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Can We Pave Our Way Out of Traffic? – Induced Traffic and Highway Extensions

Introduction

Over the past decades, "we can't pave our way out of traffic" has become a mantra of regional planning authorities, environmentalists, and transit advocates across the United States.[1] The fundamental logic underlying this claim is that increased roadway supply induces its own demand. As Kim and Thill explain, "traditional transportation planning practice rests on the premise that the demand for transportation is derived. On the other hand, economic theory advances that enhancement to the transportation system leads to lower travel cost and hence to 'induced demand'" (2005, p. 229). There are many levels to this creation of induced traffic. At one level are individual choices. As O'Sullivan describes, "When a road is widened and travel initially moves faster, travelers who were deterred by slow speed start using the road. This is the phenomenon of 'latent demand'" (2007, p. 223). At a completely different level are widespread shifts in the fabric of American society. Since the 1950s, the Interstate Highway System has allowed suburbia to explode. "Without the new mobility of the automobile and the highway, the suburban housing boom never would have spread so wide" (Lewis, 1997, p. 80). At all of these levels, induced demand is paradoxically both a sign and symptom of increased mobility. Kanchi and Levinson discuss this paradox: "In the short term, highway expansion is expected to increase travel speeds. In the long run, traffic congestion may approach or exceed earlier levels. If the

[1] This sentiment has become particularly cliché in transit authorities' long range transportation plans. The Surface Transportation Policy Partnership has also taken it up, emphasizing "the futility of trying to build our way out of congestion" <http://www.transact.org/ca/gridlock/three.htm>

sole aim of capacity expansion is to reduce congestion, expansions that increase traffic may prove counterproductive" (2005, p. 1).

Roadway supply and demand are complexly intertwined. Various studies have attempted to quantify the dynamic relationship between roadway capacity and vehicle miles traveled (VMT). Cervero and Hansen found an elasticity of VMT with respect to lane-miles of 0.56 and an elasticity of lane-miles with respect to VMT of 0.33 (2000, p. ii). Increased capacity leads to increased travel, and, to a lesser extent, increased travel leads to increased capacity. The imbalance in these elasticities leads capacity expansion to be a short term remedy; eventually increased traffic will fill most of the added capacity. "A study using 18 years of data from 14 California metropolitan areas found every 10 percent increase in highway lane-miles was associated with a 9 percent increase in vehicle-miles-traveled four years after road expansion, controlling for other factors" (Cervero, 2001c, p. 7). While abstract numerical values are available, the confounded nature of highway capacity and travel demand can make related policy decisions highly complex and hotly contested. Highway expansions and extensions have tremendous financial and environmental costs; further consideration of their effectiveness in reducing congestion is needed.[2] Especially in the case of highway extensions, induced traffic effects lead to significant impacts on land-use and congestion beyond the projects' scope boundaries.

This paper will first address the debate over induced traffic and clarify some of the terminology used in this debate. Induced traffic will then be discussed in the generalized context of highway extensions. Finally, specific components of induced traffic, namely peripheral congestion and induced growth, will be contextualized in the cases of Pennsylvania's Interstate

[2] Throughout this paper, I take highway to be a completely limited-access highway. Technically, a grade separated limited-access highway is a freeway (regardless of toll collection), while expressways and highways can have controlled at-grade intersections.

476 and California State Routes 210 and 241. These case studies of suburban highway extensions help to illustrate the significant negative consequences of induced traffic effects.

The Debate over Induced Traffic

Some experts deny the validity of induced traffic effects. In fact, "few contemporary issues in the urban transportation field have elicited such strong reactions and polarized political factions as claims of induced travel demand." (Cervero 2001a, p. 1). A general claim is that even if induced traffic leads newly expanded capacity to be overwhelmed, slowing travel speeds to their original levels, at least more people are moving towards their destination. Balaker and Staley claim, "more people traveling means more people buying, selling, and supporting businesses. In other words, induced demand means more business" (2006, p. 29). Some statistical researchers believe that capacity expansions successfully reduce congestion despite induced traffic effects. DeCorla-Souza and Cohen argue that "under even extreme scenarios of initial congestion and consequent forecasted induced travel, there is a positive impact [of highway expansion] with respect to congestion relief. (1999, p. 249). Others take a stronger stance against theories of induced demand. Balaker and Staley assert, "The notion that we cannot build our way out of congestion is wrong. It's wrong historically, and it's wrong technically." (2006, p. 177). They blame congestion on a reluctance to build highways, not an over-reliance on them. For example, they argue that Los Angeles has half the pavement per person of Dallas, and as a result suffers from twice the congestion (2006, p. 63). While this correlation can be supported analytically, the two go as far as disputing the notion that "the types and level of investment in the transportation system strongly influence development patterns" (Balaker and Staley, 2006, p. 94).[3] This denial of the mutual effects of transportation

