

MTI REPORT MTM 290-04

**A CASE FOR CONGESTION PRICING AND TOLL INDEXING
WITH THE PUBLIC RESPONSE**

June 2004

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a publication of the
Mineta Transportation Institute
College of Business
San Jose State University
San Jose, CA 95192-0219

Created by Congress in 1991

FOREWORD

Consider; If without notice oil reserves began running dry, urban centers would be forced literally overnight to ‘scramble’ for new transportation concepts. Once new transportation concepts and facilities were implemented, society would adjust (because there is no alternative), but interestingly there would probably be a heightened curiosity of why we waited for such a crisis to happen and why nothing was done sooner. Although this is certainly oversimplifying our dependence on single occupant vehicles and our approach to transportation and environmental impacts, there is no doubt something has to be done. Charging tolls on freeways in heavily congested urban centers is not the panacea, but has many benefits, and is increasingly being looked upon favorably by the public.

Real solutions require more than simply enhancing current transportation concepts, critical thinking must spark and enable new innovation creating concepts for doing new things as opposed to managing existing facilities.

ABSTRACT

Creating traveler choices by charging tolls for one or more lanes on freeways to modify travel behavior on heavily congested corridors is gradually becoming a serious consideration across the country. There are many obstacles towards implementation of toll lanes, including government statute conflicts, public resistance, and massive cost estimates. In spite of obstacles, through innovative financing several demonstration projects have been in use for many years. The greatest recent development has been the adaptation of electronic toll collection. This enables a wide variety of tools and possibilities for both toll collection and toll pricing. This report includes a public opinion poll to study the development and acceptance of congestion pricing using toll indexing. Toll indexing calculates the dynamically changing toll based upon type of vehicle, time of day, level of congestion, particular route, and frequency. Implications regarding energy conservation, environmental impacts, the economy, are included in the evaluation of the increasing demand by single occupant vehicles on the increasingly constrained capacity of the highway networks.

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INTRODUCTION

According to Henry Ford, “We shall solve the city problem, by leaving the city.” In retrospect, perhaps that advice was suitable for the times, but that mindset may be what triggered a long pattern of increasing demand on the private automobile (Henry Ford would be happy). Many issues confronting society today are debatable; however, escalating congestion and expanding urban sprawl are widely recognized and agreed upon as one of the biggest problems confronting industrialized nations. Once limited to a few major metropolitan urban centers, today congestion and sprawl are impacting virtually every community from business centers to recreational destinations. Average speed on freeways in Los Angeles is now below 30 MPH, and continues to decline. Urban sprawl in areas like the San Francisco Bay Area and Los Angeles are beyond the 3rd ring of sprawl and entering the 4th ring of sprawl.

Today in Los Angeles during peak congestion periods, the mode of choice for nearly every commuter is vehicle use that depends upon freeway capacity. Historically, congestion solutions were simply to build more roads, which have effectively painted transportation alternatives into a corner. As a result we are confronted with the reality that we can no longer simply build new roads (and now we must think). At the pinnacle of today’s transportation crisis is the dramatic need for transportation choices. Some believe the supply and demand elements that perpetuate choices will naturally occur due to free market adjustments, and others believe the change must occur due to control mechanisms.

The escalation in congestion is argued to occur due to the ineffective link between user fees resulting from gas taxes, and user costs due to time delay, and environmental consequences. Life is full of trade-offs, and travel options must be made available to account for differences in preferences, knowledge, and values. As a part of the transportation options being considered are toll lanes on freeways. The price elasticity’s are based upon how much travelers are willing to pay in money and time. And these costs are established by supply and demand. The fracture in the argument is the social costs and costs impacted upon other users.

The market economy is based upon pricing, and economists consider the congestion occurring on the highways an external cost. Individual motorists make a decision to drive on a particular highway at a particular time based upon costs they incur, but not on the costs they impose on others. As a result, users tend to overuse the highways. The theory behind congestion pricing and toll lanes is to effectively achieve economic efficiency by charging tolls based upon congestion that the motorist creates. This imposed cost or impact includes the resultant delay and costs to other motorists, as well as contributes to environmental consequences and natural resource depletion. This could be equated to the opposite of value adding, or value removed from a particular highway due to use and overuse.

Toll roads conjure up images of tollbooths and tokens, along with anxieties about missing exits and having to go miles before the next exit. And many have experience from the east coast of the United States where each toll road had separate toll tokens, requiring travelers to maintain an inventory of the varieties of toll road tokens. Originally toll roads were constructed as a funding alternative to taxes, utilizing a more direct pay as you go technique. However, today there is an epiphany of new thought regarding utilization of toll lanes as a congestion management tool. No

longer is the token or tollbooth an issue or problem, but this perception remains one of the public's objections regarding toll lane use.

Toll facilities comprise three basic forms, cordon pricing, corridor pricing, and lane pricing. Cordon pricing is the pricing to enter a district or region, corridor pricing is pricing to use a particular facility, and lane pricing is the pricing to use a particular lane or lanes while other lanes on the facility are not priced. There is much discussion in regard to varieties, and uses worldwide, but this report will consider only lane pricing for use typically in northern Los Angeles and Ventura Counties.

Two recent toll lane projects in southern California have experienced both increases in use, and increases in public acceptance, the I-15 in San Diego County, and State Route 91 in Orange County. This report presents brief case studies for each facility, and discusses public opinion and recent developments in electronic toll collection at these locations. One of the findings from the survey conducted as a part of this report, is the unexpected benefit to motorists using these toll facilities is the separation from trucks. The separation from truck traffic is a desirable component of toll pricing structures and is a part of elaborate studies on lane management concepts.

Tolls have evolved from flat rate fees imposed 24 hours a day, seven days a week, to complex variable toll schemes based upon time of day and level of congestion using seamless electronic toll systems that do not even slow drivers down. Tolls can be indexed into a very dynamic toll structure that calculates toll based upon time of day, level of congestion, particular route, frequency, type of vehicle, current pollution index, and other even more abstract data types. Toll payment methods can use prepaid transponder cards that permit anonymity or direct home and business billing. The public opinion survey conducted as a part of this study indicates both growing acceptances of toll lane pricing, and a willingness to consider complex toll indexing.

We live in a relatively finite world that limits our ability to produce more roads and more fossil fuels. Yet, society's appetite for consumption of these goods seems insatiable. To be successful, we must push the boundaries of traffic management, and consider future policy that considers intergenerational equity, ensuring future generations have some of the natural resources left over from our use.

CONGESTION STATISTICS

TRAFFIC

Demand for the private automobile far exceeds our ability to provide new capacity.

- According to the World Bank Organization in 1996, From 1950 to 2010 population projections will triple, but car usage will increase 21 times.
- California adds to the total automotive vehicle fleet an additional 1000 cars per day
- Congestion in 75 major U.S. urban areas costs \$68 billion per year in fuel and time losses ¹ .

When supply has increased by 5% over the last 20 years, and demand has risen by 200%, the result is significant congestion that is spreading further and further out from our urban centers. For the year 2001, The Urban Mobility Study published by the Texas Transportation Institute lists the following congestion statistics for Los Angeles:

- | | |
|--|---------------------|
| • Annual Congestion Cost | \$12.8 Billion |
| • Annual Congestion Cost Per Person | \$1,005 |
| • Annual Hours of Congestion | 667 million |
| • Annual Hours of Delay Per Person | 52 |
| • Annual Excess Fuel Consumed | 996 million gallons |
| • Annual Excess Fuel Consumed Per Person | 78 gallons |

The number 1 bottleneck today in the nation, is the Ventura Freeway (SR-101) at the San Diego Freeway (SR-405), in Los Angeles, California. A study performed by Davis, Hibbitts & McCaig in Jan. 2003, found congestion was LA's biggest problem, more so than Pollution, Schools, Water Supply, and even Housing ² .

Los Angeles traffic:

- More than 4 million cars are registered in the city of Los Angeles.
- During the average weekday, more than 23 million car trips are made in Los Angeles.
- 85 million vehicle miles are traveled on average per day in Los Angeles County.
- The average speed on Los Angeles' freeways during rush hour is 17 miles per hour.
- The Santa Monica Freeway is America's busiest thoroughfare.

Sources: Los Angeles Host Committee 2000; Los Angeles Convention and Visitors Bureau; Office of the Mayor; Congressional Quarterly's Politics in America 2000; Hollywood Chamber of Commerce.

Los Angeles Pollution:

The Los Angeles air basin is classified as non-attainment for CO, O3, and PM-10 consecutively every year from 1995 through 2001.

Source: U.S. Department of Transportation, Federal Highway Administration, Highway Statistics, 2001.

Even with new capacity projects creating new lanes where reasonably possible, average speeds in Los Angeles continue to rapidly decline. Once, Los Angeles had a tremendous transit system some argued was the best public transportation system in the world. This system used the streetcar system (Red Cars) over most of Los Angeles (then). In support of the automobile the transit system was progressively dismantled into extinction. Today Los Angeles has very limited

public transportation. There are new efforts being made with a new subway system, but costs limit this investment to a few areas. Getting around the city for both commuters and tourists requires great patience and flexibility to drive the freeways.

Toll lane charges are effectively user fees that are being discussed widely today under the term Congestion Pricing. Congestion Pricing is many things to many people, and can take a variety of forms. The general intention with applications of congestion pricing programs is to generate revenue, encourage other transportation alternatives, and peak shave the spikes in congestion occurrence. At the heart of the congestion issue lays the reality that it would be neither possible nor practical to consider building our way out of congestion³. Demand is by far outpacing any real supply potential for ever coming close to matching existing let alone proposed demand.

