

AN EVALUATION OF SOLUTIONS TO CALIFORNIA'S ROADWAY DIRE STRAITS
A CRITERIA ALTERNATIVE MATRIX

A Thesis

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by

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Department of Public Policy and Administration

Abstract
of
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Funding transportation projects in California presents a difficult policy problem for the state, as the current taxation mechanisms used are insufficient. The policy question at hand for California decision makers is: What viable transportation funding alternatives exist for implementation statewide to supplement the currently lacking funds? To answer this policy dilemma, this thesis delves into available literature and performs a Criteria Alternative Matrix analysis to evaluate three policy options: Public-Private Toll Roads, Mileage Fees, and a State Fuel Sales Tax. The four evaluative criteria used in this thesis to assess the practicality of the alternatives are Low Administrative Costs, Equity, Sustainability, and Internalizing Negative Externalities. Based on these criteria and their given weights and ranking, two alternatives arose as feasible policy options. As a result of the research and analysis provided herein, I recommend California State decision makers pursue implementing both Public-Private Toll Roads and a State Fuel Sales Tax as short and long term policy solutions to California's roadway dire straits.

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Date

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Chapter 1

INTRODUCTION

The California roadway system is essential to the mobility of California residents, goods, and interstate commerce. Due to California's geographical vastness, transportation on roadways is a daily necessity to travel to work, school, home, and transport goods within the state and the country (California Department of Transportation, 2010). In the last twenty years, increased demand and use of the roadway system has left many roads battered and abused. California's inability to fund necessary maintenance of the transportation system has left it aged and improperly maintained creating degradation of roads and increased future fiscal hardship within California to generate funds for roadway repairs. Currently, nearly 30% of California's roadway system, with an expected degradation of 10% more every 20 subsequent years, is in need of significant maintenance and/or rehabilitation (California Department of Transportation, 2010). In the next ten years, it will cost \$340 billion to bring roads up to transportation industry standards and specifications as outlined by the California Department of Transportation (Caltrans) (California Transportation Commission, 2012). Additionally, California faces a current need of \$195 billion in roadway expansion to meet transportation demands. With revenues amounting to only \$240 billion, California's transportation system has a funding shortfall of approximately \$294 billion dollars (California Department of Transportation, 2011). In this thesis, I offer advice to California policy makers as to what non-federal policy alternatives are available to raise revenue to pay for this roadway maintenance.

This thesis will delve into three non-federal policy alternatives to funding California roadway maintenance: Public-Private Toll Roads, Mileage Fees, and a State Fuel Sales Tax. In doing so, I begin by addressing the transportation funding background by providing an understanding of the transportation system background, federal transportation funding, state and

local transportation funding, California roadway funding history, and the policy and economic background of surface transportation. Chapter 2 of this thesis addresses the applicable research and literature identifying transportation funding alternatives being discussed by academics and industry experts. Next, I explain the Criteria-Alternative Matrix (CAM) analysis method used to evaluate the three chosen alternatives. To perform qualitative and quantitative CAMs, I identify evaluative criteria and address the sensitivity analysis necessary in Chapter 3. After identifying the CAM method, Chapter 4 analyzes the results for each alternative in both the qualitative and quantitative CAMs. Finally, based on the analysis and research, Chapter 5 provides policy recommendations to guide policy makers and the transportation industry toward the most feasible funding solution for California.

Transportation System Background

Federal, state, and local public resources fund transportation throughout the United States and its territories. Since 1776, transportation has been a focal interest for the U.S. government (London, Peek, Saltzmand, & Gunaydin, 2001). However, throughout history, the responsibility of financing transportation has shifted dramatically from primarily federally funded to largely state and locally managed and financed as the transportation network has developed and transportation shifts toward maintenance. The method of funding roads has been modified throughout the decades, changing for demand and economic conditions.

The nation's transportation network is comprised of a variety of roadway types, depending on the travel needs and function of the road. A roadway's objective and functional use determines its classification and thus its eligibility for funding. These defining road categories are Interstates, Non-Interstate Access-Controlled Arterials, Other Access-Controlled Arterials, and Local Roads. Interstates, classified for high mobility and long distance travel, are the most limited access roadways on the transportation system. Totalling approximately 1.4% of road

miles, these roads on the National Highway System are designed for the travel of vehicles and commerce between states (R.D. mingo and Associates & CDM Smith, 2012). Similarly, Non-Interstate Access-Controlled Arterials are on the State Highway System, approximately 6.7% of road miles, and designed with limited access points for maximum mobility (R.D. mingo and Associates & CDM Smith, 2012). Other Non-Access-Controlled Arterials are important roadways that provide access to the flow of traffic through intersections and driveways. This 28.8% of roadways provide for circulation, intercity travel, and neighborhood connector transportation needs (R.D. mingo and Associates & CDM Smith, 2012). Finally, Local Roads provide direct entry to roadside land and attractions. Accounting for the largest number of lane miles (63%), local roads fulfill the need for urban and rural connections to Interstate, Non-Interstate Access-Controlled Arterials, and Other Access-Controlled Arterials (AASHTO, 2013). The federal government dedicates its transportation funding primarily to roadways of regional and national significance, thus emphasizing the roadway functional classification and the focus of federal funds on Interstates and Non-Interstate Access-Controlled Arterials.

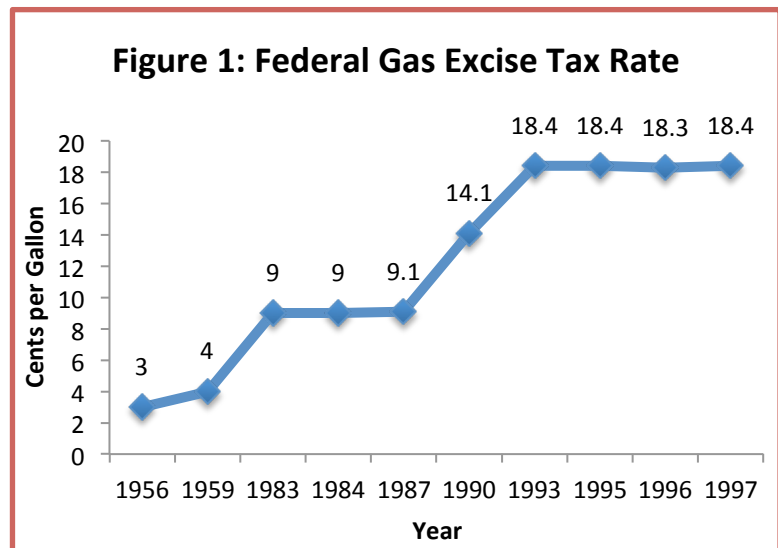
Federal Transportation Funding

For decades, the federal government shouldered much of the transportation funding burden as it focused on the westward movement and building the National Highway System. As the country industrialized, the demand for uniform and reliable highways increased. The implementation of the National Highway System, funded primarily by the federal government, laid the foundation for roadways and the integrated transportation program in place today (Surface Transportation Policy Project, 2000). In addition to the Nation Highway System, state and local governments have grown their transportation networks with state and local roads to meet the growing demand of drivers throughout the country. Moving forward, the transportation industry faces the dramatically different mission of maintaining the intricate and elaborate system

of roads (London, Peek, Saltzman, & Gunaydin, 2001). Following is an explanation of the different types of funding: federal, state, and local.

Enduring major structural changes with each transportation bill throughout history, federal funding for roads has maintained a steady role in the funding equation. In 1932, President Hoover authorized the first federal tax on fuel to close the budget gap. In 1956, Congress established the Highway Trust Fund to construct the National Highway System along with aiding in the construction of state and local roads (Transportation for Tomorrow, 2007). Since then, the

Federal Gas Excise Tax has increased from three cents to 18.4 cents per gallon of gas sold in 1997 (U.S. Government Accountability Office, 2011). Figure 1 depicts the fluctuation of the Federal Gas Tax throughout history. These funds are



funneled into the Highway Trust Fund and apportioned to states based on the transportation authorization bill to aid state and local governments in the effort to build and maintain roads throughout the country. In California, federal funds account for approximately 23% of transportation funding at \$4.6 billion (Legislative Analyst's Office, 2007).

State and Local Transportation Funding

Largely, state governments are delegated the responsibility of managing the National Highway System along with their own State Highway System and state roads (U.S. Government Accountability Office, 2012). In doing so, states have passed a variety of transportation funding

policies ranging from state gas taxes that mimic the federal method to issuing bonds, fees, and sales taxes to generate revenue for transportation. For example, all states have adopted an excise fuel tax ranging from 7 to 32 cents per gallon while only nine have instituted a type of sales tax directed toward transportation (Dierkers & Mattingly, 2009). Furthermore, many states now utilize proceeds from bonds and toll roads to fund construction and maintenance of new roadways. Fees such as vehicle registration fees, driver's license fees, and weight fees, to name a few, are used in some states to supplement transportation related expenses and departments (Dierkers & Mattingly, 2009). Each state gathers these funds, which are apportioned to projects and local governments, based on need and demand.

Although state governments have more funding policy options than the federal government, the relatively smaller and similar focused constituents of local agencies are in the best position to raise funds, depending on the economic and political environment (Bolton, 2010). For example, a city can approve a sales tax on a particular good or service in addition to any federal or state tax that applies to residents within its jurisdiction (AASHTO, 2013). The traditional funding method for local transportation projects is the use of federal or state funds supplemented by local general fund appropriations. Local governments throughout the country are beginning to employ a variety of traditionally state funding methods to supplement their transportation budgets including fuel taxes, registration fees, tolls, and fares. These funds are allocated to the agency's transportation needs (AASHTO, 2013). While passing these types of fees or taxes can be difficult due to voter apprehension, a small local agency is far better fitted to do so than a large state government where benefits of the funds are more difficult for voters to realize (Kockelman, 2006). Funds raised by local agencies can be used on local roads that federal and state funds may not be eligible for.

The three main types of transportation funding, federal funds, state funds, and local funds, provide needed resources in the roadway maintenance effort. Unfortunately, these funding methods, in their current capacities, remain insufficient in comparison to the strain of the transportation system in California and throughout the country.