[3] Here, Balaker and Staley are lambasting transportation planning in the Atlanta metropolitan region, which admittedly, has not been worthy of emulation.

infrastructure and development counters long-established historical, geographical, sociological, and economic frameworks in urban and transportation studies.

Contrary to Balaker and Staley, most economists and planners recognize the influence that transportation has on a region's development. Wright notes that "in the longer term, [transit modes] will influence the characteristics of the city itself and even the ways in which their citizens think and act" (1992, p. 145). For example, "Research…reveals significant 'induced growth' and 'induced investment' effects – real-estate development has gravitated to improved freeway corridors and road investments have been shaped by traffic trends in California" (Cervero, 2001b, p. ii). Skeptics of induced traffic effects often use short term data, rather than considering effects of highway building after five to six years, when the land use impacts begin to be felt (Cervero, 2001b, p. 24). When policymakers account for the broader effects that highway building has on development, they can begin to consider more fully induced traffic effects (See Figure 1).

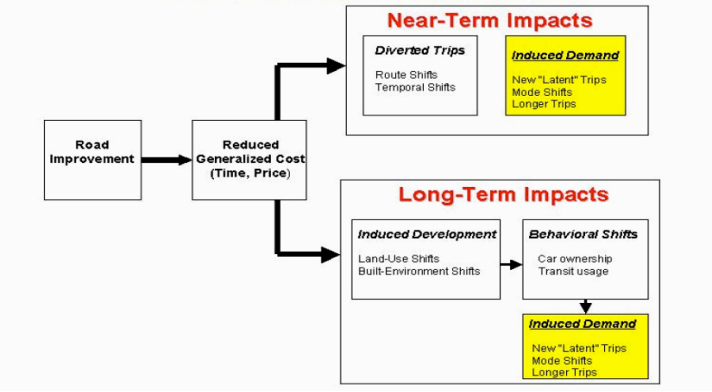

Figure 1 - Short and Long Term Generation of Induced Traffic (Cervero 2001a, p. 9)

Planners are increasingly considering induced traffic effects to assist in the formulation of appropriate transportation policy. "In recent years a spate of papers have sought to quantify the effect and obtained results suggesting that induced effects are stronger than previously believed" (Cervero and Hansen, 2000, p. 1). Cervero and Hansen summarize, "Our research found,

unequivocally, a strong two-way empirical relationship between road supply and demand…Both relationships are significant and should be acknowledged when addressing policy questions related to congestion relief and highway development" (2000, p. 18). Kim and Thill provide further support, discussing "the validity of the argument of induced demand advanced by an increasing number of transportation researchers" (2005, p. 246). At this point, it is important to consider in more detail the expressions used to describe these induced effects.

Terminology

Many arguments in this ongoing debate are based on subtle differences in terminology. Researchers have not reached consensus regarding a precise definition of induced traffic, latent demand, generated travel, or any of the other numerous terms used to describe this phenomenon. For example, disagreement exists among researchers whether diverted trips should be included in induced demand figures, or whether long-term land development should be considered. By slightly altering the definitions of terms, economists and planners can greatly overstate their cases about traffic congestion and proposed solutions. Rather than engaging in semantic arguments, this paper simply employs the term "induced traffic." Induced traffic subsumes all of the commonly used terms that describe increased traffic congestion resulting from improved roadway capacity. It is valuable, however, to consider the underlying dynamics within this broad term, without relying on narrowly defined usage of terminology. As shown in Figure 2 below, induced traffic can be considered along two axes. Behavioral factors are individual decisions about trip making, routing, and modality, while structural factors arise from macro-level forces influencing traffic. Generative factors increase VMT within a metropolitan region, while redistributive factors change the routing and timing of trips.