The FHWA instituted a congestion index referred to as the Travel Time Index (TTI). This indexes congestion caused delay in relation to a baseline index of one for the 1982. TTI measures additional time to complete a trip during a congested period against the same trip without congestion. Both recurrent delay and accident caused delay are accounted for in the TTI. The aggregate TTI increases by another 100% every 10 years.

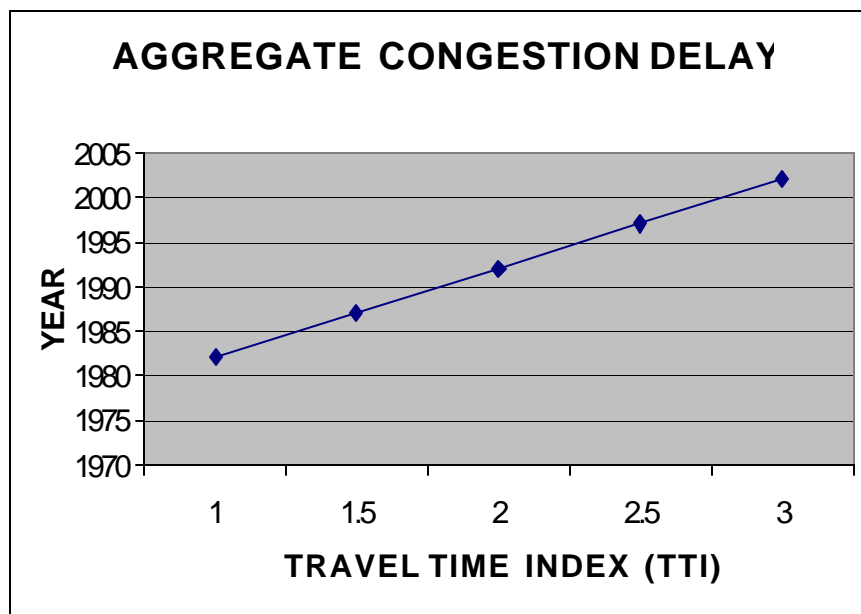


Figure 1 Aggregate Congestion Delay

When planners illustrate VMT growth or congestion increases, it is invalid to simply report in 10 years there will be a 20% increase in congestion. It should be more appropriately illustrated by saying in 10 years at current user costs there will be a 20% increase in traffic, and if user costs increase by 25% congestion will show no increase, or in 10 years if user costs show a 50% increase, there will be a 10% congestion decrease⁴.

ENVIRONMENTAL CONSEQUENCE

- The energy consumed by an average automobile in one year could power the average household's total electrical needs for over one thousand years.
- California automobiles consume over 14.4 billion gallons of fuel per year, which is approximately 40 millions gallons per day 365 days a year. For perspective, this requires a container the size of a football field, 3000 feet higher than Mt. Everest.
- A one mile per gallon fuel increase in efficiency would reduce fossil fuel demand by 70,000 gallons a day in California alone 365 days a year (on average).

The Clean Air Act and Amendments contain provisions requiring local transportation plans in the worst ozone nonattainment areas to be "in conformity with" local plans to attain air quality standards. The amendments also require problem ozone areas reduce VOC emissions by 3% per year. One approach to helping meet this demand is the use of road pricing to reduce VMT's, especially during peak periods.

In addition to supply and demand strategies for traffic management, air quality issues and regulations must be complied with. Two air standards are the federally classified non-attainment areas, and the state air quality regulations. The non-attainment areas like all of the greater Los Angeles area requires stringent air pollution strategies as a requirement for federal funding of transportation elements. The state regulations as is the case for Santa Barbara county where the county has a moderate level of one hour ozone level that are subject to tracking and meeting performance standards and reductions in the rate of vehicle miles traveled (VMT).

Strategies by SBCAG to reduce VMT's⁵:

- Trip reduction ordinance
- Work Schedule changes
- Ridesharing incentives
- Parking Management
- Telecommuting

Proposed strategies for further study:

- HOV/HOT lanes
- Vehicle use restrictions

Although Santa Barbara and Los Angeles are significantly different in almost every aspect, they both share congestion, and air pollution concerns, and both are looking at congestion pricing as a tool to help reduce peak use, VMT's, and air pollution.

Although the recognized benefit of the automobile is greater mobility and independence there are external costs created by this use. External costs include the following:

- Congestion
- Accidents
- Noise, air, visual, and water pollution
- Depletion of natural resources
- Consequential or circumstantial social behavioral separation

Do the benefits justify the external environmental costs for the aggregate? Potentially, however individually the benefits may not justify the costs for a specific use or application. It is this specific use or application that warrants the toll alternative or congestion pricing where the costs are indexed into the travel behavior. This will allow the user to evaluate options and costs for perceived benefits.

CONGESTION ECONOMICS

USER VALUES

On any given highway, all individual motorists will have a variety of needs, preferences, values, and resources. Further, these individual needs will vary from day to day, and the conditions on the highway may change at any time. Together these characteristics create a fluctuating dynamic user profile from any given moment to the next on any given highway. This user value dynamic coupled with costs creates equilibrium. This equilibrium may be controlled by adjusting costs as is proposed in this paper or allowing natural market adjustments to effect controls.

The full cost of an individuals trip down a congested highway includes the personal cost of the travelers own time, cost of the vehicle operation, and also the impacted costs to other travelers trying to use the highway at the same time. The cost to the other users for adding to the level of congestion is an external cost.

Certain motorists may have an abundance of time, others may be late for some critical function. Some motorists may dislike travel adjacent to truck traffic, while others do not care. Some motorists may have plenty of money, while others have limited resources. Decisions the average driver makes relative to times of departure, and routes, equal the travel cost which is composed of total travel time, schedule delay, and cost of toll (if any) ⁸.

Although demand on our highways is a constant, it is also a very complex issue. The variety of issues, impacts, resources, and preferences need to be provided with alternatives to the extent possible for the users to make decisions upon. The advent of toll lanes on freeways enables users to decide when the value of travel time equated against their needs and resources swayed their decision to use or not to use the toll lanes.

User values create the willingness to pay to achieve some expected outcome or benefit. When the sum of all users' willingness to pay is positive, then that moment of aggregate use could be a Pareto-improvement. It is possible that congestion pricing may provide for Pareto improvements by where users costs can benefit both the users and those impacted by the users. It may not be so much winners and losers for Pareto-efficiency, but rather a constantly changing dynamic of users and non-users. This dynamic is a function of choices, and values, mixed with needs and preferences. There may be no single identifiable group, but rather an aggregate of users made up of different individuals from day to day.

SUPPLY/DEMAND

Highway supply and demand is a critical non-linear relationship that results in total capacity breakdown at saturation levels. A highway may provide modest flow for 2000 vehicles an hour, however, when another 100 vehicles are added can suffer an 85% reduction in capacity. This backward bending curve indicates a minor reduction in demand can facilitate a substantial increase in capacity. Creating toll lanes could siphon off enough traffic from the free lanes to enable significant added capacity (at least in the short term).

Supply and demand affects the choices people make relative to their knowledge, values, and preferences. Transportation Demand Management (TDM) attempts to effect strategies that affect travel behaviors based upon options and costs. Generally, when the price of a good decreases the demand increases, and when the price increases the demand decreases. This is the “law of demand”. Transportation activities tend to follow this pattern. When time, costs, discomfort and risks decline, mobility will tend to increase. And the opposite is true; when time, costs, discomfort and risks increase, mobility tends to decrease. This price factor is considered further later in this paper under discussions on economics (elasticity).

Supply side economics and demand side economics present two different traffic management strategies. Reports covering the broad interstate issues from the federal level (FHWA), as well as local community reports addressing their ‘Main’ streets all agree it is not realistic to consider solving congestion by building new capacity (alone). That congestion problems can only be solved primarily through demand adjustment. New capacity (supply) is being pursued, but more importantly is how this new capacity will be used.

Adding one new lane each way to an existing 3 lanes each way freeway without any controls will achieve a modest and temporary congestion cure. This is due to the widely recognized fact of ‘triple convergence’⁶. Triple convergence is the latent demand that is realized from those who may have taken transit, or those who may have used alternate routes, or those who traveled at different times, who changed to use the new capacity (supply). Ultimately, simply adding supply can create more congestion than it cures, by not addressing the demand element.

ITS technologies are one approach to greater supply, based upon improved efficiency. HOV lanes are another approach. ITS applications are used to manage arterial traffic, freeways, and incidents as well as enabling more efficient commercial vehicle and transit operations⁷. ITS applications include the incorporation of toll indexing, collection, and enforcement.

Demand strategies are comprised of two fundamental beliefs. Both are dependent upon user costs, but one thought considers the costs to be natural market adjustments, and the other relies on policy control intervention in the form of user fees. The natural market adjustment is based upon user fees occurring naturally as a function of the commute and trip dynamics self imposed by the individual users.

When an individual elects to buy a home in the remote suburbs because of some personal value, that person is electing to accept the imposition of a longer commute that may have added discomfort, cost, and time as necessary to accommodate the desire for suburb living. These costs are the individual’s congestion costs. That individual is also accepting the added congestion he/she may create on the other users, as they create added congestion on him/her. The one character that is not accounted for with the Natural Market Adjustment (NMA) is the environmental consequence of his/her actions relative to their long commute. It could be argued that the individuals as an aggregate are accepting those costs, but there is neither little evidence nor direct collaboration to connect the two.

