

# Induced Travel: Frequently Asked Questions

The term "Induced Travel" is highly controversial but typically misunderstood by both highway advocates and opponents. In an effort to raise the level of understanding, which will hopefully lead to more productive discussion of this issue, FHWA has prepared the following set of frequently asked questions and answers.

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## 1. What is Induced Travel?

"Induced travel" is a term that has been widely used to describe the observed increase in traffic volume that occurs soon after a new highway is opened or a previously congested highway is widened. The term often appears in the popular press, and has been used by some advocacy groups to support their argument that "we can't build our way out of traffic congestion," because any increase in highway capacity is quickly filled up with additional traffic.

## 2. Is Induced Travel real?

Economists use the term "induced travel" to describe the additional demand for travel that occurs as a result of a decrease in the generalized cost of travel, including both travel-time and out-of-pocket costs. However, this term is often misused to imply that increases in highway capacity are directly responsible for increases in traffic. In fact, the relationship between increases in highway capacity and traffic is very complex, involving various travel behavior responses, residential and business location decisions, and changes in regional population and economic growth. While some of these responses do represent new trips, much of the observed increase in traffic comes from trips that were

already being made before the increase in highway capacity, or reflect predictable traveler behavior that is accounted for in travel demand forecasts.

### **3. Where does the additional traffic on a new or widened highway facility come from?**

In metropolitan areas, highway facilities are usually built or widened where existing traffic congestion has already decreased travel speeds during certain times of the day. To avoid the congestion, some travelers may have diverted to alternative routes, changed the time they make their trips, switched to different travel modes, traveled to other destinations, or decided not to make a particular trip at all. The new or widened highway facility can carry significantly more traffic before it becomes congested. Many travelers who previously took other routes or traveled at other times may switch to the new facility to take advantage of decreased travel times. The increase in traffic on the new facility resulting from these changes is largely offset by reductions in traffic along parallel routes and at other times of the day. The net effect on region-wide daily vehicle miles of travel (VMT) resulting from these travel behavior changes is minimal.

Decreased travel times may also encourage some travelers who previously used public transit to now make the trip by automobile. Travelers might also choose to travel to a different (more distant) destination for some trips such as shopping, or they may take a trip that they previously avoided altogether, because it was simply "too much trouble" to make under congested conditions. Each of these travel decisions can result in additional daily VMT on the highway system.

The above travel behavior responses are primarily responsible for the increases in traffic that are observed shortly after a new or widened highway facility is opened. Over a longer term, increased highway capacity may improve the accessibility of one geographic area relative to other areas in the metropolitan region, making it more attractive for development. This relationship between highway capacity and land development is discussed under the question, "Do increases in highway capacity cause 'urban sprawl'?"

### **4. Is Induced Travel a bad thing?**

Induced travel can have both positive and negative consequences. Travelers who change their tripmaking behavior to use a new highway facility do so because they perceive some benefit. This benefit may be a reduction in total daily travel time or trip cost, the value associated with a new or different destination activity (e.g., shopping at a location with more variety or lower costs), or the opportunity to make a trip at a more convenient time. Many of these "users benefits" can be quantified, and are used to justify the costs of a particular highway project.

On the other hand, each user of a highway facility contributes to increased congestion on the facility. As congestion grows on the new facility, the overall user benefits attributable to potential travel time savings may decline. In addition, increased VMT due to new or longer trips can result in air pollutant emissions and noise above the levels that would

occur without the additional vehicle travel. These environmental impacts may offset some of the direct user benefits, and should also be considered in evaluating the overall costs and benefits associated with a highway project. However, neither the magnitude nor direction of any of these impacts can be generalized, and must be determined on a case-by-case basis.

### **5. Is Induced Travel only associated with highway capacity improvements?**

No. Improvements in any transportation system can lead to changes in travel behavior that will result in increased use of the system. A new bus route, rail transit line or commuter rail service is typically developed with the expressed purpose of "attracting new riders." These new riders may come from other transit routes or former auto users, or they may represent entirely new trips to locations that have become accessible by transit.

