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Sustainable Transportation for Maine's Future

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Phase 2- Alternative Transportation Funding

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Acronym	*Definition*
AASHTO	American Association of State Highway and Transportation Officials
AEO	Annual Energy Outlook
AMFA	Alternative Motor Fuels Act of 1988
BTS	Bureau of Transportation Statistics
CAFE	Corporate Average Fuel Economy Standards
IEA	International Energy Agency
NASHTU	National Association of State Highway and Transportation Unions
NCHRP	National Cooperative Highway Research Program
NHTSA	National Highway Transportation Safety Administration

Executive Summary

Maine is dependant on its transportation infrastructure for continued economic strength and growth, particularly on the 22,670 miles of public roads.[1] Maine ranks fourteenth in the nation for the largest number of highway miles traveled annually per capita - 14,912 per year. Maine is highly reliant on its road system because large areas of the State lack transportation alternatives. This means that the current and future condition of the roadways is a major concern. How such a crucial infrastructure will continue to be supported and enhanced financially to meet the growing needs of the State must be considered carefully.

In the United States, the second most utilized source of funding for transportation is a motor fuel excise tax, second only to general funds. In 2004, this 'gasoline tax' was 3% of the State's total revenue and 68% of the Highway Fund revenue, not including taxes derived from diesel fuel. Of particular concern for the State is the erosion of motor fuel excise taxes as a primary basis for funding Maine's public road infrastructure.

Transportation policy makers have identified a number of threats to fuel tax revenue including: tighter fuel economy standards, a possible increase in the market share for alternative fuel and hybrid vehicles, the declining purchase power of motor fuel tax revenue, and increasing demands on the transportation infrastructure coupled with increasing costs of materials for transportation projects.

Maine is not alone in relying on the motor fuel taxes and in facing threats to this revenue stream. A large body of research exists which examines alternatives for funding and maintaining transportation infrastructure. This report utilizes an extensive literature

[1] Sixty one percent of Maine's roads are owned by town or municipal governments while 37% are owned by the State.

review to identify twelve financing options, many of which are simultaneously aimed at generating revenue and addressing other transportation issues such as congestion. The report also presents case studies from around the nation. To assist in presentation, four categories of alternative funding options are used throughout the report: taxes, road/direct pricing, tolls and fees. The findings of the literature review are summarized in Table ES.1.

This report also recognizes that increasingly, transportation planning must consider not only traditional issues of best practice, financing and safety, but also issues of equity and suitability. As the number of transportation initiatives grows, along with alternatives to finance them, more attention must be devoted to determining the suitability of an option for a State's specific needs. An additional important consideration in transportation decisions and investments is the subsequent effect on diverse economic groups. Such assessments of equity and suitability should be considered as Maine looks ahead in transportation planning.

Other states have begun to tackle some of these same issues and have employed a set of evaluation criteria as a means of identifying preferred options for funding transportation infrastructure. The list of financing options presented in Table ES.1, however, demonstrates that many of the alternatives were designed for major metropolitan areas and may not be suitable for Maine. This report provides a combination of suitability and equity considerations as helpful tools for evaluating the applicability of alternative financing options for Maine. The criteria outlined in Table ES.2 are intended to serve as a discussion point for policy makers.

While the primary focus of this report is the identification of financing options that *public* entities could employ for roadway financing, the report also investigates *public-private* partnerships as a financing option. Three successful, Maine, public-private partnerships (the Portland Transportation Center, Island Explorer and Maine 511 System) are included as case studies in the report. Beyond the experience in Maine, the report also discusses six possible levels of partnerships identified by the Federal Highway Administration. The report finds that the primary benefits of such partnerships include the ability to complete a greater number of projects at a faster rate as well as the potential to decrease the cost of new projects. The concerns surrounding public-private partnerships include the ability of public-private partnerships to meet the needs of the public transportation sector, issues of public safety (i.e., whether private contractors will meet the rigorous safety requirements of state and federal governments) and the assignment of risk among the partners, particularly operating revenue risk.

The report briefly describes the growing prevalence of multi-modal transportation projects as a response, in part, to the threats facing highway infrastructure funding. It is important to note that one of the largest challenges facing multimodal and intermodal project planning is that responsibilities for different modes are often held by different state agencies. Successful implementation of multi-modal and intermodal projects requires extensive communication among the relevant state agencies as well as the public.

The report includes a discussion of the important role of national transportation policies on Maine's future fuel tax revenues. Specifically, Maine transportation planners must continue to monitor the impacts of the Alternative Motor Fuels Act (AMFA) and changes in the CAFE standards and other policies that intentionally increase fuel efficiency and decrease the use of petroleum, but also, inadvertently, decrease highway infrastructure revenues.

The data analysis component of the report utilizes Maine vehicle registration data, as well as national data sources, to generate fuel consumption and motor fuel excise tax revenue projections for Maine's entire vehicle fleet, including both gasoline and diesel vehicles. Current trends in fuel economy show only modest increases in fuel economy due to the phasing in of higher CAFE standards for light-duty trucks (Figure ES.1). These modest increases in fuel economy will likely yield a constant, or slightly decreasing, nominal value of future gasoline revenues for Maine. Actual changes in future fuel tax revenues also will depend on changes in the number of miles driven per capita and changes in Maine's population, both in size and in demographics. We examine the potential revenue impacts of these modest increases in fuel economy over a twenty-year period (i.e., to 2025). This scenario is entitled 'status quo' throughout the projections.

To examine the potential revenue impacts of larger changes, we project possible 5%, 15% and 30% increases in fuel economy for Maine's vehicle fleet over a ten-year period (i.e., to 2015).[2] A graph of fuel efficiency trends for both the nation and Maine (see Figure ES.1) shows that Maine closely mirrors national fleet fuel efficiency trends. These projections are then used to calculate the impact of changing fuel economy on

[2] The 30% increase was selected based on work by the National Research Council which indicates that existing and emerging technologies could be used to increase the fuel economy of new vehicles by about 30% by 2015. At the same time, given choice, consumers might choose to purchase greater acceleration, towing capacity, or other vehicle features that work against increased fuel economy. Efforts to project revenue changes further into the future face the limitation of either assuming constant technology or assuming development of new technology and therefore face unknown increases in fuel economy as a result.

Maine's motor fuel excise tax revenue stream through 2015 (Figure ES. 2). It is clear from these revenue projections that concerns of decreasing fuel tax revenue due to changes in fuel economy are well founded. If steps are taken at the national level to increase fuel efficiency standards, or consumers on their own choose to purchase more fuel efficient vehicles, Maine could experience a decrease in revenue of up to 10% in the next ten years. However, absent changes in national transportation energy policy or changes in consumer behavior, these increases in fuel efficiency may not occur. The revenue estimate under status quo assumptions is $214 million for 2015, representing a 2.53 % decrease in revenues. Extending the status quo projection to 2025 yields a revenue projection of $209 million for 2025, representing a modest 5.03% decrease in revenue from 2005. However, to the extent that the costs of highway maintenance and construction rise above the overall rate of inflation, actual purchasing power could be lower still.

The literature review section of this report discusses possible alternatives to supplement or replace the revenue obtained from fuel taxes. One financing option identified in the literature review, and currently employed both nationally and internationally, is a mileage-based charge. The report calculates that a mileage-based charge of 0.174 cents per mile would be required in order to maintain the current level of revenue of $220 million from the gasoline tax.

Determining the alternative funding options most appropriate for Maine is properly left for the State Legislature, the Governor and appropriate State agencies and the public. However, it is evident that many of the alternatives discussed in the literature review may not be preferred given Maine's economic and geographic circumstances.

The literature review and suggested evaluation criteria provide stakeholders much of the information necessary for informed discussions on the future of Maine's transportation financing.

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Table ES.1 Literature Review Findings

Section of Report	Alternative Financing Option	Definition	Benefits	Concerns
2.2			***Taxes***	
2.2.1	Alternative Gas Tax Structure	Indexing gas tax rates to a measure of inflation.	1) Avoid politically charged situation of increasing tax rate 2) Maine currently uses an alternative gas tax structure	1) Gasoline taxes are regressive (shift tax burden to the poor & middle class)
2.2.2	Local Option Transportation Taxes	Implementation of a tax at the local level. Earmark revenue for transportation.		
	Fuel Tax	Percentage tax on gasoline sales. Revenue earmarked for transportation.	1) Easily administered by local officials and local control of revenue 2) Local drivers are the source of revenue	1) Jeopardize competitiveness of local businesses 2) Limited tax base therefore high rate would be required to raise revenue 3) Possible revenue decline over time given increasing fuel economy

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Section of Report	Alternative Financing Option	Definition	Benefits	Concerns
	Sales Tax	Implementation of a sales tax at local or state level. Earmark revenue for transportation.	1) Broad tax base 2) High revenue for low marginal tax rate; less objectionable to consumers 3) Complies with horizontal equity (all transportation users pay) 4) Direct voter involvement in implementing and maintaining tax 5) Revenue obtained from non-residents	1) Possible revenue instability during recessions 2) No incentives for decreasing use of the transportation infrastructure 3) Possibly jeopardize competitiveness of Maine businesses
	Other: Natural Resource Extraction	Levy weight-based charge on natural resource extraction.	1) Finance rural roads used only by natural resource industries	1) Jeopardize competitiveness of resource based businesses 2) Roads often privately owned by natural resource industries.
	Other: Payroll Tax	Levy tax on businesses to finance transit.	1) Finance urban transit systems	2) Possibly inappropriate for Maine's rural makeup
2.2.3	Taxation of Alternative Fuels	Levy tax on alternative fuels such as natural gas.	1) Maine currently taxes alternative fuels	1) Limited market penetration of alternative fuel vehicles

Section of Report	Alternative Financing Option	Definition	Benefits	Concerns
2.3			***Road/Direct Pricing***	
2.3.1	Area Charging/ Cordon	Implement charge for operating vehicle in specified area.	1) Promote efficient transportation behavior (carpooling, mass transit) 2) Consistent with other policy objectives (reduction of pollution, road wear, noise, etc.) 3) Large revenue base if implemented in large area	1) Possible encouragement of sprawl 2) Creation of boundary effects; motorists increase travel in order to avoid charge
2.3.2	Congestion Pricing	Implementation of variable prices dependant upon time of travel and level of congestion.	1) Reduction in congestion 2) Promote efficient transportation behavior (carpooling, mass transit)	1) Possible public opposition to fee implementation at previously free area
2.3.3	Distance Based Charges	Implement variable vehicle user fee dependant upon distance traveled (i.e. per-mile charge).	1) Stable revenue, not affected by fuel economy 2) Promote efficient transportation behavior (carpooling, mass transit) 3) Gradual implementation possible; lower public resistance	1) Implementation of viable technology on a wide scale 2) Invasion of motorist privacy 3) Evasion of tax 4) Possible shifting of burden to rural areas 5) Capturing revenue from out of state travelers

Section of Report	Alternative Financing Option	Definition	Benefits	Concerns
2.3.4	Managed Lanes/ Value Pricing	Vary price of lanes dependant upon time of day and level of congestion.	1) Present options to motorists; allow motorist to value own time 2) Congestion Management	1) Decrease amount of infrastructure available to the general public
2.3.5	Value Capture	Require private developers to pay for maintenance of roads created.	1) Local and State agencies no longer fiscally responsible for privately created roads	1) Public safety (will developers maintain road consistent with standards of public agencies).
2.4		***Tolls***		
2.4.1	Facility Congestion Tolls	Implementation of variable user fees at specific facilities (ex: bridge), dependant upon congestion level.	1) Promote efficient transportation behavior (carpooling, mass transit) 2) Reduce congestion	1) Equity – fees may be used to finance projects not related to the tolled facility. 2) Tolls are regressive (shift payment burden to the poor & middle class)
2.4.2	Weight-Distance Tolls/Tax	Heavy goods vehicles must pay facility toll or per mile rate based on weight.	1) Heavy goods vehicles pay commensurate with amount of damage inflicted on roads. 2) Captures value of roadways as ‘warehouses’ for commercial goods	1) Possible jeopardy to Maine’s trucking reliant industries

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Section of Report	Alternative Financing Option	Definition	Benefits	Concerns
2.5			***Fees***	
2.5.1	Distance Based Fees/ Price Variability	Replace currently fixed price of vehicle ownership with variable price (ex: variable registration fee based on vehicle miles traveled).	1) Motorists able to control own savings/costs by adjusting driving habits 2) Consistent with other policy objectives (reduction of pollution, road wear, etc.)	1) Evasion
2.5.2	Emissions Fees	Levy variable user fees dependant upon vehicle energy efficiency and environmental emissions.	1) Consistent with other policy objectives (reduction of pollution) 2) Promote citizen awareness of vehicle emissions	1) Availability of information on emissions of all vehicles makes/models.

Table ES.2 Sample Evaluation Criteria for Financing Options

1	What is the revenue raising potential of this option?
2	Will this option meet equity standards (do people with equal ability to pay, pay equally?)
3	Will this project meet pay-as-you-use standards (i.e. will those who use the system more, pay more)?
4	Will citizens still be able to use the roadways/transportation mode under this option, even if they have limited financial resources?
5	Will this option be enforceable and able to capture out of state travelers?
6	Is this option in alignment with other policy objectives?
7	Is this option politically feasible?

