

The Potential Impacts of PM 2.5 on Vulnerable Population in the SCAG Region: An Application of REGIONAL ROADWAY EMISSIONS Estimating and Dispersion Model

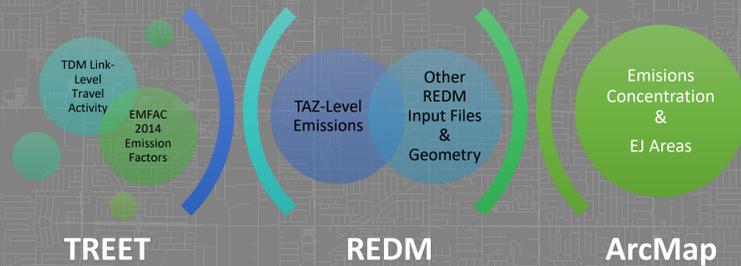
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[INTRODUCTION] This study assesses the impacts of particulate matter (PM) in environmental justice areas by using dispersion model. Southern California has about half the entire state's population, is home to roughly 19 million people, and has 15 million licensed drivers. According to United States Department of Transportation (USDOT), motor vehicles, particularly those used for freight, are a leading source of air pollutants and fine particulate matter that affect human health. The research conducted by the American Thoracic Society and New York University's Marron Institute of Urban Management found that in southern California, about 1,341 people estimated in Los Angeles-Long Beach-Glendale area, 808 people estimated in Riverside-San Bernardino-Ontario area, and 64 people estimated in Santa Ana-Irvine area to die annually due to air pollution.

As the designated Metropolitan Planning Organization (MPO), Southern California Association of Governments (SCAG) is faced with assessing the impacts from regional transportation planning and land use policies; not only for conformity but, perhaps, more importantly for public health and environmental justice (EJ) determinations. Current efforts to examine these issues rely upon emissions. However, wind transport and turbulent mixing of those emissions are the mechanisms that distribute the emissions throughout the region. SCAG continues its effort to develop an accurate method for assessing air pollutant concentrations as part of the Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) process, especially in EJ areas.

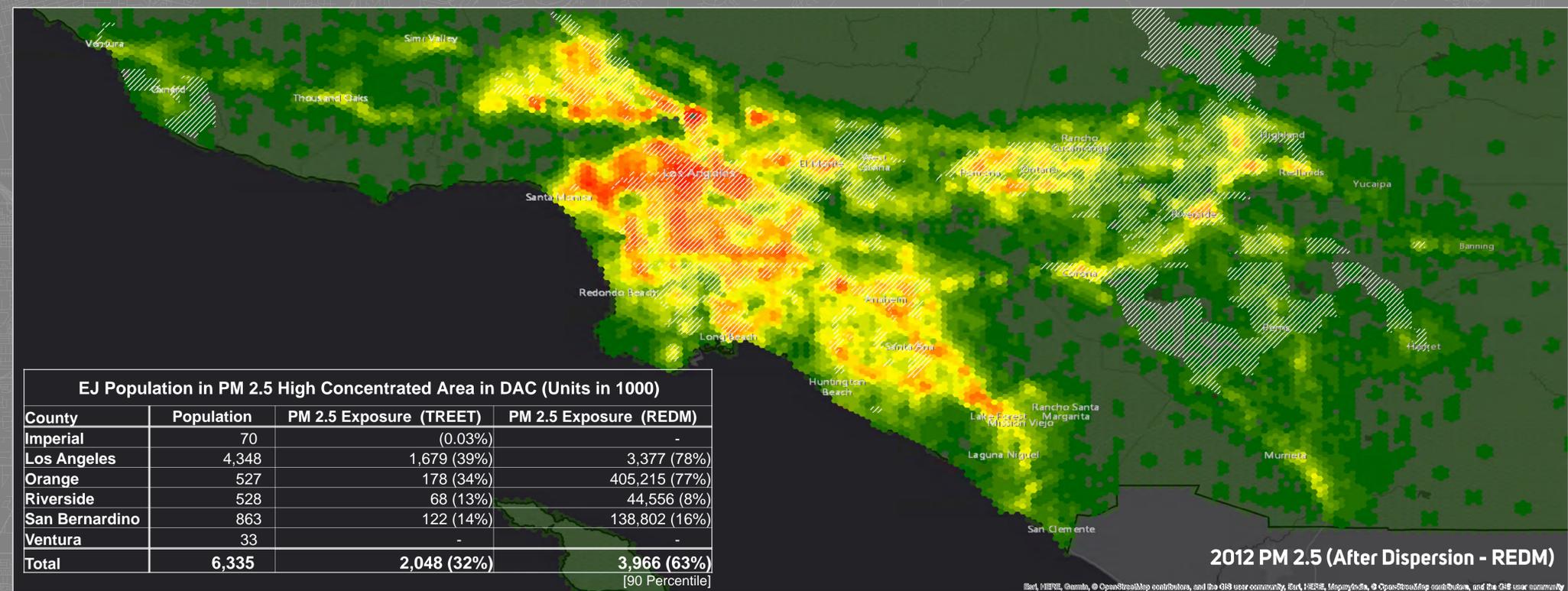
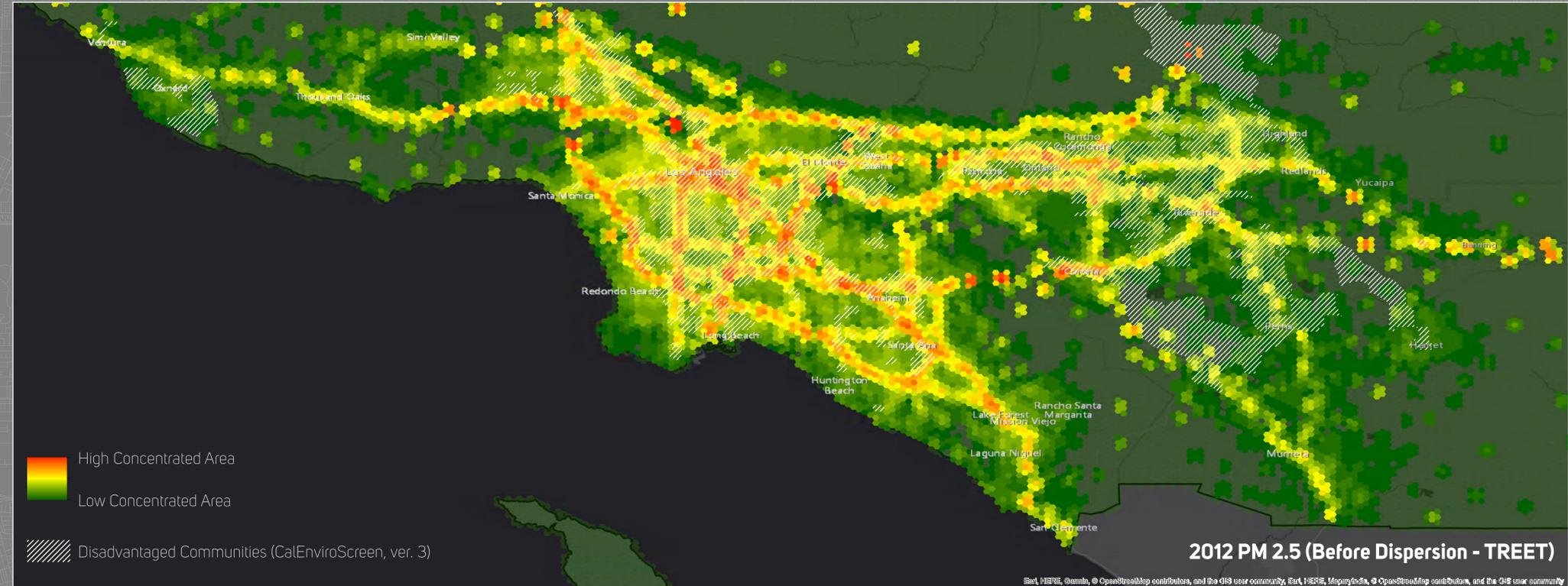
[METHODOLOGY] The purpose is to estimate the concentrations of pollutants as they travel away from emission sources by replicating the atmospheric conditions such as wind speed, wind direction, air temperature, and terrain. Transportation analysis zone (TAZ)-resolved emissions and diurnal profile information are computed from the link-level travel activity of SCAG's travel demand model (TDM) output and Air Resources Board (ARB)'s Emission Factor (EMFAC) emission factors.