As auto trips are diverted to transit, traffic congestion on parallel highway facilities may lessen, at least temporarily. This reduction in highway traffic congestion may attract additional highway trips, similar to an increase in highway capacity.

Increased traffic on a highway can also result from operational improvements that reduce delays on the facility, such as improved signal timing or incident management.

### **6. Do increases in highway capacity cause "urban sprawl?"**

"Urban sprawl" is a term that has been widely used to describe the rapid and uncontrolled growth of urban areas onto previously undeveloped land at the urban fringe. It has a popular connotation of large tracts of agricultural lands and wildlife habitats being converted to suburban single-family housing developments. Construction of new highways and even some types of transit improvements (e.g., commuter rail services) are often cited as major contributors to urban sprawl by making land at the urban fringe more accessible and therefore more attractive for development.

The relationship between transportation improvements and land development is extremely complex, and even less well understood than its impacts on travel behavior. While improved transportation accessibility in a particular corridor may indeed make land more attractive for development, other factors such as water and sewer lines, quality of schools and other public services, undevelopable land (e.g., slope, floodplains, etc.), land acquisition and development costs, impact fees, and zoning ordinances also play major roles in shaping where development will take place, its nature, and its intensity.<sup>1</sup> Furthermore, in many cases, the new development being attracted to one part of a metropolitan region often represents development that has been redirected from other parts of the region.

### **7. Do highways impact development differently in urban versus rural areas?**

Yes. One important difference is that in urban areas, it is relatively rare for a highway project to provide new or substantially improved access to a large geographic area (e.g.,

an entire county). However, in many rural areas, a new highway may provide access to large tracts of undeveloped land. In fact, a number of projects were developed specifically for this reason. Moreover, in some of the rural cases, non-highway economic development initiatives were intentionally coordinated with the improved highway access. Typically, it takes at least half a decade for such efforts to show significant economic development. As of 2004, The FHWA is monitoring two cases, one in Wisconsin and one in New York, where a substantial highway improvement was recently completed whose purpose is to encourage economic development over a multi-county corridor. Early indications show some promise, but more monitoring and analysis is required to determine the success of the highway improvement in attracting development.<sup>2</sup>

### **8. Can transportation planning tools forecast Induced Travel?**

Travel demand forecasting tools account for some, but not all of the travel behavior that may contribute to increased traffic resulting from a new or widened highway. Current 4-step travel modeling procedures typically include mode choice and trip assignment models, which can be used to forecast those travelers who change from other travel modes or alternate routes, respectively. Trip distribution models that use highway impedances (e.g., travel time) that accurately reflect congested, peak-period conditions can also account for travelers who change their destinations in response to decreased travel times.

Current models are generally insensitive to the impacts of highway improvements on travelers who change their time of travel, or those who make entirely new trips. However, travelers who simply change their time of travel do not contribute to a net increase in regional daily VMT, and there is general agreement among transportation planning professionals that entirely new trips represent a relatively small share of the increased traffic appearing on a new or widened highway facility.<sup>3</sup>

Travel models also do not directly address the effects of changes in transportation accessibility on residential and commercial land development. The distribution of future land use is an input to travel models. Land use forecasts are often developed by consensus among various local jurisdictions within a metropolitan area, without serious consideration of the potential impacts of improved accessibility caused by specific transportation projects. Failure to account for the effects of improved transportation accessibility on land use may result in underestimation of new trips created by higher-than-forecast development growth within a specific area or corridor.

Although land use policy and development decisions are often beyond the control of transportation planning, improved forecasts of travel attributable to development growth may be obtained by revising land use forecasts based on changes in accessibility obtained from travel models, and then rerunning the travel models.