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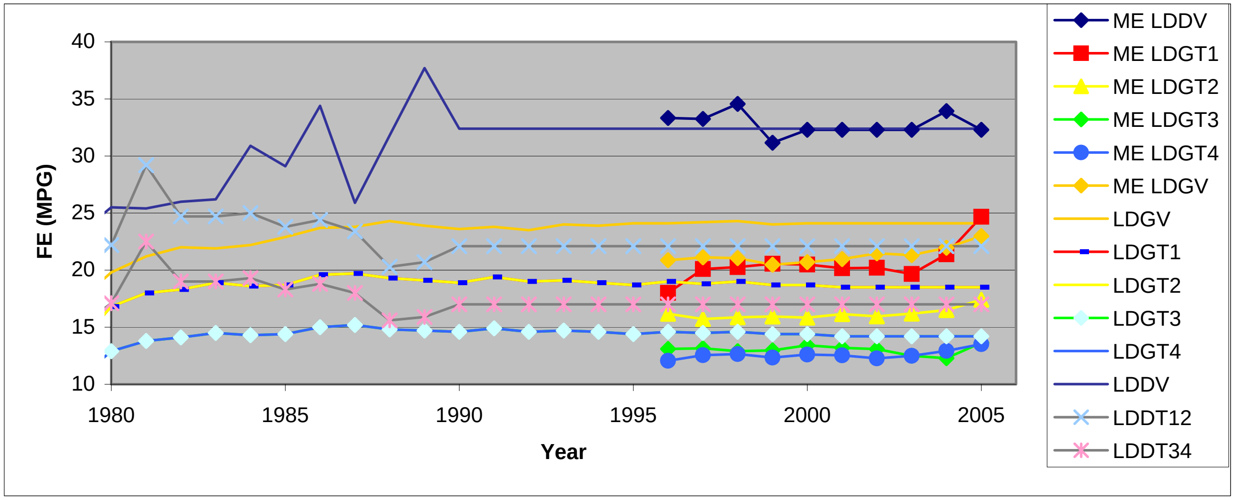
Figure ES.1 Fuel Efficiency Trends



Abbreviation	***Description***
ME LDDV	Maine Fleet of below
ME LDGT1	Maine Fleet of below
ME LDGT2	Maine Fleet of below
ME LDGT3	Maine Fleet of below
ME LDGT4	Maine Fleet of below
ME LDGV	Maine Fleet of below
LDGV	Light-duty Gasoline Vehicles (Passenger Cars)
LDGT1	Light-duty Gasoline Trucks 1 (0-6,000 lbs. GVWR; 0-3,750 lbs. LVW)
LDGT2	Light-duty Gasoline Trucks 2 (0-6,000 lbs. GVWR; 3,751-5,750 lbs. LVW)
LDGT3	Light-duty Gasoline Trucks 3 (6,001-8,500 lbs. GVWR; 0-5,750 lbs. ALVW)
LDGT4	Light-duty Gasoline Trucks 4 (6,001-8,500 lbs. GVWR; 5,751+ lbs. ALVW)
LDDV	Light-duty Diesel Vehicles (Passenger Cars)
LDDT12	Light-duty Diesel Trucks 1 & 2 (0-6,000 lbs. GVWR)
LDDT34	Light-duty Diesel Trucks 3 & 4 (6,001-8,500 lbs. GVWR)

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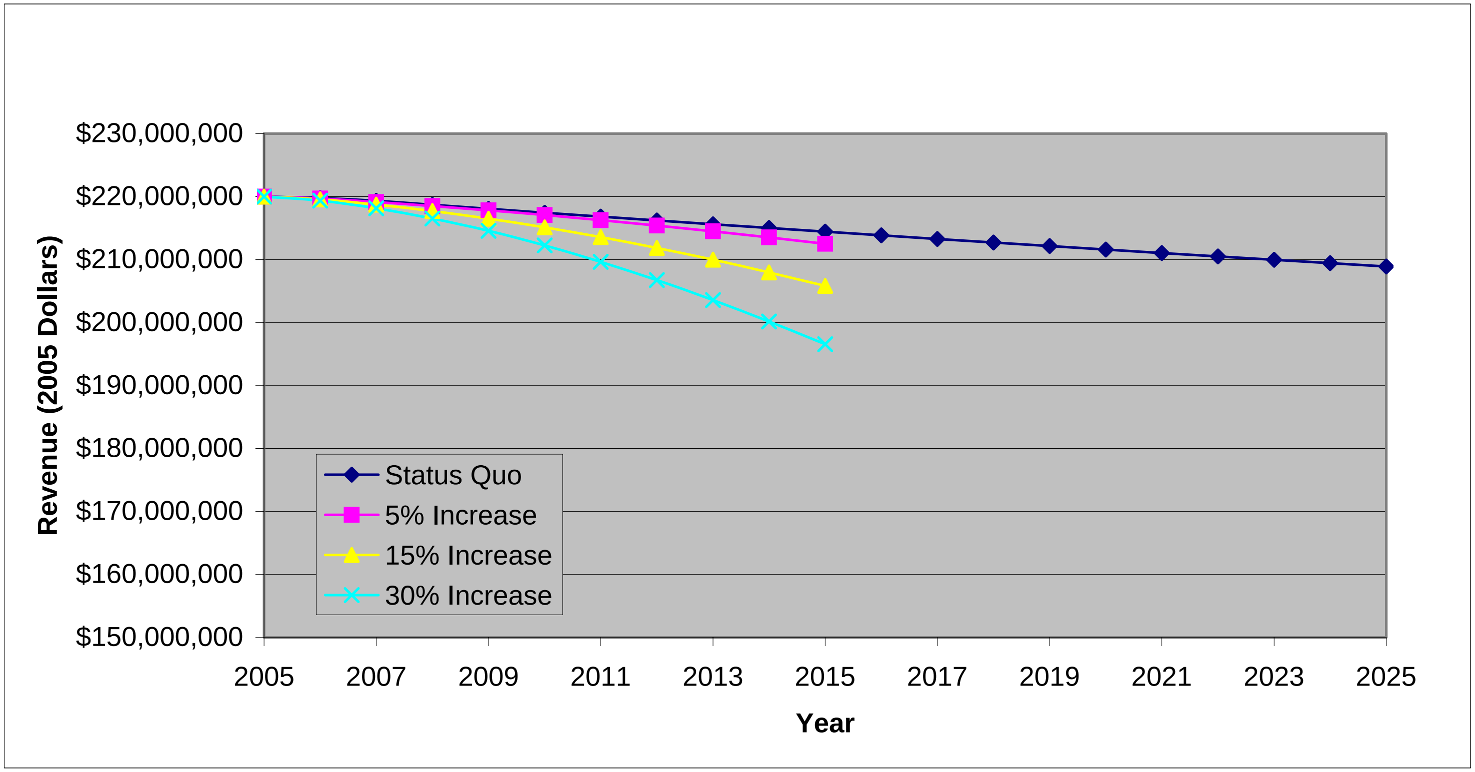
Figure ES.2 Maine Fuel Tax Revenue Projections: Change in Fleet Fuel Efficiency



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1. Introduction

I.1 Maine's Transportation sector

The state of Maine spans over 30,000 square miles and is connected by the 22,670 miles of public roads[3] that traverse the State, as well as the nine freight railroads, five major transit systems[4] and twelve toll ferries that serve the state. Over 32 million dollars of freight shipments leave Maine each year while over 4 million tons of commodities are transported by rail from Maine. Additionally, Maine is fourth in the nation in the number of US-Canadian border crossings for commercial and passenger vehicles. Including these figures with the fact that Portland is the 25th largest waterport by tonnage in the nation, a clear picture emerges that Maine's transportation infrastructure is a substantial contributor to the Maine economy (BTS, 2004).

Maine is dependant on its transportation infrastructure for continued economic strength and growth, particularly the public roads. Maine ranks fourteenth in the nation for the largest number of highway miles traveled annually per capita - 14,912 per year. Additionally, 89% of Maine's work force commutes to work by passenger vehicle with over 1 million passenger vehicles registered in the state of Maine (as of 2005: 499,554 cars, 222,998 light-duty pickup trucks, 167,665 SUVs and 80,515 vans; total fleet including heavy-duty vehicles of 1,061,471). Maine is highly reliant on its road system because large areas of the State lack transportation alternatives. This means that the current and future condition of the roadways is a major concern. Twenty percent of Maine's public roads are listed in either "mediocre" or "poor" condition, while 69% are

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[3] Sixty-one percent of Maine's roads are owned by town or municipal governments while 37% are owned by the state.
[4] The five transit systems and the municipalities served are: Greater Portland Transit (Portland), Casco Bay Island Transit District (Portland), City of Bangor (Bangor), Western Maine Transportation System (Lewiston-Auburn) and the Regional Transportation Program (Portland).

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listed as ‘fair’ or worse (BTS, 2004). How such a crucial infrastructure will continue to be supported and enhanced financially to meet the growing needs of the state must be considered carefully.

1.2 The Role of the Motor Fuel Tax- Current Revenues

Currently in the United States the second most utilized source of funding for transportation is the motor fuel tax, second only to general funds. Maine Statute Title 36 Part 5 ‘Motor Fuel Taxes’ governs Maine’s motor fuel excise taxation. Chapter 451 of this Title dictates the motor fuel excise tax on gasoline at 25.9 cents per gallon effective July 1, 2005 and is a crucial part of the financial support required to maintain and enhance Maine’s transportation infrastructure (Maine Revenue Service, 2005(b)). In 2004, this ‘gasoline’ tax was 3% of the State’s total revenue, and 68% of the Highway Fund, not including taxes derived from diesel fuel (Maine Revenue Service, 2005(c)). Maine implements additional motor fuel taxes on other fuels under Title 36 Part 5 Chapter 459 entitled ‘Special Fuels.’ These special fuels include diesel fuel, propane, compressed natural gas and others. Of particular relevance for this report, the diesel fuel excise tax is 27 cents per gallon in Maine. A majority of the revenue generated from the gasoline excise tax is designated to the highway fund, and all of the revenue from the special fuel excise tax is dedicated to the highway fund.[5] However, Maine’s excise tax statutes also allow for refunds of the motor fuel excise tax for off-highway vehicles including tractors used for agricultural purposes and recreational boats.

[5] Revenue not designated to the highway fund is dedicated to the following state agencies depending on non-highway vehicle use: Department of Marine Resources Boating Facilities Fund; for snowmobile purposes of the Department of Inland Fisheries and Wildlife and the Department of Conservation; for ATV purposes split equally between the Department of Inland Fisheries and Wildlife and the Department of Conservation. Source: http://www.maine.gov/legis/ofpr/04compendium/2004compendium.htm#GASOLINE%20TAX

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1.3 Concerns for Revenue Erosion

Of particular concern for the State is the erosion of motor fuel excise taxes as a primary basis for funding Maine's public road infrastructure. Maine experienced a 10% decrease in state per capita spending on transportation between 2002 and 2003, from $1.93 per capita to $1.72 (AASHTO, 2004 pg. 3-9). This low per capita spending ranks Maine 29th in the nation for per capita spending on transportation.

1.4 Reasons for Declining Revenues from Motor Fuel Excise Taxes

Transportation policy makers have identified a number of threats to fuel tax revenue. First, tighter standards for light-duty trucks, SUV's and mini-vans announced in August 2005 are expected to increase the fuel efficiency of the vehicle fleet nationwide (model year 2005 light-duty vehicles have the highest average fuel efficiency since 1996).

The increasing market share for alternative fuel and hybrid vehicles also may lead to an erosion of the base of the motor fuel excise tax. This is especially true given the recently adopted National Energy Bill 74-26, which gives incentives for alternative and hybrid vehicles. These incentives include tax credits for purchases of hybrids, based on fuel economy that will range from $250 to $3,400.[6] Hybrids currently comprise 0.12% of the Maine passenger vehicle fleet, and 1.52% of the model year 2005 vehicles available. However, to date, the number of dedicated alternative fuel vehicles has been too small to have a significant impact on fuel tax revenues. In fact, a provision of the AMFA, which gives favorable CAFE treatment for flexible and dedicated fuel vehicles, may have led to a decrease in fuel efficiency of the vehicle fleet and the increase in gasoline revenues (NHTSA, 2005 (b)). In addition, in the current economic climate where per gallon

[6] Tax credit range estimated by American Council for an Energy Efficient Economy.

gasoline prices have reached a high of three dollars, citizens who cannot afford newer fuel efficient vehicles may curtail their driving, although the empirical evidence suggest the magnitude of these changes are small, especially in the short run.[7]

The declining purchase power of motor fuel tax revenue is also cause for concern. While Maine, unlike other states, has tied the gas tax to an inflation index, this index is not necessarily sufficient in retaining the strength of the gas tax against the pressures of inflation.[8] A NCHRP problem statement indicates that even accounting "for inflation and fuel efficiency…, the motor fuel tax today generally provides approximately one-third of the purchasing power it did in the 1960's" (NCHRP, 2005).

Finally, the cost of materials for transportation projects increases more than the general rate of inflation primarily due to demand for materials and labor. Despite the declining ability of the motor fuel tax to provide sufficient revenue, the demand on this revenue and the infrastructure it supports has experienced an increase. This increase stems primarily from increased congestion and by the prevalence of other non-highway activities that may be eligible for funding by motor fuel tax revenue.

2. Review of Literature – Transportation Funding Alternatives

2.1 Highway Funding

Maine is not alone in relying on the motor fuel taxes and in facing threats to this revenue stream. A large body of research exists which examines alternatives for funding and maintaining transportation infrastructure. Many of these are simultaneously aimed at generating revenue and addressing other transportation issues such as congestion. This

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[7] "The demand for gasoline is quite insensitive to changes in the price of gasoline. Thus, even substantial increases in the price of gasoline, especially in the short term, are likely to cause consumers to make only small decreases in their consumption. The short-term and long-term price elasticities are generally taken to be -.10 and -0.20, respectively. (Greene 1998)

[8] Inflation Index information available at www.maine.gov/legis/ofpr/04compendium/c04opfl.htm

section will report on alternative funding options identified through an extensive literature review of nationally and internationally recognized leaders in the transportation field including: Transportation Quarterly, Transportation Research Board and the Brooking Institute's Series on Transportation Reform. Each financing option will be discussed with respect to benefits, concerns and available case studies. To assist in presentation, four categories of alternative funding options are used as an organizational tool. The four categories are: taxes, road/direct pricing, tolls and fees.

2.2 Taxes

2.2.1 Alternative Gas Tax Structures

One of the primary benefits of the motor fuel tax is that the tax is collected in small increments, which typically makes it less objectionable to consumers. However, raising the tax rate often becomes a politically charged situation as evidenced in Washington State with Initiative 912.[9] The political difficulty in raising the rate is a partial explanation for the lagging purchase power of the gas tax. An example of this reduction in purchase power can be seen in the federal motor fuel tax, which has declined from 18.3 cents per gallon in 1993 to 9.3 cents per gallon in 2003 (ME DOT, 2005).

An alternative gas tax structure known as 'Inflation Responsive' or 'Variable Rate Gas Tax' involves indexing gas tax rates to a measure of inflation to combat erosion in purchasing power, and to avoid the politically charged situations that often accompany legislated increases in tax rates. Maine has taken one of the initial recommended steps in pursuing this alternative by tying the tax rate to a measure of inflation, as authorized in the Maine statutes by Title 36 Part 5 Chapter 465. One option for Maine to increase gas

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[9] See the Washington State Department of Transportation's 2005 Transportation Tax Package Information Site for more information on this issue at http://www.wsdot.wa.gov/Projects/Funding/2005/

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tax revenue would be to change the inflation index rate to one more in line with the construction industry, such as the PPI.

A concern regarding the use of any type of fuel tax is that gasoline taxes are generally considered regressive taxes, and disproportionately shift the burden of these taxes to the poor and middle class, who typically are unable to purchase newer vehicles that may be more fuel-efficient (Chernick and Reschovsky, 1997).

2.2.2 Local Option Transportation Taxes

The implementation of Local Option Transportation Taxes (LOTT) has become more prevalent in recent years as states struggle to find options that can supplement, and possibly replace, lagging motor fuel tax revenue. LOTT's involve the implementation of a tax at the local level, where revenue is earmarked for transportation use. The rate of LOTT's could therefore vary within a state and the revenue generated would be controlled at the regional or local level. Following the categorization of LOTT options used by Goldman and Wachs (2003), four variations of LOTT's will be discussed: Fuel Taxes, Sales Taxes, Vehicle Taxes and other options including Natural Resource Extraction and Payroll Taxes. Currently, nine states authorize local option fuel taxes, twenty-three states authorize sales taxes, and sixteen states authorize vehicle taxes (Table A.2) (Goldman and Wachs, 2003).

