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VMT Reduction

IMPACTS OF VMT REDUCTION STRATEGIES ON SELECTED AREAS AND GROUPS

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16. ABSTRACT

The State of Washington has established benchmarks for reducing vehicle miles travelled (VMT). The ambitious targets call for VMT reductions of 18 percent by the year 2020, 30 percent by the year 2035, and 50 percent by mid century. This report discusses estimates and examines impacts of VMT reduction strategies on selected groups and geographic areas mandated by state legislation. The five groups and areas were small businesses whose employees cross county lines to get to work, low-income residents, farmworkers—especially migrant workers, distressed counties, and counties with more than half the land in federal or tribal ownership. The study defined these groups and areas, established a typology of VMT reduction strategies, and made assumptions about behavior and trip lengths based on available literature. It then estimated impacts on the selected groups and areas and suggested several implementation steps and areas for further research.

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Washington state RCW70.235.020, adopted as state law in 2008, sets ambitious targets to reduce greenhouse gas (GHG) emissions, and RCW 47.01.440, also adopted in 2008, sets benchmarks to achieve per capita vehicle miles traveled (VMT) reductions over the next 40 years. The VMT benchmarks are *per capita* reductions of 18 percent by the year 2020, 30 percent by the year 2035, and 50 percent by the year 2050; these are based on an estimated VMT baseline of 75 billion miles in the year 2020[1].

The purpose of this study was to identify and assess current reports, studies, and academic literature about potential VMT reduction strategies and their economic impacts on five geographic areas, populations, and business groups as specified in RCW 47.01.440. The law requires WSDOT to do the following:

> "provide a report to the appropriate committees of the legislature on the anticipated impacts of the (VMT reduction) goals on the following:
> "(a) The economic hardship on small businesses as it relates to the ability to hire and retain workers who do not reside in the county in which they are employed;
> "(b) Impacts on low-income residents;
> "(c) Impacts on agricultural employers and their employees, especially on the migrant farmworker community;
> "(d) Impacts on distressed rural counties; and
> "(e) Impacts in counties with more than fifty percent of the land base of the county in public or tribal lands."

The law does not set targets for any specific group of individuals, businesses, or geographic areas and exempts vehicles weighing over 10,000 pounds, which includes most freight and commercial vehicles. It establishes a statewide measure for VMT reduction: the total non-freight vehicle miles divided by total population (vehicle drivers and non-vehicle drivers).

Generally speaking there are three basic ways to reduce VMT:

- **Shift modes** from the private car to transit, walking, or biking
- **Increase vehicle occupancy** in private cars and vanpools
- **Travel less** through telecommuting, combining trips, reducing the number of discretionary vehicle trips, and employing tools such as a compressed work

week, pricing, and more compact land development that enhances transit, biking, and walking.

Most of these VMT reduction strategies can be practically implemented in whole or part in metropolitan areas, where the largest populations and broadest sets of alternatives to single occupancy vehicle (SOV) dependence exist.

The metropolitan/non-metropolitan divide is a distinguishing characteristic in estimating the economic impacts of VMT reduction in most of the five areas and groups examined in this report. Residents in the urban growth portions of metropolitan areas have the potential for more SOV alternatives. For example, because of the population and employment densities in the central Puget Sound, more than half the state's small business employees who cross county lines have access to ridesharing or transit to get to work, and most residents in Snohomish County, whose land base is more than half publicly owned, live in the urbanized portion of the county and have access to local and regional transit. Residents in more rural, sparsely populated areas have fewer options for reducing VMT, although trip chaining, telecommuting, working compressed work schedules, and driving less remain options in remote areas as well.

An extensive literature review undertaken for this report confirmed that very little information exists specific to VMT reduction strategies' impacts on the five areas and groups of interest to this report. What literature there is has paid most attention to the travel behavior of low income households, which own fewer cars, travel less, and share rides more. The review found one pioneering ridesharing program for farm workers in rural areas. No studies or reports were found on VMT reduction strategy impacts in distressed rural counties, counties with majority public or tribal land ownership, or small businesses whose employees cross county lines.

The literature consistently identifies pricing—through some combination of VMT charges, carbon or fuel tax, and tolls or other fees—as a proven way to reduce VMT. This study utilized pricing as the mechanism uniformly applied to each of the five groups and areas and assumed a VMT charge ranging from between $.05 and $.25 per mile for single occupant (SOV) driving. Pricing was selected because "cost" can be used as a surrogate for any other type of "disincentive to drive" program that might be adopted by the state. The increase in the cost of driving is assumed to result in a decrease in the

willingness to drive, resulting in a decrease in total VMT driven, as individuals adjust their lives to maximize their travel and quality of life benefits within the constraints of their limited personal budget.

The study, of necessity, made generalizations about the groups and areas. It is not possible to note the circumstances of each individual living in a distressed county, crossing a county line to work in a small business, or living in a low income household in a study at this scale. Generally speaking, low income households own fewer cars and drive alone less, yet many low income individuals do drive alone and may not have transit or ridesharing options. Residents in a distressed rural county may need to commute 50 miles to a lumber mill or live and work just a short walk away in a small town. On the whole, people with lower incomes, living in dispersed, car-dependent areas will be burdened by VMT reduction requirements if they are implemented. But some sub-groups might also experience positive impacts if new options such as van-sharing or increased HOV service were provided.

SMALL BUSINESSES THAT RELY ON HIRING AND RETAINING WORKERS WHO CROSS COUNTY LINES TO REACH THEIR PLACE OF EMPLOYMENT

Our analysis estimated that 227,000 workers cross county lines to reach employment in a Washington state business of fewer than 20 employees (or revenue under $3 million). Of this number, over half reside and work in the three contiguous central Puget Sound counties—Snohomish, King, and Pierce—and hence have potential access to transit and ridesharing alternatives to SOV driving. Therefore, most small businesses in metropolitan areas would likely see few negative impacts from VMT reduction, and some located in urban centers could even experience cost savings by providing transit benefits as opposed to parking to employees. For small businesses located in non-metropolitan markets or in subareas of metropolitan markets that do not have reasonable transit or rideshare alternatives, disincentives to driving would impose a burden on their employees. Were the state or county to impose a VMT charge of from $.05 to $.25 per mile, the average work round trip[2] could cost an additional $2.10 to $10.50 per day. The low end would likely have little or no impact on small businesses,

[2] Based on the national average one way commute distance of 13.94 miles.

but the high end might lead to a loss of employees or requests for higher pay to offset an additional cost of up to $52 a week for the SOV work trip.

LOW-INCOME RESIDENTS

Of necessity, low income households model VMT-reduction behavior. They own fewer cars, drive less, and share rides more than the general driving population. For those able to get around in shared vehicles and public transportation, a VMT charge would have few negative impacts. But for the majority of low income households, a VMT charge would have a negative and disproportionate effect. A VMT fee of $.05 to $.25 per mile would increase the daily work trip cost from an estimated $.1.40 to $7.00 per day for urban area low-income residents and from $2.80 to $14.00 per day for rural area low-income residents.

AGRICULTURAL EMPLOYERS AND THEIR EMPLOYEES, ESPECIALLY MIGRANT FARM WORKERS

Migrant farm workers represent a subset of low income households travelling seasonally to work fields and harvest crops. A VMT charge on SOV driving would negatively affect this group. Travel is often in shared, older vehicles. In California that led to increased roadway accidents and deaths, greater GHG emissions, and more VMT. The state of California has pioneered a farm worker ridesharing program that reduces GHG and VMT and represents a successful VMT reduction strategy in a rural context.

The Agricultural Industries Transportation Services (AITS) program was developed in the wake of a series of fatal crashes involving unsafe farm worker vanpool vehicles. A 2006 Caltrans report estimated that the program produced an annual reduction in VMT of nearly 15 million, as well as benefits from increased safety, reliability, equity, and emissions reductions valued at $16 million annually. Migrant farm workers in California experience weekly savings of between $7.69 and $10.17, a modest 2-3 percent increase in disposable income.

Were a similar program implemented in Washington's three highest producing agricultural counties, this study estimated that agricultural workers could expect savings of between $30 and $45 per month in transportation costs. The general public would

benefit from reductions in GHG emissions, newer safer vehicles, and reduced accidents valued at $5 million annually. A reduction of 3-5 million VMT could be expected.

DISTRESSED RURAL COUNTIES

Half of Washington's counties are deemed "distressed" on the basis of a state definition of having three years of an unemployment rate of 120 percent or greater of the state rate. All but one of these counties are rural, with a population of less than 100 people per square mile. This study assumed that rural commute lengths are double the national average of 28 miles round trip. A VMT charge of $.05-.25 per mile would impose a cost of $2.80 to $14.00 per day. Residents of rural distressed counties would be negatively affected, as many must travel long distances to work, shopping, and school and have few or no alternatives to the SOV. VMT charges would impose a weekly cost ranging from $14 to $70.

COUNTIES THAT HAVE MORE THAN 50 PERCENT OF THEIR LAND BASE IN PUBLIC OR TRIBAL LANDS

More than half the land base of eleven Washington counties is in public ownership. Some of those counties are primarily rural and have lower per capita VMT, such as the 8,852 in Chelan County. Others are primarily rural but contain major Interstate highway(s) and therefore have higher per capita VMT, such as Kittitas County's 26,662,. Further complicating matters is that a few of these counties have substantial urbanized land areas, such as Snohomish County, while others like Clallam County do not. For those counties or portions of counties that are rural, the impacts of required VMT reduction for SOV travel would likely be similar to those for residents of rural distressed counties. In a small number of cases urban area strategies could be employed within portions of these counties.

CONCLUSIONS

The five areas and groups that are the focus of this report are not homogenous. Within categories significant differences exist. For this reason, **there is no single strategy that will reduce VMT for each area or group**. Rather, a variety of strategies are available—singly and in combination—at different levels of government and for

different groups and individuals to employ to reach the state's VMT reduction benchmarks.

Pricing would likely be effective, but it would disproportionately burden and affect the five groups and areas of interest in this report. It is also politically difficult to implement. A per mile VMT charge or toll would adversely affect lower income populations in general, with particularly negative impacts if applied to rural area residents and workers and employees who must travel long distances to and from work and do not have access to alternative transit or ridesharing programs.

It is possible, however, to implement strategies to serve specific groups such as many farm workers who work in rural areas and are generally low income. The farm workers' vanpool program offers such a model.

VMT strategies of shifting modes, increasing vehicle occupancy, and driving less are more viable in urban areas because population and employment density enables more SOV alternatives. Most of the state's population resides in just seven of 39 counties. These metropolitan areas are where the infrastructure, population density, and land-use patterns permit the most VMT reduction alternatives and hold the most possibility for land-use changes of compact, transit-oriented development, where walking and transit become increasingly viable alternatives to the SOV.

RCW 440 does not require all areas and groups to meet VMT reduction benchmarks at the same rate or at all, so it is entirely feasible to exempt vulnerable populations from SOV VMT reduction benchmarks.

I. INTRODUCTION

Washington state has taken a leadership role in reducing greenhouse gas emissions (GHG), which contribute to climate change and global warming. Washington state has adopted some of the most progressive policies in the country for reducing GHG and has also established similar targets for reducing per capita vehicle miles travelled (VMT). Washington state's transportation sector, unlike that in many other states, accounts for nearly half of GHG emissions. Therefore, reducing VMT will have a direct and positive impact on GHG reduction.[3]

PURPOSE

The purpose of this study was to identify and assess current reports, studies, and academic literature about potential VMT reduction strategies and their economic impacts on five geographic areas, populations, and business groups as specified in RCW 47.01.440.

The law requires WSDOT to do the following:

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WASHINGTON'S GHG AND VMT LAWS

RCW70.235.020, adopted as state law in 2008, sets ambitious targets to reduce greenhouse gas (GHG) emissions, and RCW 47.01.440, also adopted in 2008, sets benchmarks to achieve per capita vehicle miles traveled (VMT) reductions over the next 40 years. The VMT benchmarks are *per capita* reductions of 18 percent by the year 2020,

[3] While the reduction targets of 18 percent, 30 percent, and 50 percent by mid-century are the same for GHG and VMT, the starting point or baseline measurement for each is different. The baseline for GHG reduction is 1990 emissions levels. The baseline for VMT reduction is a 2008 projection of 75 billion VMT in Washington state for the year 2020.

30 percent by the year 2035, and 50 percent by the year 2050; these are based on an estimated VMT baseline of 75 billion miles in the year 2020.

The law sets no targets for any specific group of individuals, businesses, or geographic areas and exempts vehicles weighing over 10,000 pounds, which includes most freight and commercial vehicles. It establishes a statewide measure for VMT reduction statewide: the total vehicle miles divided by population.

STUDY APPROACH

The study consisted of five steps:

Define Terms: Establish working definitions for the five identified areas and groups. For example, the term "small business" may connote a mom and pop enterprise with a few employees or a self-employed professional, but to the Small Business Administration it means a business of up to 500 employees (and in some cases up to 1,000 employees). Similarly, the state and federal governments define distressed counties differently.

Review the Literature: Review the field of knowledge about VMT, VMT reduction strategies, and their application and underlying theory, and assemble data sources and case examples.

Identify Strategies: Select VMT reduction strategies appropriate to the five areas and groups.

Estimate Impacts: Estimate the economic impacts—both positive and negative—these strategies might have on the study areas or groups.

Draw Conclusions: Summarize key findings regarding VMT reduction impacts and suggestions for further research.

II. BACKGROUND

WASHINGTON STATE AND CLIMATE CHANGE

Over the past decade Washington state has demonstrated a significant interest in protecting the environment from the threat of a changing climate. In 2004, Governor Gary Locke joined the governors of Oregon and California in approving the West Coast Governors Global Warming Initiative. The initiative asked states to reduce greenhouse gas emissions, invest in clean energy technology, and reduce dependence on fossil fuels (Executive Committee of West Coast Governors 2004). Three years later, Governor Gregoire and the governors of Arizona, California, New Mexico, and Oregon formed the Western Climate Initiative (WCI), which developed a multi-state registry to track and manage regional emissions (Western Climate Initiative 2010). The governors of Montana and Utah and the premiers of British Columbia, Manitoba, Ontario, and Quebec, Canada, have since joined the WCI.