California Roadway Funding History

California has five main players in the decision-making process with varying levels of influence and control of transportation funding choices: the California State Legislature, California Transportation Commission (CTC), California Department of Transportation (Caltrans), Metropolitan Planning Organizations (MPOs) and Regional Transportation Planning Agencies (RTPAs), and cities and counties (California Department of Transportation, 2011). The State Legislature serves as the transportation establishing authority as it can influence codes and laws to fund transportation programs (Public Policy Institute of California, 2010). The legislature also determines the funding levels appropriated to transportation in the annual budget and institutes funding options and dedicated revenue sources for roadways (California Transportation Commission, 2011). The CTC is a body of nine appointed officials that reviews and approves nominated transportation programs and projects for funding. The CTC determines the priority and programming of funds for projects that Caltrans will manage or oversee. Caltrans is responsible for managing the transportation system within California and balancing the local and state demand for transportation resources (California Department of Transportation, 2010). Caltrans functions as an administering and flow-through agency as it develops and executes transportation improvement projects and oversees projects administered by regional and local agencies (California Department of Transportation, 2011). MPOs and RTPAs assist with the regional transportation needs. By planning and administering regional and metropolitan level projects, MPOs and RTPAs influence and fulfill transportation needs across city lines to create an

integrated network of roads. Finally, cities and counties provide the local level urban and rural development connection for transportation and funding of the roadways by establishing appropriate planning and land-use policies within their jurisdictions (AASHTO, 2013).

Federal funds are purposed at increasing capacity to the roadways thus the use of which further increases California's road maintenance burden since these funds cannot be used for maintenance or upkeep (Committee for the Study of the Long-Term Viability of Fuel Taxes for Transportation Finance, The National Academies, 2006). Essentially, over the years California has maintained consistent revenue flow with more roads to distribute maintenance dollars across (California Transportation Commission, 2012). Legislative and statutory authority to generate revenues using taxes, fees, and bonds provides California with the ability to increase transportation funding.

California currently employs a State Fuel Excise Tax, State Sales Tax, and Fuel Tax Swap, which all contribute to transportation funding. The State Fuel Excise Tax mimics the Federal Excise Tax on fuel sales with an 18 cent per gallon tax on all fuel sales (California Department of Transportation, 2011). The revenue generated from this excise tax is allocated to state, regional, and local transportation agencies according to a formula determined by the Legislature. Additionally, California dedicates $\frac{1}{4}$ % of the 7.25 % State Sales Taxes to funding local transportation projects while the remaining 7 % goes to Local Government General Funds and the State General Fund (California Department of Transportation, 2011). The Fuel Tax Swap is a policy enacted in 2011 realigned the previous fuel sales tax and created an excise tax to generate revenues for new construction projects and roadway maintenance projects (California Department of Transportation, 2011). Furthermore, California established Truck Weight Fees, which charges heavy vehicles for the additional wear and tear done to the roadways. The revenues gathered from this policy, however, pay for transportation debt services rather than

directly maintaining the roads (California Transportation Commission, 2012). Finally, the Legislature passed Proposition 1B Bonds in 2006 to provide the necessary funding to “relieve congestion, facilitate goods movement, improve air quality, and enhance the safety and security of the transportation system” (California Department of Transportation, 2011, p. V). Proposition 1B provided approximately \$20 billion to fund such projects and allowed the transportation decision makers at all levels to execute the much needed projects to improve and enhance the transportation system. The current taxes, fees, and bonds are an attempt to provide sufficient transportation funding to California and its many local agencies. Unfortunately, due to the difficult political and economic environment, increases and adjustments to these policies are extremely cumbersome.

Policy and Economic Background

The American Society of Civil Engineering has been monitoring the state of infrastructure across the country and determined that more than 30% of American roadways are in a state of disrepair (Miller, Benjamin, & North, 2010). The roadways in the State of California, and throughout the rest of the country, are publically owned and mostly funded by taxes and fees. By paying taxes, motor vehicle fees, and gas taxes, many drivers believe that they have contributed their fair share to the roadway system. The common belief is that roadways are a public good and a right for drivers; however, this assumption is false. A public good is non-rival and use of which cannot be withheld (Miller, Benjamin, & North, 2010). With limited ways to keep people from driving on the roads, one person’s driving habits deplete the quality of the road for the next driver through congestion and road damage. As roads can be diminished, they constantly need costly maintenance as Californians continue to drive more.

The root of the roadway maintenance crisis lies in the political economy within California. Political economy refers to “the study of causes and consequences of political

decision-making” (Miller, Benjamin, & North, 2010, p. 128). Due to the constantly changing political environment, many pressures reside on politicians to create change for society and make the state a better place to live with more liberties and luxuries to enjoy. Creating new sources of funding is critical in California to decrease the impact on the current spending constraints on the budget (Taylor, 2011B). Maintaining roads brings about two negative externalities for drivers that affect a politician’s reelection ability, increased cost to taxpayers and increased congestion during the long restoration process (Surface Transportation Policy Project, 2000). Attempting to implement a new tax or increase an existing tax is political suicide in the State of California, thus many politicians attempt to contribute to infrastructure by building new construction. Bonds usually fund new construction instead of employing immediate taxes increases, which politicians hope the bills for do not come due until after Election Day (Surface Transportation Policy Project, 2000).

An alternative to consumer taxation is the idea of user fees on roads. User fees present an opportunity for drivers to pay for usage they incur. The current attempt at user fees is the gas tax of 18 cents per gallon that attempts to equate gallons of gas purchased with amount of driving (California Department of Transportation, 2011). Unfortunately, this method no longer treats each driver equitably. With the creation of hybrid and electric vehicles, people can drive farther without paying more for gas. Research shows that a vehicle that gets twenty miles to the gallon pays about \$254 per year in gas tax but a person who drives a hybrid and gets forty miles to the gallon pays half the tax bill per year (Oregon Department of Transportation, 2010). This system bears no consideration for the wear and tear that each car contributes to the roadways. Instead, a system in which users pay for the damage incurred on the roads will help sustain maintenance funds now and in the future.

The maintenance of roadways is becoming more of a problem as time progresses because the current fuel excise tax has not changed or increased since 1993 to accommodate for inflation, increased usage of roads, or the increase in lane miles built (Surface Transportation Policy Project, 2000). As inflation has risen over the years, the purchase power of the 1993 cents per gallon tax has diminished considerably thus further burdening the State's ability to pay for road maintenance. While the volume of fuel sales has increased, the growth of fuel excise tax revenues is not proportionate to inflation, as it has remained stagnant at 18 cents per gallon. Building roads and highways to accommodate the number of drivers is not sufficient. Constant maintenance and rehabilitation of the aging roadways is necessary to sustain the vast transportation needs of California residents (California Department of Transportation, 2010).

Public intervention in this maintenance problem is necessary because current standards and procedures are insufficient. As political figures shy away from these costly expenditures, the current roadway maintenance program continues to fall into disrepair along with approximately 30% of the roadways in California (California Department of Transportation, 2010). To create statewide change and maintain roads properly, political affiliations must be set aside to design a cost-effective and equitable solution that will sustain itself for years to come as to not render the maintenance funds deficient again (Surface Transportation Policy Project, 2000).

Chapter 2

LITERATURE REVIEW

There are many methods discussed by experts to fund transportation; however, change is desperately needed in the transportation-funding field to bring about new revenue sources not yet dedicated in the California State Budget. This analysis approaches the financial burden of maintaining and rehabilitating the California roadways by proposing three alternative solutions to the current situation: Public-Private Toll Roads, Mileage Fees, and State Fuel Sales Tax. Literature presented by transportation and academic experts on new alternatives focus on roadway pricing ideas such as optimizing user fee adaptations and reforming the current state gas tax to reflect a sustainable revenue source. All options presented by experts are a form of user fee or tax that attempt to assess the driver contribution to roadway maintenance based on driving patterns. First, this review delves into the concept of roadway pricing to give an understanding of the direction the transportation funding industry is headed. Following, I provide a review of the most predominant alternatives currently being explored by transportation agencies and policy experts around the country. These debated funding alternatives are Private-Public Toll Roads, Mileage Fees, and a State Fuel Sales Tax.

Defining Roadway Pricing

Decision makers in California and across the country are now broaching the discussion of charging drivers for the necessary roadway maintenance. Roadway pricing is a method of funding transportation projects by levying user fees on roads to assess the damage incurred (Kockelman, 2006). Road pricing attempts to place a value on the infrastructure system by charging drivers for their equitable portion of the extensive road maintenance costs. Experts in the field debate the equity of these mechanisms, as it is difficult to define or determine an individual's share of maintenance costs. Forms of road pricing mechanisms include urban area

tolls, congestion pricing, occupancy-based fees, emission fees, vehicle-miles traveled fees, and fuel taxes (Committee for the Study of the Long-Term Viability of Fuel Taxes for Transportation Finance, The National Academies, 2006; California Transportation Commission, 2012). Road pricing is believed to be an innovative solution to the transportation dilemma that provides options to drivers that may aid the restoration of roads and deliver premium service to those who choose to use it (Colorado State University, 2012).

Transportation funding policy proposals provide additional pecuniary or multiplier effects that may affect decision-making for policy analysts (Fuguitt & Wilcox, 1999). For example, road-pricing systems will encourage drivers to alter their travel habits potentially creating a reduction on emissions, decreased roadway congestion, and increased safety on the roads. These systems present an incentive to reduce driving when possible due to increased driving costs for high-efficiency vehicle users accustomed to smaller gas tax bills and an inability for drivers to avoid paying their fair share of roadway maintenance costs (Munger, 2000; Miller, Benjamin, & North, 2010).

Due to the groundbreaking nature of road pricing methods, public apprehension is expected. Thus, the best advice is to approach each project on a case-by-case as the factors involved are rarely standardized. The University of Texas at Austin, in conjunction with Post Buckley Schuh and Jernigan architecture, engineering, and construction management firm (PBS&J), conducted a survey to determine the public perception of transportation policies in Texas where it was identified that the public prefers funding mechanisms that assess charges or fees based on the impact to the roads (Kockelman, 2006). Because of the highly political nature of transportation funding, assessing the acceptability of policy options is essential to solving the transportation system funding dilemmas (Smirti, Evans, Gougherty, & Morris, 2007). Each of the

alternatives addressed in the subsequent sections of this chapter identify the perceptions and potential acceptability identified in various studies.

