
APPENDIX A

Literature Review

IMPACTS FROM INCREASED VEHICULAR CAPACITY

The potential for increased highway capacity to impact employment and residential location decisions is well documented. Many refer to the phenomenon as induced growth. The Portland-Vancouver area has a reputation for growth management and vibrant urban centers. Local elected and appointed officials, planning professionals, and a large number of the area's citizens have recognized sprawl to be a significant public policy issue. Local, state and federal laws and regulations also require large transportation projects to consider the potential for indirect effects on land use patterns. The following literature review discusses pertinent findings regarding induced growth resulting from highway capacity projects and specifically from a "widening" of the I-5 bridges.

PUBLISHED STUDIES

The Governor's Task Force for the I-5 Transportation and Trade Partnership appointed a Regional Land Use Assessment Committee in January 2001. The Committee worked with the larger Partnership in assessing the potential for induced growth. For that study, Parsons Brinkerhoff was contracted to complete an exhaustive literature review on the subject.

Parsons Brinkerhoff. 2001. Land Use-Transportation Literature Review for the I-5 Trade Corridor Regional Land Use Committee (2001).

This review of 75 academic reports and case studies sought to answer three questions: "How does transportation investment affect household and business location decisions," "How does transportation investment affect travel behavior," and "How can public policy shape the resulting growth." Based on this review, the authors found that roadway investments can increase accessibility to land, accessibility can alter travel patterns and changes in travel patterns potentially affect development. The review found that communities at the edge of an urban area are most often affected by expansions of transportation infrastructure, and that new development in land outside urban areas tends to be residential, followed over time by commercial development.

The review also found that, as regions grow, any one transportation investment has less impact on accessibility and therefore has less impact on development. Rather than opening up areas to new development, most transportation investment projects in 2001 (and today) provide only small accessibility enhancements in the context of the larger regional transportation system. Because of the relatively small overall impact of modern transportation projects, they are unlikely to change what gets developed, but can facilitate development that is already allowed, contributing to the rate of land use development. This study concludes that local comprehensive plans and overall economic conditions have a more significant impact on land uses than capacity changes resulting from highway widening projects.

ADDITIONAL STUDIES AND CASE STUDIES PUBLISHED SINCE 2001

The following review was completed as the CRC project team revisited published literature. Many recent studies have been completed since the review was completed for the Trade and Transportation Partnership. These are summarized below.

Paving New Ground: A Markov Chain model of the change in transportation networks and land use (Draft: May 4, 2005)

Levinson and Chen (2005) employed a Markov Chain model to understand the relationship between land use and transportation systems over time. The study area selected was the Twin Cities Metropolitan Area (Minnesota) from 1958 to 1990. In the model, the presence of highways in areas with an Agricultural and Recreation designation were much more likely to experience urbanization than Agricultural and Recreation areas without highways. Land with an Employment, Residential or Mixed Use designation (the land use designations which are urbanized) were less impacted by the presence of highways. The study produced no evidence to suggest that the presence of highways resulted in land changing from an Employment or Mixed Use designation to any other designation. However, Residential areas were more likely to change to Mixed Use areas if they contained highways.

Columbia River Crossing MetroScope Results Documentation (December 2010)

In 2010, Metro used a MetroScope model to forecast growth associated with transportation improvements of a 12-lane river crossing and light rail to Clark College. The model forecast the impacts with both a tolled and an untolled bridge. The model showed only minimal changes in employment location and housing demand compared to the No-Build Alternative. Essentially, the model verified previous analyses that found the CRC project would not significantly induce growth or sprawl.

Using Highway Investments to Shape Growth: Assessing Intentions and Reality in Virginia (July 27, 2005)

Miller et al (2005) analyzed the effectiveness of controlling highway investments to influence growth and land development over time. It focused on three areas within Virginia: Fairfax County, Spotsylvania County, and the Hampton Roads region. The study found that decisions not to build highways did not stop growth and that decisions to build highways did not produce growth in predictable ways. It concluded that while transportation investments can facilitate growth, external growth pressures play a much bigger role in triggering growth.

Economic Growth from Transportation Improvements: Does it or doesn't it? (October 28, 2005)

Weiss (2005) evaluated past research linking transportation investments with economic development. A 1970 FHWA report was referenced that showed more job growth from 1958 to 1963 in high density urban areas serviced by highways compared with job growth in similar areas without highway service. Other studies prominently featured showed a link between poverty in Appalachian communities and distance from metropolitan areas and/or a lack of improved highways. Despite finding that some studies have linked economic development with the existence of highway infrastructure, the report concluded that little conclusive evidence exists linking the existence of highway infrastructure with particular types of economic development, or whether transportation investments also produce negative consequences as well. The significant impacts from highway construction were in areas (unlike the CRC main project area) previously unserved or greatly underserved by highway facilities.