## **9. What is demand elasticity?**

Elasticity is an indicator used by economists to measure how much the consumption of a good or service changes in response to a change in some other factor, such as income, population, or the price of the good. One of the most common elasticity measures used in transportation planning is the price elasticity of demand, often called "demand elasticity." Demand elasticity is defined as the percentage change in the quantity demanded for a good, divided by the associated percentage change in the price of the good. For example, a demand elasticity value of -0.5 means that a 10 percent decrease in the price of a good will result in a 5 percent increase in demand for that good. Demand elasticity usually has a negative sign to indicate that demand increases when the price goes down.

The magnitude of demand elasticity depends heavily on the scope and time frame over which travel demand is being measured. For example, a demand elasticity measured with respect to a single facility includes trips diverted from other routes or time periods and would be much higher than demand elasticities measured over a corridor or region.

## **10. Are demand elasticities reliable measures of Induced Travel?**

A number of research studies have used demand elasticities to measure the increase in vehicle travel (usually measured as VMT) associated with a change in highway travel time or highway capacity (measured in lane-miles).<sup>4</sup> Various advocacy groups frequently cite these studies as evidence that induced travel is much greater than what is accounted for in conventional travel demand forecasts. However, extreme caution should be used when interpreting the results of these studies to make inferences about the magnitude of induced travel.

First, many of the studies that have purported to estimate induced travel using elasticities have compared changes in VMT to changes in lane-miles. By using changes in lane-miles instead of some measure of price (such as travel time), these studies overlook the importance of congestion. They imply that additional traffic would be induced by the added capacity even if there were no congestion initially on the highway facility. This conclusion is contrary to well established economic and travel behavior theory.

Second, despite the large number of empirical studies involving travel demand elasticities, there is very little agreement among researchers or transportation planning professionals on acceptable values of demand elasticities to use in estimating induced travel. Consequently, use of any single demand elasticity value to estimate induced travel is highly unreliable.

Finally, it is very difficult to measure how much of the induced travel implied by a demand elasticity is actually accounted for by travel forecasts. Clearly, some of the travel behavior changes that contribute to increased traffic are specifically addressed in travel demand models (e.g., mode and route choice), while other changes don't add new trips (e.g., time of travel). Therefore, indiscriminate application of demand elasticities can significantly over-estimate induced travel impacts.

## 11. What is FHWA's position on Induced Travel?

FHWA's position reflects the consensus of the transportation planning and travel behavior research community that induced travel is neither more nor less than the cumulative result of individual traveler choices and land development decisions made in response to an improved level of transportation service. Many, but not all, of these travel choice decisions are accounted for in current travel forecasting models or land use-transportation interaction models, and FHWA is supporting additional research and development to improve travel and land use models to address the others.

Travel forecasts represent a critical input in evaluating transportation investments, and should be based on analyses that take these travel choice decisions into account to the fullest extent possible. Where current technical limitations of analysis methods preclude accounting for some of these travel decisions, they should be identified in documentation describing the analysis. However, current technical limitations of travel models should not, in and of themselves, be sufficient cause to discredit the results of travel forecasts for planning and environmental decisions.

<sup>1</sup> Recent empirical studies conducted in Ohio and North Carolina indicate that local patterns of population growth (measured at the Census Tract level) are not highly correlated with increases in highway capacity. See Hartgen, D.T., *The Impact of Highways and Other Major Road Improvements on Urban Growth in Ohio*, The Buckeye Institute, Columbus, OH, Jan. 2003; and Hartgen, D.T., *Highways and Sprawl in North Carolina*, The John Locke Foundation, Raleigh, NC, Sept. 2003.

<sup>2</sup>The case studies are described on FHWA's Planning - Economic Development web page: <http://www.fhwa.dot.gov/planning/econdev/>

<sup>3</sup> See, for example, *Working Together to Address Induced Demand: Proceedings of a Forum*, ENO Transportation Foundation, Washington, DC, 2002, pg. 10.

<sup>4</sup> See Cervero, R., "Induced Demand: An Urban and Metropolitan Perspective," in *Working Together to Address Induced Demand: Proceedings of a Forum*, ENO Transportation Foundation, Washington, DC, 2002, Appendix C.

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