In February of 2007, Governor Christine Gregoire issued Executive Order 07-02, which set benchmarks for statewide GHG emissions as follows:

- by 2020, reduce GHG emissions to 1990 levels
- by 2035, reduce GHG emissions to 75 percent of 1990 levels, and
- by 2050, reduce GHG emissions to either 50 percent of 1990 levels or 70 percent of projected annual emissions for 2050, whichever was less.

Several months later, these benchmarks were adopted into legislation as RCW 70.235.020.

RCW 47.01.440, adopted in 2008, sets parallel benchmarks for VMT reduction, with the explicit assumption that strategies reducing per capita VMT will simultaneously reduce transportation-related greenhouse gas emissions.

In May of 2009, Governor Gregoire issued Executive Order 09-05, which directs the Department of Transportation to evaluate the benchmarks set out in RCW 47.01.440 in light of new fuel efficiency technologies. The Executive Order also directs the Department to establish plans and strategies, in coordination with the regional transportation planning organizations, that reduce VMT in the state's most populous counties.

The U.S. Global Change Research Program cites the Northwest's rapid development as one of the major causes of environmental stresses; ironically, the very natural beauty that attracts new residents may be diminished by increasing human activity. Consequences of the region's unchecked growth include loss of forests and wetlands, diminished salmon runs, and air pollution in urban environments (Parson et al. no date n.d.).

Washington's role in combating climate change has both environmental and economic dimensions. Washington's $38 billion food and agriculture industry represents 12 percent of the state's economy (Washington State Department of Agriculture n.d.). As the country's leading producer of apples, cherries, and hops, and a major exporter of timber and salmon, Washington agriculture stands to lose a great deal to climate change (Washington State Department of Ecology 2005). Additionally, the marine effects of climate change, which can include increasingly frequent or prolonged storm events, could disrupt port operations along the West Coast (Huppert et al. 2009).

A 2009 report from the University of Washington estimated that the state will experience an overall temperature increase of between 0.2 and 1.0 Celsius per decade over the next century (Mote and Salathé 2009). Models that estimate regional effects suggest substantial decreases in winter and spring precipitation in the Cascade and Olympic mountain ranges, combined with a significant decrease in snowpack (Salathé et al. 2009). These results of climate change could have potentially devastating effects on Washington farmers, salmon populations, and the skiing and recreational tourism industry, all of which depend on consistent temperatures and substantial volumes of precipitation.

A report by the Washington State Department of Ecology (2005) cataloged the economic impacts of climate change. It concluded that the costs of more frequent wildfires, water conservation, loss of hydropower revenues, droughts, temperature effects on dairy cattle, increased flooding, and higher public health costs would far outweigh the costs of any intervention. Among the specific recommendations for reducing the state’s contributions to climate change is implementation of a strategy to reduce vehicle miles traveled (Washington State Economic Steering Committee 2006).

TRENDS IN VEHICLE MILES TRAVELLED

Vehicle miles traveled (VMT) are the total number of miles traveled by all vehicles in a given area during a given period. Statewide VMT in Washington state is calculated by the Washington State Department of Transportation (WSDOT) on the basis of traffic count reports from state, county, and local government sources. VMT is considered a strong indicator of road network usage at the state and county levels (Washington State Department of Ecology 2008a). RCW 47.01.440 is the state legislation, adopted in 2008, that sets statewide per capita reduction targets over the next 40 years. The law applies to vehicles of less than 10,000 lbs, focusing attention on personal vehicles and largely exempting freight and commercial vehicles from VMT reduction targets (Washington Climate Action Team 2008).

VMT has generally increased over time in the United States since World War II, and those increases have been attributed to a combination of factors, including enormous growth of metropolitan regions, dramatic increases in private car ownership, and declining importance of transit systems in low density suburban development. However, drops have occurred, and total VMT nationwide began to plateau in 2004 (see Figure 1). Puentes and Tomer (2008) found that a 90-billion-mile decrease in VMT took place in 2007, perhaps because of increased gas prices, representing the largest annualized decrease in more than 60 years. Cars and personal trucks generate the vast majority of VMT nationally, totaling 92.6 percent of all VMT in 2006 (Puentes and Tomer 2008). Washington state per capita VMT peaked in 2000 and has dropped since then below 1993 levels (see Figure 2.)

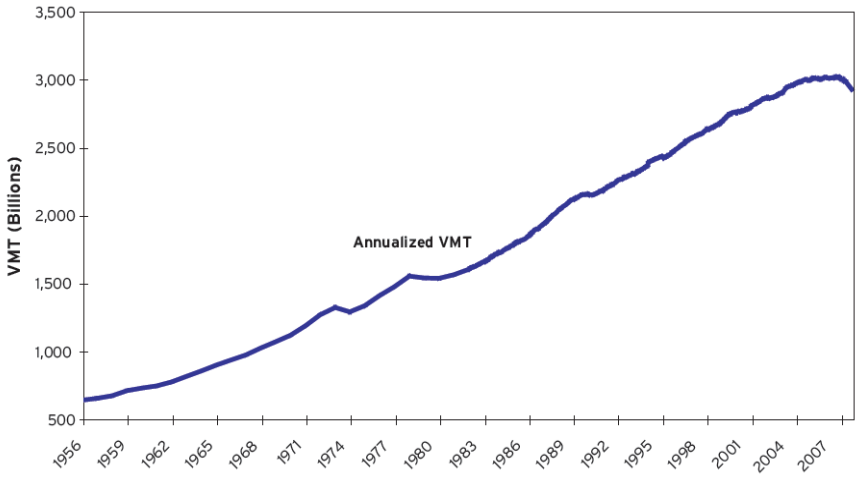

Figure 1. U.S. vehicle miles traveled, annualized, December 1956 – September 2008.

(Source: Puentes and Tomer 2008.)

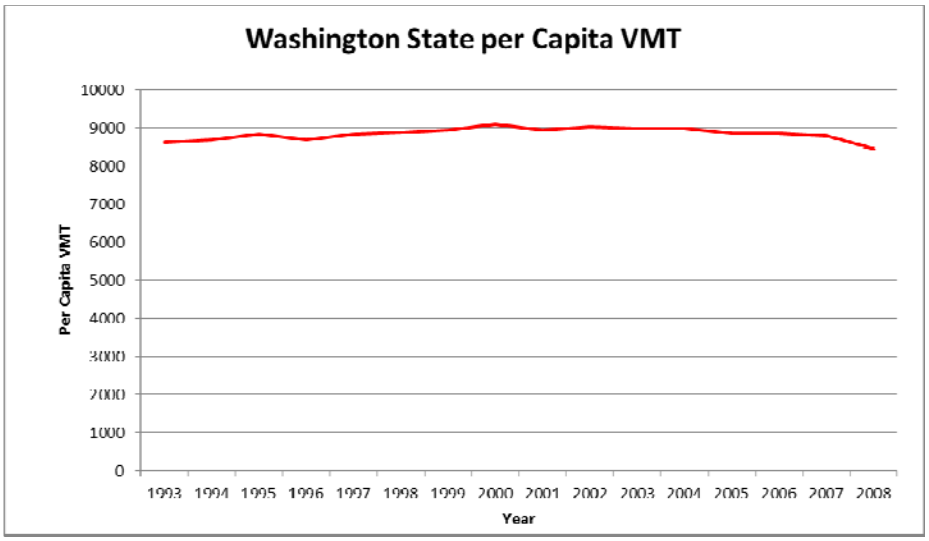

Figure 2. Washington state per capita VMT declined sharply in 2008, in line with national trends.
(Sources: U.S. Census, Washington State Department of Transportation).

Figure 3 uses data collected by WSDOT to illustrate the current VMT occurring in each county.[4] Figure 4 divides this value by the county population to show how VMT per capita changes from county to county. Figure 5 shows these same data in a slightly different format to allow a different view of county-to-county differences. In Figure 3, it can be seen that total VMT is highest in metropolitan areas (darker shade of green) and

[4] These data account for all VMT, heavy duty vehicles included. Actual VMT reduction targets apply only to light duty vehicles. Heavy duty vehicle VMT has been estimated at 11 percent of overall VMT, but this factor may or may not apply accurately to traffic on I-82 and I-90 in Kittitas County or any specific county.

rural area counties, which contain heavily used state highways, such as major interstate highways, which serve long haul, intercity traffic.

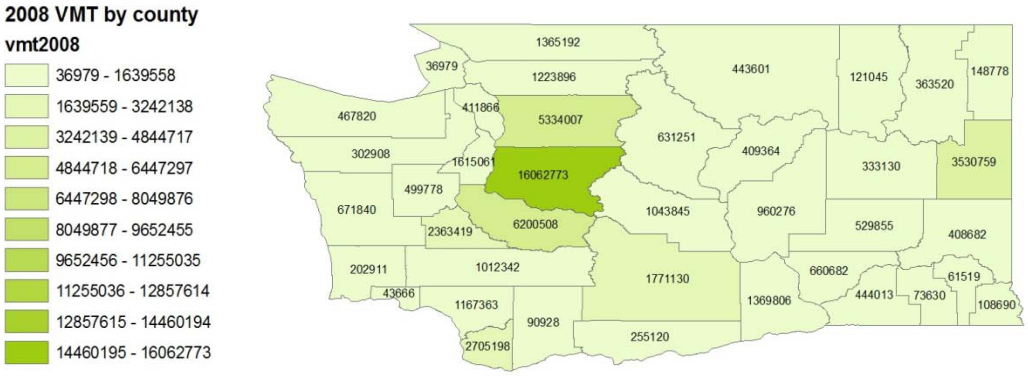

Figure 3. Annual VMT by county (in thousands), 2008

(Source: Washington State Department of Transportation).

Because VMT is allocated to where the vehicles travel and not to where the people doing that traveling live, figures 4 and 5 show that counties that have small populations but that also contain high volume state highways have disproportionate per capita VMT, through no fault of the local population. Consequently, for purposes of monitoring and reducing county residents' per capita VMT, this traditional method of computing per capita VMT (i.e., essentially the sum of all traffic counts divided by population) provides a skewed picture of county resident driving habits. If VMT reduction is an important state goal, benchmark achievement would be assisted through more precise measuring techniques and/or through a more sophisticated association of VMT on long haul routes with where that traffic is coming from and going to.

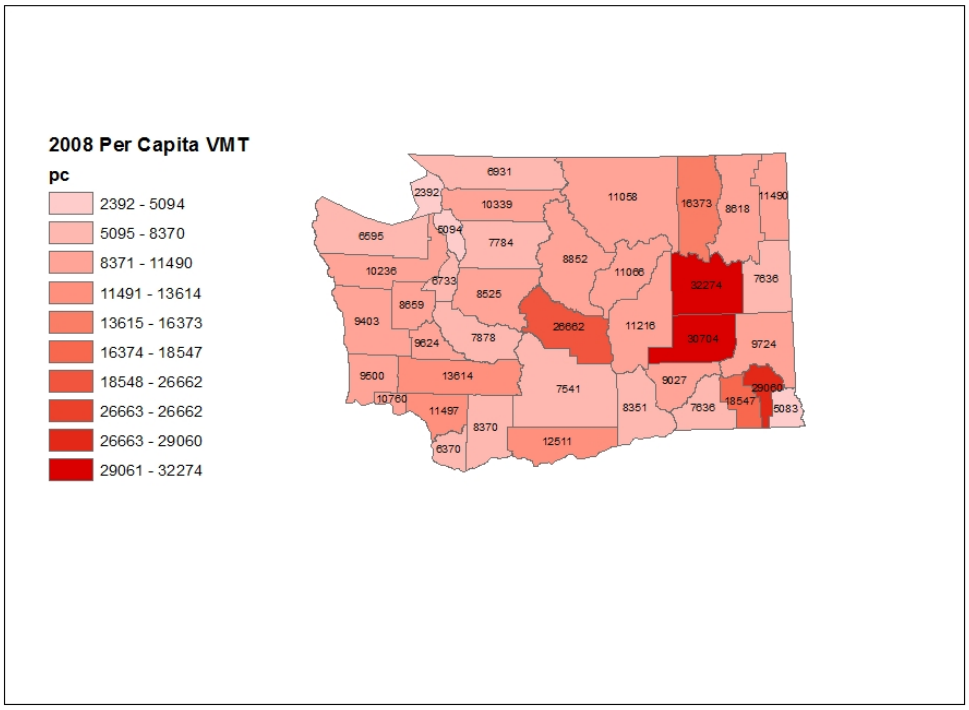

Figure 4. Per capita annual VMT by county (in thousands), 2008[5]

(Sources: U.S. Census Data and Washington State Department of Transportation)

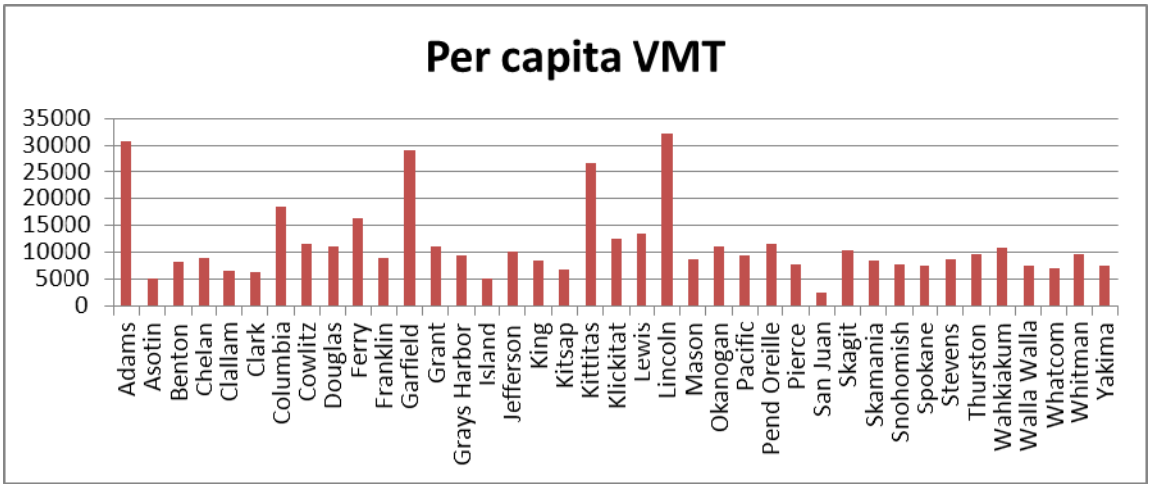

Figure 5. Per capita annual VMT by county (in thousands), 2008

(Sources: U.S. Census Data and Washington State Department of Transportation)

[5] WSDOT cannot distinguish between through-traffic and local traffic on the state highway system.