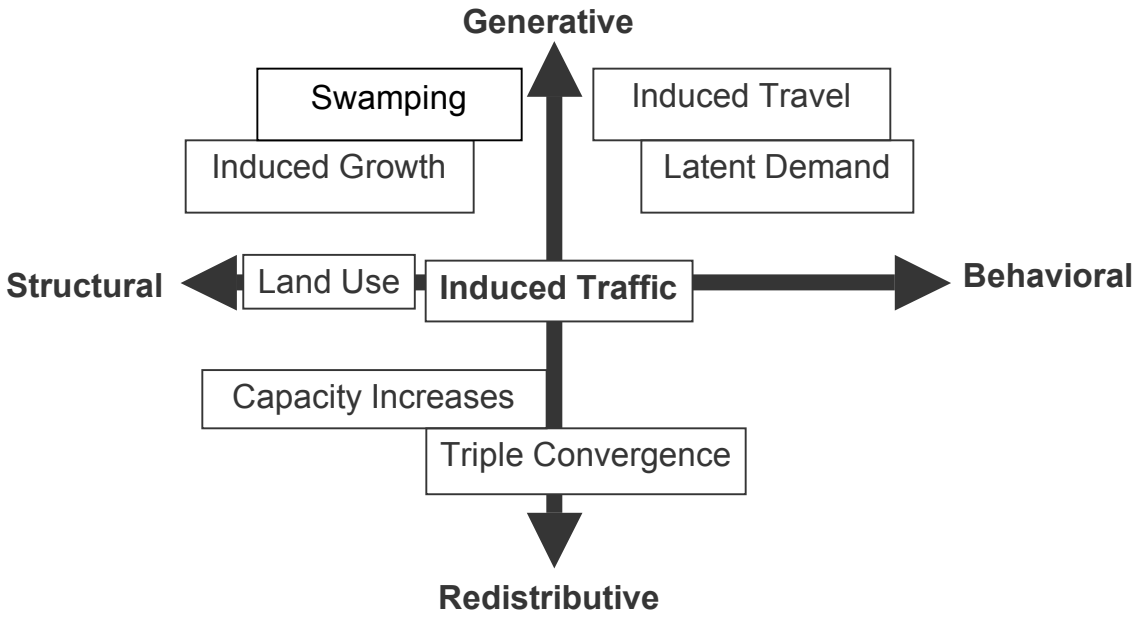

Figure 2 – Conceptual Map of Terminology Relating to Causes of Increased Congestion, Organized Along Two Axes

Examples clarify the meaning of these axes and can help locate commonly used terms along them. Consider quadrant I of Figure 2, behavioral generation of traffic. Such traffic arises largely from latent demand, trips that were previously suppressed due to high travel costs. For example, assume additional lanes on a highway reduce the travel time to a baseball stadium by ten minutes per twenty miles traveled. Baseball fans who did not attend games because of congestion costs lose their disincentive to attend, increasing both the frequency of an individual fan's attendance and the distance from which fans are willing to drive to the stadium. The resulting increase in congestion at game time is due to latent demand. Next, in quadrant II of Figure 2, consider a new suburban office park. The construction of an easily accessible interstate interchange leads directly to the office park's construction.[4] As the offices expand due to economies of agglomeration and attract more commuters, surrounding highways are swamped.

[4] Tyson's Corner, VA, and King of Prussia, PA, are salient real-world examples of such development. They were spurred by the construction of Interstate Highways interchanges (I-495 at "The Mixing Bowl" for Tyson's Corner and I-76/276 for King of Prussia).

Downs's concept of swamping, whereby regional population growth overwhelms highway capacity and leads to further construction, relies on the generation of additional trips and the subsequent self-reinforcing expansion of capacity, a structural change (2004, p. 87). This process is closely related to induced growth,[5] the development of real estate based on accessibility premiums from freely flowing and accessible highways. Clearly, induced growth is a structural change in the built environment.

Structural changes can also lead to a redistribution of trips. The construction of a parallel set of high occupancy/toll (HOT) lanes in a freeway's median will lead drivers to shift their travel patterns. Drivers who previously took circuitous routes or avoided rush hour may start driving increasingly on the direct route during peak hours. Such a structural change will lead to individual behavioral choices. Redistributive changes (the bottom axis of Figure 2), especially those coined collectively as "triple convergence" – modal, spatial, and temporal redistribution – by Downs (2004, p. 82), have become a basic component of transportation planning. Winston and others even refer to triple convergence as Down's Law: "On urban commuter expressways, peak-hour traffic congestion rises to meet maximum capacity, because commuters shift from less preferred modes and times of day" (1991, p. 114).