Public-Private Toll Roads

The first alternative for this policy problem is the implementation of toll roads throughout the State of California. A toll road is a type of roadway where a fee is collected for each driver that passes over the roadway. Toll roads provide a number of benefits including roadway construction and maintenance funding mechanisms for new and increased capacity roads (Monroe, Schmidt, & Westwind, 2006, p. 4). Due to California's dire need for restoration of its roads, toll roads provide an opportunity to help finance the costs by utilizing external sources of funds. The introduction of toll roads allows drivers to pay for their usage creating equity within the financing of roads; however, the regressive nature of tolls potentially inequitably places the toll burden on the poor (Committee for the Study of the Long-Term Viability of Fuel Taxes for Transportation Finance, The National Academies, 2006). On the other hand, tolling of roads adds numerous benefits to roadways including expedited project delivery and long-term revenue sources due to the established flow of toll fares as well as reduced congestion on the toll road and surrounding routes as the implementation provides additional driving options (Monroe, Schmidt, & Westwind, 2006). Due to the limited-access design of urban and rural roads, state and local governments are better situated to optimize the tolling potential.

Currently, the majority of roads are completely publicly funded using tax revenues to maintain and operate the roadways. Toll roads introduce the potential for privatizing roads and lessening the burden of road maintenance for the state (Port, 2005). This privatization often takes the form of public-private partnerships, which provide mutual benefit for all parties involved as these arrangements meld the available private capital with the revenue potential, and deficit of the public sector (Brown, 2007). The privatization of roads in this fashion allows municipalities to

capitalize on the unrealized efficiencies of the private sector while still upholding operating and maintenance standards typical of public sector requirements (London, Peek, Saltzman, & Gunaydin, 2001).

Goldman Sachs and Company wrote an article in *Public Works Management and Policy* about the potential of public-private partnerships as the future of transportation funding (Brown, 2007). Public-private partnerships are a step toward the privatization of roadways and transportation improvements. As a widely used funding mechanism around the world, the United States is just breaking the public-private boundaries (Monroe, Schmidt, & Westwind, 2006). Public-private partnerships can be used to finance a variety of projects; however, the financial design is best suited for revenue-generating projects that will produce the funds needed to pay off the balance of the bond or loan issued (Port, 2005). For example, the construction of toll roads provides future revenues to be realized for which bonds could be issued to fund transportation projects, providing developers annuities, concession payments, or upfront payments (The Congress of the United States, 2012). Brown states that pensions and insurance funds have fueled the market expansion as they search for long-term reliable investments and payouts (2007). Because of the growing need for transportation investments, public-private partnerships are becoming a viable funding mechanism for state and local governments. Utilizing the private sector to construct and operate transportation enhancements is of increased interest to transportation agencies as public-private partnerships supplement the limited capital for municipalities' infrastructure projects (Port, 2005).

The State of Indiana is one of many states struggling to fund its transportation program. With a multi-billion dollar projected deficit in its transportation plan, the state entered into a private-public partnership in which a private party will build, maintain, and operate the Indiana Toll Road (Brown, 2007). These concession agreements, while specific terms may vary project

by project, stipulate that the given state will provide an upfront payment to construct/perform the project in exchange for lease payments, maintenance, and operation of the roadway by the concessionaire, or private party. Private-public partnership arrangements allow for cost sharing between the private and public sectors, reducing the public upfront and maintenance burden and sets up a long-term financial arrangement in which both parties stand to realize steady cash flows in the future (Committee for the Study of the Long-Term Viability of Fuel Taxes for Transportation Finance, The National Academies , 2006).

A Texas study utilizing interviews, surveys, and focus groups identified significant support by commuting respondents for toll roads over the gas tax method. When framed as an alternative to rising gas prices, self-responders favored toll roads when understood that significant benefits can be realized for the public sector and private drivers. However, responses trended toward current toll users supporting the policy option while long distance drivers did not (Kockelman, 2006).

Additionally, respondents favored devoting lanes specifically to trucking and high occupancy vehicles in order to address growing congestion concerns on highways (Kockelman, 2006). Smirti, Evans, Gougherty, Morris performed a study of trends within California (2007). By looking at Value Pricing and High-Occupancy Toll lane pricing, Smirti *et al.* found that in order to successfully execute road pricing projects in California, policy needs to be focused “to provide more capacity, travel-time savings, and travel options, and avoid pricing facilities that have no free alternatives” (Smirti, Evans, Gougherty, & Morris, 2007, p. 41). High-Occupancy Toll lanes solicit fewer public objections than other debated alternatives. David Levinson reports that recycling under-utilized transportation routes or modes, for example converting High-Occupancy Vehicle or Carpool lanes to High-Occupancy Toll lanes, is highly favored by the public as it brings efficiency to the roadway without disrupting the norm (2010). Increasing

capacity on the roads is of utmost concern to drivers because the public supports the reduction of roadway congestion.

Mileage Fees

The second policy alternative to generate funds for the maintenance of California's roadways is to implement a system in which drivers pay a fee per mile driven. This system generates a source of funding that is representative of the wear and tear that the roads are enduring (Oregon Department of Transportation, 2010). Currently with the gas tax, drivers with less fuel-efficient cars contribute considerably more to the road system than drivers with hybrid or electric cars (Bolton, 2010). Since weight is the only difference between cars and their ability to deteriorate the roads, two similarly weighted cars should not pay different amounts for equal miles driven (London, Peek, Saltzman, & Gunaydin, 2001). A distance-based pricing system provides an avenue of funding for roadway maintenance directly correlated to the use of the roadways thus helping sustain maintenance funds now and in the future. As a funding source, this policy faces issues of high start-up, research, and development costs, uncertainty of acceptance, and questionable long-term sustainability (Whitty, 2007). On the other hand, it creates equity across all drivers by removing the advantages of wealth and fuel-efficient vehicles to evade high gas tax payments at the pump (U.S Government Accountability Office, 2012).

User fees for transportation exist in many forms including truck weight, container, vehicle registration, and licensing to name a few (California Transportation Commission, 2011). According to Kockelman, respondents generally agreed heavy vehicles that deteriorate roads at a more rapid rate should assume a higher burden of the maintenance and repair expenses (2006). Road use charges, such as trucking and licensing fees, are an established form of funding transportation; however, policy makers now face the possibility of expanding these programs to the miles traveled on roads by all drivers. These current revenue sources, while they generate

considerable income to fund transportation related expenses, are committed funds that cannot be funneled into transportation maintenance without underfunding other vital programs (London, Peek, Saltzman, & Gunaydin, 2001).

The mileage-based pricing system is a policy initiative aimed at replacing the current gas tax with a more equitable and more viable funding option for California's roadways (Levinson, 2010). This policy option proposes the installation of on-vehicle devices to track the miles driven and transmit said data to responders at gas service stations upon fuel up (Whitty, 2007). This mileage data helps calculate the appropriate dollar amount to charge drivers for the roadway damage inflicted since last fueling the vehicle. The mileage-based system attempts to hold drivers responsible for damage to the roads that they cause (Dieringer Research Group, 2008). The vehicle miles driven fee system allows municipalities to focus on the damage incurred based on the usage of the roads. Due to the dire condition of roads, alternative funding options such as the proposed mileage-based policy attempt to reform a dilapidated and outdated system by implementing a user fee approach to funding (Transportation for Tomorrow, 2007).

Upon start-up, this program faces costs related to the necessary data collection and transmission in addition to service station infrastructure upgrades. This system will collect mileage data using an on-vehicle device that transmits data to gas service stations in order for drivers to pay a given amount per mile driven since last fueling their vehicle (Whitty, 2007). The first major cost of the system is the device that will collect and transmit the necessary mileage data. Research and development costs are also extensive to create a tamper proof device that will reliably transmit mileage data and charge drivers for their use of the roadway system (Whitty, 2007). In addition to the on-vehicle device, upgrades to gas service stations must be made in order to receive the mileage data from vehicles and charge drivers the appropriate amount for the miles driven (Whitty, 2007). As this is not yet a standard device installed on vehicles at the time

of manufacturing, it must be installed on vehicles after the fact thus incurring installation and maintenance costs for the devices. Creating prototypes for this policy necessitates significant equipment, software, and installation costs that will need further evaluation and costs estimation to determine the policy's overall feasibility.

Once this policy is implemented and the necessary start-up actions have commenced, the operation, maintenance, enforcement, and auditing of the system will require exponentially more resources. Operation and maintenance of the system includes expenses for device installation, databases, administration of the program, and evaluation of inflation shifts (Whitty, 2007). Creating a system and database that maintains the mileage data will prove difficult due to the necessary capacity and security needs of the system and technological expenses to maintain its accuracy and viability to maintain fiscal solvency of the revenue source (Munger M. C., 2000). In addition, enforcement of the mileage fees requires considerable auditing of the physical devices, vehicle odometers, and gas service station receivers to ensure the accuracy and precision of the data collected and fees paid by drivers (Luburic, Miljkovic, & Buntak, 2011) (Whitty, 2007). As a source of funding for roadway maintenance, it will be important to ensure the accuracy of the system. Sustainability is questionable for this alternative due to the turnover rate of vehicles (Dieringer Research Group, 2008). This program presents a constant need for installation as every vehicle needs a transponder, thus the necessary equipment and maintenance costs could be high. However, if this policy is expanded, eventually all new cars could have these devices installed and programmed prior to purchase thus eliminating the need for future installation (Whitty, 2007).