Opposite the NMA concept is the Congestion Pricing policy control, to charge users a fee for:

- The cost, operation, and maintenance of the highway
- The inherent imposition of a vehicle on a congested network
- A fee to encourage alternative routes, modes and times of travel
- A cost relative to the environmental impacts and consequences of travel

Using the aggregate natural market adjustment technique provides planners with little advantage to efficiently and effectively orchestrate supply demand equilibrium. Ultimately over time the free market will make corrections, and business, leisure, and travel will go on, but at what costs? This approach relies on significant in-fill development to accommodate those not willing to pay the indirect congestion user fee as a part of their longer commutes. However, the available in-fill has limited capacity, and the projected outcome will be greater and greater emphasis on longer and longer commutes.

In the middle, essentially combining both concepts for natural market adjustment, and policy control, is the higher gas prices that are increasingly becoming a component in vehicle purchasing decision making. Marketing studies have concluded that higher gas prices will ultimately in the short turn result in people relying on more fuel efficient vehicles. The long term aggregate behavior may have a 'bounce' effect and potentially return to normal purchasing patterns without other policy controls, especially as wages increase.

Highways are overused in large part because individual drivers do not acknowledge, let alone pay the delay time, and environmental costs they impose on others. Policy controls that institute direct user fees can provide demand adjustments. The user fees in the form of tolls for certain lanes on freeways would provide an immediate acknowledgement of congestion costs to the individual users. This clear message and information will enable users to make decisions relative to their needs and preferences for the highway use. It will also be of great benefit for there to be a clear and transparent dedicated use to the fees paid. Whether the toll fees go to mass transit or more toll lanes will increase acceptance of the policy controls on congestion.

Although there is significant interest in rail investment, revenue made available from congestion tolls would be best allocated for bus transit improvements as the capital costs per passenger mile in LA is approximately \$0.70 for rail vs. \$0.07 for bus service⁹. Additionally, bus transit would be users of any new congestion toll lane capacity, and no new guide way need be constructed.

Congestion pricing today is a crude pricing scheme as a function of the level of congestion. This is not as effective as true marginal/social costs decisions against margins of choice. Congestion Pricing is an attempt at congestion reduction, and efficient resource allocation¹⁰, particularly peak period pricing. Under the right redistribution policy those with high value of time are willing to pay for that time, which in turn provides for greater revenue and redistributes resources to provide alternatives.

Congestion Pricing is a revenue positive strategy, although there is some current consideration for revenue-neutral programs¹¹. This revenue concept is based upon earlier findings that average commuters would be worse off without redistribution policies, and that pricing without redistribution of revenues would be regressive with tolls primarily benefiting those with high

values of travel time (VoTT). The congestion pricing concept has a great deal of history and research, but the concept of toll indexing as an application that is truly efficient and equitable is premature and novel, but may be proven.

ELASTICITY

An individual's decisions regarding how to spend limited amounts of money is a trade off against knowledge, preferences and values. Attempting to define and quantify the decision process in an attempt at predicting travel behaviors uses price elasticity's for measurement. The price someone pays often understood as monetary costs, but also includes non-monetary costs such as time, reliability, discomfort and risk. Decisions based upon prices are considered marginal when the margin of price (costs) between different alternatives is within tolerable range (for that decision or activity), and would therefore be subject to minor price changes determining the alternative. For use in predicting behaviors, the aggregate behavior is due to actual margin values per person change day to day. This price sensitivity is the elasticity. For example, a price elasticity of -0.5 means for every 1% change in price, a 0.5 % change in behavior would occur. In transportation, the arc elasticity form is widely used as a more accurate multiplier of the individual 1% increments. Sometimes referred to as log elasticity, it reflects the decreasing/increasing value of changes in behavior due to price changes.

Elasticity of fuel pricing is generally argued to be very small. For example a 10% price increase reduces automobile use by only 1% (price elasticity of -0.1). And a 50% increase (huge) will generally only reduce vehicle use by 5%. This elasticity is based upon the short run implications. If a 50% price increase were perceived as permanent, the public would alter long range decisions that affect behaviors. Additionally, over time motorists would purchase more fuel efficient vehicles, and the resultant behavior change may even be negligible. Also, elasticity values are ineffective against incrementalism pricing approaches, where negligible price increases are staggered over years.

Mode shift changes due to extreme price increases on existing HOT facilities is represented by a study that indicated doubling all tolls causes a 0.66% mode shift out of SOV's, that resulted in a decrease of only 0.33% of vehicles ¹². The Orange County SR-91 have approximated point elasticity's during the 3 hour peak period in the range of -0.7 to -0.9 ¹³, equating to log arc elasticity's of -0.8 to -1.0. ¹⁴. Freeway toll lanes are intended to be a part of an overall traffic management strategy. The following charts adopted from a study by Harvey and Deakin in 1998, reveal independently, reductions in SOV use. But there is no study that concludes what behavior changes might be attained if implemented together.

Table 1 Impacts of Fuel Tax Increase, Year 2010

California	Tax Increase	VMT	Trips	Delay	Fuel
	\$0.50	-3.95%	-3.58%	-8.25%	-9.13%
	\$2.00	-12.60%	-12.13%	-24.75%	-31.28%

Table 2 Impacts of 2¢ Per Mile Fee, Year 2010

California	VMT	Trips	Delay	Fuel
	-4.20%	-3.98%	-8.88%	-4.48%

Table 3 Impacts of Emission Charges, in Year 2010

California	Fee Basis	VMT	Trips	Delay	Fuel
	Vehicle Model	-2.45%	-2.18%	-4.25%	-3.98%
	Vehicle Use	-1.98%	-1.78%	-4.25%	-7.08%

(Tables 1,2, &3 Harvey and Deakin, 1998, Tables B.8,9,10)

Table 4 Percent Vehicle Trips Reduced by Daily Transit Subsidy

Worksite Setting	\$0.50	\$1	\$2	\$4
Regional CBD/Corridor, rideshare oriented	2.2	4.7	10.9	28.3
Regional CBD/Corridor, mode neutral	6.2	12.9	26.9	54.3
Regional CBD/Corridor, transit oriented	9.1	18.1	35.5	64.0

(Comsis Corporation, 1993)

Table 5 Vehicle Travel Reduction of VMT Fee by Income Quintile (Percent)

VMT Fee	Q1	Q2	Q3	Q4	Q5	Overall	2001
1¢	-7.0	-4.2	-2.6	-1.5	-0.5	-2.3	-1.8%
2¢	-13.3	-8.2	-5.1	-3.1	-1.0	-4.5	-3.5%
3¢	-19.1	-12.0	-7.5	-4.6	-1.6	-6.6	-5.1%
4¢	-24.3	-15.6	-10.0	-6.2	-2.2	-8.7	-6.7%
5¢	-29.1	-19.1	-12.4	-7.7	-2.8	-10.7	-8.2%
6¢	-33.5	-22.4	-14.7	-9.3	-3.5	-12.6	-9.7%
7¢	-37.4	-25.6	-17.0	-10.8	-4.1	-14.5	-11.2%
8¢	-41.0	-28.7	-19.2	-12.4	-4.8	-16.3	-12.5%
9¢	-44.2	-31.5	-21.4	-13.9	-5.5	-18.0	-13.8%
10¢	-47.2	-34.3	-23.5	-15.4	-6.3	-19.7	-15.2%

A quintile is one-fifth of the population. Values are based on 1991 dollars, except the last column, labeled 2001, which indicates travel reductions taking into account 30% inflation between 1991 and 2001. (USEPA, 1998, Table B21.)

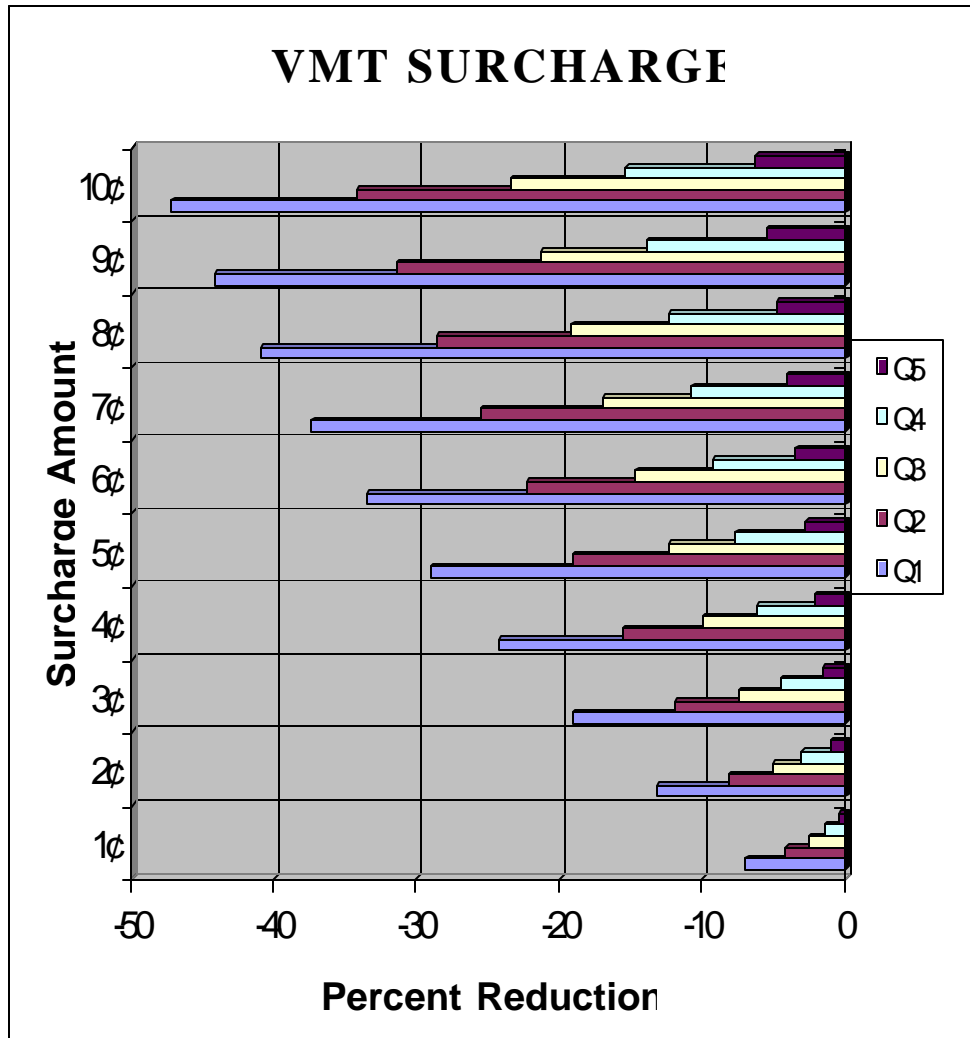


Figure 2. VMT Surcharge Elasticity

Through a combination of gas tax increases, VMT surcharges, emission charges and transit subsidies, significant reductions in SOV would be achieved. The issue is how to do this efficiently, effectively and equitably. Indexing freeway toll fees can incorporate all the features associated with each impacted element discussed above, while offering users options and alternatives necessary to maximize operational characters and minimize environmental resources and consequences.