Induced Traffic: Special Considerations for Highway Extensions

Automobile travel creates a number of negative externalities. O'Sullivan (2007) considers a number of the basic ones, including congestion, accidents, and pollution. More interesting to consider is how these externalities are distributed when highways are extended. Extending highways from suburbs to central cities brings more cars into the already overtaxed central city infrastructure. Wright explains, "These same freeways attracted new growth to the lightly populated suburbs, while their noise and proximity to heavily built-up areas imposed

[5] Induced growth is also known as induced investment or induced development.

negative externalities on the densely populated core cities" (1992, p. 157). Increased pollution in older cities is one example of the traffic spillovers that Cervero outlines (2001a, p. 5). These spillovers of highway extensions arise from the interconnected nature of highway networks in metropolitan areas. While drivers gain some advantages from a dense, extensive highway network, such as the availability of alternate routes to avoid what Downs calls incident-caused congestion (2004, p. 355), most traffic spillovers lead to significant negative externalities.

Peripheral congestion describes some of these negative externalities. Substantial congestion occurs at arterial interchanges with highways. Such interchanges draw traffic from throughout the local area, in what Weber describes as the "magnet effect" (1977, p. 73). This leads to increased congestion on local and arterial roadways beyond their capacity. Such congestion is exacerbated by the queuing of vehicles waiting to enter the highway and the deceleration and merging of vehicles exiting the highway. Downs explains another negative externality, divergence. The opposite of convergence, "triple divergence has important policy implications. Residents in fast-growing metropolitan areas are especially eager to limit traffic congestion because they want to prevent further expressway traffic from spilling over onto adjacent local streets. To many residents, such spillover is just as great a concern as the time lost in commuting" (Downs 2004, p. 86).

New highway extensions cause induced growth throughout a metropolitan region. Downs outlines this process,

> Improvements create incentives to…change the location and form of residential and nonresidential growth. Over the long run, these actions tend to intensify traffic congestion. Such increases in congestion result from induced demand caused by improving the roads. But once more population arrives, its presence may motivate authorities to build even more roads – an outcome sometimes referred to as induced growth or induced development (2004, p. 87).

Weber cites the growth of King of Prussia Pennsylvania, arguing, "It must be realized that a superhighway has a pervasive impact on the land. Much land use can be generated from a road." (1977, 68). Suburbia's rise exhibits the potency of induced growth, which can create a paralysis of "suburban gridlock" (Wright, 1992, p. 164).

Peripheral congestion and induced growth effects are more dramatic and more easily observed when highways are extended, rather than expanded. Merely adding lanes to a highway has less of an effect on regional congestion and land-use than extending highways. A discussion of peripheral congestion and induced growth in three case studies of highway extensions follows.

Interstate 476

Interstate 476 in Delaware and Montgomery Counties, Pennsylvania, is officially designated as the Mid-County Expressway (See Figure 3). It is popularly known as the Blue Route, after the color of the chosen route on an early map of potential alignments. Pennsylvania officials originally conceived it as the Chester Extension of Pennsylvania Turnpike in 1929. The Blue Route, in conjunction with the I-276 section of the Pennsylvania Turnpike, would complete a half-beltway around Philadelphia. Construction crews completed some segments in 1967, but significant local opposition delayed completion until 1992.[6]

[6] This opposition was largely due to environmental and aesthetic concerns. Swarthmore College sued to stop the construction in 1981. Such litigation eventually prompted the Blue Route to be built to stringent environmental standards, including sound walls and the prohibition of billboards.

Figure 3 – Montgomery (4), Delaware (3), and Chester (2) Counties <http://images.apartments.com/maps/RG0093.gif>

The completed extension taxed local infrastructure, worsening local and arterial bottlenecks. Even the state's Environmental Impact Report had admitted that "traffic on radial, intersecting roads would deteriorate given a new circumferential superhighway" (Weber, 1977, p. 71). Projections for the year 2000 predicted a doubling in percent of level of service F conditions (stop-and-go traffic with unacceptable delays) along Pennsylvania State Routes 320, 252, and 420, which would parallel the new extension (Draft EIR, cited in Weber, 1977, Figure 34). Similarly, levels of service would decrease from E and D to F at MacDade Boulevard and Fairview Avenue, an intersection directly adjacent to the southernmost interchange of the proposed Blue Route (Draft EIR, cited in Weber, 1977, Figure 35). Peripheral congestion effects were a major flaw in the proposed extension.

