

I-95 Corridor Coalition

A 2040 Vision for the I-95 Coalition Region

Supporting Economic Growth in a Carbon-Constrained Environment

Final Report



December 2008

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Final Report

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This report was produced by the I-95 Corridor Coalition. The I-95 Corridor Coalition is a partnership of state departments of transportation, regional and local transportation agencies, toll authorities, and related organizations, including public safety, port, transit, and rail organizations, from Maine to Florida, with affiliate members in Canada. Additional information on the Coalition, including other project reports, can be found on the Coalition's web site at <http://www.i95coalition.org>.

Table of Contents

Executive Summary	ES-1
Introduction and Approach	ES-1
Future Demand	ES-2
Continuing a “Business as Usual” Approach to Transportation Will Lead to Dire Consequences	ES-3
An Alternative Vision for the I-95 Region.....	ES-5
What Would it Take to Achieve Vision?	ES-6
Vision Study Conclusions and Opportunities	ES-9
1.0 Introduction and Vision Study Approach	1-1
1.1 Introduction.....	1-1
1.2 Setting a Strategic Vision for the I-95 Region	1-2
2.0 Demographic and Economic Drivers of Transportation	2-1
2.1 Demographic and Economic Profile of the I-95 Region	2-1
2.2 Transportation Demand	2-12
2.3 Freight Forecasts	2-16
3.0 Scenario Analysis.....	3-1
3.1 VMT	3-3
3.2 Systems Operations and Management	3-3
3.3 Modal Usage Trends	3-6
3.4 Pricing and Financing	3-13
3.5 GHG/Energy.....	3-16
3.6 Land Use	3-25
3.7 Scenario Results	3-27
3.8 Further Discussion of Investment Requirements.....	3-34
4.0 Policy Implications for the Region and Opportunities for the I-95 Corridor Coalition	4-1
4.1 Higher-Speed Passenger Rail.....	4-2
4.2 Interstate/Intercity Commerce – Freight Rail and Marine Highway Systems	4-4
4.3 Interstate/Intercity Commerce – Highway Systems	4-7
4.4 Aggressive Ops/VII	4-10
4.5 Financing/Pricing Transition	4-12
4.6 Role of Climate and Energy in Shaping and Executing the Vision ...	4-14

5.0 Vision Study Conclusions and Opportunities	5-1
5.1 Summary of Key Coalition Opportunities for Advancing the Vision.....	5-1
5.2 Collaborative Role of the Coalition in Advancing These Vision Policy Issues	5-2
A. Vision and Scenario Planning in Coalition States and Metropolitan Areas.....	A-1
A.1 State Visioning Efforts.....	A-1
A.2 Metropolitan Regional Visioning Efforts	A-11
B. Operations Deployment Impact Assumptions	B-1

List of Tables

Table ES.1	Investment Needed to Achieve Strategic Vision for I-95 Region	ES-7
Table 2.1	Coalition State Population Density per Square Mile Compared to Western European Countries	2-2
Table 2.2	Characteristics of I-95 Corridor Megaregions	2-9
Table 3.1	I-95 Vision Study Scenarios.....	3-1
Table 3.2	Scenario Assumptions	3-2
Table 3.3	Illustrative VMT Reduction Strategies for I-95 Region	3-3
Table 3.4	Marginal Improvements in Total Delay on Freeways with New Applications of Aggressive Operations and VII	3-5
Table 3.5	High Transit Assumptions by Commission	3-7
Table 3.6	Commission Assumptions for Passenger Rail Ridership and Costs	3-9
Table 3.7	PMT Nationally and for I-95 Corridor Region	3-10
Table 3.8	Commission Scenarios Regarding Future Freight Rail Market Share	3-11
Table 3.9	Summary of Scenario Results	3-28
Table 3.10	Summary of Scenario Capital Investment Requirements.....	3-34
Table 4.1	Key Vision Scenario Issues/Implications	4-1
Table 4.2	Higher-Speed Passenger Rail.....	4-4
Table 4.3	Interstate/Intercity Commerce – Freight Rail Systems and Short-Sea Shipping	4-6
Table 4.4	Interstate/Intercity Commerce – Highway Systems.....	4-9
Table 4.5	Aggressive Ops/VII.....	4-11
Table 4.6	Financing/Pricing Transition (e.g., VMT User Fees, etc.)	4-14
Table 4.7	Regional Climate and Energy Implications.....	4-16
Table B.1	Operations Impact Relationships	B-2