This study utilizes SCAG's TAZ Roadway Emission Estimator Tool (TREET) that can evaluate the existing and future impacts of PM 2.5 in the region by using transportation analysis zone (TAZ) as a unit of analysis. TREET is an application that translates SCAG's modelled traffic volumes of light and heavy-duty vehicles into TAZ-level direct exhaust emissions (e.g. PM), which feeds into the Regional Emissions Dispersion Model (REDM) to estimate the dynamics of dispersion. The TAZ-level dispersed emissions can be spatially analyzed with EJ areas using ArcGIS technologies. Specifically, it is important to identify the residents who live within the PM 2.5 high concentrated



[RESULTS & DISCUSSION] Although TREET and REDM's output can both show the concentration of PM 2.5, REDM's output provides more accurate and better understanding of emission movement. The difference is visualized in the maps as TREET's output concentrates PM 2.5 along heavy-travelled highways and REDM's output concentrates emission in nearby areas. The maps show 2012 estimated PM 2.5 before and after dispersion. In SCAG's disadvantaged communities (DACs), there is about two million people identified in PM 2.5 high concentrated areas from TREET's outputs; however, it shows that roughly four million people are exposed in the same areas from REDM's output. This is due to 90 percentile of PM 2.5 concentration from REDM, which covers larger area than TREET. The results yield roughly 78% of vulnerable residents in Los Angeles County live within PM 2.5 high concentrated areas from REDM; whereas, TREET only shows 39%. Similar trends have also seen in Orange County and San Bernardino County.

The utilization of REDM has allowed SCAG to better assess air pollutant in most vulnerable areas as included our 2016 RTP/SCS EJ Appendix. Furthermore, since air quality is an important topic and has direct impact on public health, the study suggests others entities (e.g. MPOs, local planners, non-profit organization, etc.) to utilize REDM to examine and evaluate the air pollution. The future improvement includes model refinement with accurate atmospheric data and granular model results from SCAG's activity travel model (ATM).



ABOUT SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS
SCAG is the nation's largest metropolitan planning organization, representing six counties, 191 cities and more than 18 million residents. SCAG undertakes a variety of planning and policy initiatives to encourage a more sustainable Southern California now and in the future.

GEOGRAPHIC INFORMATION SYSTEMS (GIS)
The SCAG GIS and Data Service Program was designed as the preferred source for customized demographic and economic studies, data and analysis, Geographic Information Systems (GIS) analysis and mapping for the Southern California region. We maintain data/information and GIS files for the counties of Imperial, Los Angeles, Orange, Riverside, San Bernardino and Ventura.