While projections for traffic on the project's periphery were dire, there was highly optimistic speculation about development along the route. Developers realized the vast accessibility premiums that the new Interstate extension would bring. In regards to housing developments along the Blue Route, William Tancredi, Executive Director of the Delaware County Partnership for Economic Development, explained, "Ninety-nine percent of the equation is access. You can have the best building in the world, but if you can't get to it, what's the point? It comes down to location, location, location" (St. George, 1988). Speculation also led to

industrial developments in Lester and Tinicum, PA, and across the Commodore Barry Bridge in Gloucester County, NJ.[7] This is a prime example of induced growth occurring in the wider metropolitan region. Russell Richardson, Vice President of a real estate developer, shared, "There's no doubt that development follows major roadways. With I-95 open and now [the Blue Route], it's like opening the floodgate" (St. George, 1988). Induced growth also occurred in neighboring Chester County, due to anticipation of the Blue Route's completion. Home building increased dramatically in the 1980s and 1990s, when plans for the Blue Route were being finalized and widely publicized (See Figure 4). In 1988, Chester County Predicted that 418,000 people would reside there by 2012. In 1997, five years after the opening of the Blue Route, the population had already surpassed 420,000 (Henson, 1997).

Figure 4 - Houses Built in Chester County (From Census Data)

Houses Built Since 1940	Percent of Those Built Between 1980 and 1998 (30% of Time)
136,968	42.6%

The Blue Route spurred additional economic development, but the sprawling form this development took worsened local traffic congestion. The extension of Interstate 476 illustrates the forceful effects of peripheral congestion and induced growth.

California State Route 210

Interstate 210 and its extension, State Route 210, form the continuous Foothill Freeway through Los Angeles' northern San Gabriel Valley. The 210 links the Northern San Fernando Valley, Pasadena, Arcadia, La Verne, Claremont, Fontana, and San Bernardino. Planning for the State Route extension into San Bernardino County began in 1948. The freeway had originally ended in ended in La Verne (See Figure 5). The state opened a twenty mile extension to Fontana in 2002 and a 7.25 mile extension to the City of San Bernardino in 2007.

[7] The Commodore Barry Bridge was minutes from the Blue Route's terminus. In fact, the proposed Green Route alternative had connected directly to the Bridge (Weber 1970).

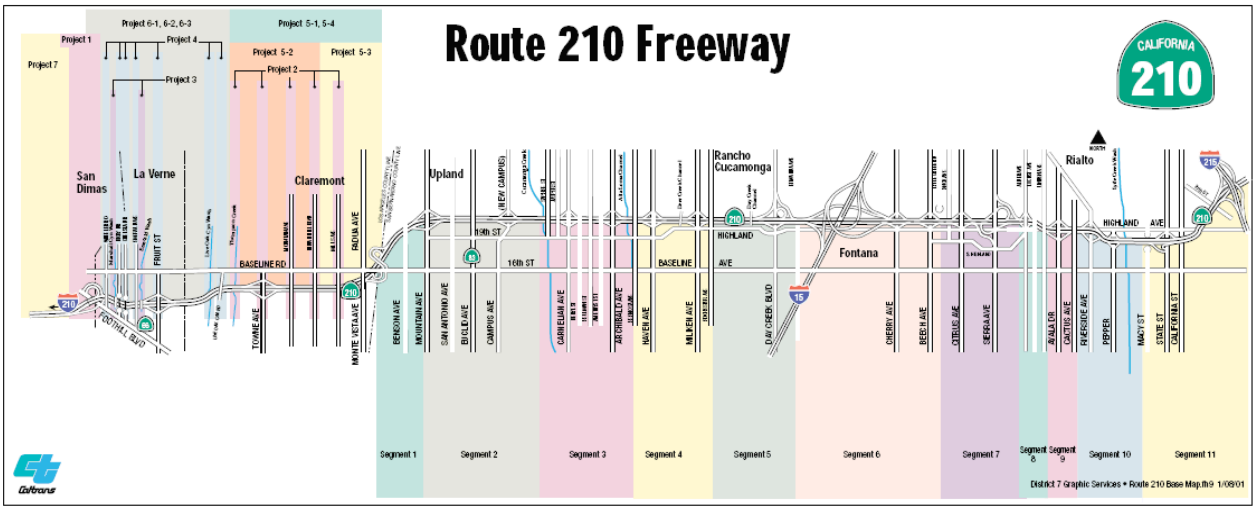

Figure 5 - Communities Along the Foothill Freeway Extension (California Department of Transportation, 2002)