Fuel Tax: A local option fuel tax calls for a percentage tax on gasoline sales, with the percentage determined by local officials and the revenue set aside for local transportation needs. The literature regarding LOTT fuel taxes indicates that this option has limited benefits, and a number of issues, which may limit long-term viability. The primary benefit of this alternative is that the tax is easily administered by local governments and provides for local control of revenues. In addition, local fuel taxes also ensure that local vehicle drivers are the primary source of revenue for this tax, which addresses some equity concerns (Goldman and Wachs, 2003). Another advantage of gasoline excise taxes is that they are relatively stable (Goldman and Wachs, 2003). That is, the income and price elasticity of demand are small, thus month-to-month and year-to-year revenues are relatively stable and predictable.

However, the presence of varied tax rates on fuel at the local level may jeopardize competitiveness of local businesses. Given the limited tax base for a local tax, the rate would need to be set at a level that, at a minimum, supports revenue collection. This higher rate may in fact drive consumers to seek fuel outside the taxed area. A final concern is that, as previously mentioned, motor fuel taxes may not be a long-term solution to the transportation financing problem.

Sales Tax: The LOTT sales tax option has become more prevalent as twenty-three states have authorized the use of local option sales taxes for transportation funding (Goldman and Wachs, 2003). This financing option implements a sales tax at a local or state level, and earmarks the revenue for transportation funding. LOTT sales taxes have a number of benefits identified in the literature. First, if the sales tax is implemented at the state level, a broad revenue base will be covered by the tax. In addition, such a tax will garner high revenue for a low marginal tax rate, which may assist with the difficulty of consumer acceptance of new taxes. Another attractive component of the LOTT sales tax is the horizontal equity component. If revenue is used for a variety of transportation systems (e.g., not just roads) the sales tax system will ensure that all transportation users pay for maintaining the systems. Under the current fuel tax system, the transportation fund pays for bicycle and pedestrian projects; thus non-motorists do not necessarily pay the fuel tax but do benefit. The LOTT sales tax ensures that all users pay. In addition, the sales tax would allow for direct involvement by voters in implementing and maintaining the taxation level, which may promote increased acceptance of new taxes. A final benefit of the LOTT sales tax may be particularly applicable to Maine. The LOTT sales tax would provide revenue from non-residents. As tourism constitutes a significant portion of Maine's sales, the implementation of a sales tax would garner revenue from out-of-state visitors who utilize the transportation infrastructure.

As with all financing options, LOTT sales taxes have a number of issues which may limit implementation viability. First, sales taxes are prone to revenue instability since revenue may decline during times of recession. Second, LOTT's do not encourage more efficient use of transportation systems because all members of the community pay. Thus, no incentives exist for decreasing use of the transportation infrastructure.

Case Study: Georgia

- Georgia, "LOTT": The State of Georgia has implemented the fuel tax variant of the Local Option Transportation Tax statewide. Any Georgia business that holds a 'sales & use tax license' must pay a local option sales tax based on net receipts. In the event that a firm does not hold such a license, the fuel supplier is responsible for collecting the local option fuel tax. This pre-paid LOTT tax replaces the motor fuel tax.[10] In total, local governments in fifteen states have implemented LOTT fuel taxes for transportation funding purposes. It should be noted, however, that many of these states have implemented such taxes only in metropolitan areas (Goldman and Wachs, 2003).

[10] Additional Information on the Georgia Tax, including rates, can be found at the Motor Fuel Tax site: http://www.etax.dor.ga.gov/motorfuel/mf_prepaidtax_070105.pdf

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Vehicle taxes: Another LOTT option employed by portions of sixteen states is the taxation of vehicles often based on value, age, class or a flat annual registration fee (Goldman and Wachs, 2003). Six states employing this option require a public vote for changes to the vehicle tax. States that collect vehicle taxes often contribute this revenue stream to general funds, although the revenue also may be earmarked for transportation needs (Goldman and Wachs, 2003). A discussion of how flat registration fees may be varied to enhance revenue streams will be included under the 'Fees' portion of this literature review.

Other, Natural Resource Extraction: Another LOTT option levies a weight-based charge on natural resources extracted from a state. Since these industries often utilize rural roads that are untouched by other users, a natural resource extraction tax can be viewed as a means of financing maintenance of these roads (Goldman and Wachs, 2003). In Maine however, many of these rural roads may be privately owned. The primary obstacle in implementing or increasing this type of tax is political feasibility. Given Maine's natural resource based economy, implementing a natural resource extraction tax may endanger the competitiveness of Maine businesses.[11]

Other, Payroll Tax: A payroll tax is a supplementary LOTT option. The benefits of this option include the ability to finance urban transit, where businesses whose employees utilize a transit system will be partners in funding the system. This particular

[11] Title 36 (Sections 2721 through 2726) of the Maine constitution calls for the implementation of a Commercial Forestry Excise Tax on landowners of more than 500 acres of commercial forestland. This tax is not a resource extraction tax, as the purpose of the tax is to pay for forest fire protection expenditures. The cost is 32 to 38 cents per taxable acre annually. Additional information is available from the Maine Revenue Service at http://www.maine.gov/revenue/propertytax/sidebar/commercialforestry.htm

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option may not be feasible for Maine, given the limited number of urban centers and the lack of urban transit systems.

In summary, local option transportation taxes, particularly sales taxes, may present an option that warrants further consideration in Maine. The primary benefits of generating revenue from a broad base as well as obtaining revenue from non-residents may be appropriate for Maine.

2.2.3 Taxation of Alternative Fuels

As noted earlier, alternative fuel vehicles and hybrids have become slightly more prevalent in the vehicle fleet, particularly with the climbing price of gasoline. Light-duty diesel vehicles are projected to experience a growth in market share from 1.5 percent of total light-duty vehicles in 2003 to 4.4 percent in 2025. "Alternative fuel vehicles…are projected to grow from 1.7 percent of the 2003 total to 2.2 percent in 2025" (AEO, 2005). Additional high-technology case projections predict much greater advanced technology and alternative fuel vehicle use. One financing option that may help to alleviate the erosion in revenue due to alternative fuel vehicles is levying a tax on alternative fuels used in such vehicles, including natural gas. Currently, the State of Maine levees such a tax on diesel fuel, methanol, ethanol and compressed natural gas, all of which may be alternative fuel sources (Table 1). Despite the rise in hybrid vehicles (0.72% of the model year 2004 vehicles registered in Maine are hybrids), alternative fuel vehicles still have a very limited market penetration in Maine (0.13 % of the Maine vehicle fleet are hybrids). Accordingly, it is not likely that revenue obtained from these fuels will be able to adequately supplement or act as a substitute for the motor fuel revenue stream.

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Table 1. Maine Alternative Fuel Tax Rates

Fuel Taxed	Tax Rate effective July 1, 2005[12] Cents/gallon
Diesel	.270
Propane	.188
Methanol	.147
Ethanol	.183
Compressed Natural Gas (CNG)	.224 (per 100 cubic feet)

2.3 Road/Direct Pricing

2.3.1 Area Charging/Cordon

Area Charging, also known as Cordons, are funding options that implement a charge for operating a vehicle in a specified area, generally a metropolitan center. Existing cordons, for example in London, Singapore and various Norwegian cities, utilize electronic sensors to monitor the perimeter of the cordon area to ensure compliance. In addition, the Singapore cordon charge varies by location of crossing, as well as by day and time of crossing (TRB, 2003). While area charging or cordons are best known as congestion management techniques, they also can be used as a revenue enhancement option.

The primary benefit of area charging or cordons is that these options encourage increased use of mass transit and pedestrian travel. These policies are thus consistent with long term policy objectives of reducing pollution, noise, fuel use and road wear. Cordons also may serve to reduce economic losses from congestion. An additional advantage is the presence of a large revenue base when cordons are implemented around major metropolitan areas. One concern with cordons is the possible encouragement of sprawl, as businesses and citizens move outside the area to avoid charges. With existing cordons, such as in London, residents living within the cordon are generally given

[12] Taxation rates obtained from the Maine Revenue Service: www.maine.gov/revenue/fueltax/Tax%20Rates.html

generous discounts to decrease the sprawl incentives. A second concern is that boundary effects may be created, encouraging motorists to increase their miles traveled as a means of avoiding the charged area.

Case Study: United States

- Fort Meyers, Florida Cordon Toll: Since 1998 Fort Myers has implemented a cordon toll at facilities located at the north and south approaches to the island Town of Fort Myers Beach.

Case Study: International

- Norway City Center Cordons: The Norwegian cities of Bergen, Oslo and Trondheim all have toll rings (or cordons) surrounding the city centers.

- London City Center Cordon: Since February 2003, a cordon has been in place around London, England. The charge to enter between 7am and 6:30 pm is £5 ($8). Feasibility studies regarding the use of cordons for Edinburgh and Leicester have been proposed.

2.3.2 Congestion Pricing

Congestion pricing is the implementation of variable prices to motorists' dependant on time of travel and prevailing congestion level. This option may be implemented on select roadways via lane management, or throughout an area by implementing electronic tracking devices (see discussion of Puget Sound Case). This option typically is considered a congestion management technique, but also may be used as a revenue enhancement option. Currently, a number of examples of congestion pricing are present in the United States. In California, State Route 91 utilizes a system of congestion pricing where middle lanes are toll lanes and are priced based on congestion levels while the remaining lanes continue to be toll-free. A second example exists in Lee County, Florida where bridge tolls are reduced during off-peak periods to encourage drivers to travel during these times (Rufolo and Bertini, 2003).

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The primary benefits of this option are reduction in congestion and promotion of mass transit and/or carpooling. This option may face public resistance when varying toll levels are implemented where previously fixed levels were in place.

Case Study: Puget Sound (Washington)

- Work by the Puget Sound Regional Council is investigating the feasibility of electronic congestion pricing. Electronic units were installed in 500 pilot program vehicles in 2004, and are able to detect when a vehicle travels on roadways subject to congestion tolling; much like the former Maine Transpass system. The units display the charge per mile for travel on the particular roadway. The study is focused primarily on gauging driver reaction to congestion pricing (Puget Sound, 2004).

<u>2.3.3 Distance Based Charges</u>

One of the most widely considered alternative financing options involves distance-based charges, also known as vehicle-miles-traveled programs. These types of programs consist of a vehicle user fee dependant on the distance traveled. There are a number of programs either proposed or operating both internationally and within the U.S. that will be discussed in the case studies below. Distance based charges may rely on technology that tracks miles as they are traveled or may be based on odometer readings garnered at state-mandated inspections or registrations.

There are a number of promising benefits associated with distance-based charges. First, many of the trial programs foresee these charges serving as a replacement for the fuel tax because the charges would not lose effectiveness from increasing fuel efficiency in the vehicle fleet. Distance-based charges also may serve to encourage more efficient behavior such as increased mass transit use and carpooling (Wachs, 2003). This set of benefits is consistent with other policy initiatives, which promote decreased vehicle use in an effort to improve environmental quality. In addition, this option may be implemented gradually, which may lower public resistance. In the Oregon case study, motorists who chose to adopt the technology will begin paying the mileage fee, while those who do not will continue to pay the fuel tax ensuring that all vehicles are contributing revenue.

Concerns surrounding this option center on technology and privacy issues. While a number of case studies have developed viable technology, concerns remain that such technology cannot be implemented on a wide scale, or will invade the privacy of motorists. In addition, GPS technology is "only as good as the base map telling the system where vehicles are traveling"(NCHRP, 2005). Equity concerns also are raised in that the tax burden may shift to more rural areas. Because fuel efficiency in city settings is typically lower, urban drivers consume more fuel per mile. Thus, under a vehicle-miles-traveled plan, city drivers may contribute less revenue than under the existing fuel tax system (Sorenson and Taylor, 2005). Additional concerns apply if distance based charges are odometer-only based, because of possible high levels of evasion and difficulty in capturing out of state travelers.

Case Studies: International

- Netherlands, Mobimeter: The Netherlands has proposed a system entitled "Mobimeter," a kilometer based charge on vehicle travel with operational capacity in 2006. The initial pilot was intended to be revenue neutral, where vehicle owners would pay no more under the "Mobimeter" than under the current system if they drove less than 18,000 kilometers per year. The system may eventually include a congestion control component, where the per kilometer charge may vary depending on travel in congested areas (TRB, 2003).

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Case Studies: United States

- University of Iowa, "New Approach": Work at the University of Iowa also has centered on mileage-based fee systems. The researchers envision their work as a possible long-term replacement of the fuel tax for passenger vehicles as well as commercial vehicles. The University of Iowa system employs GPS and GIS, and intends to distinguish the number of miles driven in an individual state by a vehicle. The work also considers variable charging for commercial vehicles dependant on the type of road the vehicle is traveling. (TRB, 2003; Sorenson and Taylor, 2005).

- Oregon, "Road User Fee Task Force": One of the most promising examples of implementing distance-based charges is being conducted by the Oregon Road User Fee Taskforce. The Taskforce was created in 2001 under legislative action HB 3946 and charges the task force to investigate various alternative financing options, much as the state of Maine is currently undertaking.[13] The pre-pilot of 20 vehicles began on October 24, 2005, with recruitment and installation of technology in up to 280 vehicles planned during Winter 2005. The pilot program will be implemented throughout 2006 and 2007, with preliminary results by summer of 2007 and possible legislative action thereafter. (TRB, 2003; Oregon DOT, 2005)

2.3.4 Managed Lanes/Value Pricing/ High Occupancy Vehicle Toll Lanes (HOT)

The premise of the managed lanes system, also known as value pricing, is to allow vehicles to buy their way out of traffic. A related concept is High Occupancy Vehicle Toll Lanes (HOT), which also will be discussed here. These options typically are utilized for congestion management, and are best implemented in urban areas with a multiple lane infrastructure. Individual lanes can be designated as high occupancy vehicle lanes, toll-free lanes or toll lanes. The cost of toll lanes may vary dependant on the time of day and amount of congestion present. Under an HOT program, a single occupancy motorist may pay a fee to travel in the HOV lane, where the fee may vary depending on time of day and level of congestion.

One benefit of this type of program is the presentation of options to motorists who can place a cost value on their own time (Muthusway and Levinson, 2003). This

[13] Road User Fee Task Force Act:
http://www.oregon.gov/ODOT/HWY/OIPP/docs/FinalReportA2003march.pdf

approach also may assist in congestion management. However, equity becomes an issue for these types of approaches. HOT and toll lanes have acquired the names of "Lexus Lanes" indicating that generally only the wealthy utilize these lanes. In addition, it can be argued that implementation of toll lanes decreases the amount of infrastructure capacity available to the general public.

Case Studies

- California, Orange County SR-91 and I-15: State Route - 91 utilizes a variable price for HOT lanes where the price is dependant on the level of congestion on the roadway. Interstate-15 in San Diego uses the HOV lane as an HOT lane where the price is adjusted every six minutes in order to maintain the required service level mandated for HOV lanes (Rufolo and Bertini, 2003).

- Texas, I-10 and US 290: HOT lanes are operational in Texas on I-10 (Katy Freeway) in Houston and on US 290 in Houston.