CONGESTION PRICING PRACTICE

STRATEGIES AND APPLICATIONS

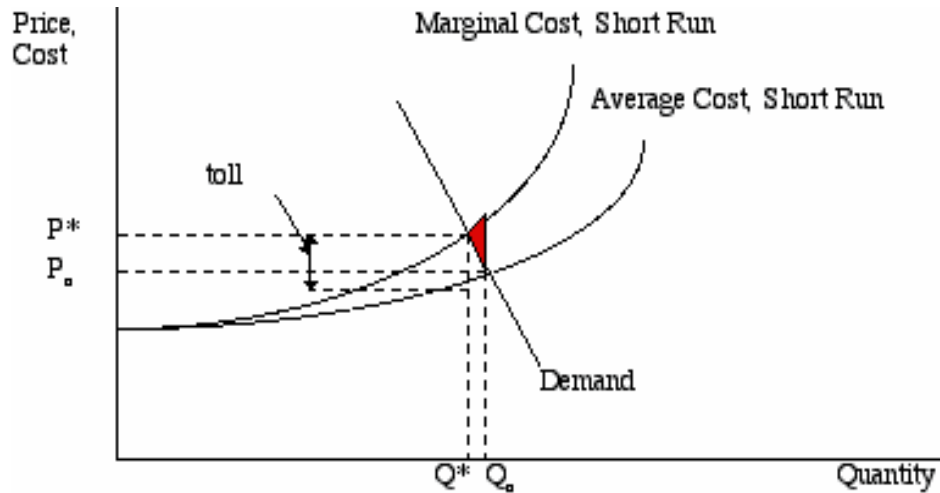
Considering any generic system of highways, optimal efficiency is attained when the network is occupied by total daily demand distributed evenly across the available 24 hour period. This is not practical due to varying user needs and values discussed earlier. To enable to the extent possible, efficiency equilibrium, price schemes would encourage efficiency equilibrium. Variable price schemes provide for adjusting user behavior patterns.

Toll Lanes (HOT Lanes) provide greater traveler choices and a range of potential benefits:


- Value of Time (VoT)
- Value of Reliability (VoR)
- Value of Comfort (VoC)
- Revenue generation
- Transit improvement funding
- Mobility options
- Reduce environmental impacts
- Reduce vehicle hours traveled (VHT)
- Traveler equilibrium
- Improved managed lanes options
- Interest in Smart Growth

David Levinson provides a narrative and illustrative explanation of congestion pricing in his paper; “Congestion Pricing: A Graphical Approach.”¹⁵ this is incorporated in this paper below.

“On the y-axis is a measure of generalized cost (e.g. price plus monetized time), on the x-axis is flow in vehicles per hour. In the absence of any toll, equilibrium occurs at (Q_o, P_o) , where demand intersects the short run average cost curve. Any traveler who values a trip more than P_o will travel, anyone who doesn't won't travel. The shaded (red) area on the graph is considered the welfare loss, the benefit which is lost when tolls are not imposed. The loss is due to the difference between the cost a driver imposes on society (the short run marginal cost) by making everyone else's trip take a little bit longer, and the cost that driver bears personally which is spent in traffic congestion due to all the other cars on the road (short run average cost). The imposition of a marginal cost toll moves the equilibrium to (Q^, P^*) and eliminates the welfare loss due to the congestion externality.”*



Legend:

P^* = Optimal Price with Tolls Q^* = Amount of Travel with Tolls
 P_0 = Price without tolls Q_0 = Amount of Travel without Tolls
 Welfare Loss without Tolls

(Source: David Levinson, Congestion Pricing: A Graphical Explanation)
 Figure 3. Traditional Price/Mobility Margins¹⁵

From the earlier elasticity discussion (Table 4), it was revealed that with a \$2.00 subsidy, transit use could be expected to increase by nearly 30%. Yet an interesting component of individual decisions relative to mass transit is that cost is less of a concern for mass transit than comfort, reliability, density of routes, and frequency. This concludes that mass transit users would be willing to pay more for better mass transit service that is perceived as a prerequisite to frequent use, yet the elasticity implies subsidies are a big issue. It may be that with existing service, users would only use mass transit with large subsidies, but users also have indicated if service was improved the subsidies are not a prerequisite to use. Considering this, the dedicated funding from toll lanes improving service could cause significant ridership increases. With mass transit, individuals are willing to pay more, which has many similarities with Congestion Pricing¹⁶.

Transportation choices or alternatives are a function of an individual’s value of time (VoT), value of reliability (VoR) and value of comfort (VoC) against price. Income groups and character of trip will affect the marginalized cost relative to VoT, VoR and VoC.

Expand mobility options by providing alternatives for reliable travel times by paying a premium. Also generates a new revenue source for added capacity and transit purposes.
 HOT lane strategies incorporate occupancy requirements and pricing systems to restrict use.

Fast and Intertwined Regular (FAIR) lanes¹⁷ is a variation on congestion pricing where reducing the size of money transfers may enable a Pareto-improving solution. Nakamura and Kockelman applied this idea to the San Francisco/Oakland Bay Bridge.

The FAIR toll facility model (DeCorla-Souza), argues for tolling the entire freeway, with revenues used to subsidize enhanced mass transit, and subsidies for low-income users. The argument here is the added benefit of tolling all lanes, with extra costs for large park and ride lots, against the cost for separate connectors for HOT lanes.

HOV+2 continues toll free in an effort at providing incentives to car pool. The success of the I-15 toll facility has prompted plans for expansion to a 20 mile managed lane facility. Revenue from tolls has subsidized the Breeze Bus service, which causes greater public acceptance of the toll facility, but little mode switch to bus service. Peak period users save 12-22 minutes per trip¹⁸. I-495 (Capital Beltway) Washington D.C. HOT lane study indicated this corridor has 250,000 vehicles/day. Improving the highway by adding one new lane and converting one existing lane to toll lane use (each way) is predicted to improve level of service from F to D. This would reduce Carbon Monoxide by 63%, Carbon Dioxide by 81 %, reduce delay by 80%, and is also estimated to save 24 lives and 3000 injuries¹⁹.

Toll lanes are often referred to as “Lexus Lanes” for the obvious reason they are perceived to be afforded by the higher income brackets. And as such there is interest in redistribution of revenues for equity purposes. However some argue that there is no subsidy to lower income groups for Amtrak, airline tickets, the U.S Postal Service, so why the inherent (Pareto-improving) need for equity on toll lanes?

Managed lanes provide an expanded traffic management system that incorporates HOV, HOT, Bus Lane, and Truck only lanes. Although this concept is gaining significant interest, and could be very effective at increasing capacity by better managing facilities, new transportation operations centers are not considering or providing for this feature at any new facilities. The FHWA held a two day workshop in November of 2003 to evaluate research and activities to advance this component of improving system performance.

There has been wide spread hopes for significant transit use increases across the country. And Federal Transit Administration (FTA) is trying to implement strategies to achieve a 2% gain in ridership²⁰.

The FHWA funded a task force called REACH (Reduce Emissions and Congestion on Highways) that concluded imposing a \$0.10/mile fee for road use, plus a \$0.016/mile fee for emissions would on an average highway increase speeds by 24%, increase HOV use by 18%, and increase transit use by 10%²¹.

Variable pricing is used to moderate demand, much in the same manner as other goods and services in the private industry (e.g. air travel, telephones, early bird dining). The use will encourage off peak use, combining with others for multi-occupancy trips, or use of alternate modes.

CURRENT USE AND CASE STUDIES

Congestion Pricing is currently being used and evaluated at the following locations ²²:

- Singapore; Began in 1978, now fully electronic, reduced volumes by 25,000 at peak periods.
- Melbourne; Citi-link toll significantly reduced traffic.
- Trondheim; Toll pricing reduces rush hour traffic by 10%, public opposition initially 72% down to 48% two months after operations began.
- Toronto; Toll highway relieves congestion, speeds double of similar routes during peak periods.
- London; Cordon pricing scheme exceeding expectations.
- Stockholm; A 13 month trial period beginning June, 2005 motorists will pay a variable toll between \$1.30 and \$2.60 to get into the city.
- Tel Aviv; Beginning formal study to implement congestion pricing for Fast Lanes

Political and public unpopularity is largely due to resistance to pay tolls for something that was once free, and the underlying lack of alternatives. When a clear redistribution of revenue received is clear, political and public resistance is minimized ²³. The public needs to see what they are getting for their money (tolls). Nakamura and Kockelman wrote “Congestion Pricing and Roadspace Rationing: An Application to the San Francisco Bay Bridge Corridor (July, 2000), that presented a toll pricing scheme to provide rationing of free toll use. This was thought to be Pareto-Improving because there would be no need for revenue redistribution. And the public was more willing to accept the plan if it appeared to benefit everyone ²⁴.

