Supplementary Information

Highway Performance Monitoring System data

HPMS data cover highways and major roadways in LA and include modeled traffic for each road segment (http://www.fhwa.dot.gov/policy/ohpi/hpms/). The HPMS network covers 92% of all highways and 54% of all major roads, a much greater coverage than TeleAtlas' Dynamap. Although more complete than the TeleAtlas Dynamap in terms of traffic counts, the HPMS physical road network was found to be simplified (e.g., the curvature of some road segments were straightened) compared to the TeleAtlas road network and digital orthophotos and locations of some roads were shifted by up to 100 m. Thus, these data offered the advantage of greater completeness, but with the disadvantage of lower spatial accuracy. Similar to the TeleAtlas' Dynamap data, we generated buffer statistics for total vehicle miles traveled (count * km) for highways and major roadways based on the HPMS data.

Combined HPMS and TeleAtlas Dynamap Data

To overcome the weakness in Dynamap traffic count data, we conflated the HPMS data to the corresponding Dynamap road segments that did not have traffic measurements. To minimize the rate of mis-assignment of HPMS traffic count data to Dynamap roadway segments, the conflation was performed for highway and major roadways separately. We found that none of the parallel highways were less than 200 m apart in the two maps and major roads were less than 100 m apart in the LA Basin. When a highway in the TeleAtlas' Dynamap was within 100 m of a highway in the HPMS roadway map, they were treated as the same highway and the highway traffic count from the HPMS data was assigned to the corresponding highway in the Dynamap data. At distances greater than 100 m, however, we considered a Dynamap highway as not corresponding to the HPMS highway and instead assigned a traffic count based on imputation of the Dynamap counts as described above. Overall, 92 % of the highways in the Dynamap were conflated with traffic data from HPMS and for 8 % we employed imputation. The conflation and imputation process for the Dynamap major roadways were completed in a similar fashion, except that roadways had to be within 50 m of each other for a HPMS value to be assigned to a Dynamap roadway segment. Otherwise, the median traffic data from a corresponding road category (i.e., A3) in Dynamap were imputed. Overall, 54 % of the major roadways in Dynamap were conflated for traffic data with the HPMS data and for 46 % we employed imputation. To avoid mis-assignment of traffic counts at road intersections, all the HPMS roads were split into polyline segments of a maximum length of 10 m. This was necessary because the conflation was done through a spatial join process that used the mid-point of a roadway as the location for the minimum distance calculation and assignment, i.e., a Dynamap road segment used its midpoint location on the roadway to locate the closest midpoint of a road segment in HPMS.

Similar to the imputed Dynamap data, the buffer statistics for the combined HPMS and Dynamap data included total vehicle miles traveled (count * km) for highways (including primary (A1) and secondary (A2) highways), major roads (A3) and both (A1 + A2 + A3).

Metropolitan Planning Organization (MPO) data

The SCAG MPO traffic data are mainly used for planning purposes. The data included not only physical roadway traffic volumes but also traffic volumes for "connectors" which carried the unattributed traffic load from one region to another. The connectors were represented in the road network but do not exist in the real world. Similar to the two methods described above, the buffer statistics for the combined MPO data included all roadways.

Employing the three methods described above, the estimated total VMT for various buffer sizes were then added separately and in addition to other spatial covariates in ADDRESS to model NO_X concentrations.