2.3.5 Value Capture

One source of infrastructure stress is the creation by private development of new commercial or residential roads that tie into existing roadways. These new roads generally become the responsibility of the municipality or state upon completion, putting additional stress on limited resources. A financing option designed to assist with this common problem is to require developers to pay for the maintenance of roads created during development. The primary benefit of this option is that local and state agencies are no longer fiscally responsible for the maintenance of these roads. However, a primary concern of this option is public safety where developers may not maintain the roads consistent with the standards of local and state agencies.

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2.4 Tolls

2.4.1 Facility Congestion Tolls

A widely used financing option is Facility Tolls and a variant, Facility Congestion Tolls. Facility tolls are user fees paid by motorists to use a specific facility, such as a bridge or tunnel, and are very common throughout the United States. Examples of the Facility Toll include the Williams Tunnel in Boston, the Chesapeake Expressway and the Emerald Mountain Expressway Bridge in Alabama. The Facility Congestion Toll varies the user fee for the facility based on the congestion level present. One benefit of the Facility Congestion Toll is that it may encourage use of mass transit as a means of avoiding the toll. The toll also may manage or reduce congestion as motorists adjust their travels to avoid high toll rates.

The primary concerns regarding this option center on equity. Facility Congestion Tolls often are used to finance projects or improvements unrelated to the facility where the toll was collected. In such cases the toll could no longer be considered a user fee, since the benefits of the toll profit a group other than the facility user/payer (Peters and Kramer, 2003). In addition, tolls are considered regressive because of the burden on poor or middle class motorists. Finally, work by Peters and Kramer (2003) has shown that generation of vehicle exhaust pollution is far greater at toll facilities than at highway speeds and that the pollution costs up to 8.3% of the revenue collected at the tolls (Peters and Kramer, 2003).

Case Studies

- Fort Meyers, Florida Cordon Toll: Since 1998 Fort Myers has implemented a cordon toll at facilities located at the north and south approaches to the island Town of Fort Myers Beach. The toll amount is congestion variant.

- Tappen Zee Bridge Congestion Relief Study: A Federal Highway Administration Congestion Pricing Pilot Project was conducted in 1998 on the Tappen Zee Bridge. The flat fee of $1.00 was replaced during the study with a congestion price dependant upon time of travel and also allowed for travel along the shoulder for a varying fee. The study found that various congestion pricing led to decreased net volume changes during peak hours as high as 11% (NY State, 1999).

2.4.2 Weight-Distance Tolls/Tax

A primary objective of an alternative financing option is to ensure that vehicle operators internalize, or consider, the external cost they are imposing on the roadway infrastructure. Heavy goods vehicles (HGV's), frequently known as commercial trucks, impose a greater external cost on roadways than passenger vehicles. Accordingly, an alternative financing option should ensure that HGV's support the high external cost they impose (TRB, 2003). The Weight-Distance Toll/Tax option is based on the premise that HGV's should pay a higher user fee. There are a number of variations on this financing option. First, HGV's may pay a higher toll at toll facilities based on their weight (or some variation such as axle configuration), as currently used by the Maine Turnpike Authority. Second, in a variation based on distance charges, HGV's would pay a higher per-mile rate based on the weight of the vehicle.

One benefit of this financing option is that such tolls or taxes on HGV's allow for payment commensurate with the amount of damage that HGV's impose on roadways. A second benefit is that this system helps close the price variation between the rail and road sectors, and captures more of the value associated with transporting goods (TRB, 2003). Currently, highways are traveling warehouses where suppliers are not charged for 'storing' their goods on Maine's roadways as they travel. Transporting these same materials by rail would include a 'storage' surcharge as part of the price. One concern

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with this type of system is the impact on the competitiveness of Maine’s trucking reliant industries. Given that the Maine economy relies heavily on resource extraction industries that require the use of HGV’s to transport goods, the impact of weight-distance tolls or taxes on these industries must be considered carefully.

Case Studies: International

- Eurovignette and the new Kilometer Charge System: The Eurovignette system imposed a standard license charge on HGV’s for travel in Belgium, Denmark, Germany, Luxembourg, the Netherlands and Sweden that varies based on the axle configuration and emission standards (TRB, 2003). In fall of 2003 this system was adjusted to a per-kilometer charge dependant on engine emission standards and axle configuration. Vehicle operators may either use an on-board electronic unit that tracks vehicle data including travel distance or manually pre-book a route they intend to travel at a toll terminal or on the internet.

2.5 Fees

2.5.1 Distance Based Fees/Price Variability Programs

The premise behind variable price programs and distance-based fees is to replace the currently fixed prices of automobile ownership with variable prices dependant on usage (i.e., vehicle miles traveled) in an effort to accurately capture the external cost imposed by vehicle use. Examples of current fixed programs that would be affected by this option include insurance rates, registration fees and title fees. The primary benefit of these programs is that vehicle operators will be able to control their own savings or costs by adjusting their driving habits. In addition, this option compliments other policy initiatives including encouraging less vehicle travel to promote lower emissions.

One of the primary concerns surrounding this option is the probability of evasion. Given that people may resist variation in previously fixed fees, they may take steps to evade the fees.

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Case Studies: United States

- Georgia Institute of Technology, "Variable Cost Study": Work at the Georgia Institute of Technology has centered on variable price initiatives, including the feasibility of tying vehicle registration to per-mile costs. The first year of study has been focused on driver response to variable fees but research is ongoing and a report of findings is not expected for at least two years (TRB, 2003).

- Minnesota Department of Transportation, "Pay as you Drive (PAYD)": The Minnesota DOT is investigating mileage based options for previously fixed costs such as vehicle leasing and insurance. Given the private market nature of some of these possibilities, the DOT enlisted private partners to join in the study, but have encountered difficulties in maintaining partnerships (TRB, 2003). A summary evaluation of findings was initially scheduled for 2005, but efforts have been unable to locate any such publication.

Case Studies: International

- Progressive Insurance/Norwich Union, "Variable Insurance Cost Study": Progressive Insurance Company teamed with Norwich Union of the United Kingdom in 2003, to follow up on a 1998–2001 study investigating driver discounts based on driving habits, including fewer miles traveled (TRB, 2005). The partnership was expected to complete the data-gathering phase of the project in late 2004. Norwich Union is currently offering Pay-As-You-Drive insurance as part of their insurance programs (Norwich Union, 2005).

2.5.2 Environmental Efficiency Charging (Emissions Fees)/Fuel Efficiency Fee

In an invited presentation to a 2002 Conference held by the Transportation Research Board, William Ankner suggested that user fees for vehicle use (such as registration fees) could be levied on the basis of a vehicle's energy efficiency and environmental emissions (TRB, 2003). The primary benefit of this option is that it is inline with other policy initiatives such as the promotion of buying "greener" cars. This option also may create incentives for the public to obtain additional knowledge regarding the environmental information of vehicles.

This option may meet with substantial resistance from consumers as well as auto manufacturers.

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Case Studies: International

- Eurovignette and the new Kilometer Charge System: Germany, as part of the comprehensive Kilometer Charge System, varies the per-kilometer charge for HGV's based on the engine emission standards of the vehicle (TRB, 2003).

2.6 Public-Private Partnerships

A number of states are turning to public-private partnerships in an effort to meet the changing demands of infrastructure maintenance and creation. The role of private companies in transportation infrastructure typically has been limited to serving as consultants to public agencies or acting as independent contractors to provide construction services, equipment and materials pursuant to low-bid contracts (Yarema, 2002). This approach is sometimes referred to as "design-bid-build" procurement where the public sector retains responsibility for financing, operating and maintaining the infrastructure produced during a project (FHWA, 2005(b)). Increasingly however, public-private partnerships have led to mounting responsibility by the private sector. The Federal Highway Administration has created a diagram that indicates the level of responsibility held by the public or private sector under various partnership types.

Figure 1. Federal Highway Administration's Assignment of Responsibility
For Public Private Partnerships

While design-bid-build has been the traditional partnership structure, the 'private contract fee service' expands the role of the private contractors by transferring responsibility for services generally handled by state agencies to private sector companies through a competitive bidding process. Operations/maintenance or financial management are two of the services that many state agencies are turning over to private sector partners (FHWA, 2005(b)). Another partnership type is a ‘design-build’ arrangement where private companies provide final design elements together with construction in a single contract for new-capacity projects. These contracts typically are publicly funded and owned, although the private contractor may provide some financing in the form of development cost advances or other mechanisms. Following along this continuum towards greater private sector involvement are forms of partnerships called ‘build-operate-transfer’ and ‘design-build-operate-maintain.’ These types of contracts allow for a private entity to complete an entire project, with public funding, with the private entity providing long-term operation and maintenance on the project at a cost previously arranged with the public partner. Some ‘design-build-operate-maintain’ contracts can allow the private contractor to own or lease the facility under contract, and to utilize private financing (Yarema, 2002). The ‘design-build-finance-operate’ option combines the responsibilities for designing, building, financing and operating into one private sector contractor. Some ‘design-build-operate-maintain’ contracts can also allow for the private contractor to own or lease the facility under contract, and to utilize private financing (Yarema, 2002). These types of projects are “either partly or wholly financed by debt leveraging revenue streams dedicated to the project” (FHWA, 2005(b)). A common revenue source is direct user fees or tolls as discussed in Section 2.4. The final public-private partnership arrangement grants the right to “develop, finance, design, build, own, operate, and maintain a transportation project” to a private sector partner (FHWA, 2005(b)).

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The benefits of the various public-private partnership types described above include the ability to complete a greater number of projects at a faster rate. In addition, some states are turning to these partnerships as a means of decreasing the cost of new projects (TRB, 2002). There is still concern in the transportation field regarding the ability of public-private partnerships to meet the needs of the public transportation agencies. Moreover, NASHTU reports have indicated that contracting out to accomplish transportation work may actually cost more money, citing the example of Boston's "Big Dig" which experienced overruns in amounts greater than one billion dollars (Kusnet, 2002). Another concern with public-private partnerships is the issue of public safety and whether private contractors will meet the rigorous safety requirements of state and federal governments. The assignment of risk, particularly operating revenue risk, is of particular concern as public-private partnerships evolve.

There are a number of cases where state transportation agencies have entered into partnerships with private entities; the State of Maine is no exception.

2.6.1 Maine Department of Transportation: Public-Private Initiatives

The Maine Department of Transportation has successfully completed a number of projects, for both roadways and intermodal or transit projects, utilizing public-private partnerships. Three successful roadways projects, including the Waldo-Hancock Bridge, the Sagadahoc Bridge in Bath and the Cushnoc Crossing located in Augusta, have all been completed using the design-build partnership arrangement.

Maine also has successfully joined public-private partnerships to fund intermodal and transit facilities. Three of the most prominent projects are included as case studies.

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Case Studies

- Portland Transportation Center: The Maine DOT in partnership with Concord Trailways developed the Portland Transportation Center, which serves rail and bus passengers. This partnership could be classified as a Build-Own-Operate partnership. The Portland Transportation Center was formerly a Concord Trailways bus station until partnership with the DOT expanded the services offered at the Center to include Amtrak rail and metro bus service. Concord Trailways financed the expansion of the building to accommodate the differing transportation forms, with design input by the Maine DOT. This on-going partnership includes building ownership and maintenance by Concord Trailways with ownership of the rail platform held by the DOT.

- The Explorers (*Island Explorer, Mountain Explorer* and *Shoreline Explorer*): The *Island Explorer*, a free bus service for all passengers, is a well-known sight around Mount Desert Island and Acadia National Park. The bus service stems from a unique public-private partnership. The need for the Island Explorer was motivated by a study administered by Acadia National Park and the Department of the Interior to gauge how congestion was affecting consumer enjoyment of the park. The study found that congestion, safety concerns due to parked vehicles, and pollution were hindering positive visitor experiences at the park. Additionally, there was interest throughout the communities and businesses of Mount Desert Island to provide transportation for visitors and residents to various areas of the island, including access to the cruise ship ports. A public-private partnership developed between the Maine DOT, Acadia National Park and the communities and businesses of the island. LL Bean joined the partnership in an effort to provide extended service by the Island Explorer into the fall months.

  A 2000 study found that intelligent transportation technology improvements to the Island Explorer fleet, including passenger counts, automated announcements, automated departure signs throughout the island and automatic bus tracking systems improved the visitor experience. This unique and enduring partnership has served as a model for other 'Explorers' around Maine, including the Mountain Explorer and the new Shoreline Explorer. The *Mountain Explorer* operates in the Bethel area and is a partnership between the Maine DOT, the Bethel Chamber of Commerce, Sunday River Ski Area and area businesses. The *Shoreline Explorer*, to be unveiled this summer, is a multi-modal public-private partnership which partners three private trolley companies, a public trolley company, the municipalities of York, Wells, Kennnebunkport and Ogunquit in collaboration with the Maine DOT.

- Maine 511 System: Maine in collaboration with the states of New Hampshire and Vermont, as well as Castlerock, a private partner, worked to develop a traveler information system. This system, known as the 511 System provides information via web (www.511maine.org) or phone regarding road conditions, accidents and tourism attractions/events. The system also includes advisory signs on Maine's roadways. This partnership has extended to 22 states that use the 511 System. However, Maine continues to lead with innovations as Island Explorer information is available on 511, and all information is also available in French.

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2.6.2 Virginia Department of Transportation: Public-Private Transportation Act

The Public-Private Transportation Act (PPTA) of 1995 allows the Virginia Department of Transportation (VDOT) to enter into partnership with private entities in order to design, build and maintain their infrastructure.[14] According to Shirley J. Ybarra of the VDOT, the original intent of the PPTA legislation was to generate projects faster and cheaper. She also noted in a discussion session at a 2003 TRB conference, that in public-private relationships, the most costly risk is often held by the public sector and that improvement in risk sharing should be a goal for future projects.

The VDOT evaluates public-private proposals based on a six phase process: 1) quality control, 2) independent review panel, 3) Commonwealth Transportation Board recommendation, 4) detailed proposal submission, 5) negotiation, and 6) interim and/or comprehensive agreement.

A comprehensive list of projects completed under the PPTA is available from the VDOT and a case study is included below for reference.

Case Study

- Richmond, Virginia Route 288: Under the Public-Private Transportation Act of 1995 (PPTA), the Virginia Department of Transportation awarded a $236 million contract to APAC-Virginia, Inc. of Danville for the completion of Route 288. The Virginia Department of Transportation (VDOT) expected the project to save $47 million and seven months in construction time. The project was completed in November 2004.[15]

2.6.3 Washington State: The Public-Private Initiatives in Transportation Act

Washington State passed legislation similar to that of Virginia with the 1993 Public-Private Initiatives in Transportation Act. The act created the authority for the Washington State Department of Transportation (WSDOT) to "solicit proposals from

[14] Information regarding the PPTA is contained at: http://www.virginiadot.org/business/ppta-default.asp
[15] Additional information on the Route 288 project is available at: http://www.route288.com/

private companies to plan, design, finance, construct, and operate transportation facilities, and to impose user fees or tolls to recover all or a portion of the cost of the project and to earn a reasonable rate of return on their investment." (Washington State Legislature, 2000). In further modification of the act, the legislature allowed for public opposition to any project to enter into the project planning (the Advisory Election Clause).