The February 2008 VMT forecast, which established the baseline for the VMT reduction legislation, estimated that per capita VMT in 2020, excluding trucks weighing over 10,000 pounds, will be 8,616 miles annually or about 23 miles per day. This is very similar to today's per capita 8,440 annual VMT. An 18 percent reduction in projected 2020 per capita VMT would translate to 7,065 VMT per capita annually or about 19 miles per day (WSDOT 2010).

The literature confirms that lower VMT rates in advanced industrial nations are possible. Per capita VMT rates in Germany, for example, are half those of the United States (Buehler et al. 2009). Low-income households faced with limited resources also have lower VMT rates and practice basic VMT reduction strategies: less reliance on and use of the single occupancy vehicle (SOV), more selectivity in trips, and greater use of public transit, ridesharing, and non-motorized travel (Murakami and Young 1997).

WHY REDUCE VMT?

Washington state's interest in VMT reduction stems from continued efforts to reduce transportation-related impacts on the environment and public health, specifically air pollution in the form of GHG emissions. Reducing VMT (while the internal combustion engine remains the primary automobile power source) will reduce GHG emissions and could also improve the overall efficiency of the roadway system (Washington Climate Action Team 2008).

Greenhouse gases (GHG) are gases that trap heat in the Earth's atmosphere and contribute to climate change. While greenhouse gases come in many forms and from many sources, they are often converted to the equivalent amount of carbon dioxide for ease of comparison. A 2007 report indicated that in 1990 Washington state produced the equivalent of 88.4 million metric tons of carbon dioxide, a figure projected to increase to 121.9 million metric tons in 2020 (Center for Climate Strategies 2007). Levels of anthropogenic (or human-caused) emissions are considered a primary determinant of future changes to environmental factors such as temperature and weather patterns (U.S. Climate Change Science Program 2007). Emissions from transportation-related activities account for nearly half of the total GHG emissions in Washington (Center for Climate

Strategies 2007). The other sources of GHG are the production of electricity and residential, commercial, and industrial energy consumption.

In Washington state, the largest single source of carbon emissions is motorized transportation, accounting for an estimated 47 percent of carbon dioxide equivalent emissions statewide in a 2005 inventory (Washington State Department of Ecology 2005). The transportation sector's output of carbon emissions has grown steadily over the last 35 years, while output from other emission-producing sources, such as electric power and the industrial sector, has remained steady or declined (Washington State Department of Commerce 2007b).

RCW70.235.020 establishes targets for reducing GHG emissions from their 1990 levels by 18 percent in 2020, 30 percent in 2035 and 50 percent in 2050 (State of Washington 2007). The order also compels state agencies to develop specific policy recommendations for the purposes of meeting the targets.

GHG and Population

Washington state anticipates a growth in population of nearly 25 percent between 2010 and 2030 (Washington State Office of Financial Management 2009). The legislature has responded to these projections by seeking to mitigate the environmental impacts of the additional population. One of the goals of the 1990 Growth Management Act, for example, is to encourage the use of efficient, multi-modal transportation systems.[6] Furthermore, the State Environmental Planning Act, or SEPA, requires planning agencies to consider the long-term environmental impacts of comprehensive plans (which include transportation elements) and transportation infrastructure construction and maintenance projects. Rather than restrict or discourage population growth, these acts accept growth estimates and seek to minimize the environmental impacts of that growth.

GHG and Vehicle Fuel Economy

In 2005, the legislature enacted RCW 70.120A, which brought Washington state motor vehicle emissions standards closer to those of California, where the emissions

[6] RCW 36.70A.020 (3).

standards reduce emissions beyond the federal requirements.[7] Beginning with 2009 vehicle models, and exempting certain military personnel, vehicles failing to meet the new emissions standard cannot be registered, licensed, rented, or sold in Washington state.[8]

GHG and VMT

Washington's 1991 Clean Air Act–Commute Trip Reduction section linked auto traffic with emissions that damage the environment[9], but RCW70.235.020 and RCW 47.01.440 are the first state laws to explicitly address the relationship between per capita VMT and GHG emissions.

[7] Governor's Communications Office, "Gov. Gregoire signs 'clean cars' bill requiring strict auto exhaust emission standards," May 6, 2005.
[8] Washington Administrative Code, Chapter 173-423, "Low Emission Vehicles," updated Jan 15, 2009.
[9] RCW 70.94.521, the "Findings" section of Washington's Clean Air Act - Commute Trip Reduction section states, "The legislature finds that automotive traffic in Washington's metropolitan areas is the major source of emissions of air contaminants. This air pollution causes significant harm to public health, causes damage to trees, plants, structures, and materials and degrades the quality of the environment."

III. WHAT THE LITERATURE TELLS US ABOUT VMT REDUCTION STRATEGIES AND TRAVEL BEHAVIOR IN SELECTED AREAS AND GROUPS

This study began with an in-depth literature review of VMT reduction strategies and their impacts, which involved a search of academic libraries, databases, and journals. Resources reviewed by the researchers included the following:

- National TDM and Telework Clearinghouse – University of South Florida
- TDM Encyclopedia – Victoria Transport Research Institute
- Compendex – civil engineering research database
- National Technical Information Services – U.S. Department of Commerce
- WSDOT Research Library
- Journal of Planning Literature
- Transport Journal
- Transportation Research Information Service – U.S. Bureau of Transportation Statistics.

The extensive review yielded little information on the economic impacts of VMT reduction generally, let alone on specific demographic sectors or geographic designations. The Puget Sound Regional Council conducted a benefit-cost analysis of its Transportation 2040 plan but did not assign benefits or costs to the forecasted changes in VMT projected in each plan scenario. What costs and benefits were found were associated with VMT reductions tied to specific case studies.

Follow-up with research librarians and municipal planning departments corroborated that general economic impacts of VMT reduction is a new and under-researched field.

Nonetheless, there is considerable information about directly relevant fields of VMT trends and reduction, congestion reduction, pricing, commute trip reduction, mode shift, SOV alternatives, and emissions control strategies. This information has informed our work and forms the foundation of this report.

VMT REDUCTION STRATEGIES

On the basis of the literature review, this study concludes that there are three basic ways to reduce VMT:

- **Shift modes** from the private car to transit, walking, or biking
- **Increase vehicle occupancy** in private cars and vanpools

- **Travel less** through telecommuting, combining trips, reducing the number of discretionary vehicle trips, and employing tools such as a compressed work week, pricing, and more compact land development, which enhances transit, biking and walking.

Shifting modes can work when viable alternatives are available. For transit, viable means frequent, reliable service that connects places people want to go. This type of service can generally only be offered in metropolitan settings where employment and residential concentrations make capital investments and operating costs financially feasible (Pushkarev and Zupan 1977, Downs 2006). Low density, dispersed settlement, and business location patterns typified by *rural areas* and much suburban development do not realistically enable widespread mode shifting to transit. At the same time, the distances that must be traveled between many activities in rural and suburban areas make non-motorized modes (biking and walking) difficult if not impossible to employ.

Increasing vehicle occupancy through formal or informal rideshare programs represents a viable alternative to SOV use in many areas, including those that cannot support fixed-route transit.

Traveling less can be accomplished in several ways. The two most common are trip chaining and trip elimination. . Trip chaining (combining multiple trip destinations into one continuous outing—for example, stopping on the way home from work at the grocery store, rather than making a separate trip from home to the grocery store and back) reduces VMT and frequently allows travelers to spend their own time more efficiently. It is already a common practice among time sensitive travelers, especially in congested urban areas. Eliminating a percentage of discretionary trips is another behavior change that travelers could adopt in response to disincentives to drive imposed externally.

To supply the external stimulus that causes travelers to reduce their VMT, economists generally favor the use of pricing. Charges imposed for parking, roadway use, and fuel use have proved effective in reducing VMT in numerous studies (Kitchen 2008, Rufolo 2008, Shoup 2005).

VMT charges, value pricing of roadway use, and increased fuel taxes are politically difficult to impose and, in the case of variable, real-time pricing, require the introduction of in-vehicle or other technologies. However, imposing a charge based on VMT accomplishes two complementary objectives: it encourages a reduction in vehicle

travel and it generates revenue that can be used to fund transportation alternatives to personal vehicle use. Some pricing strategies, such as an increase in fuel taxes or a carbon fee, also accomplish a third complementary objective: encouraging the use of more energy-efficient vehicles. For example, Germany taxes auto ownership and operation at much higher rates than the U.S. and invests the proceeds in transportation alternatives to the SOV (trains, bikeways, etc) (Buehler, Pucher and Kunert 2009).

Compact, transit-oriented development mixes residential, service, and employment activities in such a way that vehicle use is not necessary or is greatly minimized (Calthorpe, LUTRAQ). This physical development form, favored in many growth management act (GMA) comprehensive plans, represents a longer term approach to reducing VMT because development of the infrastructure and property takes time, but it certainly fits within a 40-year time frame.

Transportation planning literature on VMT reduction often focuses on the commute trip. Though work trips are no longer the most prevalent type of trip, they are still associated with peak demand periods (morning and evening rush hours) and tend to be longer than trips taken for other purposes (Hanson 2004). For the same reasons, transportation agencies seeking to reduce VMTs also tend to focus on commute trips.

Downs (2006) categorized transportation policies that influence mode choice and travel behavior as either regulatory or market-oriented strategies, and as either supply side or demand side strategies.

Regulatory strategies attempt to change behavior through government mandate. Examples of regulatory congestion-fighting strategies used in Washington state include ramp metering, HOV lanes, roadway expansion, and the Commute Trip Reduction program in western Washington. Regulation is a more precise tool for changing behavior than market intervention but can lead to more bureaucracy because of the need for enforcement and oversight.

Market-oriented strategies involve attaching monetary values to transportation choices and allowing individual users to choose among them. These strategies attempt to correct for externalities and bring transportation costs closer to their true social costs. Examples of market-oriented strategies used in Washington state include variable tolling and increased gasoline taxes; these policies generate revenues that can be used for

roadway maintenance and repairs, social costs that are not usually considered by the private roadway consumer. Market-oriented approaches leave more individual choices in place and require less effort to enforce than regulatory strategies, but they are considered more regressive because of their impact on low-income travelers. In addition, tolls do not distinguish between individuals driving more fuel efficient cars and releasing less GHG into the environment per mile driven than other vehicles. Similarly, VMT taxes, *unless they differ by type of vehicle*, do not differentiate between low GHG emitting vehicles and higher GHG emitting vehicles.

Supply-side strategies are those that seek to manage the supply of roadways in order to influence transportation choices. Adding high occupancy vehicle (HOV) lanes is an example of a supply-side strategy at work in Washington state. Supply-side strategies tend to provide some short-term incentives for reducing VMT, but they eventually lose some or all of this benefit to *induced demand*, as roads with smoothly flowing traffic will attract drivers who would otherwise have used other modes or routes, or traveled at different times to avoid congestion. Giuliano, for example, argued that increased capacity adds to VMT because of induced demand (Johnston 2004). Nonetheless, transportation economists insist that induced demand is not reason enough to forgo investing in supply management strategies altogether, as they do benefit those responding to the induced demand and almost always have a positive effect on existing congestion conditions (Downs 2006).

In metropolitan areas with sufficient residential and employment densities (Pushkarev and Zupan 1977), increasing transit capacity does provide more transportation options among communities, especially in areas where transit service is poor. Furthermore, increased transit capacity reduces light duty vehicle VMTs and, if sufficiently utilized (relatively high transit vehicle loads), also reduces greenhouse gas emissions and can reduce maintenance costs on road infrastructure (Downs 2006).

Demand-side strategies, such as removing tax subsidies for employers who provide free parking, are designed to reduce the number of vehicles or people who travel during peak hours. These strategies are designed to reduce the demand for single-occupancy travel, mostly by attempting to correct for the differences between the private and social costs of vehicle use.

Road pricing seeks to cause travelers to internalize (directly consider) transportation choice externalities. The two main types of road pricing strategies are zone pricing (also called area pricing or cordon pricing) and roadway facility tolling. Zone pricing affects drivers who enter into a geographical boundary, usually a central business district or other highly congested area. The fees can vary by the time of day to discourage congestion during peak hours, though this is not always the case in practice.

Roadway facility tolling introduces pricing to a specific length of road, usually a freeway, bridge, or tunnel. While traditional facility tolling does not vary cost on the basis of time of day, a more dynamic system can set prices higher to discourage auto travel at specific times and keep traffic flowing freely. Prices that vary by time of day or level of congestion are designed to monetize the marginal cost of capacity needed only during peak travel times of the day, thus encouraging those responsible for the added expense of providing additional lanes of travel to pay for those additional lanes. This has the result of moving discretionary trips and trips with alternative routes/modes to less congested time periods or to different routes/modes.

Perhaps the most effective demand-side strategy for reducing VMTs is encouraging those who drive alone to share their vehicles.[10] A number of different approaches for achieving this have been studied, including the following:

- Developer incentives (e.g., density bonuses) for reduced parking facilities
- Employer persuasion (e.g., Commute Trip Reduction)
- Increased gasoline taxes – dissuade people from traveling alone and encourage carpooling or use of alternative modes, thus reducing VMTs. As technology enables more fuel-efficient cars, however, gasoline taxes become less effective, both as a disincentive for VMT consumption and as a source of revenue for transportation improvements
- Increased vehicle ownership fees – discourage ownership of multiple automobiles and increase the attractiveness of alternative modes. Like gasoline taxes and road pricing, fee-based disincentives are regressive in that they have a greater proportional effect on low-income users
- "Cashing out" free parking – a strategy in which employers pay their workers not to drive to work. This strategy is borne from the costs of maintaining parking facilities – those who use them should "pay" in the sense that they are not compensated
- Peak-period parking taxes
- Publicly sponsored vanpools.

[10] Anthony Downs, *Still Stuck in Traffic*, (Washington, D.C.: Brookings Institution Press, 2006), 185.

One other demand-side strategy that reduces VMT is encouraging telework, though this strategy is not appropriate for some industries (such as manufacturing) or where Internet or telephone services are limited, such as some rural areas (Giuliano 2004).