The extensions significantly worsened traffic congestion on roadways far from the actual construction. After the extension to Fontana, traffic volumes more than doubled on preexisting sections miles away in Los Angeles County. Between 2001 and 2002, after the opening of the first extension, the average daily traffic in both directions on Interstate 210 at San Dimas Avenue spiked from 67,000 vehicles to 177,000 vehicles (Pierson and Il, 2007). Downs's theory of divergence was upheld well; as congestion increased substantially on the freeway, drivers began using local roads as alternate routes. Traffic on Huntington Drive, which parallels the Foothill Freeway, jumped 20% after the Fontana extension's opening (Pierson and Il, 2007). Ben Salvaty, chairman of San Marino's traffic commission, complained, "[Drivers] get frustrated with congestion and decide to take surface streets. In some places, it's been near gridlock" (Pierson and Il, 2007). As development moves progressively further east, cities that once benefited from the Foothill Freeway's growth are now being harmed by it. The former traffic commissioner for San Marino shared, "I think we took our hit, and I'd suspect somebody, whether it's in La Verne or Claremont or Upland, they're going to get nailed too." (Pierson and Il, 2007).

Induced growth occurring at the end of Route 210's extension is further worsening traffic congestion. In addition to housing, this development includes large shopping centers and auto dealerships. In 2002, Fontana was the nation's 21st-fastest-growing city (Pierson and Il, 2007). Growth there, and in nearby communities, is attributable to the large accessibility premiums the freeway brings. Figure 6 exhibits this accessibility premium for the City of Rancho Cucamonga.

Figure 6 – Median Price of a Rancho Cucamonga Home

1990...$164,500
1995...$145,000
2000...$180,000
2002...$245,000 [Extension to Fontana completed]
2004...$325,500

The self-reinforcing effects of induced growth led to the Southern California Association of Governments' projection "that employment in this area will increase by 57 percent between now and the year 2010" (California Department of Transportation, 2002). Unless new patterns of development are adopted, the pattern of sprawl will lead residents to continue pleas for capacity expansions that will only perpetuate further sprawl.

California State Route 241

The struggle to complete the Foothill South extension of the Foothill Transportation Corridor in many ways mirrors the controversy over the Blue Route's construction. The extension, from the toll road's current southern terminus at Oso Drive, to Interstate 5, would complete a half-beltway around the most heavily populated areas of Orange County (See Figure 7). There are significant environmental concerns that could prevent this completion, including protests about the destruction of a famous surfing beach. The Foothill South extension would complete Orange County's network of toll roads, the first of which was completed in 1994.

Despite recent setbacks, strong political support makes completion likely by 2013. Governor Schwarzenegger proclaimed, "The State Route 241 project gives us a chance to protect our parks and our coastline and reduce one of the most damaging environmental problems that plagues our state: traffic gridlock" (Reyes and Weikel, 2008).