Case Study

- SR 16/Tacoma Narrows Bridge: One of the first six projects identified by the State as qualifying for the Public-Private Initiatives Act was the State Route 16/Tacoma Narrows Bridge Project. The initial plan for re-construction was to utilize toll revenue from the bridge to finance the project. However a 2000 court decision placed the project on hold citing the fact that the WSDOT did not have the authority to toll the existing bridge. A 2002 legislative decision allowed for tolling on the bridge. This legislative decision also called for an investigation into the structure of public-private partnerships, resulting in the Yarema (2002) article previously cited.[16]

2.6.4 Georgia Public Private Initiatives

The 2003 Public Private Initiative (PPI) Legislation, revised in 2005, allows the Georgia Department of Transportation to begin entering into public private partnerships. This legislation allows for solicited proposals (via RFPs) and unsolicited proposals from private entities seeking to improve the transportation infrastructure in Georgia. The first project moving forward in Georgia is the proposed I-75/575 construction, which is included below as a case study (Georgia DOT, 2005).

Case Study

- I-75/575 PPI Proposal: The first project to move towards the negotiation phase under the PPI legislation is the addition of managed lanes and bus lanes to I-75 and 575. As of October 2005, the proposal is scheduled for public hearing, which will determine if further negotiation will continue. The proposed project was an unsolicited proposal

[16] Additional information on this project is available at http://www.wsdot.wa.gov/projects/sr16narrowsbridge/

from Georgia Transportation Partners, a joint-venture of construction companies based in Georgia.[17]

2.7 Multi-Modal Transportation

Discussion in the transportation literature indicates that continuing to focus efforts primarily on funding highway infrastructure may not be a long-term sustainable prospect, given the threats to revenue sources, the growing problem of congestion management and the inconsistency of supporting gasoline powered vehicles that are incompatible with existing energy policies. This recognition has led many states to examine multi-modal transit options as a means of addressing transportation needs. Increasingly, states have begun to focus on "transportation's role in achieving such societal goals as efficiency, equity, a sound environment, livability, and a good overall economy" (Pederson, 2000 pg. 2). However, multi-modal and intermodal planning face the challenge that responsibilities for different modes are often held by different state agencies. Successful implementation of multi-modal and intermodal projects requires extensive communication among the relevant state agencies as well as the public.

The Maine Department of Transportation, as noted in Section 2.6.1, has worked to expand transportation options in Maine beyond the roadways. The Office of Passenger Transportation is devoted to exploring transit options in Maine, and to providing information to Maine's residents and visitors regarding the various transit options as evidenced by the Explore Maine website available at www.exploremaine.org.

Continuing efforts to plan multi-modal projects should include review of documented successful projects. Examples of successful planning efforts are noted below.

[17] Additional information on this project is available at http://www.dot.state.ga.us/ppi/index.shtml

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Case Studies

- Denver's T-Rex Project: A Multi-Modal Project

The Denver I-25 project is a unique example of the ability of collaborative partnerships to combine in an effort to address highway and rail financing in a single multi-modal project. The project, started in 2001, will add 19 miles of light rail alongside the major road corridors of travel into Denver including new stations. The roadway also will be enhanced during this project via added lanes and reconstructed interchanges. In addition, in an effort to encourage bicycle and pedestrian travel, the project will add shoulders to sections of the roadway. A final component of the multi-modal project is a proposed bus service in the southeast metro area (T-Rex, 2005).

- Virginia's Statewide Multi-Modal Long-Range Transportation Plan (Vtrans 2025)

The Commonwealth of Virginia currently is planning a long-range statewide transportation plan entitled *VTrans2025*. The plan is being developed jointly by the four state transportation modal agencies: the Department of Aviation (DOAV), the Department of Rail and Public Transportation (VDRPT), the Port Authority (VPA), and the Department of Transportation (VDOT). A primary element of the *VTrans2025* project is a multi-modal investment network also known as a MIN (VDOT, 2005). Virginia planners envision MINs to be a group of aligned projects. They have classified projects as "anchor projects" and the aligning projects would be "supporting projects". An example of such 'aligned projects' is the Denver T-Rex, where road enhancement is the "anchor project" and the "supporting projects" include the rail system and pedestrian access. Currently the *VTrans 2025* initiative is considering eleven possible project sites including routes from North Carolina to West Virginia such as Interstate 77, Route 52 and Route 100. The *VTrans 2025* initiative is still in the planning phase, but has already developed a working set of criteria for plans to be considered.

3.0 Equity and Suitability Considerations

Increasingly, transportation planning must consider not only traditional issues of best practice, financing and safety, but also issues of equity and suitability. As the number of transportation initiatives grows along with alternatives to finance them, more attention must be devoted to determining the suitability of options for a state's specific needs. The alternative financing options presented in this report would have radically different effects on groups within Maine's population. Accordingly, equity and suitability issues should be considered simultaneously with the options presented above. This section

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briefly discusses some of the equity and suitability issues that surround transportation planning.

3.1 Equity

An important consideration in transportation decisions and investments is their subsequent effects on diverse economic groups. An example of equity consideration can be seen in the current gas tax. The gas tax often is considered regressive, because lower income populations pay a higher proportion of their income in gas taxes than do higher income populations. In addition, the burden of the gas tax may be disproportionately shifted onto low-income populations who may not be able to purchase the most fuel-efficient vehicles. The lower economic population therefore pays a larger fee. While many consider the gas tax to be a user fee, the current system charges less fuel efficient vehicles a higher fee although they may not create a greater level of damage to the roadways. On the other hand, such vehicles require more fuel and are thus more costly to operate, typically create more pollution than more fuel-efficient vehicles, and are contrary to other environmental and energy policies. Another income related equity consideration is citizen access to work places. A minimal level of access to employment should always be assured. Given the limited mobility choices in rural areas, lower-income workers spend a higher proportion of their income to access employment (Pederson, 2000). Such equity assessments of the distribution of benefits from statewide transportation decisions and investments should be considered as Maine looks ahead in transportation planning.

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3.2 Suitability and Criteria

Other states that have begun to tackle some of the same issues as Maine (e.g., declining revenue and purchase power from gasoline taxes and threats to sustainability of transportation infrastructure) have employed a set of evaluation criteria as a means of identifying preferred options (Oregon, 2005). The list of alternative financing options presented in Section 2, and summarized in Table A.3, demonstrates that many of these alternatives, which were designed for major metropolitan areas, may not be suitable for Maine. A combination of some of these suitability issues, as well as the previously mentioned equity issues, should be helpful tools in evaluating the applicability of alternative financing options to Maine. The criteria outlined below are intended to serve as a discussion point for policy makers in identifying such evaluation criteria.

The ability of an option to generate sufficient revenue is an evaluation criterion to consider. To this end, Section 4 of this report projects the revenue that may be raised under a few of the alternative financing options outlined above. Other criteria could address some of the equity issues outlined above. Horizontal equity standards typically dictate that people with equal ability to pay (i.e., similar economic status) should pay equal amounts. In addition, economists typically agree that a user-fee is the most efficient system of fee collection. Thus, another evaluation criterion could be the extent to which the alternative represents a pay-as-you-use standard (i.e., will those who use the system more, pay more?).

A fourth evaluation criterion could address access. This criterion measures the extent to which all citizens will be able to use roadways/transportation modes under a particular financing option. Since many of the alternatives outlined above can be

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intended to be long-term replacements for the gasoline tax, a fifth criterion that addresses evasion and enforceability must also be considered. Enforceability may be particularly applicable in efforts to capture revenue from out-of-state travelers. Maine has a large tourism based economy and out-of-state visitors inflict damage to Maine's roadways.

Alignment with existing policy objectives is a sixth evaluation criterion that should be considered. Environmental and energy policies, such as decreasing air pollution and sprawl, increasing mass transit use and non-motorized transportation, are all current policy priorities. Implementation of a financing option which is at odds with existing policy may send confusing signals to citizens. A final criterion for measuring financing options is political feasibility. A summary of these possible evaluation criteria is contained in Table 2.

Table 2. Sample Evaluation Criteria for Financing Options

1	What is the revenue raising potential of this option?
2	Will this option meet equity standards (do people with equal ability to pay, pay equally?)
3	Will this project meet pay-as-you-use standards (i.e. will those who use the system more, pay more)?
4	Will citizens still be able to use the roadways/transportation mode under this option, even if they have limited financial resources?
5	Will this option be enforceable and able to capture out of state travelers?
6	Is this option in alignment with other policy objectives?
7	Is this option politically feasible?

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4.0 Issues in Transportation Policy and Financing

Transportation planning is a complex and evolving field. Many recent energy and environmental initiatives influence nationwide transportation policy and may impact Maine's future fuel tax revenues. This section presents some of the issues that may affect fuel economy and revenues from motor fuel taxes.

With respect to alternative fuel vehicles and hybrids, the Alternative Motor Fuel Act (AMFA) creates a set of incentives that may have long-term impacts on fuel economy and revenue. Currently the AMFA allows flexible fuel vehicles (FFV) to be treated as half gasoline and half alternative fuel, although most vehicles produced in this category are used by consumers as gasoline vehicles. The net effect of this set of regulations is that manufacturers may count the fuel efficiency of flexible fuel vehicles as much higher for CAFE purposes than they are being used. This has had the effect of allowing some vehicle manufacturers to decrease the fuel efficiency of the rest of their fleet, resulting in a larger number of lower fuel-efficient vehicles being available to consumers. Thus, the AMFA inadvertently has provided incentives that allow for decreasing fuel efficiency (NHTSA, 2002). As previously noted, the recent Energy Bill has created some additional incentives for consumers to purchase hybrids. However, many hybrid engines have been employed as a means of increasing performance and not necessarily fuel efficiency. The impact of these incentives on hybrid consumption should be monitored, as well as any subsequent indications that hybrids actually have increased the fuel efficiency of the fleet.

A second issue is the common conception that the fuel economy of the US fleet (and by extension Maine) is increasing, and therefore revenue from motor fuel taxes is

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under immediate threat. The U.S. fleet fuel economy actually has been decreasing since its height in 1987-88 (NHTSA, 2002). The model year 2005 light-duty vehicle average fuel economy (21.0 mpg) is five percent lower than the 1987-1988 average but is the highest average since 1996 (Heavenrich, 2005). The fuel economy changes are due partially to the composition of the fleet where light-duty trucks are expected to account for 50 percent of all light-duty vehicles in model year 2005, up from 28% in 1987 (Heavenrich, 2005). Thus, the fleet fuel economy is not necessarily currently increasing, and therefore revenue concerns may not be as immediate as previously anticipated. Recent national transportation policy initiatives will affect future fleet fuel efficiency and should be considered in future efforts to project revenue.

A third important issue is the role that vehicle-miles-traveled plays in transportation revenue. The Federal Highway Administration indicates that, on average, vehicle-miles-traveled has experienced a historical growth rate of 1.7 to 2.6% (2005). The net effect of this VMT increase has been an increase in gas tax revenue. The data analysis presented in Section 5 assumes a constant VMT, and will therefore over estimate the revenue impacts that increasing fuel economy will have.

A final issue to consider is rebound effects. Two rebound effects have been discussed in transportation policy literature: micro and macro. The micro effect also is known as the primary effect, the direct rebound effect, or the take-back effect. The primary effect states that increased fuel efficiency will actually lower the cost of driving for consumers due to lower fuel consumption. If driving a vehicle becomes a cheaper transportation option, rebound effects indicate that consumers will actually drive their passenger vehicles more. While rebound effects are still under discussion by energy

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economists, the current estimates range from 10 to 20% (IEA, 2005).[18] That is, raising fuel efficiency by 10% reduces gasoline demand by only 8% to 9% because consumers drive more. The macro effect considers the rebound impact on a larger base. If the cost of driving becomes less expensive, this may increase the competitive nature of Maine industries. The question that remains is whether increasing transportation efficiency (and more competitive industries) will induce enough expansion in GDP to offset the fuel efficiency gain.

Maine transportation planners must continue to monitor the impacts of the Alternative Motor Fuels Act (AMFA) and changes in the CAFE standards and other policies that intentionally increase fuel efficiency and decrease the use of petroleum, but also, inadvertently decrease highway infrastructure revenues.

5.0 Data Analysis

5.1 Data Sources and Limitations

This section discusses the sources of data used in the analysis and data limitations. In Section 5.4 we perform detailed data analysis on financing options given these limitations in the data available. We also note instances in which Maine already employs some of the financing options. Appendix Table A.1 identifies the type of data that would be required to perform analysis or revenue projections for all alternative financing options.

Maine vehicle fleet information used in the data analysis was obtained from the Maine Bureau of Motor Vehicles, through Information Resources of Maine (InforME).[19]

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[18] These ranges were determined based on fuel price and fuel economy changes over a 25-year period.

[19] Vehicle data from: Maine vehicle registration records as of 3/31/2005, provided by InforME, http://www.maine.gov/informe/

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The data includes all Maine vehicle registrations from 2004 and 2005 as of March 31, 2005. Regrettably, the Maine Bureau of Motor Vehicles and InforME do not maintain electronic files of previous years' registration data, which makes identifying trends and creating projections challenging. Due to the lack of historical Maine data, we also use data from national sources. Every effort has been made to utilize Maine data sources and to note the source of data. In addition, we note data collection and retention procedures as well as research areas that are of high priority for further study.

A key component of the data analysis involved decoding vehicle identification numbers (VIN) to obtain the fuel economy of individual vehicles. The VIN decoding services supplied by ESP Data Solution, Inc., provided fuel economy data.[20] The exact fuel economy of vehicles in the Maine fleet older than model year 1996 was unobtainable. However, the EPA/Mobile6.2 model utilizes fuel economy data for pre-1996 vehicles and this information was applied to vehicles of the Maine fleet older than model year 1996.[21] In an effort to ensure that the nationwide data were compatible with Maine data, a weight was utilized to reflect the difference between Maine and National average fuel economy for each year.[22]

The registration information for heavy-duty vehicles (e.g., vehicles weighing over 8,500 lbs) was contained in the Bureau of Motor Vehicles data. However, the EPA does not regularly test the fuel economy of heavy-duty vehicles and therefore fuel economy could not be obtained by VIN decoding. Thus, a national survey implemented by the

[20] ESP Data Solutions maintains a large database able to match vehicle identification number to manufacturers specifications for a vehicle, including fuel economy estimates from the US EPA. As recommended by the EPA, the fuel economy estimates posted by manufacturers were reduced by 15% to reflect expected on road performance.

