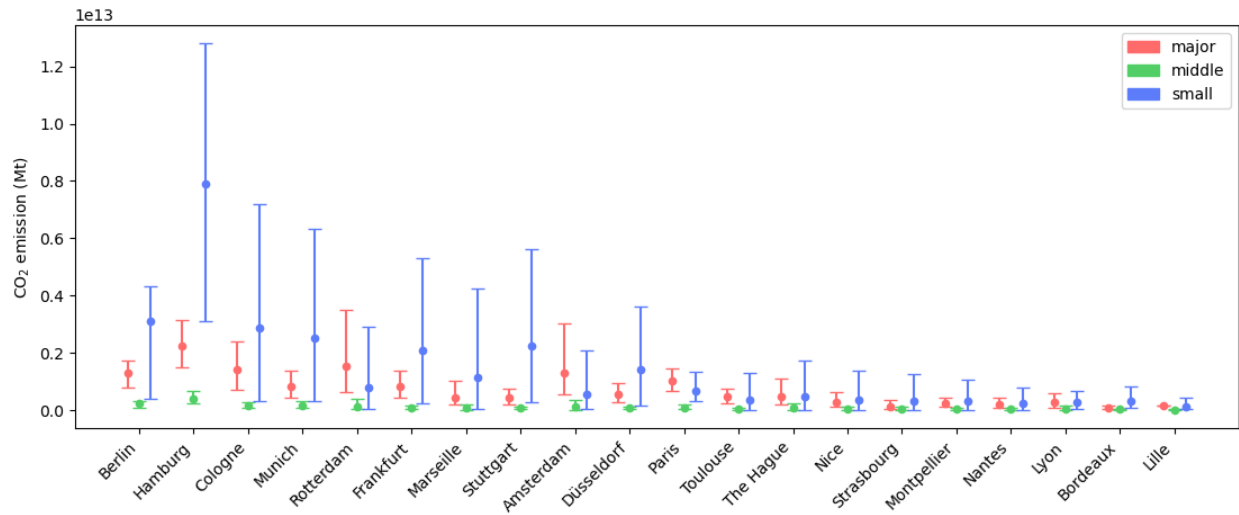
**Figure S6: Weekly patterns for the seven cities**



**Figure S7: Variations in normalized daily traffic-related CO<sub>2</sub> emissions by weekday and day type in seven cities.**



**Figure S8: Normalized daily CO<sub>2</sub> emission of 13 cities in 2023.** Y-axis represents each day's CO<sub>2</sub> emissions divided by the city's total emissions in 2023. The light blue and grey shades represent school holidays and public holidays, respectively. The y-axis represents each day's CO<sub>2</sub> emissions divided by the city's total emissions in 2023.



**Figure S9: Road-class-specific CO<sub>2</sub> emission uncertainty across 20 cities.** Points denote Monte Carlo mean estimates, and error bars show the 95% uncertainty interval (P2.5–P97.5).