Influence of Transportation Access on Individual Firm Location Decisions (2006)

Targa et al (2006) analyzed the relationship between transportation investments, business cost structure and the decisions by firms on where to locate. The study used a firm-level econometric

model to analyze data collected from a web-based survey about individual firms in a four-county region of Maryland. It found that having existing access to major highways contributed to firms remaining at their present locations and further extrapolated that land along primary highways is more attractive to firms when making location decisions.

Road Expansion, Urban Growth, and Induced Travel (2003)

Cervero (2003) tested the theory that roadway building decreases roadway congestion in the short term, resulting in new development (and therefore new trips) and shifts in existing driving behavior that results in a return to a congested state in the long term. The study compared information related to select California highway expansions from 1980 to 1994 with building records for the same period. It found that roadway expansions do contribute to new residential and commercial building activities as well as congestion-inducing changes in existing travel patterns. However, overall effect of induced travel is of a lesser magnitude than estimated by previous studies, and it is unclear whether the induced demand effect that occurs in suburban settings would apply to urban settings. The study found that other factors, such as a community's relative level of affluence, have a greater effect on spurring development than transportation investments.

A Guidebook for Evaluating the Indirect Land Use and Growth Impacts of Highway Improvements: Final Report (2001)

In 2001 (Moore and Sanchez 2001), the consulting firm ECONorthwest and Portland State University completed a guidebook based on the findings of a 1998 ODOT study of the link between highway capacity, travel demand, and development patterns.

The guidebook identifies a number of factors influencing indirect impacts: socioeconomic conditions, land use patterns, transportation system characteristics, public services, and public policy. It determined that added highway capacity does not change development from local land use plans, or what would have occurred in no-build scenarios. It also found that public investment in utilities (e.g. water, sewer, or roads) and zoning tools were the primary shapers of development patterns. The study differentiated past large projects (new corridors, greatly enhancing transportation access to areas of the country that did not previously have access) from small, incremental projects on a few miles of existing highways, without substantial improvement and no new access.

Evaluating Transportation Land Use Impacts (2005)

Litman (2005) reviewed findings from other academic studies. The report stated that decisions that reduce the overall cost of vehicular travel increase the amount of traffic and low density, dispersed, outlying development. As with other studies, it acknowledged that it is difficult to determine exactly what land use impacts are caused by specific transportation infrastructure investments.

The Cost of Congestion to the Economy of the Portland Region (2005)

The Economic Development Research Group (2005) prepared a study of congestion in the Portland area for the Portland Business Alliance, Metro, the Port of Portland, and ODOT. This study's findings include:

- Congestion currently threatens economic growth in the Portland region.
- Congestion problems are already reducing profits for local businesses.

- Failure to invest in the region's transportation system could create an \$844 million annual value loss.

According to this study, increased regional investment in transportation would create a \$2 benefit for every dollar spent. Interviews conducted for this report found that local businesses have shifted their work shifts and deliveries to the early morning to avoid congestion, but as congestion increases, the peak period gets longer and businesses are being left with an even smaller early morning window. Some businesses have increased their internal inventory to reduce disruption from missed deliveries. Still others have passed transportation cost increases on to the consumer. Additionally, some have chosen to relocate outside the region. These locational decisions may indirectly affect land uses and land use plans.

Many other regions are currently addressing the need to reduce congestion. For the Portland area to stay competitive, this study recommended addressing congestion and mitigating future congestion growth.

I-80 and Alice's Road/105th Street Interchange Indirect and Cumulative Impact Analysis: Technical Report (2006)

CH2M Hill completed an analysis in 2006 of the Interstate 80 and Alice's Road/105th Street Interchange. The Indirect and Cumulative Impact Analysis Technical Report had key findings associated with the following two issues:

The first issue was the impact of transportation investment on household and business location decisions. Transportation was found to have historically played an important role in shaping modern U.S. metropolitan urban forms. Improved transportation access (and reduced travel times) can improve an area's attractiveness for development, though with diminishing returns. Transportation is not the only influence on development, and many times is not the most important influence on development.

The second issue was the role of land use and public policy in shaping regional growth following transportation investments. The land use effects of transportation investment are often small compared to the effect of local land use plans, policies and political structures. Effective policies are able to control growth resulting from transport investment, effectively disconnecting the land use response from the transport network. Oregon and Washington planning rules in general, (Portland and Vancouver's plans and regulations in particular) are considered to be some of the most effective controls that exist in the United States.