Moreover, this program faces tremendous uncertainty because it proposes an increase in financial contributions from citizens and faces issues of sustainability (Committee for the Study of the Long-Term Viability of Fuel Taxes for Transportation Finance, The National Academies ,

2006). Some research has commenced to gain an understanding of the public reaction to this type of program. Main public concerns from the Oregon case study center on the apprehension with the government tracking personal driving patterns. U.S. Department of Transportation research shows that these public opinions highly influence the acceptability of the vehicle miles traveled fee systems. Unfortunately, much of this research is based on a hypothetical context thus citizens may not be adequately assessing the possibilities of the program (Dieringer Research Group, 2008).

Using the research gathered from the State of Oregon's pilot program, analysts can evaluate the small-scale success and acceptance of the program. Pilot program reports show an increase in funding and a general acceptance of the program by voluntary participants (Whitty, 2007). Policy makers must address mitigation strategies to satisfy the public's privacy concerns prior to a statewide implementation of this funding source. Unfortunately, these results cannot be accepted at face value because the responses are a result of voluntary actions. It cannot be assumed that the greater population will share these same beliefs and opinions about the program (Colorado State University, 2012) (Dieringer Research Group, 2008).

On the other hand, Kockelman's public opinion study in Texas identified that when given the choice of funding methods, fuel taxes were deemed the most inefficient and equating use to the fees charged was desired by respondents (Kockelman, 2006). This presents considerable uncertainty and risk for this program because the most current and viable research available needs extensive validation and analysis of its transferability to the State of California. In addition, the initial start-up costs of this program present considerable risk to the success of the program (Oregon Department of Transportation, 2010). If the program fails or meets implementation difficulties after the extensive costs, little research indicates the program's long-term viability (Whitty, 2007). As stated above, this program faces sustainability issues thus if these issues

cannot be mitigated then the overall viability of the policy is degraded by the constant redevelopment and technological costs.

This policy presents a complex decision dilemma for policy analysts. With high initial costs of the program, policy analysts should utilize additional avenues for decision making in order to address and consider all obstacles for the program. For example, considerable public opinion studies should be conducted in order to understand the potential public pushback for the program (Dieringer Research Group, 2008). This program directly affects the amount of funding contributed to the maintenance of roads and thus it will be important for the public to understand the full benefits and costs. In addition, gaining an understanding of all alternatives for funding to establish the most viable policy option is essential.

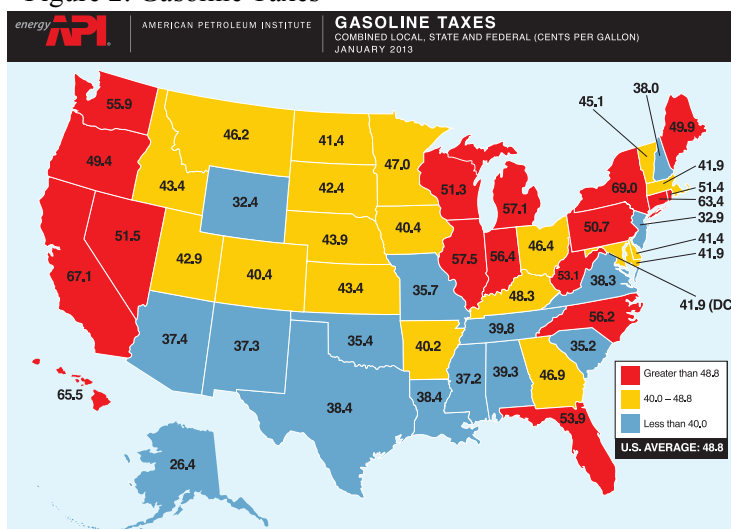
State Fuel Sales Tax

The final alternative to this policy issue is to amend the current gas excise tax in California to a State Fuel Sales Tax. According to the California State Controller's Office, the current gas tax in California is an

excise tax in the amount of 18 cents per gallon for a combined local, state, and federal tax rate of approximately 67 cents per gallon (California State Controller's Office, N.D.)

(American Petroleum Institute, 2013). A comparison of

Figure 2: Gasoline Taxes



California in relation to other states is depicted in Figure 2 above. Reform to the current fuel tax structure will remove the flat cents per gallon excise tax and implement an *ad valorem* tax on the

sale of fuel in the state (Transportation for Tomorrow, 2007). This type of tax places a fixed percentage tax on each fuel sale. Research proves that Californians' driving habits have increased exponentially in the last decade thus restructuring the gas tax to accommodate the wear and tear on roads is justifiable (Bolton, 2010). However, these driving habits may shift with an increase in gas expenses encouraging the use of more fuel-efficient vehicles.

The current funding source for the maintenance of roads, the gas tax, leaves a funding gap year after year due to inflation and the considerably lower purchasing power of a dollar, thus making the maintenance of roadways more of a problem (Markow, 2012). Upon implementation of the gas tax, there were considerably fewer vehicles on the road and less surface damage to the roadways than in the present day (London, Peek, Saltzman, & Gunaydin, 2001). As inflation has risen over the years, the purchasing power has diminished considerably thus further burdening the State's ability to pay for road maintenance (California Department of Transportation, 2010). Additionally, since the development of high efficiency vehicles, the current roadway maintenance funding options do not generate equitable or representative funding levels for the damage incurred on the roads.

Implementing a sales tax on fuel will establish a funding stream that adjusts to the changes of gas prices and inflation. The low administration costs of a sales tax on fuel are highly beneficial as the tax structure in California is already established (Transportation for Tomorrow, 2007). A shift to the application of this tax will have minimal cost increases to the state and pose few additional long-term burdens on the California State Budget (U.S Government Accountability Office, 2011). Research shows that a 1-cent increase in the current tax will generate approximately \$1.9 billion more in tax revenues. Thus, shifting to a sales tax will potentially increase the revenues exponentially as the revenues will increase with the cost of gas (Transportation for Tomorrow, 2007).

On the other hand, legislation is required in many states to alter the fuel tax structure thus raising the excise tax or shifting the fuel tax structure is difficult if not impossible depending on the political environment (Transportation for Tomorrow, 2007). Public acceptability of this alternative is discouraging for lawmakers, as history has shown many state failures when passing an *ad valorem* tax or fuel tax indexing in past decades (Public Policy Institute of California, 2010). For example, in the 1980s, about 15 states attempted to implement formulas to maintain a proportional tax rate to inflation; however, the inability to predict steady revenues and lack of political and public support caused the policies to be withdrawn (Committee for the Study of the Long-Term Viability of Fuel Taxes for Transportation Finance, The National Academies, 2006). Additionally, as stated above, surveys show that the public perception is that fuel taxes are an inefficient method of assessing the necessary funds to maintain and operate the transportation system (Kockelman, 2006). Instead, assessing necessary contributions should be based on use and not fuel sales.

Conclusion

Current California cases show that sole funding is the least common avenue for transportation projects as the magnitude of projects such as the State Route 91, the Oakland-San Francisco Bay Bridge, and the Presidio Parkway reach into the billions of dollars to construct. By combining funding options and road pricing alternatives, transportation agencies can limit the perceived burden on the public. Considerations for local opinions, possibilities for alternatives, and specifics of each situation should be addressed in order to successfully implement alternative transportation funding policies (Surface Transportation Policy Project, 2000). These alternative transportation projects face public scrutiny; however, examples of successful cases throughout the country show that with careful manipulation of policy and public support, the potential for successful implementation of funding alternatives exists in California.

Chapter 3

METHOD FOR EVALUATION

This chapter outlines the method of performing the analysis of alternative funding options. I begin by breaking down the importance of conducting a thorough analysis of public policy by explaining the elements of Eugene Bardach's (2009) Eightfold Path. Secondly, I describe the principles of conducting a qualitative and quantitative Criteria Alternative Matrix (CAM) and how this method will aid in the decision making process. Additionally, this chapter identifies and justifies the specific criteria and weights used to analyze the proposed policy alternatives. Finally, I address the importance of a sensitivity analysis and explain my approach for conducting one to validate the CAM results.

The analysis of public policy consists of ethical and moral conversations alongside weighing the political and organizational implication of options. Bardach (2009) proposes a framework for policy analysis called the Eightfold Path. This framework outlines the steps of analysis in order to address all aspects of the policy problem. The eight procedural steps outlined are problem definition, gathering evidence, identifying alternatives, criteria selection, projecting outcomes, weighing tradeoffs, deciding on a policy alternative, and illustrating the story.

Problem definition is the first and most important step of policy analysis as it sets the groundwork for solving the policy issue. Defining the policy problem provides analysts with a purpose for researching, evaluating, and recommending solutions to decision makers for change. A problem statement addresses the political, social, and/or economic insufficiencies of the current practice directing research toward possible solutions. Nevertheless, desired solutions should not be identified in the issue statement and reevaluation of the problem should occur at every stage of policy analysis. The introduction of this thesis identifies a clear policy problem in transportation funding due to the gap between revenues and needed expenditures. By providing industry and

historical background on the issue, Chapter 1 lays the framework for this public policy dilemma that requires public intervention.

Following problem definition, the next natural stages are to gather evidence and determine possible policy alternatives. Assembling research and data are an essential element of policy analysis in order to gain an understanding of available research and information available on the topic. It is important to evaluate the literature and data available to determine whether the policy problem has already been answered or if the necessary expertise or data is available to develop solutions. Furthermore, reviewing the research aids in the identification of policy alternatives. Devising alternatives is a matter of assessing possibilities from research and experts while also looking for innovative solutions. The process of developing alternatives begins with a broad scan of possibilities to ascertain general policy directions. An analyst concludes this process by focusing on specific alternatives to assess for implementation. Chapter 2 addresses the industry and academic research available on alternative transportation funding options. This research identified three main types of policy for California to implement which serve as the alternatives for this thesis: Public-Private Toll Roads, Mileage Fees, and State Fuel Sales Tax.

Bardach's fourth step in the Eightfold Path is to select criteria to evaluate the outcomes of the policy alternatives. In order to understand the potential for each alternative, policy analysts must look to the possible outcomes for society. Using criteria allows for the inclusion of values especially when criteria are weighted to reflect the priority of each criterion in the decision making process. The quantitative CAM described later in this chapter identifies specific criteria and weights that are used to evaluate the alternatives. Bardach's criteria element aids the assessment of outcomes through this CAM analysis to provide recommendations to decision makers. Furthermore, predicting outcomes helps facilitate the CAM and decision making process. By playing through the possibilities, both positive and negative, for each of the

alternatives, an analyst is able to determine the appropriate weights and ranking of each alternative and criteria. This step is explained in detail in the evaluative criteria section below, the results of which are depicted in the Analysis Chapter.