Demonstration and implementation of congestion pricing schemes is increasing around the world. Although there is always a mix of support and opposition, generally the results are favorable, and over the course of time, public acceptance and use seems to increase as shown in the two demonstration studies below.

Southern California I-15/SR91

SR91 Express Lanes in Orange County California, provides two lanes in each direction for approximately 10 miles. Access points are only provided at each end. This \$134 million facility was unique considering the funding was provided by a private partnership beginning in 1995. The express lanes offer three types of user fees for infrequent, occasional, and frequent users. Monthly toll minimums, and toll discounts are applied separately to each plan. In 1998 the free provision for HOV (3+) was changed to a 50% discount, and zero emission vehicles were included in the 50% discount user fee. Tolls vary upon time of day. Tolls are solely time based and with only one entry/exit for the full 10 mile length, all tolls are the same for a given time of entry. Tolls vary from \$1.00 to \$4.75 with the highest being for eastbound PM trips. Toll is collected via transponder electronic monitoring and either pre-pay or direct billing. AS of 1999, about 124,000 transponders were issued ²⁵, only 25,000 to 35,000 vehicles use the toll lanes each day. The toll lane usage is approximately 12% of the SR91 corridor. The HOT lanes provide 1/3 of total lanes, yet carry only 14% during off-peak, but during peak the HOT lanes carry 33% of volumes ²⁶. The 1999 income distribution for the 91 Express lane users were as follows; 19% users incomes under \$40,000, 23% incomes between \$40,000 and \$60,000, 37% incomes between \$60,000 and \$100,000, and 21% over \$100,000 ²⁷.

San Diego I-15

This I-15 is an 8 mile HOT lane segment that began as HOV only lanes in 1988. The HOV lanes were underutilized, and converted to HOT lanes in December 1996. In 1998 variable pricing replaced the flat toll. The HOT lanes had the following use frequencies:

- 1-5 times per month 53%
- 6-10 times per month 18%
- 11-15 times per month 11%
- 16-40 times per month 19%

The frequency of use suggests user's criteria changes from day to day.

The medium value of travel time for the I-15 HOT lane users is \$30/hour with the upper quartile being \$43/hour and the lower Quartile being \$23/hour ²⁸. For the 8 mile segment, travel time savings could vary between 5 and 30 minutes, which complement the variable toll pricing scheme. The variable toll pricing is based upon level of congestion, and can range from \$0.50 to \$8.00, and rates are adjusted every six minutes. Although many SOV's use the HOT lane facility frequently and pay these tolls as appropriate, it is important to note that HOV volumes are nearly three times SOV use. This suggests greater interest in decision making for trip times and routes as well as interest in car pooling.

From the Caltrans website for May 14, 2004 at 4:30 PM the speeds on the free lanes was below 30 MPH and the toll lanes were above 50 MPH, and at 5:30 PM the speeds were nearly equal. There has been some argument that at peak toll conditions when tolls are the highest, the toll lanes are the least valuable because at the convergence point, traffic is backed up for both alternatives reducing the potential benefit for the higher toll. But as shown from the single observation, that was not the case at 4:30 PM on that date. There is a potential for toll lanes to develop significant queues at convergence points, but this issue could be resolved with improvements to the lengths and convergence strategies.

Surveys used to evaluate acceptance and use for the I-15 lanes reveals strong support with over 70% of respondents indicating the HOT lanes were both fair to non-users and users. Additionally, there is strong support for the policies and consideration for HOT lane extensions.

CONGESTION PRICING TOLL INDEXING STRATEGY

FUNDEMENTALS

Toll indexing uses a taxonomy pricing scheme to capture the inherent coupling of relationships between all the external costs, as well as user benefits. External costs include:

- Direct hard costs of the vehicle operation
- Direct hard costs of roadway construction, operation, and maintenance
- Direct soft costs of natural resource consumption
- Indirect hard costs of delay
- Indirect soft costs congestion impacts on other users

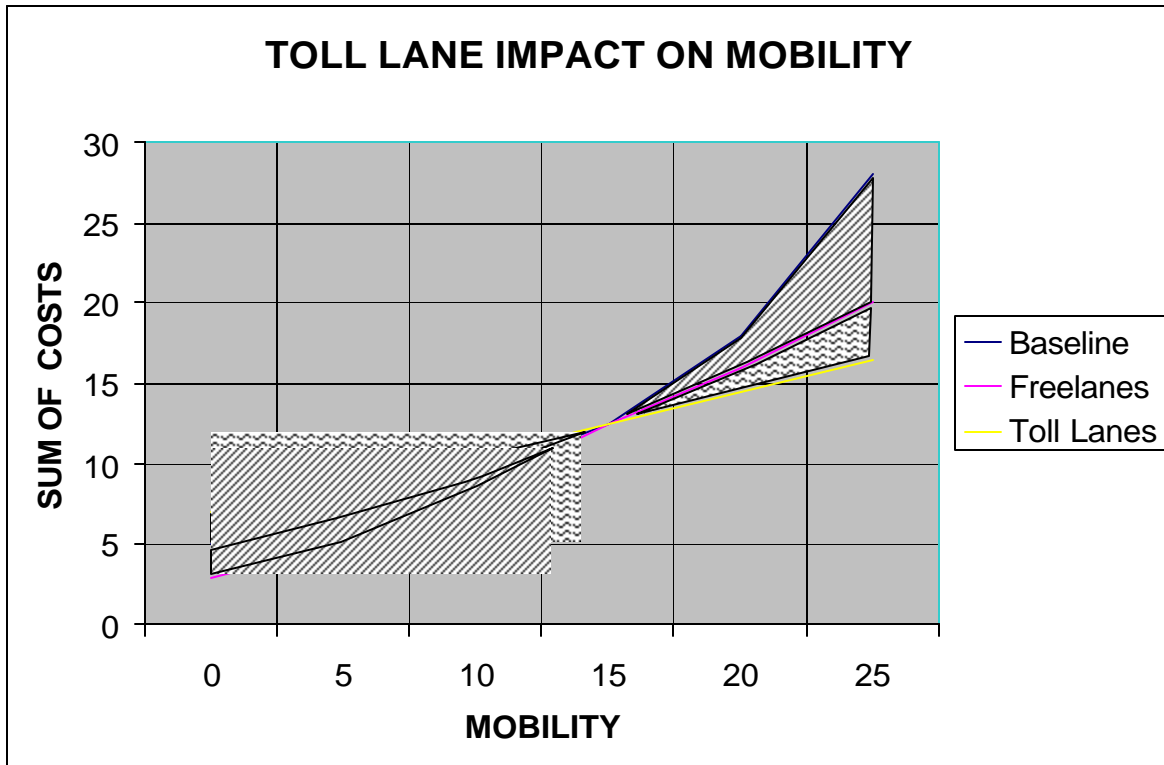


Figure 4. Toll Lane Impact on Mobility

In Figure 4 (above):

- Baseline represents the existing highway without toll lanes
- Freelaners represent the free lanes portion after installing toll lanes
- Toll lanes are the new added toll lanes

This figure illustrates that when those users shift from free to fee lanes, they are reducing demand on the free lanes and is so doing creating greater mobility for the free lane users. This applies to both non-congested periods as well as congested periods. Certainly for the free lane users, their sum of costs may be higher as mobility increases, but these costs include discomfort, time, and reliability costs as well as indirect costs to natural resource depletion and environmental consequences. It should be noted that without the toll lanes, the aggregate costs are substantially greater than with the toll lanes.

The enormous cost of mobility and resultant congestion is largely due to the lack of efficient choices by individual drivers. Toll lanes and toll indexing are not a singular solution to society's mobility needs, but must be evaluated as one of many solutions working separately. The toll indexing technique is more effective at providing alternatives, to provide choices, based upon individual driver's decision making criteria that are comprised of values, preferences, and resources. Consider the following list of toll index components:

- Time of day
- Level of congestion in free lanes
- Level of congestion in toll lanes
- Frequency of use
- Vehicle MPG rating
- Vehicle emission rating
- Air quality level

Although many other arguments will surface against every item in this list, so can arguments be made for every conceivable mobility issue. If transportation investments and improvements were dependent upon exhaustive analysis where any chink in the armor would cause prospective plans to be dismissed, we would be crossing the country on foot. However, there are two fundamental arguments opposing toll and toll indexing.

Toll lanes are a form of policy control to manage lane use, and using tolls to predict and manage drivers' behavior jeopardizes the natural market adjustment. But it is the natural market adjustment that has effectively painted transportation into the corner. One argument against charging for emission or fuel consumption as a part of the toll index is ineffective because whether a compact or 4WD, the impact in congestion is the same. And if the charge is for energy use, then the charge should be for routine as well as commute use. However, a highly consumptive 4WD stuck in traffic will not only generate multiple emissions from the adjacent compact, but other drivers nearby are subjected to directly breathing the emissions from the 4WD. This is not to say that there could or should be other taxes or fees associated with routine use of the 4WD.

Although individual behavior cannot be predicted, aggregate behavior can, but alternatives based upon aggregate behavior are not as helpful, where price schemes are considered. Attempting to set equilibrium between level of congestion and pricing is dependent upon a variable pricing scheme. Congestion pricing is an evolving concept, and the use of toll indexing to achieve pareto-improving efficiency will enhance capacity on our highways.