[21] Light Duty Fuel Economy Data for Model Years 1996-2005 from: ESP Data Solutions Inc, Lawrence, MA, 2005

[22] EPA Mobile6 model information available from: http://www.epa.gov/otaq/m6.htm. Details regarding the sources of EPA's estimates are available at: http://www.epa.gov/otaq/models/mobile6/p02005.pdf

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Bureau of Transportation Statistics was used to determine average fuel economy for heavy-duty vehicles.[23]

An additional component of the data analysis was determination of the vehicle-miles-traveled (VMT) by Maine's vehicle fleet. For light-duty vehicles and heavy-duty pickups and SUV's (i.e., personal vehicles exceeding the 8,500 lbs weight limit) the vehicle-miles-traveled data were obtained from the 2001 National Household Transportation Survey administered by the U.S. Department of Transportation. Other heavy-duty vehicle's vehicle-miles-traveled information is based on a survey conducted by the United States Census, which provides heavy-duty VMT information by state.[24,25]

5.2 Maine's Vehicle Fleet

5.2.1 Maine's Light-duty Vehicle Fleet

In order to obtain an accurate picture of Maine's current vehicle fleet, the Bureau of Motor Vehicles registration data were analyzed by class of vehicle and by fuel type.[26] Figure 2 presents the basic composition of the Maine light-duty vehicle fleet.[27] Light-duty vehicles make up 84% of Maine's total vehicle fleet, and are a crucial component of the revenue base. It should be noted that the type of vehicle and their prevalence within the fleet are important aspects in future efforts to identify how fleet changes will affect revenue.

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[23] Heavy-Duty Fuel Economy from: Tables 4-13 & 4-14, National Transportation Statistics 2005, Bureau of Transportation Statistics, 2005, http://www.bts.gov/publications/national_transportation_statistics/2005/index.html

[24] Heavy-Duty Vehicle VMT Data, excluding Buses : Table 3a Maine: 2002 Vehicle Inventory and Use Survy Geographic Area Series, US Census Bureau, 2003, http://www.census.gov/svsd/www/02vehinv.html

[25] Bus VMT Data from: Table 4-15, National Transportation Statistics 2005, Bureau of Transportation Statistics, 2005, http://www.bts.gov/publications/national_transportation_statistics/2005/index.html

[26] Vehicle classification data from: ESP Data Solutions Inc, Lawrence, MA, 2005

[27] Light-Duty Vehicles are defined as vehicle weighing under 8,500 lbs. Heavy-Duty Vehicles are defined as vehicles weighing over 8,500 lbs.

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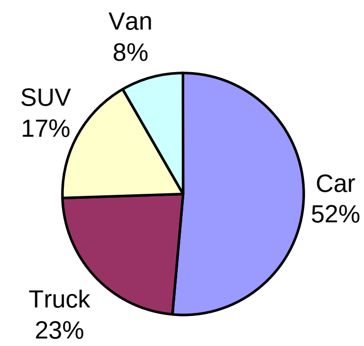
Figure 2. Maine's Light-Duty Vehicle Fleet Composition



Within each class of vehicle, further specific categories were utilized in the analysis. An example is the car class. Within this class there are small, mid-size and large cars, and within each of these categories some vehicles utilize gasoline and some use diesel. Tables 3a-d show the composition of Maine's vehicle fleet by vehicle class and include the percentage of that vehicle type on the road, average vehicle miles traveled, average fuel economy, total vehicle-miles-traveled and total fuel consumption.[28] The data contained in these tables will be used repeatedly throughout the analysis. Section 5.3 examines how changes in the fuel economy of the fleet will impact fuel consumption and revenue. Section 5.4 investigates the revenue ramifications of implementing a distance per-mile charge, which employs the vehicle-miles-traveled data.

[28] Motorcycles and 'Other' unclassified vehicles comprise 7.77% of the total vehicle fleet (i.e. light-duty and heavy-duty). These vehicles will be included in the data analysis but are not included in Tables 3a-d.

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Table 3.a Maine's Car Fleet

VehicleClass	FuelType	Percentage	Avg VMT	Avg MPG	Total VMT	Fuel Consumption (gal)
Large Car	Diesel	0.0[29]	6,502	28.47	104,038	3,654
Large Car	Gasoline	12.69	10,638	19.48	674,429,349	34,621,224
Mid-size Car	Diesel	0.16	7,082	28.81	5,637,319	195,693
Mid-size Car	Gasoline	51.48	10,785	20.24	2,773,833,451	137,057,714
Small Car	Diesel	0.35	11,226	32.59	19,634,191	602,401
Small Car	Gasoline	34.37	10,997	22.28	1,888,279,167	84,760,338
Unknown	Diesel	0.0[30]	9,908	31.39	29,725	947
Unknown	Gasoline	0.94	10,840	20.85	50,894,412	2,440,731
-	Electric	0.00	-	-	-	-

Table 3.b Maine's Light-Duty Truck Fleet

VehicleClass	FuelType	Percentage	Avg VMT	Avg MPG	Total VMT	Fuel Consumption (gal)
Large Pickup Truck	Gasoline	63.40	11,918	13.50	1,685,112,361	124,863,707
Small Pickup Truck	Diesel	0.03	2,898	25.62	179,673	7,012
Small Pickup Truck	Gasoline	34.79	11,991	16.25	930,361,491	57,257,351
Unknown	Diesel	0.02	2,898	25.62	130,408	5,090
Unknown	Gasoline	1.76	11,944	14.47	46,773,356	3,232,189
-	Electric	0.01	0	-	-	-
-	NG/Propane	0.00	0	-	-	-

Table 3.c Maine's Light-Duty SUV Fleet

VehicleClass	FuelType	Percentage	Avg VMT	Avg MPG	Total VMT	Fuel Consumption (gal)
Large SUV	Gasoline	13.14	12,359	13.02	272,314,546	20,912,014
Mid-size SUV	Gasoline	55.38	12,776	15.02	1,186,386,282	78,966,237
Small SUV	Gasoline	31.34	12,852	17.71	675,282,234	38,124,378
Unknown	Diesel	0.00	-	-	-	-
Unknown	Gasoline	0.13	12,745	15.60	2,701,970	173,156
-	NG/Propane	0.01	-	-	-	-

Table 3.d Maine's Van Fleet

VehicleClass	FuelType	Percentage	Avg VMT	Avg MPG	Total VMT	Fuel Consumption (gal)
Large Van	Gasoline	17.25	11,495	13.74	159,670,786	11,618,683
Mini Van	Gasoline	82.69	12,851	16.72	855,680,276	51,175,553
Unknown	Gasoline	0.05	12,617	16.21	529,926	32,698
-	Electric	0.01	-	-	-	-
-	NG/Propane	0.00	-	-	-	-

[29] There are 16 vehicles on-road.
[30] There are 3 vehicles on-road.

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5.2.2 Maine's Heavy-Duty Vehicle Fleet

Maine's vehicle fleet includes 90,674 heavy-duty vehicles, which comprise 8% of the total vehicle fleet (Table 4).

Table 4. Maine's Vehicle Fleet Composition

Type	Current on Road		Model Year 2004	
	Count	Percent	Count	Percent
Light-duty	970,797	84.35	56,962	83.87
Heavy-duty	90,674	7.88	7,808	11.50
Motorcycles	30,063	2.61	3,079	4.53
Other	59,418	5.16	72	0.11
Total	**1,150,952**	**100.00**	**67,921**	**100.00**

Under current standards many passenger vehicles qualify as heavy-duty. SUV's and pickup trucks constitute 54% of heavy-duty vehicles in the Maine Fleet (Table 5). A second interesting aspect from a policy and revenue standpoint is that 29% of these heavy-duty passenger vehicles are diesel. This is of interest given that the sale of some diesel-fueled passenger vehicles is currently illegal in the state of Maine (in terms of California emissions standards) and will be until 2007.

Table 5. SUV and Pickup's in Maine's Fleet

SUV's and Pickup Truck's		
Class	**Count**	**% of Class**
Light-duty	390,698	40.25
Heavy-duty	48,774	53.79

5.2.3 Maine's Vehicle Fleet by Fuel Type

The extent to which alternative fueled vehicles capture larger portions of the passenger vehicle market may cause a decline in gasoline excise tax revenues. Table 6 documents the type of fuels being used by Maine's vehicle fleet.

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Table 6. Fuel Type of Maine Vehicles

Fuel	Current on Road		Model Year 2004	
Fuel Type	Count	Percent	Count	Percent
Diesel	44,490	4.08	3,024	4.67
Gasoline	1,046,944	95.91	61,725	95.30
NG/Propane	57	0.01	2	0.00
Diesel/NG	87	0.01	19	0.03
Electric	43	0.00	0	0.00

From a revenue generation perspective, another source of concern is the increase of hybrid and other higher efficiency vehicles into the passenger vehicle market. As shown in Table 7, Maine's hybrid fleet is only 0.13% of total light-duty passenger vehicles. However, these vehicles constituted 0.72% of the model year 2004 vehicles registered in Maine, which may be an early indicator of approaching trends. Section 5.3 addresses the revenue ramifications of changes in fleet fuel efficiency.

Table 7. Hybrid Vehicles in Maine

Hybrids		Count	
Make	Model	Total	MY 2004
Toyota	Prius	797	308
Honda	Accord	14	0
Honda	Civic	278	100
Honda	Insight	91	2
Ford	Escape	38	0
Total		**1218**	**410**
% of Light-duty Vehicles		**0.13**	**0.72**

5.3 Changes in Fleet Fuel Efficiency

The objective of this section is to project Maine's revenue from the motor fuel excise tax under various fuel efficiency changes to the vehicle fleet over time. Work by the National Research Council (NRC, 2002) identified packages of existing and emerging technologies for light-duty vehicles that could be introduced over the next 10 to 15 years that would result in fuel economy improvement up to the point where further increases in fuel economy would not be reimbursed by fuel savings. Given a number of important

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assumptions, the NRC determined that fuel economy improvements of about 30% are possible by 2015.[31] The break-even fuel economy levels are not recommended fuel economy goals. Rather, they reflect technological possibilities as well as economic realities and assumptions.

However, these fuel economy increases will take an act of Congress to implement. Without Congressional action, current trends in fuel economy show only modest increases in fuel economy due to the phasing in of higher CAFE standards for light-duty trucks (Figure 3). These modest increases in fuel economy will likely yield a constant or slightly decreasing nominal value of future gasoline revenues for Maine. Actual changes in future fuel tax revenue will also depend on changes in the number of miles driven per capita and changes in Maine's population, both in size and demographics. We examine the potential revenue impacts of these modest increases in fuel economy over a twenty-year period (i.e., to 2025). This scenario is entitled 'status quo' throughout the projections.

If, however, Congressional action were to increase fuel economy standards in response to concerns over petroleum dependence or emissions of gasses linked to global warming, this could lead to a substantial increase in the fuel efficiency of the U.S. light-duty vehicle fleet.[32] This would lead to a considerable decrease in motor fuel excise tax revenues for Maine and the nation. To examine the potential impacts of these actions we

[31] As the NRC notes, these break-even calculations depend critically on the assumptions one makes about a variety of parameters including: price of gasoline, number of miles driven, actual on-the-road fuel economy (NRC Table 4.1). Consumers may also choose to purchase greater acceleration, towing capacity, or other vehicle features that work against increased fuel economy.

[32] Actions may include raising CAFE standards or a voluntary agreement similar to that between Canada and vehicle manufacturers associations.

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project a possible 5%, 15% and 30% increase in fuel economy for Maine’s vehicle fleet over a ten-year period (i.e., to 2015).[33]

5.3.1 Fuel Consumption Projections

As noted above, Maine’s revenue stream from the gasoline tax may be threatened by measures taken at the national level to mandate increases in fuel efficiency. This section will identify factors that may increase vehicle fuel economy, and project the potential impacts that increasing fuel efficiency may have on fuel consumption in Maine.

In order to examine the potential impacts of increasing fuel efficiency, data were obtained on the fuel efficiency of vehicles at the national level from 1980 to 2005. As discussed above, we were able to decode fuel efficiency information only for vehicles model year 1996 or newer in the Maine vehicle fleet. Figure 3 shows the fuel efficiency trends both in Maine and nationwide. The vehicle categories are described in Table 8. Figure 3 demonstrates that Maine closely mirrors national fleet fuel efficiency trends.

[33] Efforts to project further into the future are limited in reliability. Extended projections face the limitation of either assuming constant technology or assuming development of new technology and therefore face unknown increases in fuel economy as a result.

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Figure 3. Fuel Efficiency Trends

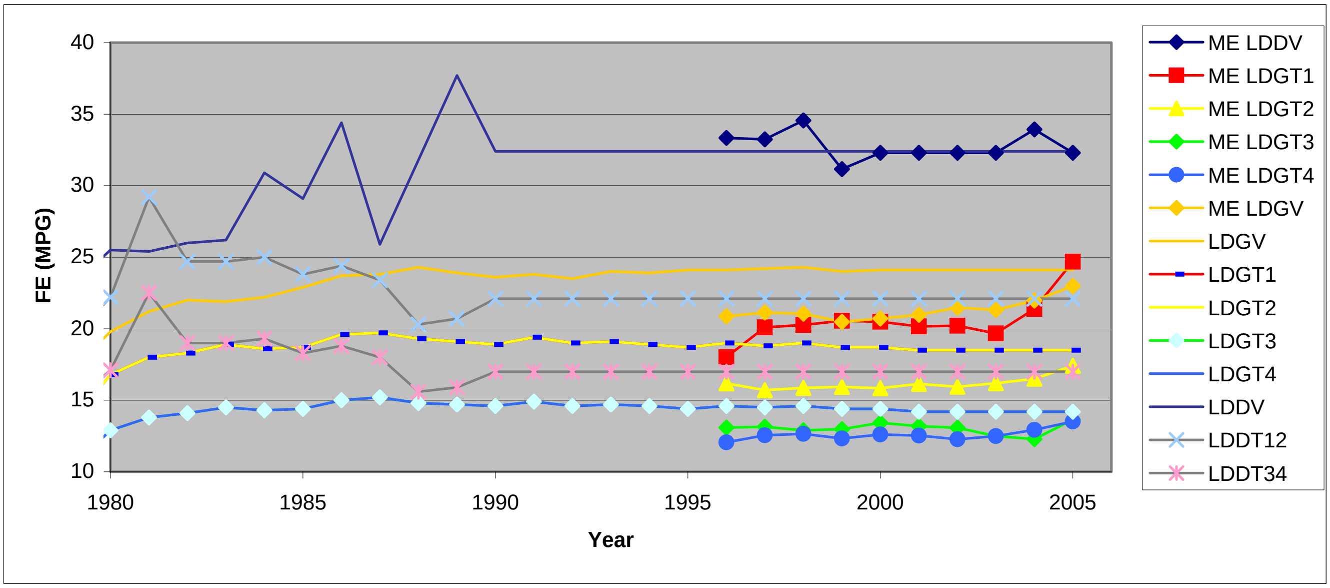

Table 8. Mobile6 Vehicle Classifications

Abbreviation	***Description***
ME LDDV	Maine Fleet of below
ME LDGT1	Maine Fleet of below
ME LDGT2	Maine Fleet of below
ME LDGT3	Maine Fleet of below
ME LDGT4	Maine Fleet of below
ME LDGV	Maine Fleet of below
LDGV	Light-duty Gasoline Vehicles (Passenger Cars)
LDGT1	Light-duty Gasoline Trucks 1 (0-6,000 lbs. GVWR; 0-3,750 lbs. LVW)
LDGT2	Light-duty Gasoline Trucks 2 (0-6,000 lbs. GVWR; 3,751-5,750 lbs. LVW)
LDGT3	Light-duty Gasoline Trucks 3 (6,001-8,500 lbs. GVWR; 0-5,750 lbs. ALVW)
LDGT4	Light-duty Gasoline Trucks 4 (6,001-8,500 lbs. GVWR; 5,751+ lbs. ALVW)
LDDV	Light-duty Diesel Vehicles (Passenger Cars)
LDDT12	Light-duty Diesel Trucks 1 & 2 (0-6,000 lbs. GVWR)
LDDT34	Light-duty Diesel Trucks 3 & 4 (6,001-8,500 lbs. GVWR)

As noted above, the fleet fuel efficiency gains assumed during the projections may come from a variety of sources including changing national regulations regarding efficiency standards, increases in the price of motor fuels, and a growing market-share of hybrid vehicles and/or diesel fueled vehicles. This market share may experience more rapid growth than initially anticipated by market analysts due to federal tax credit purchase incentives.[34]

A second possible impetus for change in fuel efficiency stems from the role of diesel fueled vehicles, particularly with respect to changing Maine state law. The state will allow the sale of diesel passenger vehicles in Maine in 2007. As shown in Figure 3, diesel vehicles of the same class achieve higher average fuel economy. Additional evidence of this can be seen in the car class data (Table 3.a). Gasoline fueled cars achieve an average fuel economy of 20.6 miles per gallon. In contrast, diesel fueled cars achieve an average fuel economy of 29.95 miles per gallon. Diesels also may be experiencing a nationwide trend of increasing market share. In 2002, light-duty diesel vehicles comprised 2.2% of the market and accounted for 2.9% in 2004. In addition, more automakers are offering diesel models in the United States. In 2004, eleven diesel models were available in the United States. This number has grown to fourteen models in 2005 (Welsh, 2005).