Other demand-side strategies focus on the relationship between land use and transportation demands. Low density development, for example, is one of the principal contributors to VMT. By increasing density and mixing compatible land uses, community planners simultaneously reduce road maintenance costs (by reducing the total number of miles of road per capita), increase the feasibility of public transit, enable non-motorized travel, and reduce the overall amount of vehicular transportation demand. Mixing land uses can correct for distributional imbalances between jobs and housing and reduce commute and other trip purpose travel distances (Downs 2006).

Greater numbers of residents living in proximity to one another and to employment centers foster more choices to SOV dependence. VMT reduction strategies identified in the literature are summarized in Table 1, where they are listed by primary category and by applicability to the urban and rural environments.

Table 1: Applicability/effectiveness of VMT reduction strategies to urban and rural areas

Strategy	Urban	Rural
Shift to transit	++	-
Shift to walk/bike	++	+
Increase car/vanpool occupancy	++	+
Travel less through telecommuting	+	+
Combining trips	++	++
Reducing discretionary trips	+	+
Compressed workweek	+	+
Pricing	++	+
Compact transit oriented development	++	+
Location efficient mortgages	++	-
Inclusionary zoning	++	-

Key:
++ Applies strongly
+ Applies in some cases
- Applies rarely

VMT REDUCTION AS A TOOL FOR GHG EMISSIONS REDUCTION

Some have argued that VMT reduction policies risk reducing mobility and increasing real estate prices while failing to reach established targets.[11] But a number of studies have determined that VMT reduction plays a critical role in reaching goals for emissions reduction. Without substantial reduction in VMT, argued Condon (2008), growth in emission levels can only slow but not reverse. Other studies have pointed out that even with gains in fuel economy standards, per capita VMT would still need to fall drastically in order for emissions targets to be reached. Frank et al. (2007) reviewed numerous land use and technological forecast scenarios and found that those with the most advanced levels of change "which [assume] 75 miles per gallon and [cut] greenhouse gases per gallon of fuel nearly in half would still need to cut per capita VMT by nearly 20 percent"[12] in order to reach emissions targets.

ECONOMIC IMPACTS OF VMT REDUCTION STRATEGIES

The positive correlation between VMT and productivity has led many to call for more research into the causal relationship between vehicle usage and economic prosperity (Pozdena, 2009). However, Litman (2010), found that at a certain level of per capita VMT (he estimated 4,000), costs begin to outweigh the benefits. He demonstrated that economic productivity increases with public transit ridership, fuel costs, and land-use densities, yet decreases with increased roadway supply.

Studies of the economic impacts of VMT reduction policies point to a variety of welfare effects. General effects of transportation policy are often analyzed by using benefit-cost analysis or modeling software. For example, Taylor and Ampt (2003) reviewed a number of Australian strategies that discourage SOV travel, finding that the benefits in decreased travel time, congestion reduction, and environmental impacts exceeded the cost in every case. VMT reduction strategies that combine dense, compact development, transportation demand management, and transit investments have been found to yield economic benefits in terms of reduced infrastructure costs, increased

[11] A review of such arguments appears in Moore et al. 2010.
[12] Lawrence D. Frank, and others. "The Urban Form and Climate Change Gamble," *Planning Journal*, 73(8), 22.

private investment, lower public health expenses, and improved energy security (Winkelman et al. 2010).

Similarly, the PROPOLIS program modeled seven urban regions in Europe; scenarios involving a combination of VMT reduction policies such as road pricing, transit fare subsidizations, and vehicle excise fees were shown to produce a net present value per capita benefit of between 1,000 and 3,000 euros over 20 years (PROPOLIS 2004).

While illustrative of the general economic benefits possible with VMT reduction strategies, the above examples did not take specific equity effects into consideration and also occurred exclusively in urbanized areas. Litman (2009) found that most VMT reduction strategies can be implemented with consideration for equity. Strategies that inherently harm low-income users can be supplemented by mitigating policies that address equity issues.[13] In cases of road pricing, which present a greater economic burden on low-income travelers, revenues can be used to improve public transit access to benefit those with lower incomes (Urban Land Institute 2009).

As summarized above, the literature addresses the economic impacts of VMT reduction in regard to the general economy and to one of the groups of interest in this report—low-income households—but we could find no research specific to impacts on the other areas and groups except for migrant farm workers. Through our research, we did find a farm worker van sharing program and related data, which is summarized on page 36.

STRATEGIES AT WORK IN WASHINGTON STATE

The Commute Trip Reduction (CTR) program, legislated in 1991, requires employers with more than 100 workers to devise plans that shift commuters out of single-occupancy automobiles and into alternative modes. The program is in operation at 938 workplaces in the state's nine most populous counties (Clark, King, Kitsap, Pierce, Snohomish, Spokane, Thurston, Whatcom, and Yakima counties).

In 2009, CTR was credited with reducing the average daily weekday morning peak-period trips by 28,000, reducing congestion delays by 12,900 hours in the central Puget Sound (in comparison to drive alone rates before worksites first entered the CTR

[13] A recent example of this phenomenon applied to Washington state is available in Plotnick et al. 2009, http://depts.washington.edu/trac/bulkdisk/pdf/721.1.pdf (accessed Jun 23, 2010).

program, as early as 1993), reducing annual VMT by 62 million, and reducing fuel consumption by 3 million gallons (Washington State Commute Trip Reduction Board 2009). This equates to a reduction of about 27,500 metric tons of carbon dioxide emissions. The state invested $5.5 million in the CTR program in the 2007-2009 biennium (WSDOT 2010).

The Growth and Transportation Efficiency Center program (GTEC) expands the CTR program model to encourage individuals, small employers, and students to consider alternative modes. The program was funded by the state in seven cities (Bellevue, Olympia, Redmond, Seattle, Spokane, Tacoma, and Vancouver) through 2009, though funding was not renewed into the 2009-2011 biennium. *Ex post* analysis has not yet been completed, so the impact of the program has not been fully quantified.

In the Environmental Impact Statement for its Transportation 2040 (T2040) plan, the Puget Sound Regional Council (PSRC) outlined policy approaches to VMT reduction:

- Developing urban land more compactly
- Encouraging carpooling, transit, telework, and providing transportation choices
- Curbing congestion due to non-recurring events by using intelligent transportation systems (ITS).[14]

Combinations of these approaches were used in the development of five alternative scenarios for 2040 projections of transportation demand measures, including per capita VMT. In comparison with 2006, the PSRC's baseline year, regional per capita VMT reduction of 1 percent to 16 percent could be achieved by the year 2040. The alternative with the greatest projected VMT reduction would include the most aggressive emission reduction strategies. Specific VMT reduction strategies that would be implemented in this alternative include the establishment of a GTEC-style program in all cities with regional growth centers, and provision of car sharing and vanpool incentives to small businesses.

[14] The T2040 plan includes a fourth strategy, "Strategically expanding capacity to alleviate excess demand in specific locations." While this may be an important congestion reduction strategy for the region, it is not a VMT reduction strategy.

RECOMMENDATIONS OF THE TRANSPORTATION IMPLEMENTATION WORKING GROUP AND VMT REDUCTION POTENTIAL

The Climate Change Challenge from Governor Gregoire directed the departments of Ecology and Community, Trade and Economic Development to convene a taskforce to develop strategies to help meet statewide GHG reduction goals. This group, the Climate Action Team, divided itself into several working groups, one of which was the Transportation Implementation Working Group (TIWG). The goal of the TIWG was to develop tools and report best practices to help meet VMT reduction targets outlined in ESSHB 2815/RCW 47.01.440 (Washington State Department of Ecology 2008b).

The strategies developed by the TIWG fall into three broad categories consistent with the literature and summarized below.

1. Transit, Ridesharing, and Commuter Choice Programs*, including recommendations to expand and enhance current programs to increase viable transportation options available to Washington residents to conduct the activities, trips, and travel needed and desired for daily life.*

The TIWG recommended a vast, context-sensitive expansion of transit throughout the state. The system would connect urban centers and county seats in more rural counties while augmenting existing service in more urban areas. By connecting existing residential and employment centers by transit, the state can provide a transportation alternative that some will find more cost effective or time saving than driving alone.

Increasing transit capacity is a common strategy for reducing VMT by providing high-occupancy alternatives to SOV travel. Increasing transit capacity provides more choices for travelers and is especially effective in areas where transit service is poor and where residential or employment density is high (Pushkarev and Zupan 1977). Furthermore, increased transit service reduces VMT and greenhouse gas emissions if transit vehicles are well-utilized (comparatively high load factor) and can reduce maintenance costs on road infrastructure (Downs 2006).

The TIWG also recommended expanding vanpool, carpool, and other traditional Commute Trip Reduction programs in urban areas. Current CTR programs have demonstrated success in reducing VMT and encouraging alternative modes of transportation. Recent data suggest that the longer a business implements its own CTR

strategies, the more successful they are at reducing VMT (Washington State Commute Trip Reduction Board 2009). Downs argued that CTR strategies such as encouraging vanpools, carpools, condensed work weeks, telework, and other CTR strategies are politically palatable and have proved effective (Downs 2006).

2. Compact and Transit-Oriented Development (CTOD) and Bicycle and Pedestrian Accessibility *that support the development of compact walking, bicycling, and public transportation-friendly communities and increase the travel choices available.*

The push for increased density in new development relies on the premise that density decreases VMT. In densely settled development with pedestrian, bicycle, and transit facilities, travelers are provided with options for both short and long trips that do not involve driving alone. A growing body of research indicates that compact development patterns such as CTOD can reduce VMT (Walters and Reid 2009). A recent review of 370 metropolitan areas revealed that higher population densities are strongly associated with lower per capita VMT consumption (Cervero and Murakami 2010). Along with housing density, the TIWG report explicitly called for employment density within CTOD developments. As Downs pointed out, this strategy can only reduce commute-related VMT if it is accompanied by extensive transit service, effective ridesharing programs, or both (Cervero and Murakami 2010). A recent study by the American Public Transportation Association found that in addition to the primary reductions in VMT that transit users contribute, there are additional secondary benefits from denser land-use and development patterns because when many people live adjacent to travel, they benefit from reduced fuel consumption and lower per capita VMT (Bailey et al. 2008).

Parking incentives and management strategies recommended in the TIWG report include parking taxes and support systems that incentivize developers to add density while minimizing parking, especially for CTOD developers. Research has shown that the availability and cost of parking is the most important factor in personal decisions about travel behavior (Ulberg et al. 1992). A 2005 study showed that a 10 percent increase in parking costs is associated with a 1 to 3 percent reduction in overall vehicle trips (Vaca and Kuzmyak 2005). An earlier study by Donald Shoup looked at the travel behavior of employees at seven worksites before and after the work places stopped offering free

parking to employees and found single-occupancy vehicle trip reductions of between 7 percent and 32 percent (Shoup 1994).[15]

The TIWG also recommended the provision of pedestrian and bicycle facilities, though strategies for implementation center mostly on legislative and planning mechanisms such as sidewalk design guidelines, rather than on developer incentives.

Current best practices stress the importance of integrating pedestrian and cycling facilities with transit service and increased urban densities (Victoria Transport Institute n.d.). The need for simultaneous improvements indicates that pedestrian and bicycle facilities may not be a blanket solution but should be implemented strategically in locations where other improvements are also feasible.

3. Transportation Funding and Pricing Strategies *that identify and create potential pricing mechanisms to support and encourage GHG and VMT reductions and that stress key considerations for revenue use to support transportation infrastructure maintenance and operations.*

Economists have long argued that transportation, like other commodities, should be priced to reflect the marginal social costs of travel—that is, that the cost of driving an automobile should reflect the collective costs of motor vehicle traffic to society, such as road construction and maintenance, noise, pollution, and energy consumption. One example of an external cost is the vulnerability that American motorists face in oil market fluctuations. A 2002 study estimated that the cost of the military intervention and intergovernmental relations necessary to secure a stable supply of petroleum to the U.S. equates to about 26 cents a gallon but is not factored into current gas prices (National Research Council 2002). Despite growing calls for these external costs to be reflected in the price of vehicle use, the gap between private and social costs continues to exist, and in many cases it is growing larger (Sorenson and Taylor 2006). The TWIG report argued that VMT reduction goals will be difficult to meet without some sort of usage-based pricing, such as tolls, gas taxes, or user fees.

A 2008 study by the PSRC provided participant households with a monthly travel budget, from which per-mile tolls were deducted whenever certain roads were used.

[15] Shoup noted that increasing parking prices needs to be accompanied by the existence/expansion of travel alternatives--either transit or carpooling programs--in order to achieve reduced SOV trip making.

Participating households decreased their weekly overall VMT by 12 percent, while the miles driven on tolled roads decreased by 13 percent (Puget Sound Regional Council 2008).

IV. SELECTED AREAS AND GROUPS: DEFINITIONS, STRATEGIES AND IMPACTS

The state has not determined how it intends to reach its VMT reduction goals. The measures it adopts to achieve the changes in travel behavior needed to meet those goals will significantly affect the positive and negative impacts of meeting those goals and how those impacts are distributed across the state's population. To undertake this project, it was therefore necessary to assume the adoption of a mechanism that would encourage the five groups being studied to decrease the number of miles they drive. While nothing in the current state legislation requires that VMT reductions occur equally across all segments of the state population, this study assumed that the mechanism selected by the state would be a charge of between $.05 and $.25 per mile on SOV driving, and that it would be applied uniformly to all vehicles not specifically exempted by the legislation. This mechanism served as a means to examine the impacts of any given VMT reduction strategy on the designated study groups. It was selected because "cost" can be used as a surrogate for any other type of "disincentive to drive" program that might be adopted by the state. The research team assumed that this increase in the cost of driving would result in a decrease in people's willingness to drive, producing a decrease in total VMT driven, as individuals would adjust their lives to maximize their travel and quality of life benefits within the constraints of their limited personal budget.

Out of necessity, this report generalizes the potential responses of the five groups of interest to the mechanism we selected. Given <u>any</u> VMT reduction strategy, specific individuals within a group will be affected differently. For example, those with good alternative travel options will be more inclined to take those options, while those without good alternative travel options will be more likely to simply travel less. Similarly, if the state chooses to impose a per mile charge such as that assumed in this report, <u>all other factors being equal</u>, those individuals with more discretionary income will more likely simply choose to pay the increased expense, while individuals with less discretionary income and no good travel alternatives will likely choose to simply travel less often. Because we cannot explore the specific details of individuals, the conclusions of the project are therefore based on

- the generalized socio-economic and travel characteristics of our five study groups as described in the available literature
- the travel options that typically exist in given geographic areas of the state
- what the available literature says about travel behavior change given various price and transportation modal options
- what the transportation literature offers as examples and models of implementation strategies.