As Einstein has been reported to have quoted, "Today's problems cannot be solved by the same thinking that created them", travel options and mobility choices need to be enhanced and developed. Toll lanes are increasing in practice around the world. Toll indexing brings this concept to a new concept that I would like to label in its own right, 'Multidisciplinary Design Optimization or MDO. Because this is what toll indexing seeks to accomplish is the design optimization through multidisciplinary consideration.

TECNHICAL ISSUES

Toll indexing (Multidisciplinary Design Optimization or MDO) that considers such a great variety of components in the dynamic structure of the toll is only recently possible through the use of advanced electronics. Tolls would need to be clearly displayed at several locations well in advance of entering the toll area. With a minimal of expense, during vehicle manufacture, there could or should be a transponder built into the vehicle that would only need to transmit the vehicle VIN number. Each vehicle would have an onboard screen to display the upcoming toll. Certainly factory and aftermarket VIN transponder equipment will be far less than costs associated with vehicle detection, cameras, and violation equipment.

There are distinct privacy issues that also could be provided for with prepaid cards to be inserted into an in-dash slot. This is similar to prepaid phones that provide for a certain amount of privacy. Again, privacy and payment options are a purely technical issue that should not confuse the viability of MDO policy using toll indexing.

It is unfortunate that many of the technical requirements of toll pricing and toll indexing are not being incorporated into current traffic management control centers. For instance, in Los Angeles, at what is reported to be the state of the art brand new Transportation Management Center (TMC), there is no consideration for the equipment or the technology that will be necessary to accommodate toll lanes. It is difficult to predict the technological needs of the future, but it is not difficult to know it is not if, but when they are coming. In the brand new TMC to be officially opened in 2005, there is virtually no room or any critical thinking to connect toll lane needs on the horizon into the TMC business plan.

Many cities have been resistant to congestion pricing because of lack of political acceptance. Critical political resistance has been due to; the publics opposition to any new taxes or fees, economic equity concerns, and lack of regional alternatives. However, where implemented, there is growing acceptance and statistics indicating congestion pricing is successful. In San Francisco there was an increase in public acceptance for a proposed congestion lane over the Oakland/San Francisco Bay Bridge when it was proposed to offer to all users a ration of free use. This provided all users a base amount of free trips every period that could be used or lost depending upon user needs. The free rations were not transferable. This concept of allocating some form of free trips or etokens could be applied to the toll lanes using toll indexing.

Ultimately the future of mobility will be based upon MDO, and toll indexing is one form of MDO. Together toll indexing can work to create the necessary options and choices that incorporate all the costs against all the benefits. The use of technology can facilitate the needed communication and information transfer efficiently and effectively, as well as enable toll collection issues seamless.



Figure 5. Public Opinion Survey Location Map

LOCATIONS

Locations were selected to cover the State Route 101 corridor and were intended to solicit responses from a variety of potential users. Projected respondents included upscale businessmen/women, contractors, and stay at home parents. Surveys were taken at the following seven locations, plus by telephone:

- 1) Santa Barbara, random sidewalk and coffee house surveys
- 2) Ventura, Lowes Home Improvement Store
- 3) Ventura, Local coffee house
- 4) Westlake Village, coffee house
- 5) Agora Hills, Random Strip Mall
- 6) Studio City, Coffee House
- 7) Los Angeles, Financial Center sidewalk random survey.

Also, where a particular respondent either offered further information, or was willing when asked, I completed informal interviews.

DESCRIPTION

This survey was developed to enable potential respondents to answer as many or all as their particular time or feelings so dictated. Although most respondents were able to complete the survey, some only checked a few items. The survey questions were structured to correlate from one question another, but subsequent questions were not dependent upon previous questions. Although the survey was intended to be fully self descriptive, and not requiring any help to complete, many individuals were either compelled to ask specific questions, or request additional

information. The survey consisted of 13 questions and was totally anonymous. The survey is attached at appendix A

OBSERVATIONS

Setting out for my first public interaction, I was confident that seeking public opinion regarding freeway congestion and potential toll lanes on freeways would be easy. This assumption was immediately proven in error. The dynamics of soliciting public opinion did present some interesting findings in its own.

Generally the public at large was not interested, with one exception. Westlake Village; where I specifically targeted the relatively affluent business person, was very successful. Generally, everyone was not only willing, but interested in providing input. I may draw a crude parallel that although not a part of this survey, but apparent was that most everyone appeared well educated, and routinely read the morning papers. Often respondents would flag others to join in the discussion. We were often sitting down together, going into great detail on my toll indexing theory, as well as receiving an abundant amount of feedback on the respondents experiences (sometimes worldwide). Compare this to my time in front of the Target store in Ventura, where I did not and could not get a single survey filled out.

At Lowes Home Improvement Store, getting responses was also difficult, with a running hit/miss list that produced about a 15% success ratio. That means simply that 10% to 15% of the people are providing public opinion and feedback that is used to generate public acceptance for everyone. This could be further argued that 85% to 90% of the public do not care, or feel they have no control and they are prepared to just deal with it. Even official voting results often have less than 50% of registered voters turning out. I must wonder if it is reasonable to allow the plurality of the majority to rule, when that plurality is perhaps 10%. And further with a simple survey, decisions may not reflect knowledge of the subject. To get effective survey question answers, it would take a lengthy preface of data and information that must be read and assimilated prior to being given the survey form to fill out.

In general from the plurality it appears the public approves not only toll lanes for freeways, but also indexing against the MPG rating as well. And that many of the respondents have heard or direct favorable experience with either the SR91 or I-15 toll lanes in California. Especially in West Lake Village, there was overwhelming support for both toll lanes and indexing, with surprising support for using revenues to support mass transit.

When comparing the results of this paper and this survey to the report issued regarding the I-495 Toll HOT lane facility in Washington D.C., with a projected 80,000 vehicles a day increase in demand by 2020, there appears to be strong a correlation. Four Daniel has submitted a proposal for a Public-Private Partnership on this Toll HOT lane facility, where an independent public opinion survey of 600 citizens indicated 62% favor the project (ROADS & BRIDGES, April 2004). The 62% in favor of the Washington D.C. project closely mirrors the results of this survey and paper. The Washington D.C. project does not include toll indexing as discussed in this paper, but if the public were approached, there would probably be equal support as evidenced here.

Survey Results (see 11)

#	QUESTION	ABSOLUTELY VERY MUCH SOME	NEUTRAL	LITTLE RARELY NOT AT ALL
1	Is congestion on the highways a problem for you?	82%	1%	17%
2	Can Gov. build enough new highways to solve congestion?	20%	10%	70%
3	Should highway capacity/congestion be used to restrict real estate development and growth?	53%	17%	29%
4	Of every dollar, about \$.80 goes to roads and \$.20 goes to mass transit, would you support more money for mass transit?	64%	9%	27%
5	Would toll charges encourage less automobile use?	41%	14%	45%
6	Would increasing gas taxes encourage less automobile use?	36%	10%	55%
7	Would you support toll lanes?	53%	4%	43%
8	Would you support adjustable/varying tolls based upon level of congestion?	57%	12%	31%
9	Would you support adjustable/varying tolls based upon time of day?	58%	11%	30%
10	Would you support adjustable/varying tolls based upon a vehicles gas use? (compact cars would pay less than 4WD)	58%	8%	33%
11	Would you support toll lanes only on new construction?	36%	15%	49%
12	Would you support converting existing lanes to toll lanes?	53%	7%	39%
13	If you are familiar with toll lanes on route 91 in Orange Co. and route 15 in San Diego Co., do you think they are successful?	51%	22%	27%

Table 6. Survey Results (See appendix B for all survey charts)

Significant results related to congestion in general indicated the following:

- Congestion is by far a major problem for most people (82%)
- Government cannot build our way out of congestion (70%)
- More funding should go to mass transit (64%)

In relation to toll lanes there is significant support for every category except limiting toll lanes to new construction only, where this received only 36% support. And incorporating the use of adjustable/varying toll pricing received strong support for every category, even for adjusting toll pricing based upon the vehicles fuel use rating. Demographically, the Santa Barbara regions distinctly responded with the greatest opposition to toll lane development and toll indexing in general. While those who it is speculated drive into Los Angeles on a regular basis favor toll lanes and toll indexing by a wide margin.

It was interesting to see the familiarity for toll lanes in use on SR91 and I-15, and the nearly 2:1 support considering their use successful. From interviews on this question, many who were familiar with the existing toll lanes preferred to use them in large part because of the truck separation. This factor reinforces the benefit of choices to satisfy the needs of individual drivers.

Further, from interviews it was noticed that those in opposition were significantly more emotional and determined in their opposition. The general argument from the opposition was that they have already paid for the highways and they are not going to pay again. Even when presented with the proposal that any newly constructed toll lanes would be financed exclusively through toll receipts, the opposition was entrenched in belief that tolls are double taxing, when users pay at the pumps for highways, why should they have to pay again as users. There was little argument speculating the benefit of toll lanes would be for the wealthy only. However, one respondent let me know he would use the toll lanes if they kept the 'riff rat' out. This benefit is not quantifiable but does reinforce the myriad of preferences and benefits considered by the individual users.

CONCLUSIONS

The most remarkable characteristic was the empirical discovery that nearly 85% of the public does not care to take the time to participate in a public opinion poll about solutions to highway congestion. This apathy is reinforced by the underwhelming response from registered voters during elections. However, of the 15% that chose to take the time (one to three minutes) to complete the public opinion survey, there appears to be a clear and decisive shift to public acceptance of toll lanes on freeways, and further significant support for toll indexing based upon commute variables. The public by a large margin understands the impossibilities of building our way out of congestion, supports more money for mass transit, and is willing to pay direct user fees for alternatives.

