

Research Note

An Assessment of Urban Form and Pedestrian and Transit Improvements as an Integrated GHG Reduction Strategy

WA-RD 765.1

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April 2011

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WSDOT and City of Seattle Collaborate to Reduce Greenhouse Gases and Vehicle Miles Traveled in Meeting State Goals

Washington State adopted policy goals to reduce greenhouse gases (GHGs). Transportation is one of the state's largest sources of GHG emissions, and the Washington State Department of Transportation (WSDOT) is identifying ways to reduce Vehicle Miles Traveled (VMT) statewide, to meet State goals for VMT reduction. The local governments of King



County and the City of Seattle, Washington also established VMT reduction goals.

Research in land use and transportation consistently identifies urban form (the physical layout and design of a city including density, land use, street layout, transportation and employment areas), transit service, and pedestrian infrastructure as key factors associated with travel behavior characteristics, including VMT and associated GHGs. The combination of all three factors helps to create places conducive to walking and transit use and less reliant on automobile transportation.

In this study, WSDOT and the City of Seattle collaborated to test the effects of sidewalks and pedestrian crossings on travel patterns and sidewalk availability with VMT and GHG emissions. Several large jurisdictions in King County recently developed local sidewalk data layers, creating a new opportunity to look at pedestrian infrastructure with other investment and policy strategies associated with reduced VMT and carbon dioxide (CO₂) emissions (Figure 1.).

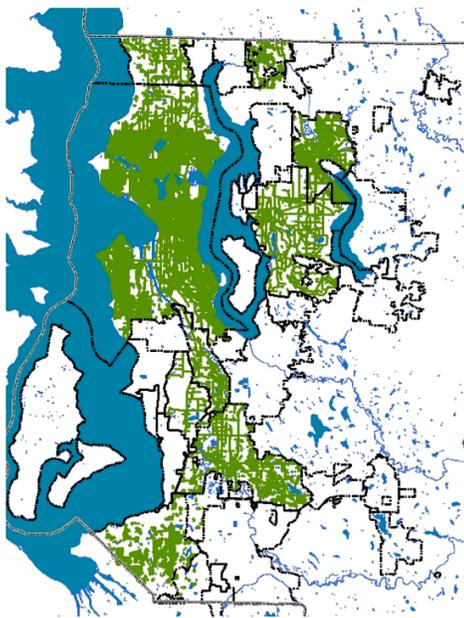


Figure 1. Pedestrian Infrastructure in King County, WA

Researchers Studied Effect of Sidewalks and Pedestrian Crossings on Travel Patterns and VMT and GHG Emissions

Researchers studied the effect of sidewalks and pedestrian crossings on travel patterns and VMT and GHG emissions. The researchers used three basic steps to develop a method to look at pedestrian infrastructure with other investment and policy strategies associated with reduced CO₂/VMT.

First, the researchers developed a method to assess the association between CO₂/VMT emissions and three principal strategies: a) connectivity and completeness of pedestrian infrastructure; b) urban form strategies such as compactness of and proximity between complementary land uses and street network connectivity; and

c) quality of transit service. The analysis controlled for other influences on household CO₂/VMT generation, as household socio-demographic characteristics.

The researchers next analyzed the association between the three principal strategies (sidewalk connectivity, urban form, and transit service), and CO₂/VMT. The researchers tested multiple variables within each of the three principal strategies and the final model results retain only the most effective strategies.

Lastly, the researchers applied the results of the statistical analysis in two neighborhood scale case study locations in Seattle, Bitter Lake and Rainier Beach, and generated a comparison between base case or current conditions and one emphasizing sidewalk connectivity, urban form, and transit service. The model indicates the effect of each independent variable on CO₂/VMT, so that it is possible to see the separate, proportional impact in CO₂/VMT produced by the change in each input variable.

The study used travel outcome data from the 2006 PSRC (Puget Sound Regional Council) Household Activity Survey, a recent two day travel survey of the four-county Puget Sound Region. The research restricted the household-level analysis to households in King County cities where sidewalk data was already available: over 70 percent of the King County Activity Survey participants are drawn from nine of the most populated cities in King County.

Research Indicates Potential of Pedestrian Infrastructure to Reduce CO₂ and VMT

The analysis of the case studies provides early evidence of the potential effectiveness of pedestrian infrastructure to reduce CO₂/VMT, in addition to a mixed land use pattern, shorter transit travel and wait times, lower transit fares, and higher parking costs. This study is an important first step toward a complete understanding of how investments in pedestrian facilities, urban form, transit, and demand management or pricing policy interact to meet the state's goals for VMT reduction. Including sidewalk data from an entire county or region would provide further, and more conclusive, insights.

Based on the study results, the research team developed and tested a technical modeling tool and used it in repeated applications to estimate the potential reduction in CO₂/VMT. The tool works in a number of contexts where scenario analysis or impact assessment is appropriate, such as comprehensive or neighborhood planning, transit-oriented development, or transit corridor planning.

Researchers applied the tool in three scenarios in the two Seattle case study neighborhoods, Bitter Lake and Rainier Beach. Rainier Beach is the location of a

new light rail (LRT) stop, while Bitter Lake lies along a forthcoming bus rapid transit (BRT) service corridor. Both have future potential to transition into pedestrian and transit supportive areas.

The scenario analyses completed for these two Seattle case study neighborhoods indicated that applying current Seattle policy with investments in sidewalks and transit service resulted in small decreases in VMT and CO₂: nearly an 8 percent decrease in VMT, and a 1.65 percent decrease in CO₂ for Bitter Lake; and a 6.75 percent decrease in VMT and a 2.2 percent decrease in CO₂ for Rainier Beach.

More Testing Needed

WSDOT, the City of Seattle, and our regional, local, and national partners plan to build on this work in future research by testing the framework developed for broader statewide application. Such a tool is useful to WSDOT, PSRC, Seattle, and other regional and local agencies in corridor planning, modal planning, and development of investment and VMT reduction strategies. This and future research helps develop a common understanding and the evidence base for specific VMT targets and capital investments and promoting public health and sustainable urban design.

Contact Information

Report Title and Number

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WA-RD # 765.1

www.wsdot.wa.gov/research/reports/fullreports/765.1.pdf

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Funding

\$80,000	Federal
\$20,000	State
\$40,000	City of Seattle, WA

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