I. SMALL BUSINESSES THAT RELY ON HIRING AND RETAINING WORKERS WHO CROSS COUNTY LINES TO REACH THEIR PLACE OF EMPLOYMENT

The definition of a small business varies greatly. The Regulatory Fairness Act, RCW Chapter 19.85, defines a small business as being "owned and operated independently from all other businesses, and [having] fifty or fewer employees."[16] Other state laws provide small business tax credits to businesses on the basis of their gross revenues, regardless of the number of employees.[17]

Federal law bases the small business designation on a firm's industry classification, the number of workers it employs, and/or its annual receipts.[18] Small businesses can have up to 500 employees and in some industry subsectors up to 1000 employees (U.S. Small Business Administration 2006).

For the purposes of this study, small businesses were defined as having fewer than 20 employees and less than $3 million in annual revenue, as defined in a 2007 report on small business survival in Washington state (Smith and Welsh 2007). When data sources on small businesses lacked information on annual revenues, an employer size of fewer than 20 workers was used as the sole defining criterion.

The U.S. Census records data on the number of workers living in one county while working in another. Table 2 details the number of jobs in each county in 2008 and the number of workers who came from other counties to fill them.

[16] RCW 19.85.020(3)
[17] RCW 82.04.4451.
[18] Code of Federal Regulations, Title 13, Section 121.201.

Table 2. Primary jobs by county and number of workers crossing county lines to fill them.
(Source: U.S. Census Data)

County	Total jobs 2008	Same county	Cross county lines	% cross county lines
Adams	6285	3115	3170	50.44%
Asotin	5314	2698	2616	49.23%
Benton	68141	42726	25415	37.30%
Chelan	30406	16940	13466	44.29%
Clallam	19052	14931	4121	21.63%
Clark	120239	87226	33013	27.46%
Columbia	1082	679	403	37.25%
Cowlitz	33816	22881	10935	32.34%
Douglas	8270	3115	5155	62.33%
Ferry	1574	686	888	56.42%
Franklin	21453	7474	13979	65.16%
Garfield	553	268	285	51.54%
Grant	26807	17284	9523	35.52%
Grays Harbor	20923	14575	6348	30.34%
Island	12566	9207	3359	26.73%
Jefferson	8229	4836	3393	41.23%
King	1068956	731098	337858	31.61%
Kitsap	61472	42711	18761	30.52%
Kittitas	13355	7892	5463	40.91%
Klickitat	4044	2207	1837	45.43%
Lewis	22459	13242	9217	41.04%
Lincoln	3001	1183	1818	60.58%
Mason	13069	7342	5727	43.82%
Okanogan	12678	7626	5052	39.85%
Pacific	5483	3395	2088	38.08%
Pend Oreille	3429	1365	2064	60.19%
Pierce	242947	161270	81677	33.62%
San Juan	4499	3238	1261	28.03%
Skagit	41915	25974	15941	38.03%
Skamania	3067	1061	2006	65.41%
Snohomish	212562	132666	79896	37.59%
Spokane	202032	160542	41490	20.54%
Stevens	8843	6143	2700	30.53%
Thurston	91663	54236	37427	40.83%
Wahkiakum	754	369	385	51.06%
Walla Walla	22720	13566	9154	40.29%
Whatcom	71325	55862	15463	21.68%
Whitman	15444	8671	6773	43.86%
Yakima	83413	63128	20285	24.32%
TOTAL	2593840	1753428	840412	
		67.60%	32.40%	

Table 3. Estimated number of small business employees who cross county lines in 2008.
(Source: U.S. Census Data)

County	Small Business Employees	Percent That Cross County Line For Work	Employees Who Cross County Lines
Adams	2,209	50.4%	1114
Asotin	1,473	49.2%	725
Benton	17,738	37.3%	6616
Chelan	11,649	44.3%	5159
Clallam	8,172	21.6%	1768
Clark	36,594	27.5%	10049
Columbia	609	37.3%	227
Cowlitz	9,714	32.3%	3142
Douglas	2,664	62.3%	1660
Ferry	448	56.4%	253
Franklin	7,091	65.2%	4620
Garfield	243	51.5%	125
Grant	9,753	35.5%	3464
Grays Harbor	7,817	30.3%	2372
Island	6,143	26.7%	1642
Jefferson	3,826	41.2%	1577
King	242,889	31.6%	76777
Kitsap	21,677	30.5%	6616
Kittitas	4,577	40.9%	1872
Klickitat	1,654	45.4%	751
Lewis	8,301	41.0%	3407
Lincoln	1,309	60.6%	793
Mason	4,196	43.8%	1839
Okanogan	5,917	39.9%	2358
Pacific	2,688	38.1%	1024
Pend Oreille	759	60.2%	457
Pierce	65,449	33.6%	22004
San Juan	3,241	28.0%	908
Skagit	14,031	38.0%	5336
Skamania	791	65.4%	517
Snohomish	59,029	37.6%	22189
Spokane	49,800	20.5%	10229
Stevens	3,293	30.5%	1005
Thurston	23,723	40.8%	9686
Wahkiakum	402	51.1%	205
Walla Walla	6,547	40.3%	2638
Whatcom	23,586	21.7%	5113
Whitman	4,042	43.9%	1773
Yakima	24,347	24.3%	5921
TOTAL	698,391	26.9%	227933
Percent of small business employees who cross county lines			32.6%
Small business employees who cross county lines as percent of all workers			8.8%

Table 3 shows the estimated number of small business employees who crossed county lines in 2008. Because the census data are not structured to allow a direct estimation of these figures, we assumed that small business employees crossed county lines at the same rate as all employees. Our calculation indicated that about 227,000 small business employees crossed county lines to get to work in 2008.

Not surprisingly, the larger, more populous counties had small businesses that drew the most employees across county lines. Combined, the counties of King, Pierce, Snohomish, Kitsap, Spokane, and Clark generated around 147,800 cross-county line work trips. In these counties approximately 20 to 30 percent of employees crossed county lines to get to work. In the smaller counties, the percentage of employees that crossed county lines to get to work tended to be much higher than in the larger counties, but the absolute number of workers crossing county lines in these counties was quite small. For example, although we estimated that only 583 small business employees crossed county lines to work in Wahkiakum, Garfield, and Ferry counties, they were approximately 51 to 56 percent of small business employees in those counties.

The length of trips for workers crossing county lines is not a statistic tracked by the National Highway Transportation Survey or the Census. A 2008 survey conducted as part of WSDOT's GTEC program, which was implemented in urban centers and targeted employers with fewer than 100 workers, offered a very small sample to analyze. Of a sample of 643 respondents, 115 (17.9 percent) reported working in a county other than the one in which they lived. Commute lengths, calculated as the straight-line distance between ZIP code centroids, differed between those who lived and worked in the same county and those who did not. Commuters who worked within their home county faced a median commute length of 6.5 miles, whereas those who commuted across county lines had a median commute length of 24.3 miles.[19] In the case of GTEC respondents, county line crossers had median trips longer than in-county resident workers.[20] It is not possible to generalize this finding to all small business employees crossing county lines. It is

[19] The GTEC survey was presented in an on-line format, which may have excluded retail and other types of workers who did not have access to e-mail or Internet services while at work. Additional data on cross-county small business commute patterns are needed to corroborate the GTEC survey findings.

[20] The average one-way work trip in 2009 was 13.94 miles in comparison to GTEC survey findings for cross-county small business workers, whose median trip was 24.3 miles. One figure is the mean, the other the median.

likely that some proportion of cross-county work trips are also shorter than the national average and occur in urban areas served by transit. Examples include Mill Creek (Snohomish County) to the UW Bothell Campus (King County), and Federal Way (King County) to Tacoma (Pierce County). Such information will need to be systematically tracked and collected if it is of further interest to the state.

Strategy: Impose VMT Charges and/or Fuel and Carbon Fees

This study assumed the following:

- Employees who cross county lines to work in a small business travel farther than in-county employees. The national average roundtrip to/from work is 28 miles; this project assumed an average roundtrip to/from work that is 50 percent longer, or 42 miles, for this group.
- Employees in areas well served by transit have the option of shifting modes, sharing rides, and/or teleworking for all or a portion of the work trip.
- A VMT charge would range from $.05 to $.25 per mile.

Impacts

The economic impact on small businesses[21] would depend on whether the employees were served by viable transit and vanpool services. The majority—53 percent or 121,000—of small business employees who commute across county lines do so in the adjacent King, Snohomish, and Pierce counties, which are served by local and regional transit and vanpools. Many of these workers would likely have access to a viable mode shift or rideshare option for some work trips. Some small businesses in the central Puget Sound area could benefit economically if they cashed out employee free parking and provided an ORCA pass to employees.[22] The ORCA calculator values employee parking at $80 per month and an ORCA pass at $63 per month, for monthly savings to the small business of $17 per employee.

For small businesses outside of metropolitan areas, we assumed that mode shift and rideshare options would be largely unavailable and hence would not apply. If policy

[21] Small businesses are defined as having fewer than 20 employees and annual revenue of less than $3 million.
[22] Based on a calculator used by the Tacoma Transportation Management Association.

makers decide to impose a VMT charge of $.05 per mile, then the cost impacts to an individual would be an additional $2.10 per day for a 42-mile round trip. If the VMT charge were higher, $.25 per mile for example, then the cost impact to an individual would be $10.50 per day for the 42-mile round trip.

The low end would likely have a minor impact on small businesses, but the high end might lead to the loss of employees or requests from employees for financial assistance from their employer to offset this additional charge

II. LOW-INCOME RESIDENTS

Low-income status is determined by a comparison of household income to benchmarks established annually by the federal department of Housing and Urban Development (HUD). The benchmarks vary on the basis of household size and location within a county or metropolitan area. Much of the demographic data related to income are reported at the household level rather than for individuals.[23]

According to U.S. Census data from 2008, an estimated 727,156 Washington residents (11.3 percent) live in poverty, in comparison to an estimated 13.2 percent nationwide. County by county, estimates of people living in poverty range from Snohomish County's 8 percent to Whitman County's 23.7 percent (U.S. Census Bureau 2008). But poverty is only the most extreme dimension of low-income status. The U.S. Department of Housing and Urban Development defines low-income households as earning 80 percent of the area's median income. This threshold varies by county, ranging from about $28,000 in Ferry County to about $56,000 in King County, and is adjusted for household size (U.S. Census Bureau 2008). Demographic surveys do not appear to capture the true number of low-income individuals in the state, but it is clear that the number of persons who are low income in Washington state is much higher than just those below the poverty line.

Murakami and Young (1997) used the 1995 National Personal Transportation Survey to examine the travel patterns of low-income households. The study found that 74 percent of low-income households have a car, and over 84 percent of their trips to work are made in private vehicles. Ownership varies by family structure—64 percent of low-

[23] Hence care should be taken when interpreting household-level data with regard to RCW 47.01.440, which is concerned with per capita VMT reduction.

income single parent households own cars, in comparison to 79 percent of other low-income households. On average there are 0.7 vehicles per adult in low-income households, in comparison to more than 1 vehicle per adult in other households. Average vehicle occupancy and time to work for low-income and non low-income households commuting to work by private vehicle do not differ significantly. Low-income individuals are more likely to walk to work (6 percent vs. 3 percent) and to use public transit (5 percent vs. 2 percent) than their non-poor counterparts.

People in low-income households travel nearly 40 percent fewer miles [per year] (9,060 versus 14,924 person miles). Also, since vehicle availability is also lower, VMT per household is about half that in non-low income households (11,594 miles versus to 23,427 miles) (Plotnick et al. 2009).

Low-income households faced with limited resources practice basic VMT reduction strategies: less reliance on and use of the single occupancy vehicle (SOV), more selectivity in trips, and greater use of public transit, ridesharing, and non-motorized travel.

In general, transportation policy favors high-income users over low-income users (Sánchez et al. 2003): people living in poverty spend a significantly higher proportion of their income on transportation costs (U.S. Department of Transportation 2003), and more low-income individuals depend on bus service. Yet typical American suburban and metropolitan low-density development favors auto dependence and leads to longer travel times, while making viable transit service difficult or infeasible.

Plotnick et al., in their recent study for WSDOT titled “Impact of Tolling on Low Income Persons in the Puget Sound Region” (2009), compiled an extensive review of literature confirming and updating Murakami and Young’s (1997) findings. They also estimated that tolling regimes would cost poor households between 4.4 and 15 percent of their annual incomes, approximately two to four times the impact on non-poor households (Plotnick et al. 2009). They also found that the regressive nature of tolling would vary depending on how the toll proceeds were used. If tolling proceeds were invested in public transit or to mitigate the impact on low-income households, this would be less regressive than if the tolls were used to pay for highway facilities.

Strategy: Impose VMT Charges and/or Fuel and Carbon Fees

This project assumed that :

- The VMT charge would range from a low of $0.05 per mile to a high of $0.25 per mile.
- Low-income persons' work trip lengths are similar to those of other people.
- The U.S. average one-way work commute trip was 13.94 miles in 2009 (Federal Highway Administration 2009).
- Rural residents travel double that distance, or 28 miles one way.

Impacts

The daily work trip cost increase would range from $1.40 to $7.00 per day for urban area low-income residents, and would be an estimated $2.80 to $14.00 per day for rural area low-income residents.

As with tolling, VMT charges would negatively and disproportionately affect low-income residents.

Strategy: Reward Transit and Rideshare Use

This study assumed the following:

- Low-income residents are heavy transit users and should be rewarded for their VMT-reducing behavior.
- Two one-way fares of $2.00 would be discounted 25 or 50 percent.[24]

Impacts

Low-income transit users would receive a daily benefit ranging from $1.00 to $2.00.

[24] In recognition of low-income populations' dependence on transit service, most transit operators offer reduced fares to low-income individuals or service providers working with low-income populations. For example, King County Metro and the City of Seattle both offer heavily subsidized bus fare vouchers to human services agencies that serve homeless and low-income individuals. Other municipalities, such as the Los Angeles County Metropolitan Transportation Authority, offer subsidized fares directly to low-income individuals who meet HUD's low-income definition.