Often respondents were initially opposed to tolls from dissatisfaction for tollbooths, but when informed of the seamless transition was in favor of tolls. This condition may also have predicated others who marked opposition to tolls on their survey forms. When discussing the use of transponders to transmit vehicle Identification, informally I discussed privacy issues, and privacy issues did notably not bother respondents. Even when confronted with the potential for automobile manufacturers incorporating transponders that could transmit vehicle VIN numbers, respondents rarely seemed strongly opposed to the concept.

The survey results offer the following significant statistics:

- Over 8 out of 10 people found congestion a real problem
- Nearly 8 out of 10 conclude Gov. cannot build our way out of congestion
- Toll charges will have a greater chance of reducing VMT than higher gas taxes
- Nearly double the respondents favored toll indexing as opposing it
- Double the respondents thought existing toll lanes on SR91 and I-15 were successful
- Strong consideration for conversion of existing lanes to toll lanes was surprising
- Double the respondents favored greater allocations for mass transit

The author could not find any recent surveys within the past year or so. Word of mouth and personal use regarding the existing toll facilities in Orange County (SR91) and San Diego County (I-15) has significantly affected the public's response, at least in this survey. It appears there is a trend of greater public acceptance for toll lanes. This survey information would indicate the public is gaining a better understanding of toll lane use. And support for toll lane use is rising significantly over the 50% mark, and will likely increase even further with greater public awareness of the technology, and the intentions to enhance alternatives for the users discretion.

The results may have been biased with those in support of tolls being more likely to respond to the survey, but this is noted only for speculative purposes. The survey was conducted at a table set up with a banner advertising public opinion on congestion and toll lanes. The public opinion survey was presented in an unbiased manner. It could even be argued that those in opposition could have been more interested in voicing their opinions.

From many discussions with the respondents, the overriding issue often repeated was that as commuters, they have no real alternatives. This would have been a good question for the survey, and is noted here only to reinforce the general conclusion that the users do need more choices, and greater information to enable efficient use of transportation alternatives.

From these survey results it appears there is support for the inclusion of a toll lane as a part of SR101 from the City of San Buenaventura to downtown Los Angeles. It would be of great interest to develop concept plans for this alternative, and then repeat this survey with a specific proposal that outlines benefits and costs in detail. It appears this would receive support for both the creation of new lanes as well as conversion of existing lanes to be used for variable toll pricing use.

FINAL REMARKS

In closing, this analysis concludes that (corridor) transportation demand significantly exceeds supply, and this deficiency will grow dramatically. This growing deficiency leads to fewer traveler alternatives/choices. Incorporating toll lanes will advance interest in new choices regarding mode choice, route choice, and time of day travel choice.

Fundamentally, there is no silver bullet to solve congestion and the inherent costs it creates on the individual users as well as society as an aggregate. The one underlying absolute is that the dependence on single occupant vehicles for mobility cannot succeed. And this pursuit has effectively painted our transportation infrastructure into the corner. There is no easy way out and no proposal that is without flaw. It is only through incorporation of a myriad of solutions that together can reverse the exponentially increasing levels of congestion and congestion costs.

Toll lanes on freeways were once viewed as political poison for anyone who dared to propose it. Now through several successful demonstration projects, this concept is gradually receiving greater support and interest. This interest is evolving in an effort to capture what the mobility costs really are, and equate those costs to the users in an efficient and effective manner. Utilizing toll lanes with toll indexing will begin a new chapter in offering users greater choices. CONGESTION PRICING with a TOLL INDEXING policy should be created with the ultimate ambition of efficient highway use, accounting for the true costs of use.

Lee Iacocca the Chairman of Chrysler has said, “the good engineer is the one that will make a decision”. Lee Iacocca was referring to many engineers who wanted to study new ideas seemingly forever, but that did no one any good. To this end, toll lane technology has proven significant merit, and toll index pricing is the only complete pricing scheme that incorporates all the costs, and we have the technology to implement this program. As I tell my daughter’s, look for ways to say yes, instead of looking for excuses to say no. Toll lanes are effective, and toll indexing is appropriate, let’s see next how we can make this happen efficiently, for society depends upon it.

APPENDIX A

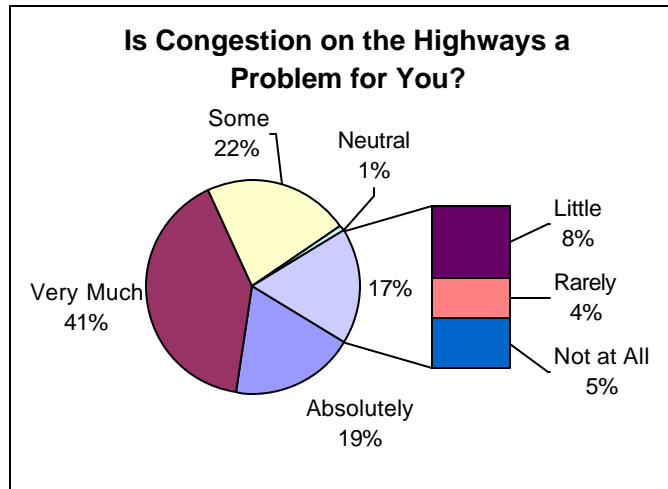
TRANSPORTATION CONGESTION RESEARCH

LOS ANGELES AND VENTURA COUNTIES

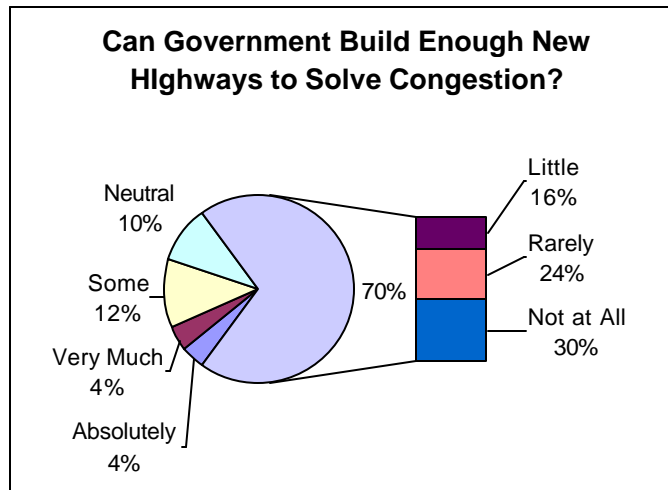
TOLL ROADS/LANES

<u>QUESTION</u>	Absolutely	Very Much	Some	Neutral	Little	Rarely	Not at all
Is Congestion on the highways a problem for you?							
Can gov. build enough new highways to solve congestion?							
Should highway capacity/congestion be used to restrict real estate development and growth?							
Of every dollar, about \$.80 goes to roads and \$.20 goes to mass transit, would you support more money for mass transit?							
Would toll charges encourage less automobile use?							
Would increasing gas taxes encourage less automobile use?							
Would you support lane tolls on freeways?							
Would you support adjustable/varying tolls based upon level of congestion?							
Would you support adjustable/varying tolls based upon time of day?							
Would you support adjustable/varying tolls based upon a vehicles gas use? (compact cars pay less than 4 wheel drives)							
Would you support toll lanes only on new construction?							
Would you support converting existing lanes to toll lanes?							
If you are familiar with toll lanes on routes 91 in Orange County and route 15 in San Diego County, do you think they are successful?							