As previously discussed, changing national regulations also may factor into the future fuel economy of Maine's vehicle fleet. Announced in August 2005 Reformed CAFE standards, an update to the current CAFE standards, would increase fuel economy across all vehicle types. The current standards for light-duty trucks are 21 miles per gallon in 2005 with an increase in fuel efficiency to 22.2 miles per gallon for model year 2007 (NHTSA, 2005). To the extent that efficiency increases are not offset by increased driving, the revenue stream from motor fuel excise taxes could decline in nominal terms

[34] Citizens purchasing a hybrid vehicle of market year 2001 or newer (of certain makes and models), are eligible to receive a $2000 dollar tax credit if these vehicles are registered by December 31, 2005. The tax credit structure will be changing in 2006 but may still offer tax credits to consumers who purchase hybrid vehicles. Information available at: http://www.fueleconomy.gov/feg/tax_hybrid.shtml

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in addition to their decline in real purchasing power due to the effects of increases in inflation.[35] The potential impact on revenue streams due to the new CAFE standards are included in the status quo projections presented below.

The analysis presented here is based on a number of assumptions. First, we assume that the fuel economy of the newest model year increased by 5%, 15% or 30% by the year 2015. Thus we assume an incremental increase in fuel economy for all years between the base (2005) and the final (2015) year. We assume a constant rate of replacement (i.e., the fleet does not grow) and that the composition of the fleet remains constant. We assume the vehicle-miles-traveled was constant.[36] In addition, since the data spanned two years and new tax rates are effective as of July 1, we employ a mix of the 2004 and 2005 tax rates.[37] Thus, revenue projections are in 2005 dollars and are based on the percent change in miles per gallon and subsequent change in fuel consumption, but do not account for increases in miles traveled. The effect of increasing vehicle-miles-traveled is discussed at the end of this section.

In the case of a 5% increase in fuel efficiency between 2005 and 2015, the projections assume a 0.5% increase in fuel efficiency in each year of the ten-year span.[38] Given the example of Maine's mid-size gasoline cars that achieve on average 20.24 miles per gallon and travel collectively 2,773,833,451 miles per year, this produces a fuel consumption rate of 137,057,714 gallons for the year 2005 using Equation 1.

[35] National statistics indicate a trend of increasing vehicle miles traveled however, Maine Department of Transportation traffic count data from 2004 indicates that Maine vehicle miles traveled may be decreasing.
[36] As noted in Section 4, the historical rate of VMT growth nationally is 1.7 to 2.6%.
[37] 2004 tax rate of .252 and 2005 tax rate of .259 for gasoline and diesel rates of .263 and .270.
[38] Due to recently released CAFE standards for upcoming model years, the increase in fuel efficiency per year for the overall fleet was adjusted to .0003 for this scenario. Similar adjustments were made for the 15 and 30% increases.

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Equation 1: Fuel Consumption = $\dfrac{\text{Vehicle-miles-traveled Annually}}{(1 + \%\text{ change in yearly fuel efficiency} * 20.24)}$

Under a 5% increase in fuel efficiency, fuel consumption in Maine's mid-size gasoline cars would decrease to 137,022,635 gallons in the year 2006, or a 0.03% change in fuel consumption. By 2015, the fuel consumption for this category of car would decrease to 135,154,669 gallons per year, a 1.39% decrease from 2005 as shown in Table 9. Continuing with the same example of Maine's mid-size gasoline cars under a 15% and 30% increase in fuel efficiency, the fuel consumption in 2015 would decrease by 4.50% (to 131,502,839 gallons) and 7.79% (to 126,380,698 gallons) respectively (Table 9). This example clearly demonstrates that changes in fuel efficiency can have a rapid, and profound effect on fuel consumption. The example analysis given above was performed for each vehicle class (and category within class) for both diesel and gasoline vehicles in order to generate the revenue estimates discussed in Section 5.3.2.

As previously mentioned in this report, the assumption of constant vehicle-miles-traveled may overstate the decrease in fuel consumption. Applying the national VMT growth rate trend of 2% annually to the 5% change in fuel economy projections results in 40% of the anticipated decline not materializing due to increasing vehicle miles traveled.[39]

[39] In the 15 and 30% fuel economy increase scenarios, the decrease in fuel consumption is over stated by 13 and 6%, respectively.

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Table 9. Fuel Consumption Projections: Mid-Size Cars

% Change in Fuel Economy from 2005 to (2006-2015)

	5%		15%		30%	
	Gallons	*% Change*[40]	*Gallons*	*% Change*	*Gallons*	*% Change*
2006	137,022,635	-0.03%	136,952,531	-0.08%	136,847,509	-0.15%
2007	136,952,531	-0.08%	136,742,648	-0.23%	136,429,027	-0.46%
2008	136,847,509	-0.15%	136,429,027	-0.46%	135,806,081	-0.91%
2009	136,707,730	-0.26%	136,013,097	-0.76%	134,984,283	-1.51%
2010	136,533,407	-0.38%	135,496,737	-1.14%	133,970,916	-2.25%
2011	136,324,806	-0.53%	134,882,257	-1.59%	132,774,780	-3.12%
2012	136,082,242	-0.71%	134,172,370	-2.11%	131,406,006	-4.12%
2013	135,806,081	-0.91%	133,370,166	-2.69%	129,875,847	-5.24%
2014	135,496,737	-1.14%	132,479,076	-3.34%	128,196,463	-6.47%
2015	135,154,669	-1.39%	131,502,839	-4.05%	126,380,698	-7.79%

5.3.2 Revenue Projections

In this section the change in fuel consumption generated in Section 5.3.1 is translated to revenue impacts. Given that gasoline and diesel fuel are assessed different taxation rates, the data were divided by fuel type in order to continue the analysis. For each year, the total fuel consumption projections for all vehicles of one fuel type were summed. For example, the 2006 fuel consumption projections for all gasoline vehicles were summed to 701,318,005 total gallons of gasoline consumed. Since gasoline taxes are effective as of July 1, the 2004 gasoline tax was in effect for six months of 2005 and the 2005 gasoline tax was in effect for the second sixth months of 2005, the per gallon gasoline tax applied for the revenue projections was an average of the two tax rates.[41] The steps outlined above for calculating total fuel consumption and taxation rate was repeated for all diesel vehicles. To complete the analysis, these two projections were summed to provide total revenue estimates under the fuel economy scenarios outlined

[40] To calculate total percent change between each year and the base year of 2005 the following equation was used: (gallons consumed in [YEAR] – gallons consumed in 2005)/gallons consumed in 2005.

[41] Gasoline Tax for 2005 = (.252+.259)/2 = .2555. Diesel Tax 2005 = (.263 + .27)/2 = .2665

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above. The impact on revenue from changing fuel economy is shown in Figure 4. The data used to create Figure 4 are contained in Table 10 for reference.

Absent changes in national transportation policy or changes in consumer behavior, these increases in fuel efficiency may not occur. The revenue estimate under status quo assumptions is $214 million for 2015, representing a 2.53% decrease in revenues. Extending the status quo projection to 2025 yields a revenue projection of $209 million representing a modest 5.03% decrease in revenue from 2005.

Figure 4. Maine Fuel Tax Revenue Projections: Change in Fleet Fuel Efficiency

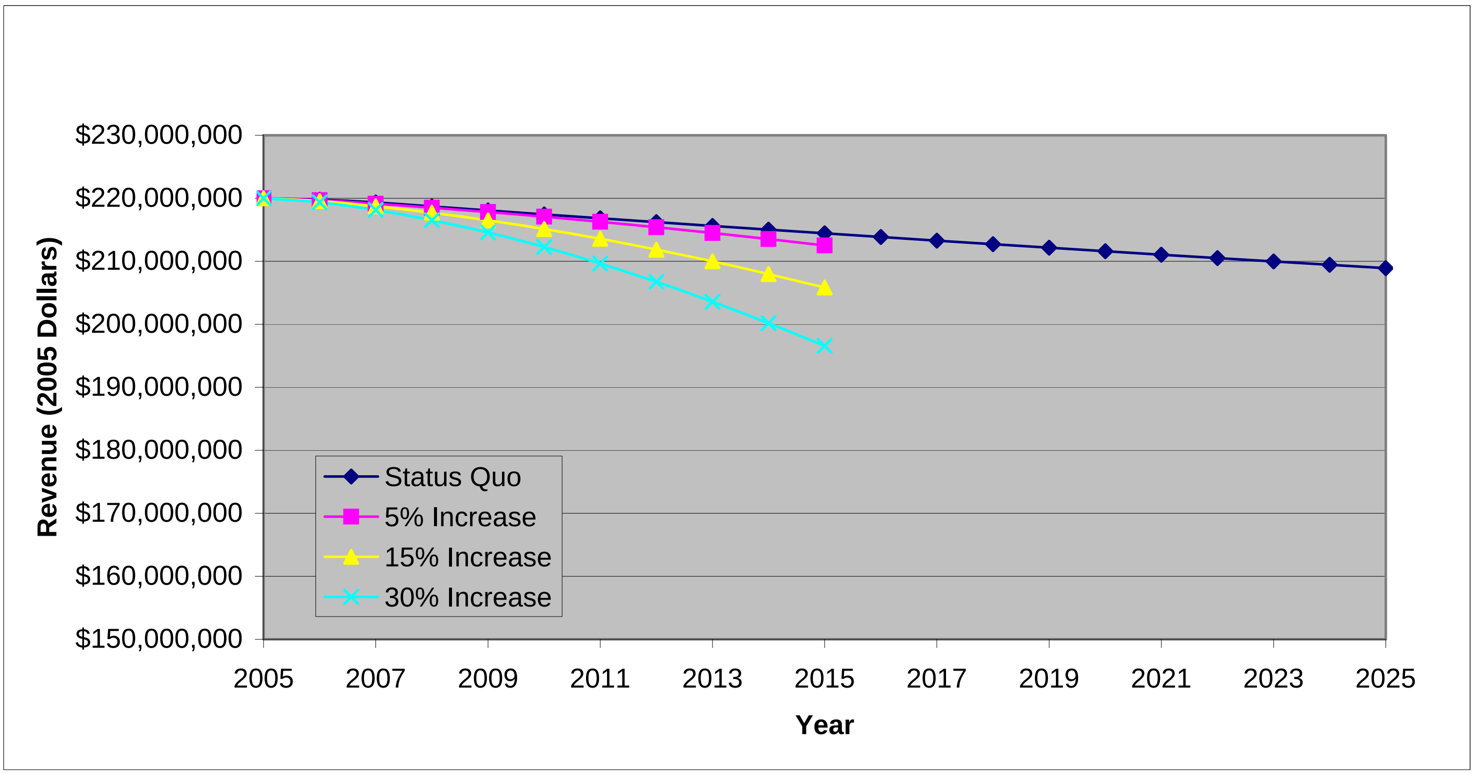

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Table 10. Total Revenue Impacts[42]

	Status Quo		5%		15%		30%	
	Revenue	*% Change*	*Revenue*	*% Change*	*Revenue*	*% Change*	*Revenue*	*% Change*
2006	$219,771,139	-0.10%	$219,703,607	-0.13%	$219,568,672	-0.19%	$219,366,590	-0.28%
2007	$219,339,959	-0.29%	$219,138,435	-0.39%	$218,736,531	-0.57%	$218,136,520	-0.84%
2008	$218,699,877	-0.59%	$218,511,546	-0.67%	$217,714,455	-1.03%	$216,529,998	-1.57%
2009	$218,067,690	-0.87%	$217,824,159	-0.98%	$216,508,323	-1.58%	$214,564,993	-2.47%
2010	$217,443,250	-1.16%	$217,077,579	-1.32%	$215,124,876	-2.21%	$212,262,679	-3.51%
2011	$216,826,418	-1.44%	$216,273,197	-1.69%	$213,571,616	-2.92%	$209,646,884	-4.70%
2012	$216,217,055	-1.71%	$215,412,476	-2.08%	$211,856,716	-3.70%	$206,743,505	-6.02%
2013	$215,615,025	-1.99%	$214,496,951	-2.50%	$209,988,918	-4.55%	$203,579,919	-7.46%
2014	$215,020,198	-2.26%	$213,528,221	-2.94%	$207,977,424	-5.46%	$200,184,406	-9.00%
2015	$214,432,445	-2.53%	$212,507,942	-3.40%	$205,831,799	-6.44%	$196,585,607	-10.64%

It is clear from the revenue projections above that concerns of decreasing fuel tax revenue due to changes in fuel economy are well founded. Section 2 of this report discussed possible alternatives to supplement, or replace, the revenue obtained from fuel taxes. Forecasts regarding the possible revenue obtained from these alternatives are discussed in Section 5.4.

5.4 Alternative Financing: Tax Revenue under Distance Based Charges

In Sections 2.3.3 and 2.5.1, two alternative financing options were presented that centered on varying costs to drivers depending on the vehicle miles traveled. Section 2.3.3 described systems of distance-based charges that track a driver's mileage, some via electronic tracking systems. Section 2.5.1 discussed varying registration fees based on vehicle-miles-traveled from odometer readings. As both options are mileage based, the following analysis can be useful in considering the revenue possibilities of these options.

[42] To calculate total percent change between each year and the base year of 2005 the following equation was used: (revenue in [YEAR] – revenue in 2005)/revenue in 2005.