Strategy: Include Affordable Housing in Compact, Transit-Oriented Developments

Many lower income workers travel long distances because affordable, market rate housing is available only far from major employment centers. These individuals trade affordable housing against the costs of transportation and time to reach their work place. In addition to lost time and more VMT, longer commute times are associated with higher worker turnover in local businesses, which can harm the regional economy (Burchell et al. 2000). Inclusionary zoning pioneered in Montgomery County, Maryland, mandates that a percentage of newly developed housing units be affordable to moderate and low-income households. This approach is not part of Washington state law, but it could be a strategy to increase the jobs-housing balance and reduce VMT among a population that already uses SOVs less

Impacts

The provision of more affordable housing in areas of high employment would increase the ability of many low-income workers to commute via modes other than SOV.

III. AGRICULTURAL EMPLOYERS AND THEIR EMPLOYEES, ESPECIALLY MIGRANT FARM WORKERS

Transport to the farm fields and orchards has often occurred in crowded, older, and substandard vehicles that represent safety and pollution problems. Migrant workers are defined as those who leave their place, often even their country, of residence and travel to other regions to engage in agricultural, often seasonal, work. Because of the temporary and seasonal nature of many agricultural jobs, understanding the number of migrant workers presents a challenge. A 2000 report estimated 185,000 agricultural workers in the state, 64,000 of whom were considered migrants (Larson 2000). A 2007 report estimated that 93,582 people were employed in the agricultural industry, most of them seasonal laborers.[25] Agriculture is a significant industry in Washington state, accounting for 12 percent of all economic activity, and the basis for many rural economies (Washington State Department of Agriculture 2009).

[25] This same report also highlighted the unique geographical constraints on the agricultural industry in Washington state. For example, in 2005, 80 percent of all workers worked west of the Cascades, while 20 percent worked to the east of the Cascades. For farm workers, these proportions were reversed, with large agricultural worker populations in Yakima, Chelan, and Douglas counties.[25]

Migrant farm workers are a subset of low-income workers. In 2006, hourly wage rates for agricultural workers were about $2.00 higher than the state minimum wage (U.S. Census Bureau 2008). Relying on this income alone, many agricultural workers would be considered low income. Some general travel demands of low-income residents, such as low individual VMT, likely also apply to agricultural workers. Seasonal shifts in the volumes of laborers also have an impact on travel demand; while the average number of seasonal workers per month is 32,000, the number peaks in the summer months at around 67,000 workers (Washington State Department of Commerce 2007a).

The effects of a VMT charge on farm workers would be negative, similar to those on other low-income households in rural areas. As scheduled transit service is generally unavailable to remote agricultural locations, it is not an option as it might be for urban area low-income residents.

A California Experience

The state of California has pioneered a farm worker ridesharing program that reduces GHG and VMT, while also promoting safety. The Agricultural Industries Transportation Services (AITS) program in California's San Joaquin valley is a pioneering farm worker ridesharing program that reduces GHG and VMT. It was developed by the Kings County Area Public Transit Agency (KCAPTA) in the wake of a series of fatal crashes involving unsafe informal farm worker vanpool vehicles. A pilot program begun in 2002 established 40 15-passenger vans, serving 450 workers daily over four counties. Routes for the program were selected following a spatial analysis of transportation access for agricultural workers and a survey of workers at large farms. The program went through a series of expansions and now operates 100 vans (with 23 additional spare vans) carrying 1,000 workers daily. Start-up funding of $6 million to capitalize and administer the program came from the Job Access Reverse Commute fund along with Caltrans funds. The program claims to be self sustaining (KCAPTA 2009), with each van averaging eleven riders and generating between $1100-$1800 per month in user fees, which "consistently covers maintenance and operational overhead" (KCAPTA 2009). The daily fee ranges between $5 for work trips under 60 miles to $12 for work trips over 200 miles. A 2006 report estimated that the program produces an annual VMT reduction of nearly 15 million, as well as benefits from increased safety, reliability,

equity, and emissions reductions valued at $16 million annually (Caltrans 2006). Migrant farm workers in California experience weekly savings of between $7.69 and $10.17, a modest 2 to 3 percent increase in disposable income.

Table 4. Comparison of the three highest producing agricultural counties in California and Washington.

	California (2007)			Washington (2007)		
	Fresno	Tulare	Kern	Yakima	Grant	Chelan
Gross value ($ billions)* **	5.35	4.87	4.09	1.20	1.19	0.21
Land area (sq. mi)***	5,963	4,824	8,152	4,296	2,681	2,921
Farm employment (rank in state)#	22,496 (1)	17,767 (2)	15,497 (4)	14,090 (1)	6,638 (2)	5,008 (3)
Population (2008 estimates)##	909,153	426,276	800,458	234,564	84,697	71,540
Net population density (people/sq mi)	152.5	88.4	98.2	54.6	31.6	25.5
Farm job density (jobs/sq mi)	3.8	3.7	1.9	3.3	2.5	1.7

* California Department of Food and Agriculture (2008)
** Washington State Department of Agriculture (n.d.)
*** U.S. Census Bureau (2010)
# U.S. Department of Commerce (2008)
U.S. Census Bureau (2010)

The AITS program currently serves workers in Fresno, Tulare, and Kern counties, the three largest agricultural producers in the state in terms of gross value (California Department of Food and Agriculture 2008). Table 4 compares those three counties with Washington's highest producing counties. The Washington counties' farm worker population ranges from 33 percent to 56 percent of their California counterparts. While the absolute farm worker population is less, the proportion of farm workers to the total residential population is two to three times greater in Washington. Hence the awareness of, and impact from, farm workers as they travel in and around the communities is likely greater in Washington counties.

Strategy: Institute a Formal Ridesharing Program for Agricultural Workers

This study assumed the following:

- A Washington program would be one third the size of California's: 33 vans operating in three counties carrying 333 workers daily.
- Program costs and savings to users would be the same as in California.

Impacts

Agricultural workers could expect savings of $30 to $45 per month in transportation costs. The general public would benefit from reductions in GHG emissions and reduced accidents valued at $5 million annually. A reduction of 3-5 million VMT annually could be expected extrapolating from the California experience.

IV. DISTRESSED RURAL COUNTIES

According to Washington state law, a distressed county experiences a "three-year average unemployment rate equal to or greater than 120 percent of the statewide unemployment rate." In 2009, as defined in this way, there were 19 distressed counties in Washington state; these are shown in Figure 6 as the darker shaded counties.

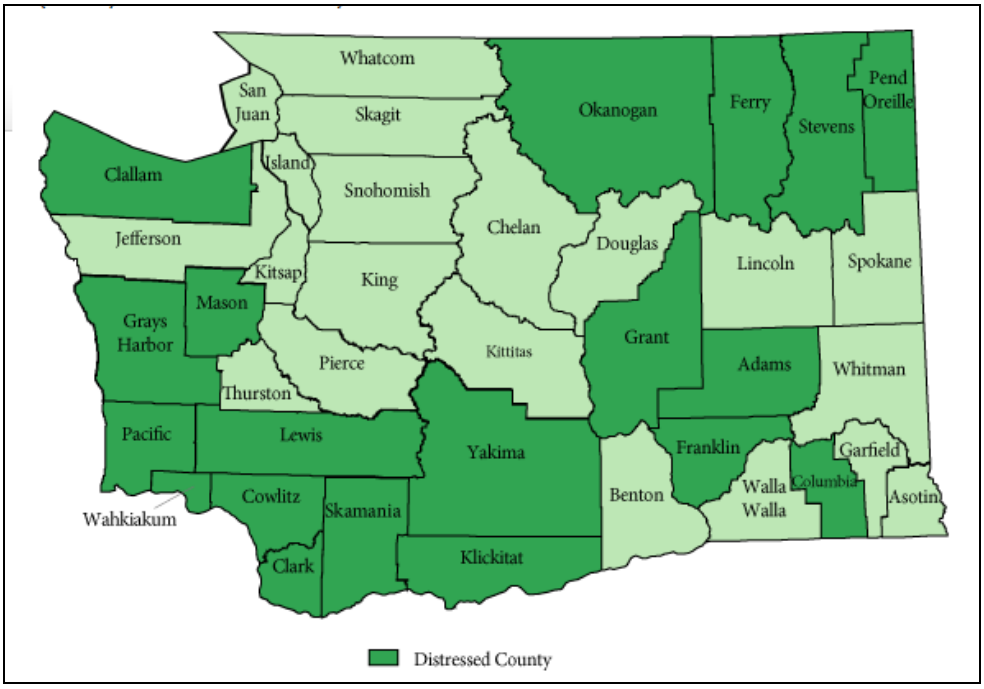

Figure 6. Distressed counties in Washington state, 2009.
(Source: Washington State Department of Transportation
http://www.wsdot.wa.gov/planning/wtp/datalibrary/Economy/DistressedandRural.htm
accessed Mar 1, 2010)

Federal standards for identifying distressed areas differ from Washington state's. For the purposes of the federal government, economically distressed counties are those that have the following:

- per capita income of 80 percent or less than the national average
- an unemployment rate 1 percent greater than the national average for the past 24 months or
- unemployment or economic adjustment problems, "special need" as determined by the Secretary of Commerce.

By this federal definition, 28 of Washington state's 39 counties are economically distressed, including, by way of the "special need" clause, King and Spokane counties. Rural counties that are distressed under federal (but not state guidelines) are Asotin, Douglas, Garfield, Kittitas, Lincoln, Walla Walla, and Whitman (WSDOT n.d.).

Using the state's definitions of distressed counties, a rural county has a population density of less than 100 persons per square mile or a geographic land base smaller than 225 square miles (WSDOT n.d.). All of the distressed counties in Figure 6 are also rural *except* Clark County, which is considered urban but distressed by the above definition.

Rural distressed counties, while representing nearly 53 percent of the state's land base, contain only 14.9 percent of the population. Overall, the rural distressed counties of Washington state produced 19.2 percent of VMT in 2008 and 17.8 percent of all non-freight VMT. Per capita non-freight VMT ranged from 2,687 (Yakima) to 15,917 (Adams).

The distribution of land uses in rural areas has the tendency to produce longer though fewer trips. Travel behavior in rural areas is largely auto-dependent, as destinations are too dispersed to support other modes (Federal Highway Administration n.d.). Car ownership rates in rural areas tend to be higher, while public transit, as an alternative mode for those who cannot drive, tends to be underfunded or unavailable (U.S. Department of Agriculture n.d.).

Reducing VMT in rural distressed counties is not a priority in the TIWG report recommendations. All but one of the distressed counties have populations below 245,000, the threshold for Executive Order 09-05, which calls for county planning coordination to achieve annual VMT reductions in the state's most populous counties.

It is possible to implement targeted VMT reduction strategies in rural areas, with the agricultural workers van program being a prime example. However, rural areas are not places that will produce measurable gains in statewide VMT reduction, simply because there is too little population in those areas. Nonetheless, as many rural distressed counties had higher per capita VMT in 2008 than the state average[26], certain strategies could reasonably be expected to apply in rural distressed counties. Ridesharing, trip chaining, teleworking, and compressed work week schedules could have positive effects in sparsely populated areas of the state (WSDOT 2008).

Strategy: Impose VMT Charges and/or Fuel and Carbon Fees

This study assumed the following:

- Work trip lengths in the rural and remote sections of distressed counties are double the national average, or 56 miles round trip.
- The VMT charges would range from $.05-$.25 per mile.

Impacts

Residents of rural distressed counties would be negatively affected, as many of them travel greater distances than the Washington average and have few or no alternatives to the SOV. VMT charges would impose an additional daily cost from $2.80 to $14, a disproportionate burden on a population that has elevated and long-term unemployment levels.

Strategy: Provide Broadband Connectivity to Rural Distressed Counties

Providing high quality, high speed broadband connectivity to rural, distressed counties would allow those counties to attract businesses that depend on those services and that could take advantage of the low cost of land and lower labor costs in these communities. (For example, the State of Wyoming has successfully followed this approach to increase the number of Internet economy jobs in the state.)

[26] The reader is cautioned that some of the high per capita VMT counts in rural counties are likely not reflective of county residents' VMT patterns but, rather, of non-county drivers travelling on Interstate and major highways passing through the county.

Impacts

High speed Internet access would enable more existing residents to telework and work remotely without having to travel long distances, hence it could be an effective VMT reduction strategy. However, it would also open up remote, rural areas to new residents, the "lone eagles and high fliers" who could locate where they wanted and who might, in aggregate, add as many VMT as were restricted by the absence of quality Internet access.

V. COUNTIES WHOSE LAND BASE IS MORE THAN HALF PUBLIC OR TRIBAL LANDS

According to a 2001 public lands inventory conducted by the Washington State Recreation and Conservation Office (2001), no one county's land base is made up of more than 45 percent tribal lands. A 2005 inventory confirmed the stability of these figures (Interagency Committee for Outdoor Recreation 2005). Counties with a high proportion of tribal land areas include Ferry (45 percent), Yakima (41 percent), and Grays Harbor and Okanogan (both with 14 percent).

The 2001 report indicated that eleven counties are made up of more than 50 percent public lands. These are Benton (65 percent), Chelan (81 percent), Clallam (62 percent), Jefferson (78 percent), Kittitas (61 percent), Okanogan (57 percent), Pend Oreille (63 percent), Skagit (62 percent), Skamania (86 percent), Snohomish (61 percent), and Whatcom (68 percent) (see Figure 5). Overall, the eleven counties with more than 50 percent public lands contain 22.6 percent of the population and produced 25.5 percent of the state's VMT in 2008.

Figure 7 illustrates those counties where more than 50 percent of the land area is publicly held.

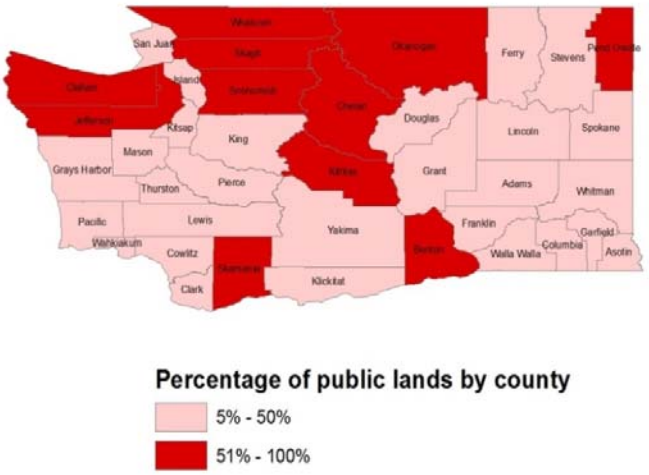

Figure 7. Counties with the majority of their land base in public lands.
(Source: Washington State Recreation and Conservation Office 2001.)