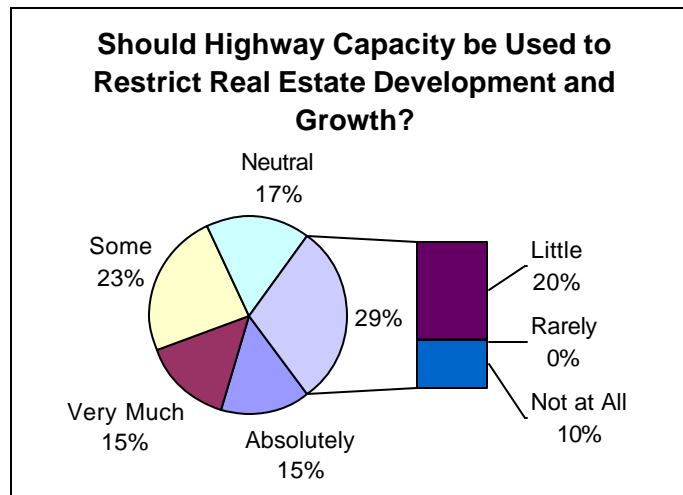
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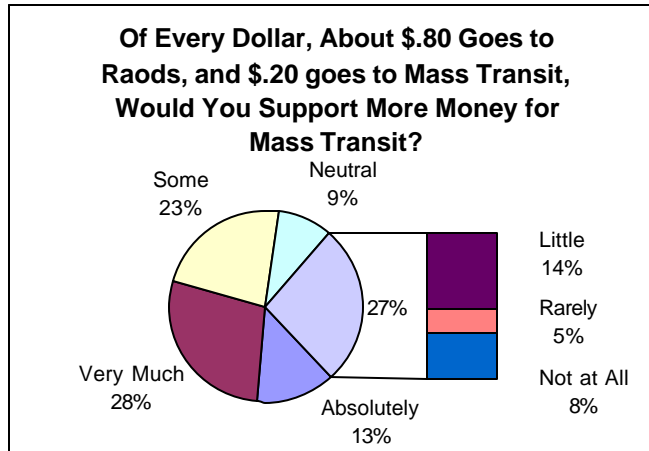
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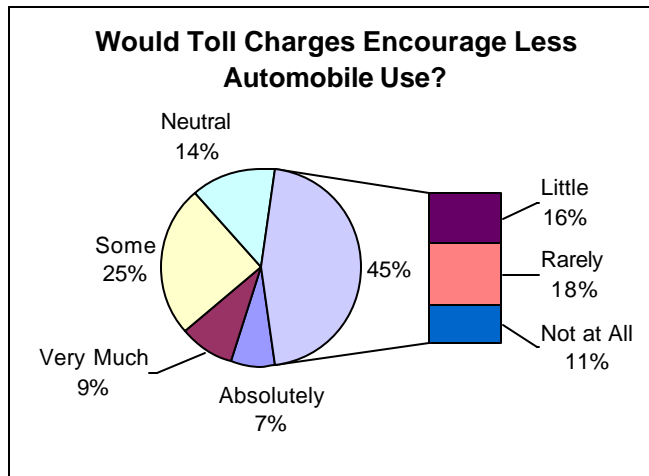
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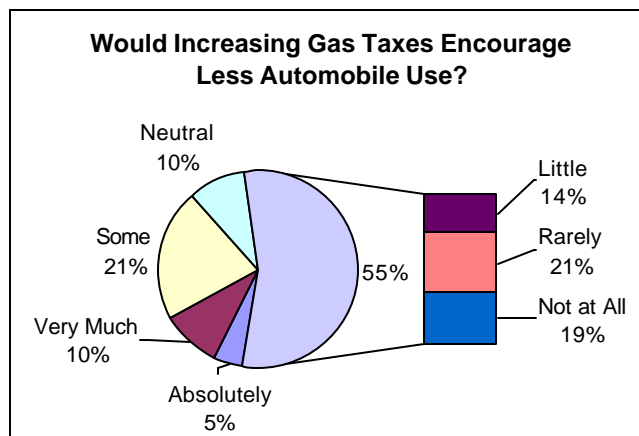
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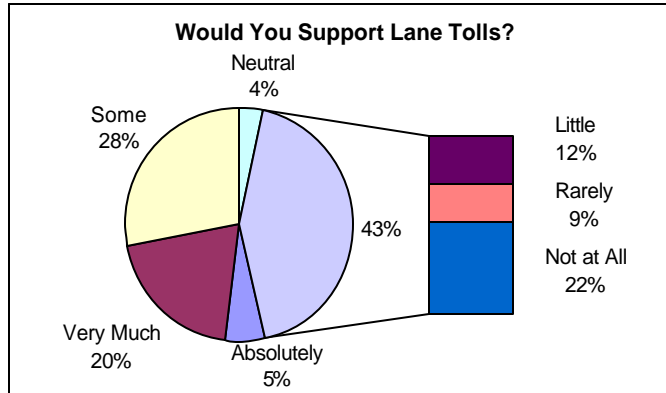
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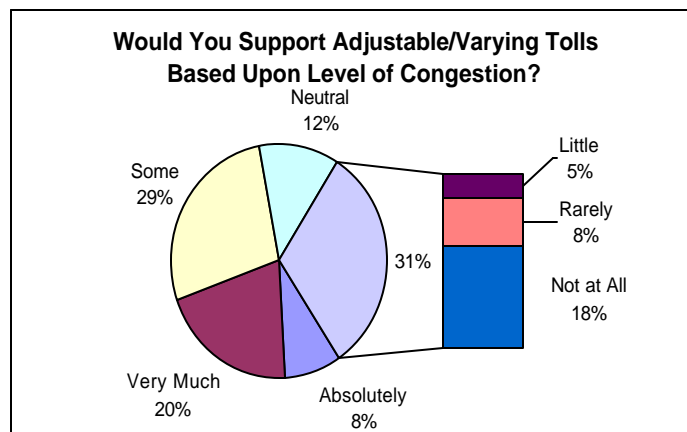
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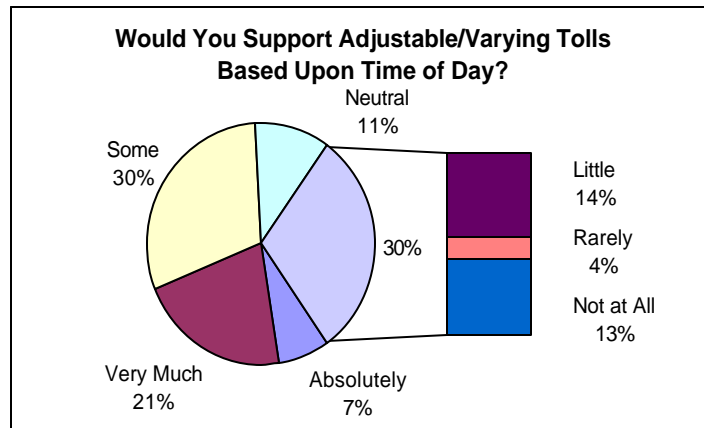
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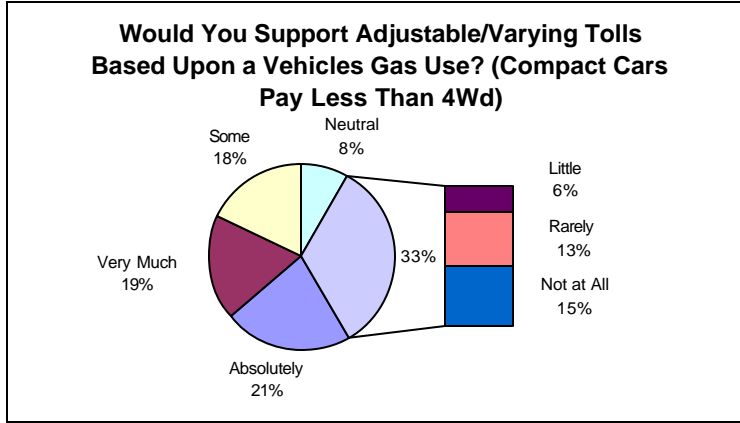
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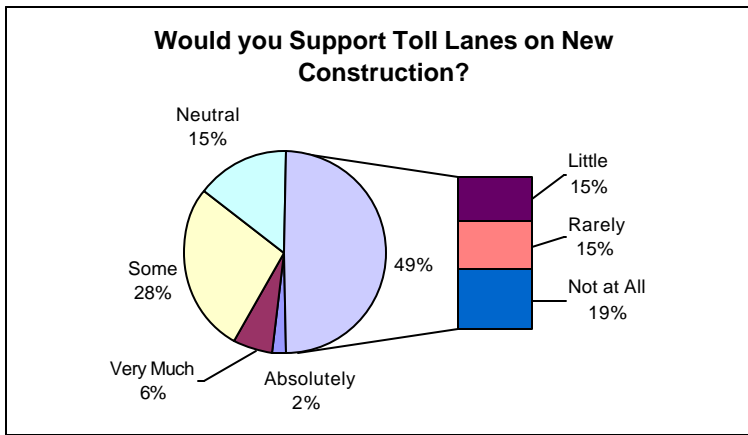
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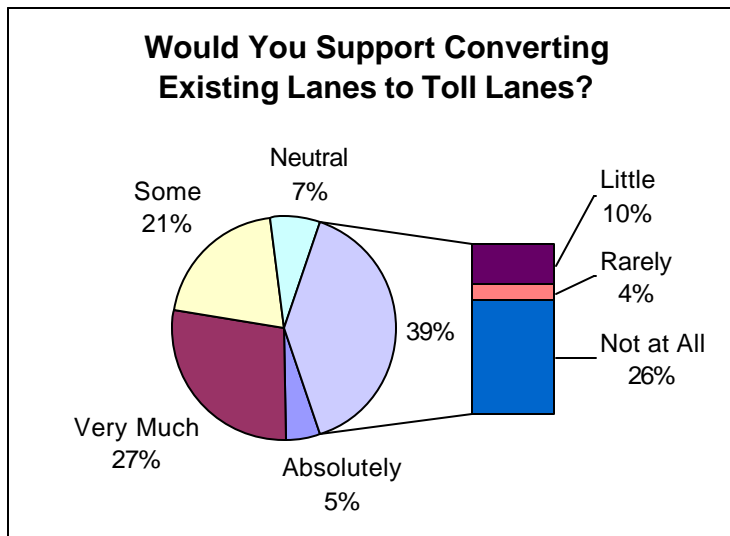
Question 9



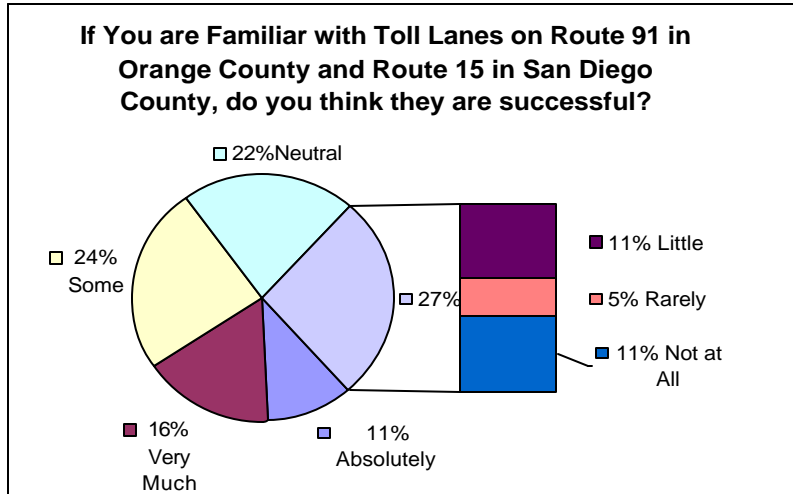
Question 10



Question 11



Question 12



Question 13

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