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Using data from the Maine Revenue Service, the revenue obtained from the gasoline tax in 2004 was $175,970,766. A second category of 'Special Fuel' tax, which includes diesel fuel taxes, garnered revenue in the amount of $40,391,130.[43] Collectively, these two taxes amounted to $216,361,896 in 2004 revenue. Based on the stated assumptions regarding the rate of taxation for diesel and gasoline for the 2005 fiscal year, the estimated 2005 tax revenue for Maine was calculated to be $219,988,083.

In order to maintain this level of revenue using a mileage-based charge instead of a state gasoline tax, the charge required is1.74 cents per mile traveled. This rate was calculated using the data contained in Table 11. For comparison purposes, the per-mile charge currently used by the Oregon Road User Fee Task Force pilot program is 1.22 cents per mile traveled.

Table 11. Expected Revenue from Mileage Charge at 1.74 cents per mile

Expected Revenue				
Fuel Type	Total VMT	Fuel Consumption	Fuel Revenue	VMT Revenue
Gasoline	11,851,800,308	702,400,273	$181,921,671	$206,221,325
Diesel	781,080,603	112,456,657	$30,363,297	$13,590,802
Total	12,632,880,911	813,774,663	$212,284,968[44]	$219,812,128

To compare equity in terms of burden of cost between the fuel tax and per-mile charge alternatives, we performed analysis at the aggregate level. Tables 12 and 13 demonstrate that under the current fuel tax system, drivers of light-duty vehicles pay 79% of the revenue generated from the gas tax. Under a vehicle-miles-traveled (VMT)

[43] Revenue information obtained from www.maine.gov/legis/ofpr/04compendium/c04opf1.htm. The "Special Fuel" tax provisions apply to: diesel, propane, methanol, ethanol and compressed natural gas per www.maine.gov/revenue/fueltax/Tax%20Rates.html

[44] This does not account for the 5.16% of the vehicle fleet classified as "unknown". "Unknown" vehicles were unable to be decoded typically due to older makes/models or error in the data. The revenue projections in Section 4.3 include these "unknown" vehicles.

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charge, which assumes a constant rate of VMT for both light-duty and heavy-duty vehicles, light-duty vehicles would pay 89% of the revenue generated. In order for light-duty vehicles to pay 79% of the revenue, an adjusted charge (1.49 cents per mile) would need to be implemented. Similarly, in order for heavy-duty vehicles to maintain 21% of the revenue, would require an adjusted charge of 3.3 cents per mile for heavy-duty vehicles. Further analysis of appropriate per-mile charges would be required to adjust the burden of payment. Additional analysis also could consider the impacts, in terms of both revenue and the competitiveness of Maine's industries, of imposing higher mileage charges on heavy-duty vehicles given that HGV's typically create greater damage to roadways.

Table 12. Division of Payment under Fuel Tax

Revenue Division				
	Fuel Consumption	Fuel Rate	Fuel Revenue	Percent Paid
Light-duty	646,050,771	0.259[45]	$167,327,150	79%
Heavy-duty	166,762,630	0.2664[46]	$44,425,565	21%
Total			$211,752,714	100%

Table 13. Division of Payment under Vehicle-miles-traveled Charge

Revenue Division				
	VMT	VMT Rate	VMT Revenue	Percent Paid
Light-duty	11,227,964,962	$0.0174	$195,366,590	89%
Heavy-duty	1,351,654,848	$0.0174	$23,518,794	11%
Total	12,579,619,811		$218,885,385	100%

[45] This rate is based on the fact that 99.9% of the light-duty vehicle fleet are gasoline fueled vehicle. Thus the 2005 gasoline tax rate was applied.
[46] This rate is a weighted average based on the fact that 67% of the heavy-duty vehicle fleet are diesel fueled vehicles, while only 33% are gasoline fueled. The weight applied was [(.259*.33) + (.27*.67)].

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6.0 Results, Implications and Future Research

6.1 Results and Implications

A result called for by the Maine Department of Transportation in commissioning this work was to begin building "a body of information that considers (revenue) alternatives within the economic context of Maine" (ME DOT, 2005(b)). The literature review section is a first step in this process of identifying and providing information on existing alternative financing options prevalent in the transportation literature and in use internationally. For each alternative, the benefits and concerns are identified and, when possible, reviewed with an eye towards the needs of Maine. The literature review section also identifies case studies of alternative financing options currently being employed by other states or nations. These case studies further contribute to the base of knowledge regarding alternative options. In addition, these case studies provide information for Maine policy planners to discuss experiences with other states or nations utilizing alternative funding options, particularly with regard to transitioning from a motor fuel tax program.

Determining the alternative funding options most appropriate for Maine is properly left for the State Legislature, the Governor and appropriate state agencies and the public. However, it is evident that many of the alternatives discussed in the literature review may not be preferred given Maine's economic and geographic circumstances (Table A.3). Accordingly, Section 3.2 (Table 2) presents possible criteria for evaluating alternative-financing options to address Maine's specific needs. The literature review and suggested evaluation criteria provide stakeholders much of the information necessary for informed discussion on the future of Maine's transportation financing.

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The data analysis results further contribute to such discussions. First, the analysis demonstrates that fears regarding diminishing revenues due to changes in fuel efficiency are well founded. If steps are taken at the national level to increase fuel efficiency, Maine could experience a decrease in revenue of up to 10% in the next ten years. However, absent changes in national transportation energy policy or changes in consumer behavior, these increases in fuel efficiency may not occur. The revenue under status quo assumptions represents a modest 5.03% decrease in revenue in the next twenty years. The information provided on the types of vehicles that comprise Maine's vehicle fleet will better enable policy makers to consider issues of equity and tax burden when considering financing options. In addition, the data analysis demonstrates how an alternative-financing option could generate revenue that is equal to or greater than current gas tax revenue.

6.2 Future Research

As discussed in Section 5.1, a focus of future research should be to obtain and utilize more comprehensive vehicle data. First, we recommend that the Bureau of Motor Vehicles, through InforME, maintain electronic records of prior vehicle registration data so that an historical electronic archive can be developed going forward. Such data will provide an accurate picture of the Maine vehicle fleet and will allow for statistically stronger analysis of trends across time. In addition, these data will allow Maine to generate information specific to the state, without having to rely on national data. A second focus of future research should be the collection and use of the type of data presented in Table A.1. Such data can be used to determine the revenue impacts of other alternative financing options.

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This report presents a firm foundation for future studies related to the role that alternative funding mechanisms may play in supporting Maine's transportation infrastructure. Future research should continue to monitor the successes and failures of currently employed alternative funding mechanisms.

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Table A.1 Data Limitation or Requirements

Section	***Alternative***	***Limitation/Requirements***
2.2.1	Alternative Gas Tax Structure	Maine already employs alternative gas tax structure via inflation index.
2.2.2	LOTT: Natural Resource Extraction	Require data on natural resource extraction activities, and use of rural roadways by industry.
	LOTT: Payroll Tax	Require data regarding urban employment
	LOTT: Sales Tax	Require data regarding volume of sales in Maine.
2.2.3	Taxation of Alternative Fuel Source	Maine already employs an alternative fuel tax
2.3.1	Area Charging/Cordon	Require Data on traffic flow into major metropolitan cities[47]
2.3.2	Congestion Pricing	Require data on congestion experienced in areas of Maine.
2.3.3	Distance Based Charges	Data Analysis Component
2.3.4	HOT Lanes	Require data regarding areas with infrastructure capacity for HOT's
2.3.5	Value Capture	Require data on development of new roads, and anticipated maintenance cost of these roads.
2.4.1	Facility Tolls/Facility Congestion Tolls	Maine currently employs facility tolls along the Maine Turnpike and for Ferry Service. Require data on vehicles passing through various tolling facilities and congestion experienced at these facilities.
2.4.2	Weight Distance Tolls	Maine implements a modified version of this option, as tolling along the Maine Turnpike is dependant on number of axles of a vehicle. Require data on distance traveled by HVG's in Maine.
2.5.1	Distance Based Fees	Data Analysis Component
2.5.2	Environmental Emissions Fees	Require Data on the emissions scores of Maine's vehicle fleet[48]
	Fuel Efficiency Fee	Changes in fuel economy, are considered in the data analysis as fuel economy applies to the gas tax.

[47] This type of data may currently be available from the Maine Department of Transportation at http://www.state.me.us/mdot/traffic-counts/traffic-monitoring.php

[48] This information could be extrapolated by applying the Environmental Protection Agency's air pollution score and/or greenhouse gas score to individual vehicles in Maine's vehicle fleet. It should be noted that these scores are only available for Model Year 2000 vehicles or newer.

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Table A.2 Local Option Transportation Tax use in the United States

State Name	***Type of LOTT Employed***
Alabama	Fuel Tax, Sales Tax
Alaska	Fuel Tax, Vehicle Tax
Arizona	Sales Tax
Arkansas	Sales Tax
California	Vehicle Tax, Sales Tax
Colorado	Vehicle Tax, Sales Tax
Connecticut	Vehicle Tax
Florida	Fuel Tax, Sales Tax
Georgia	Sales Tax
Hawaii	Fuel Tax, Vehicle Tax
Idaho	Vehicle Tax
Illinois	Fuel Tax, Sales Tax
Indiana	Vehicle Tax
Iowa	Sales Tax
Kansas	Sales Tax
Louisiana	Sales Tax
Minnesota	Sales Tax
Mississippi	Fuel Tax, Vehicle Tax
Missouri	Vehicle Tax, Sales Tax
Nebraska	Vehicle Tax
Nevada	Fuel Tax, Sales Tax
New Mexico	Sales Tax
New York	Sales Tax
North Carolina	Sales Tax
Ohio	Vehicle Tax, Sales Tax
Oregon	Fuel Tax
South Carolina	Vehicle Tax, Sales Tax
South Dakota	Vehicle Tax
Tennessee	Vehicle Tax, Sales Tax
Texas	Vehicle Tax, Sales Tax
Utah	Sales Tax
Virginia	Fuel Tax
Washington	Vehicle Tax, Sales Tax

Data obtained from Goldman and Wachs, 2003. Tables 1, 2, 3a and 3b.

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Table A.3 Literature Review Findings

Section of Report	Alternative Financing Option	Definition	Benefits	Concerns
2.2			***Taxes***	
2.2.1	Alternative Gas Tax Structure	Indexing gas tax rates to a measure of inflation.	1) Avoid politically charged situation of increasing tax rate 2) Maine currently uses an alternative gas tax structure	1) Gasoline taxes are regressive (shift tax burden to the poor & middle class)
2.2.2	Local Option Transportation Taxes	Implementation of a tax at the local level. Earmark revenue for transportation.		
	Fuel Tax	Percentage tax on gasoline sales. Revenue earmarked for transportation.	1) Easily administered by local officials and local control of revenue 2) Local drivers are the source of revenue	1) Jeopardize competitiveness of local businesses 2) Limited tax base therefore high rate would be required to raise revenue 3) Possible revenue decline over time given increasing fuel economy

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Section of Report	Alternative Financing Option	Definition	Benefits	Concerns
	Sales Tax	Implementation of a sales tax at local or state level. Earmark revenue for transportation.	1) Broad tax base 2) High revenue for low marginal tax rate; less objectionable to consumers 3) Complies with horizontal equity (all transportation users pay) 4) Direct voter involvement in implementing and maintaining tax 5) Revenue obtained from non-residents	1) Possible revenue instability during recessions 2) No incentives for decreasing use of the transportation infrastructure 3) Possibly jeopardize competitiveness of Maine businesses
	Other: Natural Resource Extraction	Levy weight-based charge on natural resource extraction.	1) Finance rural roads used only by natural resource industries	1) Jeopardize competitiveness of resource based businesses 2) Roads often privately owned by natural resource industries.
	Other: Payroll Tax	Levy tax on businesses to finance transit.	1) Finance urban transit systems	1) Possibly inappropriate for Maine's rural makeup
2.2.3	Taxation of Alternative Fuels	Levy tax on alternative fuels such as natural gas.	1) Maine currently taxes alternative fuels	1) Limited market penetration of alternative fuel vehicles

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Section of Report	Alternative Financing Option	Definition	Benefits	Concerns
2.3			***Road/Direct Pricing***	
2.3.1	Area Charging/ Cordon	Implement charge for operating vehicle in specified area.	1) Promote efficient transportation behavior (carpooling, mass transit) 2) Consistent with other policy objectives (reduction of pollution, road wear, noise, etc.) 3) Large revenue base if implemented in large area	1) Possible encouragement of sprawl 2) Creation of boundary effects; motorists increase travel in order to avoid charge
2.3.2	Congestion Pricing	Implementation of variable prices dependant upon time of travel and level of congestion.	1) Reduction in congestion 2) Promote efficient transportation behavior (carpooling, mass transit)	1) Possible public opposition to fee implementation at previously free area
2.3.3	Distance Based Charges	Implement variable vehicle user fee dependant upon distance traveled (i.e. per-mile charge).	1) Stable revenue, not affected by fuel economy 2) Promote efficient transportation behavior (carpooling, mass transit) 3) Gradual implementation possible; lower public resistance	1) Implementation of viable technology on a wide scale 2) Invasion of motorist privacy 3) Evasion of tax 4) Possible shifting of burden to rural areas 5) Capturing revenue from out of state travelers

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Section of Report	Alternative Financing Option	Definition	Benefits	Concerns
2.3.4	Managed Lanes/ Value Pricing	Vary price of lanes dependant upon time of day and level of congestion.	1) Present options to motorists; allow motorist to value own time 2) Congestion Management	1) Decrease amount of infrastructure available to the general public
2.3.5	Value Capture	Require private developers to pay for maintenance of roads created.	1) Local and State agencies no longer fiscally responsible for privately created roads	1) Public safety (will developers maintain road consistent with standards of public agencies).
2.4			***Tolls***	
2.4.1	Facility Congestion Tolls	Implementation of variable user fees at specific facilities (ex: bridge), dependant upon congestion level.	1) Promote efficient transportation behavior (carpooling, mass transit) 2) Reduce congestion	1) Equity – fees may be used to finance projects not related to the tolled facility. 2) Tolls are regressive (shift payment burden to the poor & middle class)
2.4.2	Weight-Distance Tolls/Tax	Heavy goods vehicles must pay facility toll or per mile rate based on weight.	1) Heavy goods vehicles pay commensurate with amount of damage inflicted on roads. 2) Captures value of roadways as 'warehouses' for commercial goods	1) Possible jeopardy to Maine's trucking reliant industries

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Section of Report	Alternative Financing Option	Definition	Benefits	Concerns
2.5			***Fees***	
2.5.1	Distance Based Fees/ Price Variability	Replace currently fixed price of vehicle ownership with variable price (ex: variable registration fee based on vehicle miles traveled).	1) Motorists able to control own savings/costs by adjusting driving habits 2) Consistent with other policy objectives (reduction of pollution, road wear, etc.)	1) Evasion
2.5.2	Emissions Fees	Levy variable user fees dependant upon vehicle energy efficiency and environmental emissions.	1) Consistent with other policy objectives (reduction of pollution) 2) Promote citizen awareness of vehicle emissions	1) Availability of information on emissions of all vehicles makes/models.