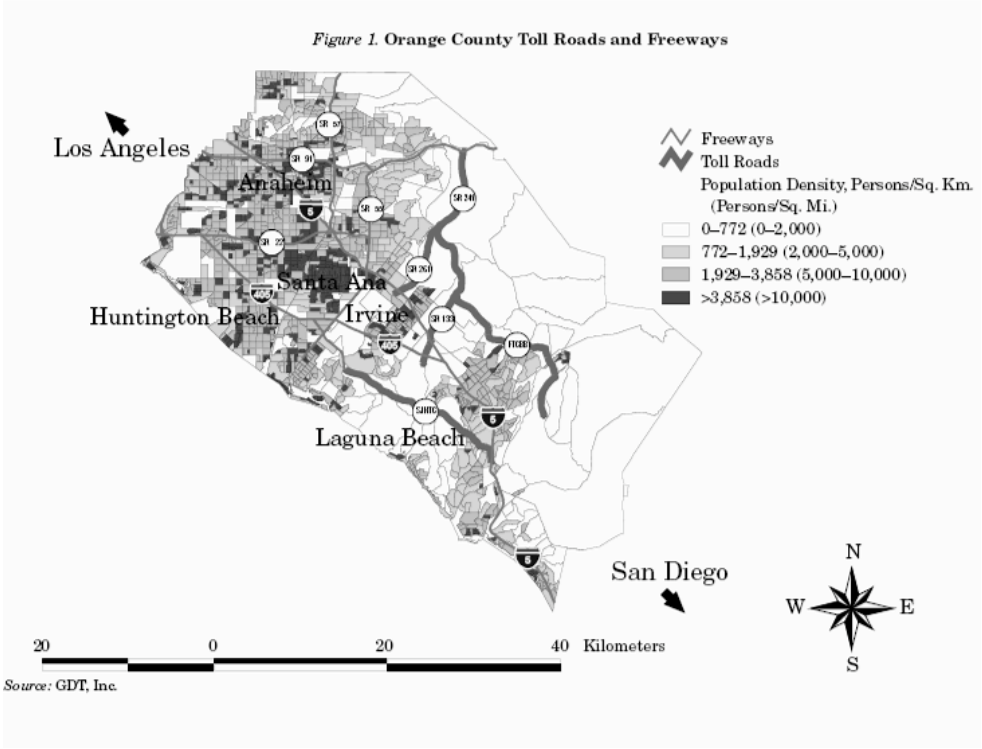

Figure 7 - Toll Roads in Orange County, California

Proponents of the extension stress the traffic relief it would provide for Interstate 5. Peripheral congestion effects on local streets are largely ignored. A Fannie Mae Foundation study in 2001 investigated the effect of the first segments of the Foothill Transportation Corridor on induced growth and housing prices. It concluded, "The implication for induced travel is that the evidence from Orange County suggests rather strongly that new highways change the geographic pattern of accessibility, that those changes are reflected in home sales prices, and that it is thus reasonable to conclude that new highways will also create changes in development patterns." (Boarnet and Chalermpong, 2001, p. 600). Based on the previous two case studies and

theoretical results, induced traffic and induced growth would likely lead to a vast increase in VMT in Southern Orange County. While Southern California's population will surely continue to grow, highway projects should not encourage low density sprawl in environmentally sensitive areas.

Conclusions

During the controversy surrounding the construction of the Blue Route, Weber wrote, "Growth can proceed in an orderly fashion or it can sprawl indiscriminately. A policy decision is required now that more understanding has been gained of the effects of superhighway placement" (1977, p. 68). Unfortunately, almost forty years later, it seems that this increased understanding has not yet been gained. Recurring and worsening congestion problems stem in part from "the absence of thoughtful and integrated land-use planning around new interchanges and along new corridors" (Cervero, 2001a, p. 33). In this complex policy issue, transportation planners need to move away from individual projects' cost-benefit analyses. The widespread and delocalized externalities arising from highway expansions require a broader perspective on transportation and land-use planning. There is a tradeoff between local development and regional congestion, further emphasizing the need for a broader, more holistic approach. Wright suggests moving away from considering individual projects and adopting a characteristics approach: "The characteristics approach is systemic in nature and requires consideration of interrelationships and feedback effects. Projects are not seen in isolation but as part of a general strategy" (1992, 227).[8]

[8] A discussion of Kelvin Lancaster's approach of characteristics analysis provides meaningful insight into transportation modal choices, but it is beyond the scope of my research. For more information, see Wright (1992) and Lancaster, Kelvin. "A New Approach to Consumer Theory" *Journal of Political Economy* 74:132-157.

This paper has shown that there are numerous factors that should be included, yet have sometimes been undervalued, in policy decisions about highway extensions. The complex interrelations between highway extensions and land-use leave considerable ambiguity in this policymaking process. Cervero observes, "Whether new roads are on balance beneficial to society cannot be informed by studies of induced demand, but rather only through a full accounting and weighing of social costs and benefits" (2001c, p. 26). Searching for such a complete understanding of these social costs and benefits is a daunting task. Thomas Hine, the *Philadelphia Inquirer's* architecture critic, wrote only half-jokingly a month after the Blue Route's opening, "While other cultures may be able to deal with transportation as a practical matter of moving people and things from place to place efficiently, Americans seem doomed to grapple with it as an existential one. We are born free, but we are everywhere in traffic jams" (Hine 1992). While it is still unclear if we can truly pave our way out of traffic, history has shown that we can certainly pave our way into it.

Bibliography

Balaker, Ted and Sam Staley. *The Road More Traveled: Why the Congestion Crisis Matters More Than You Think, and What We Can Do About It.* Lanham, MD: Rowman & Littlefield, 2006.