List of Figures

Figure ES.1	Vision Study Approach	ES-2
Figure ES.2	Megaregion Trade Areas and GDP of Major U.S. Cities.....	ES-3
Figure ES.3	Congestion Spreads Widely under “Business as Usual” Assumptions	ES-5
Figure ES.4	New Financing Model for Region	ES-8
Figure ES.5	Potential Green House Gas Emission Reductions in I-95 Region from Transportation Strategies	ES-8
Figure 1.1	I-95 Vision Principles and Scenario Analysis	1-3
Figure 2.1	Percentage Change in Population by County within I-95 Region.....	2-3
Figure 2.2	Megaregion Trade Areas and GDP of Major U.S. Cities.....	2-4
Figure 2.3	Megaregions Around the World	2-10
Figure 2.4	Alternative VMT Projections	2-14
Figure 2.5	Historic VMT Growth Rates by Decade.....	2-14
Figure 3.1	VII Concepts.....	3-5
Figure 3.2	Passenger Rail 2050 Vision.....	3-8
Figure 3.3	U.S. Coastal Marine Highway System	3-12
Figure 3.4	Illustrative Transition to VMT Fees as Replacement for Fuel Taxes	3-14
Figure 3.5	VMT Revenue/Pricing Model for the Future	3-15
Figure 3.6	Proposed Network of Variably Priced (e.g., HOT) Lanes in Washington, D.C. Metropolitan Area.....	3-16
Figure 3.7	World Peak Oil Production Scenarios	3-18
Figure 3.8	Comparison of Fleet Average Fuel Economy Standards for New-Sale Light-Duty Vehicles	3-19
Figure 3.9	Globally Averaged Surface Air Temperature and CO ₂ Concentrations Since 1880.....	3-21
Figure 3.10	Infrastructure Vulnerability in Gulf Coast Region.....	3-22
Figure 3.11	Potential Greenhouse Gas Emission Reductions in I-95 Region from Transportation Strategies.....	3-25
Figure 3.12	Orlando 2050 Regional Growth Vision	3-26
Figure 3.13	Congestion Spreads Widely under Trend Assumptions	3-31
Figure 3.14	Truck Volumes Nearly Double by 2035	3-32

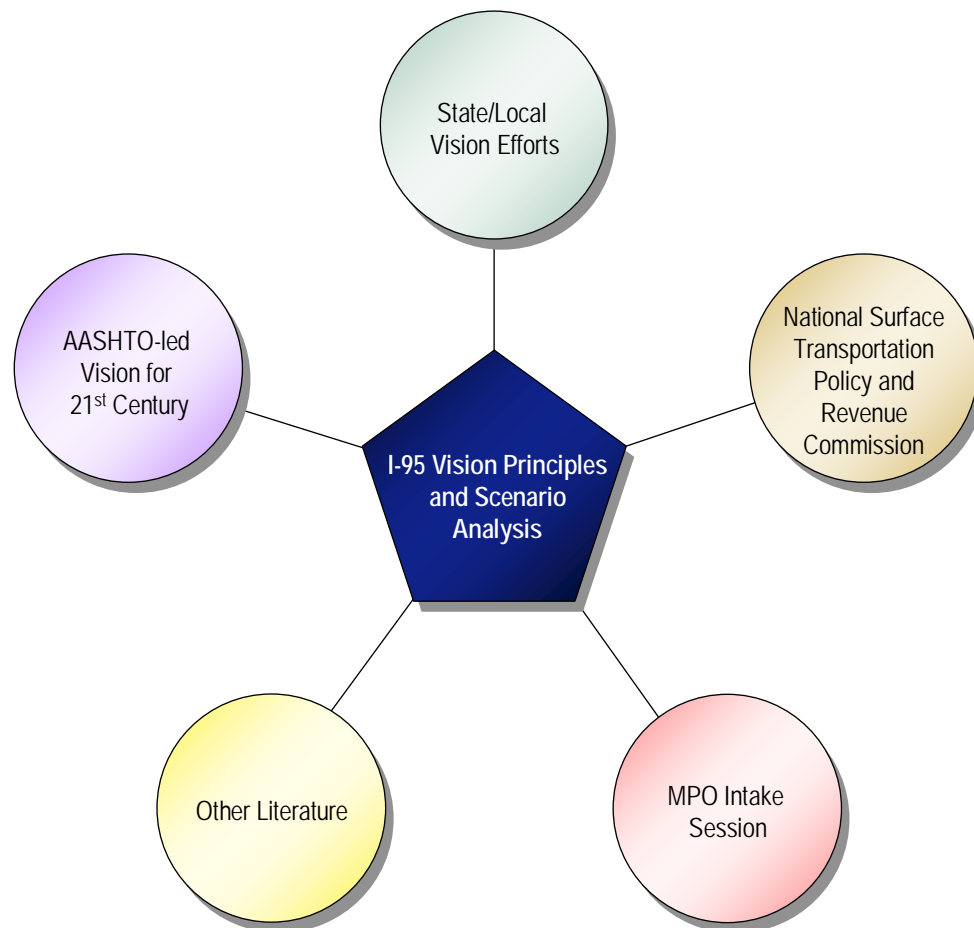
Executive Summary

INTRODUCTION AND APPROACH

The I-95 Corridor Coalition's Vision project is a departure from the Coalition's historic role that focused primarily on shorter-term operational improvements in the corridor. In the past, most of the day-to-day issues confronting the Coalition members have tended to be on a subregional scale. Today, however, it is increasingly recognized that there are a range of issues at a larger scale, the most obvious being the movement of people and freight within the north-south transportation corridor along the east coast, involving common concerns ranging from real time operations to improved modal integration and the long-term viability of the system in light of energy and climate concerns. The project, therefore, was designed to formulate and analyze an alternative vision of the future for the entire region – one which accommodates other key values and issues related to climate change, energy, a global economy, and quality of life, while reexamining the traditional modal mix and service options available for passenger and freight transportation in the corridor.