Likewise, a policy analyst must confront the issues within each policy alternative especially concerning tradeoffs. For example, a policy that proposes increased services will likely have added costs to the municipality as a tradeoff. The analysis of alternatives in Chapter 4 provides an opportunity to assess the drawbacks of each alternative and weighs these against the societal benefits. After assessing these tradeoffs, analysts can make informed decisions in the form of policy recommendations to decision makers. Deciding on a course of action and communicating the policy story are the final and essential steps of Bardach's Eightfold Path. Culminating the policy analysis with appropriate concluding remarks and recommendations provides decision makers with synthesized analysis of the data and policy implications. This aspect is covered in Chapter 5 of this thesis.

CAM Methodology

Decision making in the public policy realm requires an analysis of alternatives and policy options that evaluates each with consistent criteria. This thesis is purposed at assessing available funding options in California and providing a tool that aids the discussion and decisions between alternatives. The CAM is a method of organizing the policy analysis process that follows the essential elements of the Eightfold Path (Bardach, 2009). By choosing alternatives and criteria to evaluate, the CAM provides a method for comparison and evaluation of each (Munger M. C., 2000). The CAM analysis allows for evaluative weighing and ranking of alternatives based on specific criteria that play a role in deciding the value of the policy alternative.

Performing a quantitative CAM analysis involves the development of alternatives, decision criteria, quantitative weights, and a scoring system. In order to assign these values and

properly assess the alternatives, I first perform a qualitative CAM analysis evaluating the contributing factors for each as it relates to the criteria. The qualitative analysis allows for proper comparisons by evaluating the consequences of each alternative in relation to the corresponding criterion and permits readers to understand the benefits and drawbacks that each option offers. The findings from this analysis are provided in Chapter 4 along with the quantitative CAM results. The literature review identified three main funding alternatives, Public-Private Toll Roads, Mileage Fees, and State Fuel Sales Tax, which serve as the policy options for evaluation. Public-Private Toll Roads is a policy option where roads are leased to private firms that utilize tolling to generate funds for lease payments and maintenance of the roadway. The Mileage fees program utilizes an on-vehicle device to record and report miles driven to service stations to charge drivers the appropriate fee. Finally, a State Fuel Sales Tax converts the current fuel excise tax to an *ad valorem* tax to charge a percentage of each sale versus the current flat cents per gallon.

Additionally, four evaluative criteria serve as the elements used to determine the viability of each alternative (Munger M. C., 2000). These criteria are selected for the intended audience and analyze the alternatives based on the needs of decision makers (Bardach, 2009). By assigning alternatives to the rows and criteria to the columns of the matrix, each cell signifies the evaluation of the corresponding alternative and criteria.

Furthermore, this evaluation is done both qualitatively and quantitatively to express outcomes and strength of each alternative (Bardach, 2009). The quantitative CAM approaches the alternatives and criteria mathematically by assigning weights to the criteria and ranking each to calculate the value of different policy options (Munger M. C., 2000). This method allows for adjustment as the audience can change a weight or ranking based on their values and generate an outcome that is more fitting of their priorities.

In order to assign a value to each option this analysis uses a ranking system of 1-5 where 1 represents “very weak”, 2 represents “weak”, 3 represents “moderate”, 4 represents “strong”, and 5 represents “very strong”. These rankings allow policy decision makers to understand the relative impact of each criterion on the policy problem. The ranks are assigned relative to the other alternatives. In addition to ranking the alternatives, I assign a weight to evaluate their overall importance. These weights attempt to balance the importance of each criterion in the overall equation; depending on one’s values and priorities these weights can vary dramatically. After assigning and evaluating the values, multiplying the ranking and weight of the alternative to criterion produces a score that estimates the value of the policy option. This CAM structure can be seen in Table 1 below. The method is merely a way of evaluating policy options; the decision of choosing the most appropriate alternative requires additional consideration of each and the implications they may present.

Rating: (1) very weak (2) weak (3) moderate (4) strong (5) very strong					
	Criterion 1: Low Administrative Cost	Criterion 2: Equity	Criterion 3: Sustainability	Criterion 4: Internalizing Negative Externalities	TOTAL
Alternative #1 <i>Public-Private Toll Roads</i>					
Alternative #2 <i>Mileage Fees</i>					
Alternative #3 <i>State Fuel Sales Tax</i>					

Evaluative Criteria

In order to evaluate the three policy alternatives discussed above, I identified three criteria that are relevant to both the State of California and its residents. Criteria are selected as the benchmark measures for analyzing policy options. Transportation funding is a sensitive policy topic because it requires significant financial resources and continues to need a strong political champion to create change.

The evaluative criteria selected for this CAM analysis are low administrative cost, equity, sustainability, and internalizing negative externalities. These measures were selected to address four core concerns of passing transportation policy. The low administrative cost criterion addresses concerns of implementing fiscally sound policy that will not over burden the California State Budget or require extensive taxes to fund (Taylor, 2011A). Equity looks to account for the fairness of the policy and attempts to evaluate the it's parity across the population or drivers. It is critical to assess this aspect, as policy makers must limit the disproportional incidence of public policies on specific groups. Additionally, due to pressures on policy makers for timeliness of legislation and the budgetary process, sustainability is selected to evaluate how the policy will endure with time. Since there is increased difficulty to pass taxes and new legislation, it is important for decision makers to implement policies that are self-sustaining and adjust with the demands (The Economist, 2009). Finally, assessing negative externalities is an important factor of policy analysis to address the market failures associated with driving. The internalizing negative externalities criterion evaluates each policy's ability to solve the market failures of driving and the transportation industry.

Each of these criteria carries a different weight in the quantitative CAM analysis as to demonstrate the value of each and provide a basis upon which to evaluate the economics, fairness, and long-term effects of the policy alternatives (Munger M. C., 2000). Table 2 below

depicts the assigned weights of these criteria, the justification for which I explain in more detail with each of the criteria.

Criterion	Weight
Low Administrative Cost	.40
Equity	.25
Sustainability	.20
Internalizing Negative Externalities	.15
Total:	1.00

Low Administrative Cost criterion evaluates a potential program's costs against its outcomes. This criterion is purposed at performing a revenue analysis to determine the effectiveness of the revenues source. Meaning if the revenue source generates high revenues but also incurs excessive expenses to implement and administer the program then the policy would have a low revenue benefit. Since this analysis aims at selecting a policy option that will increase the available funding for roadway maintenance, the costs associated with the additional revenue should be minimized if possible.

For a program to score well in the low administrative cost criteria, it must provide a larger advantage than the costs incurred by implementing it. The highest scoring policy in this criterion yields the highest return relative to the costs of implementation. An alternative that scores poorly in this criterion would be costly with little benefit for society (Munger M. C., 2000). In other words, if the alternative is relatively less costly to the state to implement and returns substantial funds to maintain the roadways, it would rate strong in the low administrative cost criterion. The budgetary crisis in California drives many policy decisions now as resources are limited and policy makers are looking at spending cuts in order to balance the State Budget (Taylor, 2011B). Due to California's current financial crisis and inability to invest in expensive programs with questionable outcomes, this criterion carries the highest weight of 0.4 in the

quantitative CAM analysis. Of the three evaluative criteria, policy makers emphasize revenue benefits the most, thus its weight should reflect the largest portion of the equation.

The second criterion, *equity*, evaluates the fairness of a policy alternative relative to the stakeholders: Caltrans and California drivers. A strong equity rating signifies that the policy option incorporates the needs of all parties involved, successfully generating the funds necessary to maintain the roadways without subjecting any one party to extreme hardship (Monroe, Schmidt, & Westwind, 2006). This means that if an alternative negatively affects the poor, it will score a weak equity rating. The intent is to distribute the burden of roadway maintenance proportionately. In a perfectly equitable situation, the desirable alternative to California's roadways funding policy problem would equally make drivers liable for the wear and tear that they personally cause to roads without targeting one demographic over another (U.S Government Accountability Office, 2012). For example, heavier vehicles and those who drive excessively should carry a larger portion of the funding burden for roadway maintenance. However, in many cases the poor are disparaged more than the wealthy. For instance, the tax incidence for fuel taxes is disproportionately placed on those who cannot afford expensive hybrid vehicles or who must travel longer distances to work from affordable housing options (U.S Government Accountability Office, 2012). These conditions require the poor to contribute higher amounts to fuel tax revenues with the purchase of more gas.

Evaluating the equity factor for each policy option helps decision makers understand the impact on society of each alternative. While a toll of \$4 per passage is an equal amount per person, the placement and frequency of that toll may be inequitable because it is the only route out of a neighborhood or town, thus disproportionately affecting one group of individuals (Monroe, Schmidt, & Westwind, 2006). I have assigned this criteria at 0.25, making it valued as the second most important for California and its residents. The concern for equitable policy

warrants a high weight in the CAM analysis since research shows that transportation funding's complexity is inherently biased as there are methods to avoid contribution.

The *sustainability* criterion evaluates the capability for the program to withstand time with the least amount of intervention in the form of manipulation or additional spending after the initial policy has ended. This criterion looks at the future outcomes of a program and gauges whether or not it can sustain itself without future public intervention or reform (One Hundred Twelfth Congress of the United States of America, 2012). In terms of maintaining roadways, no program is completely self-sustaining; however, a policy alternative that continually generates revenue based on the wear and tear induced on roads provides funds for maintenance more closely matched with the potential need (Colorado State University, 2012). Creating a solution that is proactively sustainable by making drivers pay for their use of roads is optimal for this policy problem, thus this criterion will help decipher which solution best fits California's needs. I weigh this criterion at 0.2 because even though it is important to create a sustainable program, it is expected that monitoring and regulation will still be necessary to ensure that the program continues to generate sufficient funds in an equitable manner. Since the economic downturn and the rise of public involvement, groups like the Occupy Movement stress the need for responsible and accountable policy. As policy makers want to avoid negative opinions and expedite bills, this weight emphasizes sustainability but does not require a flawlessly sustainable policy.