Boarnet, Marlon and Saksith Chalermpong. "New Highways, House Prices, and Urban Development: A Case Study of Toll Roads in Orange County, CA." *Housing Policy Debate,* 2001, *3*, 575-605.

California Department of Transportation. "District 7 Update 2002." 2002.

Cervero, Robert and Mark Hansen. "Road Supply-Demand Relationships: Sorting Out Causal Linkages." *Institute of Transportation Studies*. UC Berkeley. October 2000.

Cervero, Robert. "Induced Demand: An Urban and Metropolitan Perspective." Prepared for U.S. Environmental Protection Agency. March 2001.

Cervero, Robert. "Transport and Land Use: Key Issues in Metropolitan Planning and Smart Growth." *Australian Planner*, 2001, *1*, 29-37.

Cervero, Robert. "Road Expansion, Urban Growth, and Induced Travel: A Path Analysis." Institute of Urban and Regional Development, UC Berkeley. July 2001.

Consalvo, Lori. "Freeway Alters how Area Lives, Works," *San Bernardino Sun*. November 23, 2006.

DeCorla-Souza, P. and H. Cohen. "Estimating Induced Travel for Evaluation of Metropolitan Highway Expansion." *Transportation*. 1999, *3*, 249-262.

Delaware Valley Regional Planning Commission. "*1985 Regional Transporation Plan*." 1969.

Downs, Anthony. *Still Stuck in Traffic.* Washington, D.C.: Brookings Institution Press, 2004.

Henson, Rich. "Chester County Bears Brunt of the Car Crunch – In the Suburbs, It's a Traffic Mess." Philadelphia Inquirer. October 6, 1997.

Hine, Thomas. "Readers' Alternate Routes of Thought." *Philadelphia Inquirer*. January 26, 1992.

Kanchi, Seshasai and David Levinson. "Road Capacity and the Allocation of Time." *Journal of Transportation and Statistics,* 2005, *1,* 25-46.

Kim, Marim and Jean-Claude Thill. "Trip Making, Induced Travel Demand, and Accessibility." *Journal of Geographical Systems*, 2005, *7*, 229-248.

Lewis, Tom. *Divided Highways: Building The Interstate Highways, Transforming American Life*. New York: Viking Penguin, 1997.

Nechyba, Thomas and Randall Walsh. "Urban Sprawl." *Journal of Economic Perspectives*, 2004, *4*, 177-200.

O'Sullivan, Arthur. *Urban Economics*. Boston, MA: McGraw-Hill Irwin, 2007.

Pierson, David and Rong-Gong Lin II. "Freeway Link a Door for Some, a Jam for Others," *Los Angeles Times*. July 23, 2007.

Pothier, Dick. "Swarthmore Sues to Stop Work on the 'Blue Route'." *Philadelphia Inquirer*. December 23, 1981.

Reyes, David and Dan Weikel. "Tollway is 'Essential,' Gov. Says," *Los Angeles Times*. January 16, 2008.

San Bernardino Associated Governments. "Measure I Freeway Projects," <http://www.sanbag.ca.gov/projects/mi_fwy_foothill.html>. August 20, 2007.

Seelye, Katharine. "The Last Land Rush: Who Gains?" *Philadelphia Inquirer*. February 20, 1986.

Shirley, Chad and Clifford Winston. *Alternate Route: Toward Efficient Urban Transportation*. Washington, D.C.: Brookings Institution Press, 1998.

Southern California Association of Governments. *2004 Regional Transportation Plan*. 2004.

St. George, Donna. "The Blue Route Developers are Betting the Payoffs Will Be Big." *Philadelphia Inquirer*. January 31, 1988.

Sullivan, Susan. "Room to Stretch Out in Rancho Cucamonga," *Los Angeles Times*. March 28, 2004.

Weber, Peter. *I 476*. 1977.

Weber, Peter. *Interstate 476: A Highway and a Community*. Middletown, CT: Wesleyan University, 1970.

Weber, Peter. Personal Correspondence, 2007-2008.

Winston, Clifford. "Efficient Transportation Infrastructure Policy." *Journal of Economic Perspectives*, 1991, *1*, 113-127.

Wright, Charles. *Fast Wheels, Slow Traffic: Urban Transport Choices*. Philadelphia: Temple University Press, 1992.