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Research

Notes

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Project Title:
Biking in Fresh Air: Consideration of
Exposure to Traffic-Related Air Pollution
in Bicycle Route Planning

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Consideration of Air Pollution Exposure in Bicycle Route Planning

Developing a bicycle route planning tool that considers exposure to traffic-related air pollution

WHAT IS THE NEED?

Active transportation modes such as walking and biking are a key element of sustainable transportation systems. Biking is advocated as a way to mitigate local street congestion, foster community livability, and boost local economy. In addition, biking is also a form of exercise and regular exercise is encouraged to help keep oneself healthy and prevent diseases. From a mode choice perspective, it may be argued that exposure to traffic-related emissions could be one factor that makes biking less appealing to travelers (i.e., a “disutility”). As a result, they would have another reason to be more inclined toward the use of automobiles, contributing to an increase in vehicle traffic and the associated air pollution in the process. In order to promote biking as an alternative form of transportation, a holistic approach to improving the quality of biking experience is needed. This includes, for example, providing route access to a variety of destinations, dedicating spaces for bicycle parking, ensuring a safe and secure biking environment, and maintaining bicycle infrastructure.

Local, regional, and state agencies in California are making efforts to increase bicycle infrastructure in the state in order to promote sustainable and multi-modal transportation. In most areas, bicycle routes are a subset of vehicle routes and new bicycle infrastructure is created by adding bicycle lane(s) to existing rights-of-way. The planning of bicycle routes typically takes into consideration available right-of-way, existing roadway infrastructure, vehicular traffic volume, safety concern, and built environment, among others. Exposure to traffic-related air pollution, on the other hand, is rarely considered in route planning. However, bicyclists are the most vulnerable to the harmful air pollution due to their direct exposure to vehicular exhaust and increased breathing rate during biking. Traffic volume alone is not a sufficient surrogate for the level of air pollution on the road, though; it also depends on traffic speed, fleet mix, meteorology condition (e.g., wind speed and wind direction), and terrain.



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WHAT ARE WE DOING?

In this study, the research team aims to introduce reduced exposure to traffic-related air pollution as another consideration in improving the quality of the biking experience. This project will develop a method for incorporating the consideration of exposure of bicyclists to traffic-related air pollution in bicycle route planning. The method will be applied to the city of Riverside, California, as a case study. Specifically, the researchers will:

1. Create a streamlined process for estimating the level of near-road air pollution concentration in the city,
2. Develop a novel bicycle route planning tool that allows planners to compare the exposure of bicyclists to traffic-related air pollution among different bicycle routes, and
3. Demonstrate the method for considering bicyclists' exposure to traffic-related air pollution in bicycle route planning.

WHAT IS OUR GOAL?

This research is expected to result in a method for incorporating consideration of bicyclists' exposure to traffic-related air pollution in bicycle route planning. The main product of this research will be a web-based application of the bicycle route planning tool. Using this application, planners will be able to visualize how different bicycle routes would produce different levels of bicyclists' exposure to traffic-related air pollution.

WHAT IS THE BENEFIT?

Exposure to traffic-related air pollution has been proven to contribute to a wide range of health problems such as lung and heart diseases. A bicycle route planning tool that takes into consideration exposure to traffic-related air pollution will help to reduce the amount of air pollution exposure by bicyclists, thus improving public health. In addition, the tool has the potential to induce mode shift, from driving to bicycling. Fewer automobile drivers would, in turn, help to reduce greenhouse gas (GHG) and other harmful emissions from vehicles.

WHAT IS THE PROGRESS TO DATE?

This Task Order was given Notice to Proceed on December 30, 2015, and has thus just recently begun. In the first task of this study, the research team will estimate the levels of near-road air pollution concentration in the city of Riverside, California. First, the team will estimate the amount of vehicle traffic on city streets using a transportation model. Then, the researchers will estimate the amount of emissions associated with the traffic using a vehicle emissions model. Lastly, they will use an air dispersion model to simulate how the vehicle emissions mix with the air and disperse into the nearby environment.

Using results from the air dispersion model, the research team will be able to estimate the levels of traffic-related air pollution at any location in the city, for example, on the roads, on the existing bikeways, and in the surrounding neighborhoods. Essentially, the team will be able to create a high-resolution air pollution map for the city.