The final criterion, *internalizing negative externalities*, addresses each policy's ability to correct market failures in surface transportation funding. A negative externality occurs when the actions of one person diminishes the welfare of another who has no control over the actions of others. This economic event occurs frequently especially as it relates to driving habits. Driving has many negative externalities including congestion degradation of roads, and collisions. These negative externalities occur when there is a market failure in the industry. Thus, policy proposals

should attempt to internalize these externalities and make the market more effective. The internalizing negative externalities criterion evaluates the policy's ability to lessen the externalities of driving (Dubner & Levitt, 2008). An effective policy for this criterion would decrease the externalities such as congestion and road damage due to the increased price to drive and people's choice to find more cost effective methods of transportation. Creating market efficiencies is a desirable attribute of public policies as it limits future need for intervention by governmental agencies. This criterion is weighted at 0.15, as internalizing the externalities is a benefit of the program because it potentially decreases the roadway maintenance needs if drivers chose to alter their driving habits. This criterion is weighted the lowest because it may be difficult to predict the rate at which externalities will be internalized. While some people may change their driving habits due to an increase in taxes, others may have a higher threshold for driving costs.

Sensitivity Analysis

The sensitivity analysis in quantitative evaluations is a process of determining the level of uncertainty among the options. The purpose of this test is to gain an understanding of the relationship between the alternatives and chosen criteria (Sensitivity Analysis, N.D.). When evaluating policy options, it is critical for decision makers to know the variance in results should the criteria priority or emphasis shift. To test the validity of the quantitative CAM analysis, I present the results of a sensitivity analysis in Chapter 4. This analysis determines whether significant changes occur when the weights or values of each criterion are changed (Munger M. C., 2000).

Due to the specific criteria used in this analysis, the CAM is likely to be sensitive to varying weights of the criteria. Depending on the varying priorities of decision makers, different weights for each criterion can change the results of the CAM analysis dramatically (Munger M.

C., 2000). It is important to evaluate different possibilities for weighing criteria to capture the potential changes to the results of the analysis. For example, recent policy initiatives in California and throughout the country have stressed the importance of responsible policy making thus sustainability may be of higher importance now than ever before (One Hundred Twelfth Congress of the United States of America, 2012). For this reason, the sensitivity analysis adjusts the weights to reflect a priority for sustainability. In this case, I will use 0.3 as the weight for sustainability in the sensitivity analysis. Additionally, internalizing negative externalities has the potential to decrease the need for future policy and needed maintenance of roads due to reduced driving. This benefit adds to the sustainability criterion and thus it is weighted 0.2 in the sensitivity analysis. Furthermore, equity is an issue that can be handled at multiple levels of government. Policy makers may decide that a policy like tolling is viable statewide and leave the equity consideration to transportation agencies when determining which tolls to implement. For this reason, the criteria should be of less value to decision makers and is assigned a 0.2 weight in the sensitivity test. Finally, as low administrative cost is of utmost concern to policy makers in this current financial crisis, it is expected that it will maintain a high level of importance to decision makers (California Department of Transportation, 2011). With new trends to create efficient policies and cut unnecessary waste within government agencies, this sensitivity analysis must maintain a high weight for the low administrative cost at 0.3. Table 3 below summarizes these weights for the sensitivity analysis.

Criterion	Weight
Low Administrative Cost	0.3
Equity	0.2
Sustainability	0.3
Internalizing Negative Externalities	0.2
Total:	1.00

I test the criteria and alternatives with these different weights assigned to understand the sensitivity of the policy options. Major shifts in the CAM results will show that the alternatives are highly sensitive to the weights and thus the priority of the criteria by decision makers (Sensitivity Analysis, N.D.). However, if the results remain relatively similar, then the analysis and criteria reflect a firm evaluation of the alternatives with little fluctuation with differing political and societal priorities.

Chapter 4

ANALYSIS

This chapter assesses the policy alternatives outlined in chapter 2 using the evaluative criteria specified in chapter 3. For each alternative, I first explore the qualitative CAM analysis and explain the considerations that lead to the rating determination for each criterion. The qualitative analysis addresses the criteria and explains the reasoning for the value determinations that are depicted in the accompanying quantitative CAMs. The quantitative CAM shows the calculation for the alternatives and criteria to determine the total CAM value of each alternative. Finally, I address the Sensitivity Analysis and explain the meaning and implications of the changes to the results.

Alternative 1 – Private-Public Toll Roads

The Private-Public Toll Road program consists of leasing roads to private entities, relinquishing the State's maintenance and operation expenses. These systems have expanded greatly in places like Japan and Europe helping mitigate the extreme costs to maintain and manage roads.

Criterion 1: Low Administrative Cost

The administrative costs related to this policy are focused on program implementation, contracting services, and roadway inspections to determine adequate operation and administration. Ensuring proper payment of lease agreements and contract administration is also a factor that increases administration and auditing costs for the program (Brown, 2007) (London, Peek, Saltzmand, & Gunaydin, 2001). Additionally, as identified in the literature review in Chapter 2, drivers do not favor this alternative and thus the State may encounter resistance from voters and interest groups that will incur added public expenses. However, delegating the brunt of the maintenance expenses to private firms makes this program strong in the low administrative

cost criteria because the majority of expenses and construction are managed by the private sector. Additionally, these private-public agreements guarantee a constant revenue stream to the state in the form of lease payments for decades to come. The consistent revenue stream is expected to outweigh the costs of implementation thus this alternative is rated a 4 value for strong in the Low Administrative Cost criterion.

Criterion 2: Equity

While toll roads present an opportunity to charge for access to roads or lower congestion lanes, these roads present an equity dilemma depending on the implementation and selection of roads to toll. The placement of these toll roads must be considered in order to prevent overburdening a particular group. Although the dollar amount per passage on the route may be equal, the ability or need to use said road may overburden the poor. For example, tolls are typically implemented on highways inbound to cities. Many disadvantaged individuals seek lower income homes outside of downtown area yet must commute to places of employment within city lines, thus are subject to toll roads more than drivers that can afford intercity housing options. However, some tolling options are limited to increased lanes that target drivers desiring lower congestion and thus not all lanes on the route are tolled. Due to this disparity in the potential implementation of toll roads, Private-Public Toll Roads are rated very weak (1) in the equity criteria.

Criterion 3: Sustainability

Private-Public Toll Roads is a policy designed for long-term investment and return for the State. As this policy looks at private sector investment in roads and leasing agreements to span decades, this policy is purposed at implementing sustaining revenue streams from the private sector to invest on non-tolled roads and the security that leased roads will be operated and maintained according to regulation for years to come with little intervention from the State.

These stipulations in the program attempt to assure sustainability of the policy and viability of roadway maintenance funds into the future. However, this policy carries the possibility that the venture does not prove profitable or beneficial for the private sector entity and it dissolves or walks away from the private-public tolling commitment. Research identified few instances where these private-public toll roads failed in their intent either due to bankruptcy or uncontrolled rate increases due to poor economy and insufficient revenues (Minnesota Trucking Association, 2012). These failures can require additional intervention from the state, which jeopardizes sustainability. These instances are rare and with appropriate legal precautions within the agreement, State agencies can protect their interests and institute regulative controls on the private entity. This alternative thus rates very strong (5) in the sustainability criterion.

Criterion 4: Internalizing Negative Externalities

Public-Private Toll Roads in general do not internalize the negative externalities of driving. However, some toll roads take the form of High Occupancy/Toll (HOT) lanes provide the option for single occupancy vehicles to drive in carpool lanes for a fee. This popular adaptation in Southern California creates a market for decreased congestion, thus internalizing this negative externality. By providing this option, drivers in a hurry or frustrated with other vehicle may pay to use other lanes for speedier travel. In doing so, not only does the driver enjoy the benefits of the carpool lane but also as a result, there is one less driver contributing to the congestion on regular lanes. The alternative being evaluated in this thesis, Private-Public Toll Roads, is a policy to approve the expansion of privatizing roads with the use of leasing and tolling agreements. This policy can take many forms including HOT lanes that may internalize negative externalities of driving by adjusting fees based on time of day or number of passengers. When this policy is implemented on entire interstates or bridges there is no internalizing of negative externalities as congestion, roadway damage, and collisions are not decreased by this policy

option. Consequently, Public-Private Toll Roads rate weak (2) for the internalizing negative externalities criterion.

Rating: (1) very weak (2) weak (3) moderate (4) strong (5) very strong					
	Criterion 1: Low Administrative Cost	Criterion 2: Equity	Criterion 3: Sustainability	Criterion 4: Internalizing Negative Externalities	TOTAL
Alternative #1 <i>Public-Private Toll Roads</i>	Rating: 4 Weight: 0.4 Total: 1.6	Rating: 1 Weight: 0.25 Total: 0.25	Rating: 5 Weight: 0.2 Total: 1.0	Rating: 2 Weight: 0.15 Total: 0.3	3.15

Alternative 2 – Mileage Fees

A mileage fee system proposes installing on all vehicles a device that record miles driven in order to charge drivers for the damage imposed on the roads based upon the miles driven.

Criterion 1: Low Administrative Cost

This policy presents considerable start-up, product research, and development expenses related to implementation. Additionally, the administrative and auditing expenses for this policy are high as state agencies must to ensure the program is operating appropriately and fees are collected in accordance with the laws and regulations. On the other hand, this program shifts the collection of dollars to reflect the accurate amount of damage to roadways. Since all vehicles are charged for their miles driven and not the fuel consumed, the program will increase revenues to account for high efficiency vehicle drivers currently not contributing a proportionate amount to the maintenance expenses imposed. For these reasons, relative to the other policy options, this alternative is rated weak (2) in the Low Administrative Cost criteria as it is expected to require extensive implementation and continued administrative costs for California.