Market studies will determine a proposed project's feasibility at a certain location, and the developer will consider the size, location, environmental constraints, and access of a site. Existing and programmed transportation improvements play a role in the decision-making process, though they are not the driving force itself. The jurisdiction's willingness to work with developers, and the predictability of their development permit and exactions process is also important.

Washington SR 520 Indirect and Cumulative Effects Discipline Report (2005)

In 2005, a report entitled the "Indirect and Cumulative Effects Discipline Report" was published as a part of the environmental analysis for the Washington State Route 520 Bridge Replacement and HOV Project Draft EIS. The Discipline Report included a literature search and used a land use/transportation model called Dram/EMPAL. Forecast results for indirect effects showed minor differences in the distribution of population and employment for the No Build Alternative relative to the Build Alternatives. The differences would range from an increase of less than one percent to a decrease of less than 0.5 percent. The alternatives did show a slight difference in where

population and employment growth may occur under both scenarios; however, the differences were minor. The report concluded that the forecasted distribution of population and employment growth without the project would not be noticeably different from the distribution of population and employment growth that could occur under either of the Build Alternatives. There are similarities in the SR 520 project and the proposed CRC alternatives, and these findings are generally applicable to the proposed CRC alternatives.

Alaska Way Viaduct and Seawall Replacement Project Land Use and Shoreline Technical Report (2005)

Another current, major project for the Washington State Department of Transportation is the potential replacement of the Alaska Way Viaduct. The 2001 Nisqually earthquake damaged the viaduct and its supporting Alaskan Way Seawall. Replacement options will have transportation improvements as well as structural improvements. Parsons Brinkerhoff Quade & Douglas, Inc. (2006) suggested it is difficult to predict land use effects for the Alaska Way Viaduct project and that it was unlikely that redevelopment over a large area would occur as a result of the Alaska Way project. They cited the following reasons:

- The project does not open up large areas of land for development or redevelopment.
- The project is replacing an existing structure, not creating a new travel route.
- There are many other improvements which have occurred or are planned to occur in downtown Seattle.
- The City of Seattle has begun a Central Waterfront Concept Plan which will lead to the establishment of allowable development patterns adjacent to significant portions of the Alaska Way Viaduct replacement project.

The CRC project is similar, as it is within the core of an urbanized, managed area.

IMPACTS FROM LIGHT RAIL TRANSIT

Transit options, such as light rail transit, have a significant impact on both the urban landscape and the economy. The American Public Transportation Association (APTA) estimates that each dollar invested in public transportation generates \$4 - 9 in local economic activity. Furthermore, every \$10 million in capital investment generally produces a \$32 million increase in business sales (APTA 2007). These figures support the argument that economic development opportunities have, and will continue to arise from investment in transit. Case studies of transit projects in the United States reveal that transit may increase both residential and commercial property values and attract future development. Increased pedestrian activity near transit stations can also improve economic vitality within transit corridors. The following literature review discusses pertinent findings regarding the impacts of public transportation on development activity. Though several of these studies compared the development impacts of light rail transit versus bus rapid transit systems, the analysis and conclusions of each study remains relevant to the discussion of light rail transit as an element of the LPA.

Published Studies

The following points are critical to the understanding of the indirect impact of light rail transit in the Columbia River Crossing Project.

1. **Economic development and land use intensification opportunities have, and will continue to, arise from investment in high-capacity transit.** There is documented

evidence of this occurring at both light rail and bus rapid transit stations. (APTA 2007; Cura 2003; Levinson et al. 2003; Light Rail Now 2006; MaryPIRG Foundation 2003; Weinstein 1999). This has also been found to be the case in the Portland Metropolitan Area. (Portland Office of Transportation 2006; TriMet 2006).

2. **There is still limited documentation about the expected level of economic development around bus rapid transit and light rail transit stations, or whether one mode of transit will consistently induce more economic development than the other.** Local zoning, market forces, developer incentives, origin and destination points, and public preferences have been found to greatly affect the levels of economic development at transit stations. (Cervero 1993, 2004; ECONorthwest 1998; Seskin 1996; Thomas 2004).
3. **Ridership is directly correlated with transit-oriented development (TOD) potential.** light rail transit is preferred by riders because it is considered to provide better transit performance and because it is less associated with the noise and pollutants of diesel based transit systems. (Currie 2006; Dittmar and Poticha 2004; Henry 1989; Kenworthy 2000; Vuchic, 2005).
4. **There is a perception amongst the public and among real estate developers that rail is a more permanent transit investment and therefore more likely to encourage and sustain TOD.** (Austin Planning and Growth Management Department 1986; California Department of Transportation 2002; City of Ottawa 2003; TCRP 2007; WMATA 2005).