Given the diversity of these counties—some are urban, some rural; some are distressed, while others are not—travel patterns vary. The fact that land is publicly owned does not affect travel behavior. The real key is whether that land is primarily rural or urban in character. Publically owned urban land (e.g., the Everett naval base in Snohomish County) can support a variety of effective VMT reduction programs such as those described throughout this report. Publically owned rural land (e.g., the portions of Snohomish County in the Mt. Baker-Snoqualmie National Forest), like all rural lands, have much more limited VMT reduction options, as the distances between activities are large, and few if any acceptable travel options exist besides the automobile.

When looking at VMT per capita among counties where more than 50 percent of the land is publically owned, another key factor is whether a county contains a rural Interstate highway. For example, Kittitas County has one of the higher annual per capita VMT rate in the state—26,662. The high level of VMT is largely a function of the presence of I-90 and I-82, with most of that travel not undertaken by county residents or people working in the county. Instead, much of it starts and ends outside of the county. Conversely, neighboring Chelan County contains no major interstates and accounts for 8,852 annual per capita annual VMT, about a third of that of Kittitas County (WSDOT 2008).

As a consequence of the large, non-local VMT on rural interstates, VMT reduction strategies aimed at residents of Kittitas County will have little impact on total VMT per capita in that county, even if they are successful in changing behavior. Thus, VMT as currently measured cannot reflect the opportunities for or results of VMT reduction efforts in counties that contain rural Interstate highways (Snohomish, Whatcom, Skagit, and Kittitas).

Counties with large amounts of public land are often destinations for recreational purposes, such as camping trips, vacations, and casino gambling. The literature tends to under-represent the value of and demand for recreational travel (Victoria Transport Policy Institute 2009), and consequently, most VMT reduction strategies focus primarily on peak-period trips, ignoring long distance recreational car travel.

Strategy: Limit Long Distance Driving through VMT Fees and Provision of Alternative Travel Options

The primary options in this regard are the provision of viable travel options, including better long haul bus, rail, and air service to these counties. When these alternative travel modes are combined with subsidies to their cost and disincentives to driving (e.g., VMT fees), some reduction in long distance VMT is possible.

Impacts

It is not possible within the scope of this project to estimate whether such a multi-pronged approach to changing long distance travel decisions would have overall positive or negative effects on residents of these counties. Without an imposition of a VMT fee or other revenue generating system, funding for significant improvements to the currently available levels of service via alternative modes is unlikely to appear. Without such an improvement, no mode shift is likely to occur. If some type of fee is imposed and the revenue is spent on improving alternative modes of travel, it is unclear whether the negative effects from that fee would be greater than or less than the benefits gained from better access to additional modal options.

Strategy: Destination-Oriented VMT Reductions (e.g., Park Shuttle Services)

Recreational users of national forests, national parks, casino gambling, and other federal lands drive to them from neighboring counties, and other parts of the state, nation,

and world. There have been efforts to develop high capacity transit systems to and within some national parks, a strategy that could apply in Washington state. One VMT reduction strategy is highly specific to a few frequently visited national parks, notably Zion and Yosemite National Parks, where use of shuttle buses on the valley floor is required, and private vehicles are prohibited during peak usage periods. Such a strategy could be employed in Olympic National Park, which lies within Jefferson County. A variant could expand shuttle buses from urban areas to casinos on tribal lands. (Shuttle services already exist to many tribal casinos.)

Impacts

Park service VMT reduction programs such as the shuttle bus systems in Zion and Yosemite have significant local impacts, but the total VMT reductions from these programs are very minor in comparison to the VMT driven to reach these parks.

IMPACT ON MEETING THE LAW'S INTENT

To achieve significant reductions in average statewide VMT per capita, it is most important to concentrate on reductions in major urban areas. This is true for two reasons:

1. The vast majority of the state's population resides in urban/suburban areas, and thus small changes in per person VMT in these areas will have much greater effect on total statewide VMT than very large per person VMT reductions achieved only by the smaller number of rural residents of the state.
2. It is much easier to provide reasonable alternatives to the single occupant vehicle in urban areas than in rural areas.

In general, it is also easier to provide competitive transportation alternatives in areas of dense activity (population, employment, commercial activity) than in low density geographic areas. Areas of dense activity are generally associated with larger urban areas. Figure 8 illustrates which counties have the greatest population density. Not surprisingly, the state's most populous counties, Clark, King, Kitsap, Pierce, Snohomish, Spokane, and Thurston, have much greater densities than the state's rural counties.

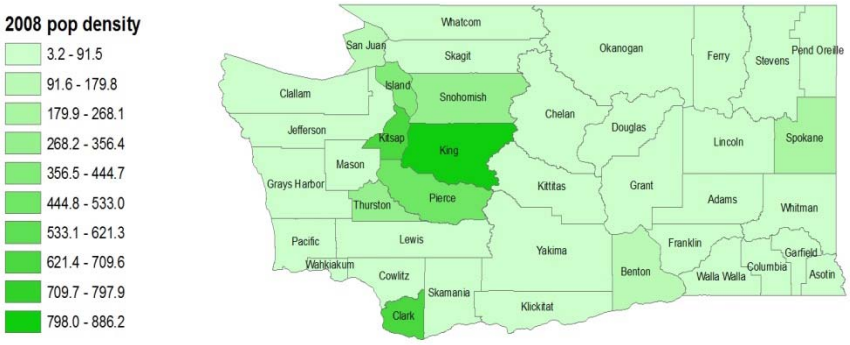

Figure 8. Washington state population densities by county

Figures 9 through 11 illustrate the impact that VMT reduction in urban and rural counties can have on statewide per capita reduction targets. Figure 9 shows the current average annual VMT for the seven most populous (urban) counties in the state, as well as the annual average per person VMT for the 32 other (rural) counties in the state. It also shows the statewide average, as well as the amount of reduction needed to achieve the 2020 benchmark of an 18 percent reduction in statewide per capita VMT.

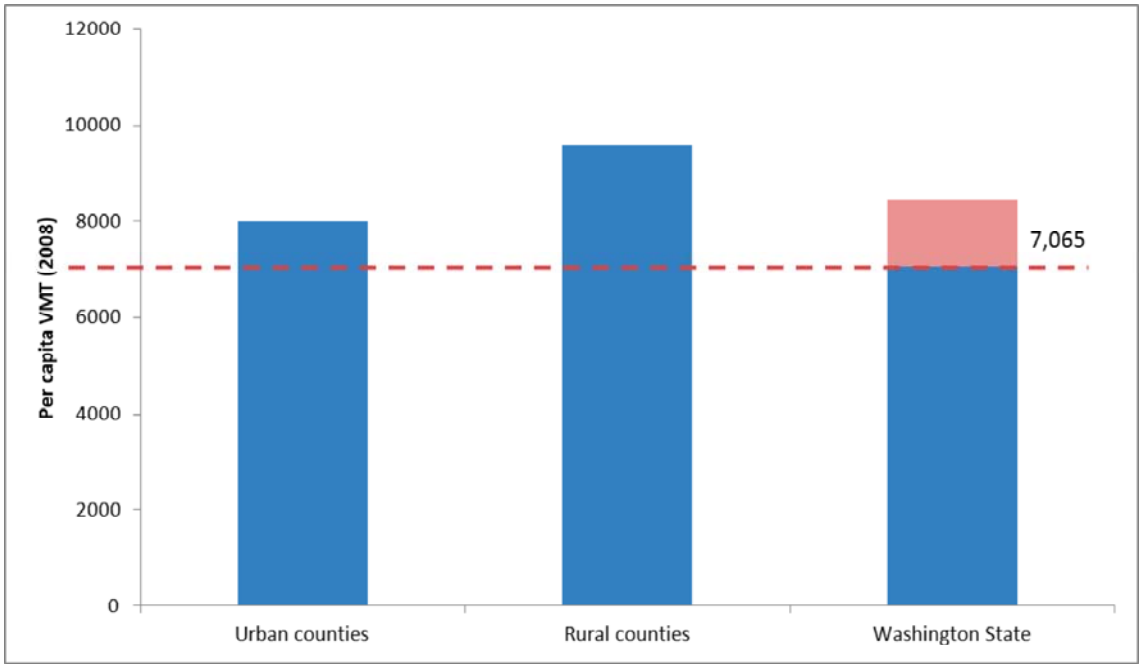

Figure 9: Average annual VMT per person urban versus rural counties

Figure 10 shows that if VMT were reduced in only the seven most urban counties, a 22.7 percent reduction from 2008 VMT levels in the state's seven most populous counties would lower overall state VMT enough to achieve the state's 2020 per capita VMT target. On the other hand, as shown in Figure 11, if VMT reductions were required in only the 32 more rural counties, a reduction of 58.4 percent in the per capita VMT would be needed to achieve the year 2020 target.

A more likely VMT reduction scenario would balance VMT reductions across counties. The largest total VMT share would come from the urban counties, but that large VMT reduction would be proportionally smaller than that achieved in the rural counties. For example, as shown in Figure 12, the 2020 state targets could be met of the seven urban counties reduced per capita VMT by 18 percent, while the 32 rural counties simultaneously reduced their VMT by 12 percent.

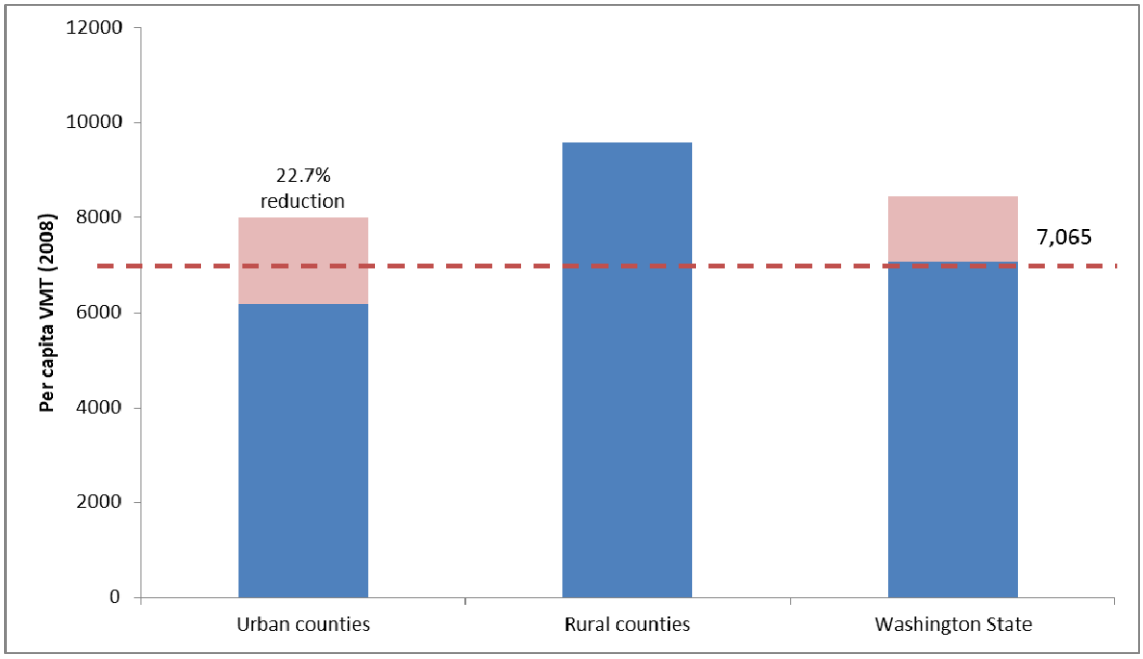

Figure 10: Reduction in average annual VMT per person required from seven most urban counties to meet 2020 state VMT reduction target

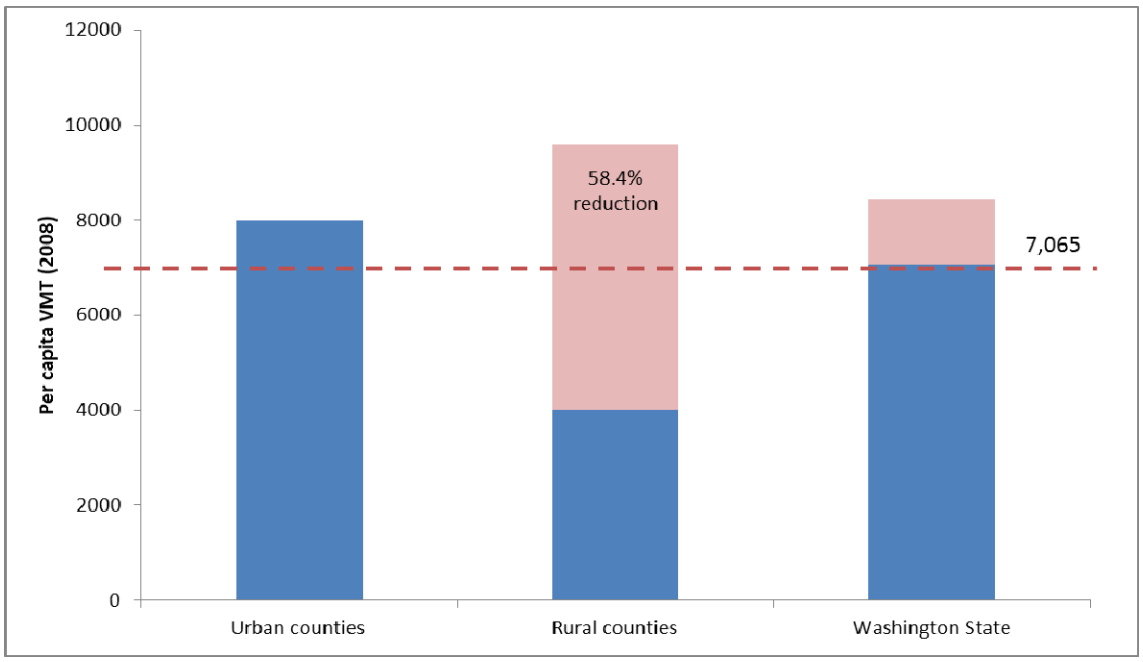

Figure 11: Reduction in average annual VMT per person required from the 32 most rural counties to meet 2020 state VMT reduction target