Criterion 2: Equity

The mileage-based pricing system attempts to bridge the equity gap that currently exists in the contribution toward the maintenance of California's roads. A pressing issue with funding a program is determining whether anyone is particularly overburdened by the policy. Currently with the gas tax, drivers who have less fuel-efficient vehicles contribute considerably more to the road system than drivers who have hybrid or electric vehicles (Bolton, 2010). Since weight is the only difference between cars and their ability to deteriorate the roads, two similarly weighted cars should not pay different amounts for the same miles driven. The mileage-based fee system attempts to fill the gap between the weight and fuel excise tax contributions by creating a more equitable distance over consumption fee.

In recent years with the increasing price of gasoline, the presence of hybrid and electric vehicles has increased. These vehicles are options for the wealthy and provide an opportunity for people to use less fuel and in turn pay less gas tax to maintain the roadways. Unfortunately, since fuel-efficient vehicles are only an option for financially affluent individuals, the financially disadvantaged population contributes an inequitable portion of the funding for road maintenance (Dieringer Research Group, 2008). The mileage-based pricing program is highly equitable in this aspect because it charges drivers for the miles driven thus each person contributes their fair share towards maintenance based on the deterioration of the roads they incur (Whitty, 2007). This program accommodates for hybrid and electric vehicles creating more damage to roads than their owners pay in gas taxes by charging all drivers for each mile driven and thus the damage to the roadway system. However, this policy does not account for the reality that poorer families and communities must driver longer distances as affordable housing options tend to be remotely located. Thus, this policy is rated moderate (3) in the equity criteria.

Criterion 3: Sustainability

The Mileage Fee system is a complicated policy that requires extensive monitoring and analysis for viability of the funding option. In addition to the expenses for implementing this program, the development of the on-vehicle device, research, and analysis of inflation costs to assess the appropriate price per mile to be charged will necessitate continuous re-evaluation and manipulation of the policy and program. Furthermore, this policy needs continuous monitoring and maintenance to the physical devices, service stations, and auditing departments to maintain accountability and reduce evasion of the fees. While changing the rate per mile to charge appears simple, the analysis and monitoring required to adequately assess the necessary changes to the policy and the required legislative action to increase or modify fees creates greater sustainability issues (Oregon Department of Transportation, 2010). Consequently, mileage fees rate weak (2) for the sustainability criterion.

Criterion 4: Internalizing Negative Externalities

Transitioning to a system that charges drivers for each mile driven creates a direct incentive to decrease driving habits and seek alternate forms of transportation. This system imposes a significant increase in the expenses associated with driving thus it is expected that drivers will turn to more cost effective methods of transportation. This behavior shift is the internalizing of the market failures associated with driving. As more drivers seek alternate transportation methods or carpool, congestion decreases, roadway damage is minimized, and collisions become less frequent. Unfortunately, this policy does not account for peak driving times and thus does not directly target congestion concerns. However, it disincentives driving altogether and research from the Oregon pilot program shows that wide application of this policy is likely to decrease congestion as drivers seek alternate methods of transportation (Oregon

Department of Transportation, 2010). For these reasons, this alternative rates strong (4) for internalizing negative externalities and provides favorable economic benefits to transportation.

Rating: (1) very weak (2) weak (3) moderate (4) strong (5) very strong					
	Criterion 1: Low Administrative Cost	Criterion 2: Equity	Criterion 3: Sustainability	Criterion 4: Internalizing Negative Externalities	TOTAL
Alternative #2 <i>Mileage Fee</i>	Rating: 2 Weight: 0.4 Total: 0.8	Rating: 3 Weight: 0.25 Total: 0.75	Rating: 2 Weight: 0.2 Total: 0.4	Rating: 4 Weight: 0.15 Total: 0.6	2.55

Alternative 3 – State Fuel Sales Tax

A State Fuel Sales Tax utilizes the current tax structure to implement an *ad valorem* tax that charges a percentage tax of each fuel sale.

Criterion 1: Low Administrative Cost

This tax has limited additional administrative expenses than are already in place for the fuel excise tax. However, it proposes a considerable increase to the revenues generated as research shows that a mere 1% increase in the tax rate will generate approximately \$1.9 billion in revenues. Since this tax structure generates increased revenues for each fuel sale with minimal increased implementation costs, this revenue source rates very strong (5) in the low administration costs criterion.

Criterion 2: Equity

The State Fuel Sales Tax increases the rate at which drivers are taxed for the volume of fuel consumed. This tax will further the gap between wealthy and poor drivers as those with hybrid vehicles will continue to pay for damage they create based on a lower volume of fuel sales. This means that disadvantaged drivers will be charged increased tax amounts to account for the lack of funding contributions by high efficiency vehicles. While hybrid drivers will pay a higher tax rate along with all other drivers due to this policy, this amount is not equitable to the

taxes paid by those driving less fuel efficient vehicles even though the damage to roads may be the same. Furthermore, the Oregon Center for Public Policy addresses in its tax structure analysis that both excise and *ad valorem* taxes are regressive meaning that the taxes paid by individuals represents a higher percentage of income for disadvantaged drivers than wealthy drivers (Thompson & Sheketoff, 2003). The inability for this policy to correct this inequity further compounds that this alternative rates poorly in the equity criterion relative to other policy options. For these reasons, this policy is rated very weak (1) in the equity criterion.

Criterion 3: Sustainability

Similar to the low administrative cost criterion, sustainability of the State Fuel Sales Tax is going to mimic the current excise tax program in place. The tax structure will require review and auditing to ensure the correct rates are applied and that tax evasion is minimized; however, this infrastructure is already in place for the fuel excise tax and all taxes applied in California. Additionally, since this tax will implement a percentage to be charged per fuel sale, it will not require any assessment of inflation or cost of living expenses. This *ad valorem* tax will adjust the revenues as the sale prices increase due to demand and inflation. On the other hand, since this alternative does not account for high efficiency vehicles, should the industry transition primarily or solely to hybrid or electric vehicles, fuel sales will decrease and this policy will no longer provide adequate funding to maintain the roads. Accordingly, this policy alternative is moderately sustainable (3).

Criterion 4: Internalizing Negative Externalities

Shifting the fuel tax structure to an *ad valorem* tax increases costs at the pump as the tax rate changes from a flat cents per gallon to a percentage of each sale. This increase in costs decreases the demand for driving as it becomes too costly and drivers seek alternative transportation methods where possible. On the other hand, due to the increased disparity between

older and more fuel efficient vehicles, some drivers will not feel the financial impacts of this increase as drastically. In these instances, the internalization of negative externalities will not be as significant. Due to the uncertainty of the effect that this policy will have on externalities of driving this alternative is rated moderate (3) for the internalizing negative externalities criterion.

Table 6: State Fuel Sales Tax Quantitative CAM

Rating: (1) very weak (2) weak (3) moderate (4) strong (5) very strong					
	Criterion 1: Low Administrative Cost	Criterion 2: Equity	Criterion 3: Sustainability	Criterion 4: Internalizing Negative Externalities	TOTAL
Alternative #3 <i>State Fuel Sales Tax</i>	Rating: 5 Weight: 0.4 Total: 2.0	Rating: 1 Weight: 0.25 Total: 0.25	Rating: 3 Weight: 0.2 Total: 0.6	Rating: 3 Weight: 0.15 Total: 0.45	3.3

The analysis above identifies the considerations and evaluation of each alternative in relation to the criteria selected. The qualitative analysis, provided in a narrative format, outlines the reasoning behind the each of the ratings provided in the quantitative CAM analysis. Tables 4-6 depict the results of the qualitative CAM analysis. From these tables, the Public-Private Toll Roads and State Fuel Sales Tax alternatives rated the highest options for implementation with scores of 3.15 and 3.3 respectively. The lowest scoring alternative is the Mileage Fee system due primarily to the high cost and troubles with equity and sustainability. However, all three alternatives have total scores within 0.75 points of each other meaning that there is not a highly dominant or favored option as the sole source of funding for transportation in California. In the following section, I perform the sensitivity analysis using the ratings with different weights for the criteria to determine if a shift in priorities changes the outcome of the CAM analysis.

Sensitivity Analysis

As explained in chapter 3, this sensitivity analysis intends to gauge the shift in the analysis based on changing priorities or importance of each criterion. The analysis below uses

the rating for each of the alternatives and criteria. Chapter 3 identified new weights for each criterion, which are reflected in the CAM below in Table 7 and are used to calculate the sensitivity analysis.

Rating: (1) very weak (2) weak (3) moderate (4) strong (5) very strong					
	Criterion 1: Low Administrative Cost	Criterion 2: Equity	Criterion 3: Sustainability	Criterion 4: Internalizing Negative Externalities	TOTAL
Alternative #1 <i>Public-Private Toll Roads</i>	Rating: 4 Weight: 0.3 Total: 1.2	Rating: 1 Weight: 0.2 Total: 0.2	Rating: 5 Weight: 0.3 Total: 1.5	Rating: 2 Weight: 0.2 Total: 0.4	3.3
Alternative #2 <i>Mileage Fees</i>	Rating: 2 Weight: 0.3 Total: 0.6	Rating: 3 Weight: 0.2 Total: 0.6	Rating: 2 Weight: 0.3 Total: 0.6	Rating: 4 Weight: 0.2 Total: 0.8	2.6
Alternative #3 <i>State Fuel Sales Tax</i>	Rating: 5 Weight: 0.3 Total: 1.5	Rating: 1 Weight: 0.2 Total: 0.2	Rating: 3 Weight: 0.3 Total: 0.9	Rating: 3 Weight: 0.2 Total: 0.6	3.2

The quantitative CAM analysis above in Table 7 identifies that with the new weights both the Public-Private Toll Roads and State Fuel Sales Tax alternatives maintain the highest total scores with 3.3 and 3.2 respectively. Additionally, Mileage Fees maintains a relatively similar score of 2.6 keeping it the least viable policy option. In the sensitivity analysis, Public-Private Toll Roads and the State Fuel Sales Tax alternatives shifted in ranking making them only 0.1 apart in total score. These very slight changes show that even with varying priorities and weights, these alternatives maintain very similar results in the quantitative CAM analysis. Since these results remained relatively similar to those of the original CAM analysis, it is assumed that these results are accurate and appropriate to base policy recommendations upon.

Conclusion

In conclusion, this chapter analyzed the proposed policy alternatives in a qualitative and quantitative CAM analysis. Each evaluative criterion was addressed qualitatively in a narrative

format to determine the key influences and factors for assessing quantitative values.

Additionally, a quantitative analysis identified the values and calculation of each alternative to determine its viability as a policy option. Finally, a sensitivity analysis was performed with different criteria weights resulting in similar CAM results as the original analysis. Chapter 5 uses these results to identify policy recommendations and implications for decision makers on the future funding alternatives for California's transportation program.

Chapter 5

RECOMMENDATIONS AND CONCLUSIONS

This chapter provides the concluding remarks and recommendations to this thesis given the transportation funding context and problem, the information gathered through the literature review, and the results of the CAM analysis. In this chapter, I give a brief summary of the thesis, the process used, and key findings identified through the Criteria Alternative Matrix. Following that, I offer policy recommendations based on the analysis and explain how these recommendations will help solve the transportation funding gap. I conclude by using similar innovative policy recently instituted by the County of Los Angeles to further inform my recommendations to California as a whole.

Summary

This thesis aims at evaluating policy alternatives to supplement roadway maintenance funding. Transportation funding in California is in critical need of reform as increased roadway damage and decreased revenue receipts has created a deficit between the supply and demand of funds. After reviewing available industry and academic research on alternative transportation funding mechanisms, three policy options were identified: Public-Private Toll Roads, Mileage Fees, and a State Fuel Sales Tax. These alternatives were examined through the literature review and specific criteria, weights, and ranks explained in the methodology. Using this methodology, I performed qualitative and quantitative CAM analyses as well as a sensitivity analysis to assess the viability of the alternatives as they relate to each evaluative criterion. The analysis resulted in two predominately favored policy options: Public-Private Toll Roads and State Fuel Sales Tax.

The Public-Private Toll Road policy presents the opportunity for the State of California to capitalize on the efficiencies of the private sector. This alternative provides a steady revenue stream of lease payments and reduces the inventory of roads for the State to maintain. The CAM

analysis identified that this alternative exhibits relatively low administrative costs compared to other policy options addressed in this analysis. Shifting the maintenance and operation responsibility to private firms and initiating long-term lease payments to the state establishes a favorable economic and fiscal impact for California transportation agencies.

Additionally, this structure provides for sustainable policy, as it requires little manipulation as time progresses. Once the policy is in place, lease and tolling agreements are arranged between the parties involved. Reevaluation of agreement terms are only done when deemed necessary due to new legislation or unforeseeable circumstances such as default by the managing firm. However, the tolling of roads presents equity concerns for the disproportionate burden of tolling fees on poorer drivers. With these considerations, Public-Private Toll Roads ranked among the highest two alternatives as a viable long-term policy for implementation statewide.

On the other hand, the State Fuel Sales Tax proposes altering the fuel tax structure within California to align revenues with the inflating price of gasoline. This alternative will change the tax structure from a flat excise tax to an *ad valorem* tax, which charges drivers a percentage on each fuel sale. In the CAM analysis, this alternative rated moderate to very strong in low administrative costs and sustainability criteria. Since the tax structure is well established, the change proposes little increase in expenses and need for change in coming years. All taxes require a moderate level of reevaluation to maintain the sustainability of the revenue source; however, these expenses are minimal in comparison to those of other proposed alternatives to the transportation funding problem.

Furthermore, this policy increases costs considerably for a driver, which in turn is expected to incentivize alternative transportation methods. Decreasing the number of drivers on the road internalizes the negative externalities of driving as congestion, pollution, the probability

of collisions, and the degradation of roads decreases. Conversely, as more wealthy drivers have access to hybrid and electric vehicles, the State Fuel Sales Tax neglects the distribution equity of the tax on drivers. This tax structure disproportionately burdens those without access to fuel efficient vehicles or unable to reduce commute distances for other economic concerns. Thus, while this policy ranks high in the CAM along with Public-Private Toll Roads, it continues to harm poorer individuals disproportionately.

Policy Recommendations

Policy change in the transportation funding industry is essential, as current funding levels have not risen to match the degradation of roads. Transportation funding has evolved over the years; however, no sole funding source has proven sufficient. Many sources struggle to generate sufficient funds while maintaining low administrative costs, sustainability, and equity among all drivers. For example, the Mileage Fee system, while well intentioned to bring equity into transportation funding, presents significant expenses and sustainability concerns making it unfeasible for California in the current budgetary and economic crisis. Based on the CAM results identifying two viable policy options to solve the transportation funding problem, I recommend decision makers implement both as partial funding mechanisms that supplement the overall funding to California's transportation needs.

My first recommendation for policy makers is to implement Public-Private Toll Roads as a long-term solution to California's roadway funding problems. Implementing this policy statewide will allow California the opportunity to generate revenues and increase the quality of roadway travel both on tolled roads and throughout the state due to the revenue potential of the funding alternative. Since toll roads and public-private partnership agreements take considerable time to arrange the terms, begin construction, and start realizing revenues, the State cannot expect a quick turnaround of funding for transportation. The funds from leasing roads, while a steady

source of revenue, will take time to initiate and accumulate, as it is unreasonable to expect toll road establishment on a large scale within the next five to ten years. Due to this delay, this alternative does not serve as an immediate solution to the funding deficit. Accordingly, as a sole funding option, this policy is insufficient; however, supplementing the long-term revenues with a short-term policy will generate the revenues currently needed.

Furthermore, California decision makers should implement the structural change to the State Fuel Tax. The State Fuel Sales Tax alternative establishes an immediate increase to the state tax revenues for transportation funding. The *ad valorem* tax significantly inflates the transportation tax revenues needed in order to carry out the growing number of roadway projects throughout California. A sales tax on fuel will maintain a constant percentage charged to drivers, whereas the current excise tax policy charges approximately 4.5% of the fuel price per gallon, which fluctuates dependent on the price of gas. This structure solidifies the revenue stream and assures the transportation industry proportionate funding levels should the price of gas increase. While this policy has some equity concerns as outlined in the analysis chapter, it provides a high return on the administrative effort, maintains sustainability, and internalizes many of the negative externalities of driving. The increases in driving costs because of this policy are estimated to significantly decrease the number of drivers on the road as alternate forms of transportation are incentivized. The inherent decrease internalizes negative externalities such as congestion, air quality, road degradation, and collisions, thus possibly lessening the dramatic demand for transportation funds in the future, as drivers seek new methods of transportation.

The Los Angeles Metropolitan Transportation Authority (Metro) provides an example of an attempt to combine these two policy concepts in order to fund transportation within its jurisdiction. Los Angeles County faces some of the State's most costly transportation projects as the population and driving habits are exponentially larger in its metropolitan areas than in some

of California's more rural and less densely populated regions (Los Angeles County Economic Development Corporation, 2011). In order to address its funding needs, Metro introduced project delivery and funding initiatives that would generate funds and speed up project delivery times. These initiatives include the use of Public-Private Partnerships in 2007 and increasing the county sales tax on all goods in 2008 to fund additional transportation projects (Metro, 2010 B).

The Public-Private Partnership program boasts incredible promise according to Metro as it will bring in new capital from the private sector, ramp up project delivery and completion rates, shifts much of the maintenance risk and responsibility to private firms, provides for less costly construction expenses, and superior roadway quality (Metro, 2010 A). By partnering with private companies, Metro has found that the efficiencies of providing services at a faster pace with fewer expenses and potentially better quality can benefit the transportation industry and aid in the delivery of much needed roadway improvements (Metro, 2010 A). Additionally, Metro proposed an increase to county sales taxes of a half percent with Measure R, which passed by voters in 2008 by more than 68% (Tan, 2012) (Metro, 2011). This community support displays the necessary commitment to transportation investment in order to fund transportation appropriately. According to the economic impact study on Measure R, Metro can anticipate approximately \$40 billion in tax revenues over the next 30 years for use toward roadway enhancements throughout the county (Los Angeles County Economic Development Corporation, 2011).

Due to Los Angeles Metro's policy initiatives still being in the infancy stages, it is difficult to determine what successes or failures may arise as projects are developed and executed under the new funding and policy structure. As noted in the literature review, Public-Private Partnerships have the possibility of default if the venture turns unprofitable to the private firms. In these cases, the public agency is reverted the responsibility of operating and maintaining the

roadway and must again assume the risks and provide the necessary funding while losing its revenue source from the leasing agreement.

Additionally, Metro recently faced a funding setback when voters failed to approve a 30-year extension of Measure R on the November 2012 ballot (Bloomekatz, 2012). Due to the increasing need for funding and Los Angeles' goal to issue bonds for the projected future tax revenue, Metro placed Measure J on the ballot to increase the term of Measure R from 30 to 60 years (Metro, 2010 B). The change in voter support after four years should lead officials to believe that although Los Angeles residents are committed to fixing their roadway problems, taxes are not viewed as a sole option. State officials can use these successes and challenges, although still very new, to understand the feasibility of the proposed policies. Moving forward, decision makers on the state level weighing these policy options should acknowledge that while these policy options rate well with the chosen CAM criteria, many additional influences may be key to the success or failure in implementation.

Metro's aim with this combined source initiative attempts to utilize the efficiencies of the private sector while leveraging tax revenues to further the transportation program. By creating an additional sales tax and limiting risk and construction responsibility, Metro has established a similar policy structure to the recommendations provided in this thesis. In order to tackle the growing degradation percentage of roads, California decision makers must act and engage in policy that will bring an influx to transportation funding levels now and into the future.

California infrastructure is an enormous investment that requires continued maintenance, thus the funding needs to match the demand. Combining the two highest rated alternatives provides the State of California with both short and long term solutions to the policy needs. While both policies have down falls, they meet the funding needs based on the criteria and weights selected for this analysis. No policy can eliminate all negative externalities and provide a completely

equitable front; however, these combined alternatives address many of the concerns driving policy making today including fiscally responsible and sustainable legislation.

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