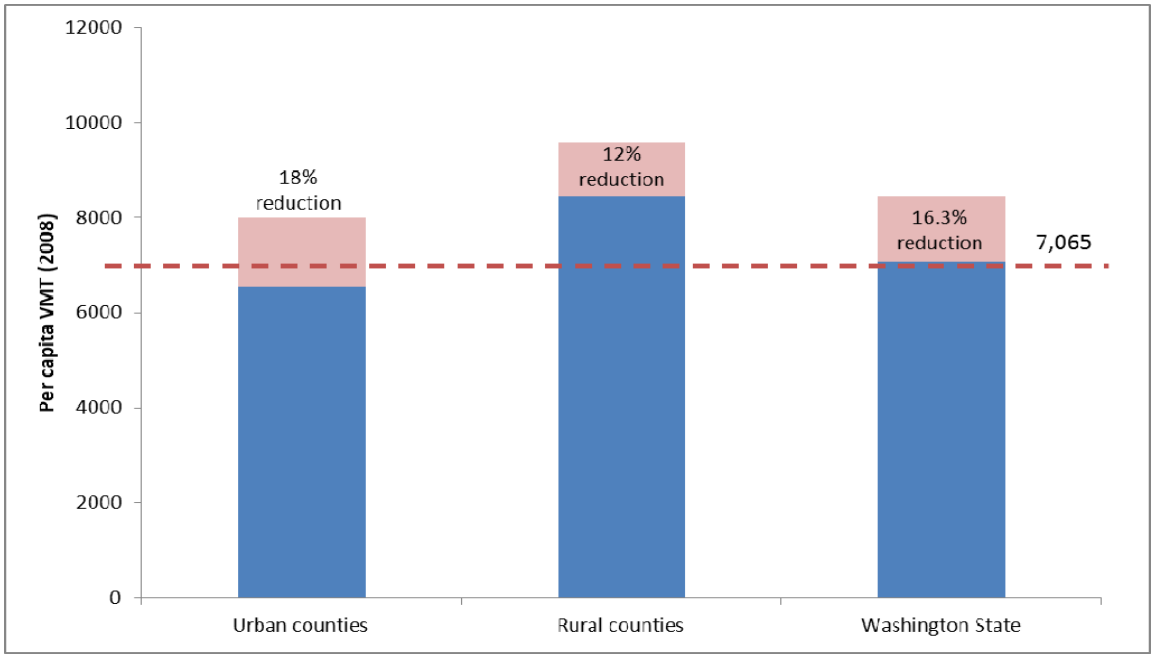

Figure 12: Example of a mixed VMT reduction strategy between rural and urban counties for achieving 2020 statewide per capita VMT targets

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

The five areas and groups that are the focus of this report are not homogenous. Within categories, significant differences exist. Some low-income households in urban areas do not own or drive a car, while others do, and rural area, low-income households are often car dependent. Counties with more than half their land in public or tribal ownership can be entirely rural/resource based or a mix of urban and non-urban areas. For this reason **there is no single strategy that will reduce VMT for each area or group**. Nor is it clear which is the most appropriate strategy in each case. Rather, a variety of strategies is available—singly and in combination—at different levels of government and to different groups and individuals to employ to reach the state's VMT reduction benchmarks.

The high entry costs of car ownership, combined with the relatively low marginal costs of driving, make additional miles driven less expensive once a car has been purchased. Therefore, the imposition of different pricing signals can help individuals perceive the cost of each mile driven and result in fewer VMT.

Pricing may be effective, but it disproportionately burdens and affects the five groups and areas of interest in this report. It is also politically difficult to implement. A per mile VMT charge or toll would adversely affect lower income populations in general, with particular negative impacts if applied to rural area residents and workers and employees who must travel long distances to and from work and do not have access to alternative transit or ridesharing programs.

However, it is possible to implement strategies to serve particular groups, such as many farm workers who work in rural areas and are generally low income. The farm workers' vanpool program offers such a model.

VMT strategies of shifting modes, sharing rides and driving less are more viable in urban areas because population density enables more SOV alternatives. Most of the state's population resides in just seven of 39 counties. These metropolitan areas are where the infrastructure, population density, and land use patterns permit the most VMT reduction alternatives and hold the greatest possibility for land-use changes to compact

development, where walking and transit become increasingly viable alternatives to the SOV.

RCW 440 does not require all areas and groups to meet VMT reduction benchmarks at the same rate or at all, so it is entirely feasible to exempt vulnerable populations from SOV VMT reduction benchmarks.

RECOMMENDATIONS

- Focus VMT reduction strategies on the state's metropolitan regions.
- Mitigate the impacts of VMT reduction strategies to low income and vulnerable populations through subsidy or exemption
- Concentrate near-term efforts on ridesharing and transit use in urbanized areas.
- Concentrate mid- and long-term efforts on land use and infrastructure changes and pricing policies for SOV use and affordable housing.
- Collect and track VMT data in different ways, as current counts and estimates are imprecise and inaccurate.

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APPENDIX A. CASH-OUT-FOR-PARKING AND ORCA PASSPORT SAVINGS CALCULATOR FOR TACOMA-AREA SMALL BUSINESS

The Tacoma Transportation Management Association uses this calculator to demonstrate savings that firms can realize while supporting commute-related VMT reduction. The employer's name has been anonymized for privacy purposes.

Employer Name **********

Total Number of Employees 85

PARKING		**Per month**	**Annually**
Number of Employees Receiving Subsidy	70		
Existing Employee Parking Subsidy		$ 80	$ 960
Employer Cost for Parking			**$ 67,200**

TRANSIT		**Per month**	**Annually**
Number of Employees Receiving Subsidy	0		
Existing Employee Transit Subsidy		$ -	$ -
Employer Cost for Transit			**$ -**

TRANSPORTATION MENU (if in place)		**Per month**	**Annually**
Number of Employees receiving allowance	0		
Existing Employee Transportation Allowance			$ -
Employer Cost for Transportation Allowance			**$ -**

TOTAL ANNUAL EMPLOYEE TRANSPORTATION BENEFIT **$67,200**

ORCA Calculator			**Annually**
Cost of ORCA business choice monthly pass*	$ 756	per year	
Number of on-site eligible employees	16		
Annual Cost of ORCA to employer			**$ 12,096**

Cost savings (+) or increase (-) to purchase ORCA business choice	***$ 55,104***

OPTION TO SHARE SAVINGS		
-	**Percent**	
% of savings as cash back to all employees (if desired)	**100%**	
Total Allocation to employees		$ 55,104
Potential monthly cash out to each employee		$ 287
Savings returned to BLRB		$ -
% of savings as cash back to all employees (if desired)	**75%**	
Total Allocation to employees		$ 41,328
Potential monthly cash out to each employee		$ 215
Savings returned to BLRB		$ 13,776
% of savings as cash back to all employees (if desired)	**50%**	
Total Allocation to employees		$ 27,552
Potential monthly cash out to each employee		$ 144
Savings returned to BLRB		$ 27,552
% of savings as cash back to all employees (if desired)	**25%**	
Total Allocation to employees		$ 13,776
Potential monthly cash out to each employee		$ 72
Savings returned to BLRB		$ 41,328
% of savings as cash back to all employees	**0%**	
Total Allocation to employees		$ -
Potential monthly cash out to each employee		$ -
Savings returned to BLRB		$ 55,104

* Different rate than the ORCA passport, but does not require purchase for all employees. Card would be loaded with a Pierce Transit pass at $63 per month per employee card purchased.

APPENDIX B. IMPORTANCE OF SMALL BUSINESSES TO COUNTY ECONOMIES

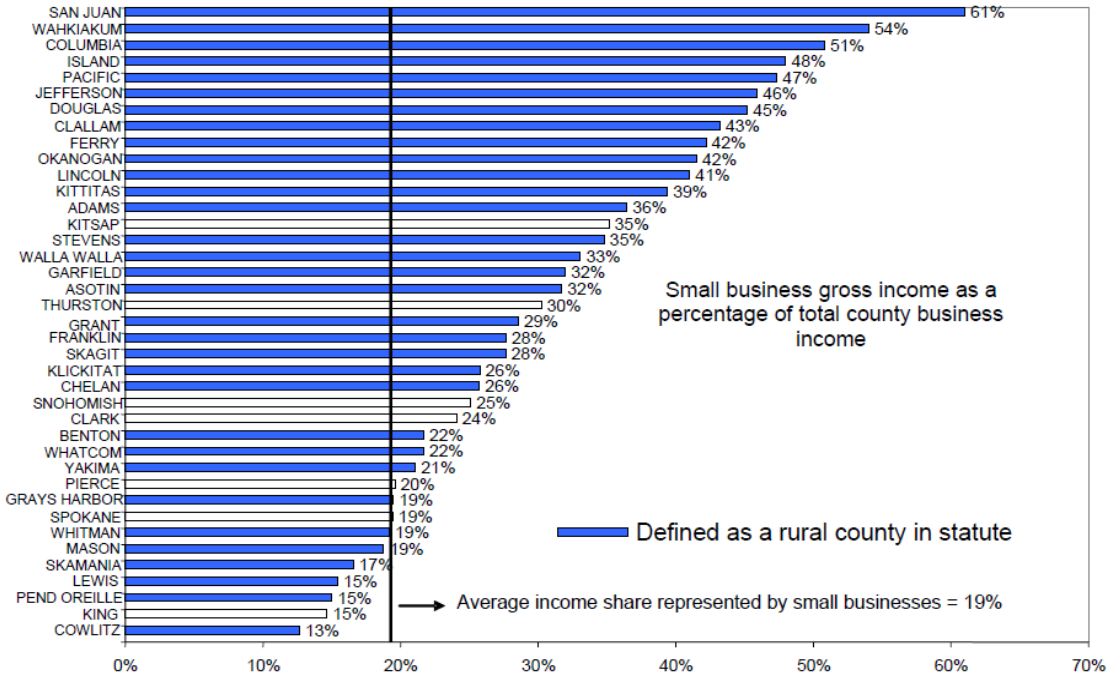

Figure B-1.Small Business Income As a Percentage of County Business Income. Most large employers locate in metropolitan areas. In their absence, small businesses account for an increased percentage of county business income in rural areas.

(Source: Washington Department of Revenue et al, 2005, Small Business Survival: A Joint Report to the Governor.)

APPENDIX C. REVISED CODE OF WASHINGTON 47.01.440

To support the implementation of RCW 47.04.280 and 47.01.078(4), the department shall adopt broad statewide goals to reduce annual per capita vehicle miles traveled by 2050 consistent with the stated goals of executive order 07-02. Consistent with these goals, the department shall:

(1) Establish the following benchmarks using a statewide baseline of seventy-five billion vehicle miles traveled less the vehicle miles traveled attributable to vehicles licensed under RCW 46.16.070and weighing ten thousand pounds or more, which are exempt from this section:

(a) Decrease the annual per capita vehicle miles traveled by eighteen percent by 2020;

(b) Decrease the annual per capita vehicle miles traveled by thirty percent by 2035; and

(c) Decrease the annual per capita vehicle miles traveled by fifty percent by 2050;

(2) By July 1, 2008, establish and convene a collaborative process to develop a set of tools and best practices to assist state, regional, and local entities in making progress towards the benchmarks established in subsection (1) of this section. The collaborative process must provide an opportunity for public review and comment and must:

(a) Be jointly facilitated by the department, the department of ecology, and the *department of community, trade, and economic development;

(b) Provide for participation from regional transportation planning organizations, the Washington state transit association, the Puget Sound clean air agency, a statewide business organization representing the sale of motor vehicles, at least one major private employer that participates in the commute trip reduction program, and other interested parties, including but not limited to parties representing diverse perspectives on issues relating to growth, development, and transportation;

(c) Identify current strategies to reduce vehicle miles traveled in the state as well as successful strategies in other jurisdictions that may be applicable in the state;

(d) Identify potential new revenue options for local and regional governments to authorize to finance vehicle miles traveled reduction efforts;

(e) Provide for the development of measurement tools that can, with a high level of confidence, measure annual progress toward the benchmarks at the local, regional, and state levels, measure the effects of strategies implemented to reduce vehicle miles traveled and adequately distinguish between common travel purposes, such as moving freight or commuting to work, and measure trends of vehicle miles traveled per capita on a five-year basis;

(f) Establish a process for the department to periodically evaluate progress toward the vehicle miles traveled benchmarks, measure achieved and projected emissions reductions, and recommend whether the benchmarks should be adjusted to meet the state's overall goals for the reduction of greenhouse gas emissions;

(g) Estimate the projected reductions in greenhouse gas emissions if the benchmarks are achieved, taking into account the expected implementation of existing state and federal mandates for vehicle technology and fuels, as well as expected growth in population and vehicle travel;

(h) Examine access to public transportation for people living in areas with affordable housing to and from employment centers, and make recommendations for steps necessary to ensure that areas with affordable housing are served by adequate levels of public transportation; and

(i) By December 1, 2008, provide a report to the transportation committees of the legislature on the collaborative process and resulting recommended tools and best practices to achieve the reduction in annual per capita vehicle miles traveled goals.

(3) Included in the December 1, 2008, report to the transportation committees of the legislature, the department shall identify strategies to reduce vehicle miles traveled in the state as well as successful strategies in other jurisdictions that may be applicable in the state that recognize the differing urban and rural transportation requirements.

(4) Prior to implementation of the goals in this section, the department, in consultation with the *department of community, trade, and economic development, cities, counties, local economic development organizations, and local and regional chambers of commerce, shall provide a report to the appropriate committees of the legislature on the anticipated impacts of the goals established in this section on the following:

(a) The economic hardship on small businesses as it relates to the ability to hire and retain workers who do not reside in the county in which they are employed;

(b) Impacts on low-income residents;

(c) Impacts on agricultural employers and their employees, especially on the migrant farmworker community;

(d) Impacts on distressed rural counties; and

(e) Impacts in counties with more than fifty percent of the land base of the county in public or tribal lands.

[2008 c 14 § 8.]

Notes:

*Reviser's note: The "department of community, trade, and economic development" was renamed the "department of commerce" by 2009 c 565.

Findings -- Intent -- Scope of chapter 14, Laws of 2008 -- Severability -- 2008 c 14: See RCW 70.235.005, 70.235.900, and 70.235.901