This study has capitalized on a range of recent policy-driven transportation studies oriented to developing a long-range vision for transportation as illustrated in Figure ES.1. The AASHTO led vision summit, National Transportation Vision and Strategy for the 21st Century, held May 2007 at Cambridge, Maryland culminated just at the time of scoping for the I-95 Vision project, so it was an important initial building block for the project. The team solicited Vision efforts from states and subsequently held an intake session with the larger MPOs in the region and got their input on related vision efforts and scenario testing in their respective regions. Another key resource was the National Surface Transportation Policy and Revenue Study Commission (Commission) data and analytical tools which were used to support technical analyses for this study.

Figure ES.1 Vision Study Approach



FUTURE DEMAND

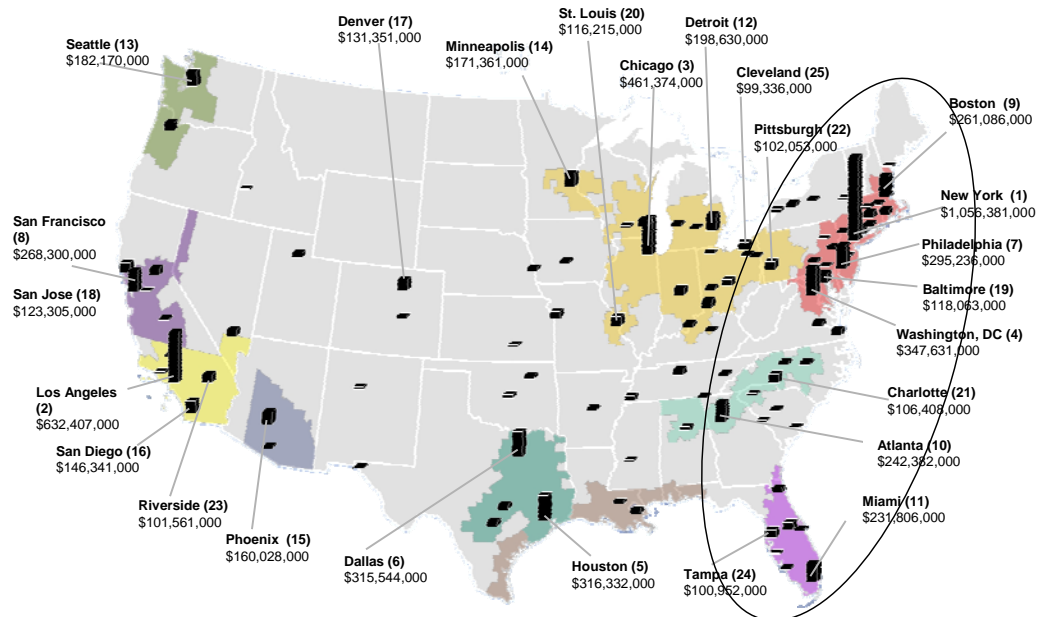
According to 2006 Census population estimates nearly 110 million people lived in the Coalition region. The corridor region occupies 10 percent of the nation's land area but contains almost 37 percent of its population. At 256 people per square mile for the entire corridor region it is over three times more densely populated than the United States as a whole, and notably, densities for many of the states are in the range of many Western European countries. Such densities should, in theory, be capable of supporting higher speed ground transportation in the 100 to 500 mile market. Population within the Coalition region is projected to increase by approximately 36 million people (33 percent) between 2006 and 2040 which will create a Corridor population of 146 million.

The 16 Coalition states and the District of Columbia contributed \$5.1 trillion to the national gross domestic product (GDP) in 2006. This constitutes 38.7 percent of the nation's GDP. If the Coalition region were accounted as a separate country, it would constitute the third-largest economy in the world. The corridor has

42 of the nation's top 100 metropolitan areas based on population and economic activity. The nation's top 25 metro areas as measured by GDP are shown in Figure ES.2. Eleven of the top 25 and 5 of the top 10 metropolitan economies (i.e., New York, Washington, D.C., Philadelphia, Boston, and Atlanta) in the United States are in the I-95 region.

The development of metropolitan areas in the region are pretty well understood; less well understood are the new patterns formed where such metropolitan areas tend to blur together into larger complexes. These complexes have recently been labeled as “megaregions.” The Regional Plan Association has identified 10 such megaregions in the United States, 3 of which are in the I-95 region as shown in Figure ES.2

Figure ES.2 Megaregion Trade Areas and GDP of Major U.S. Cities



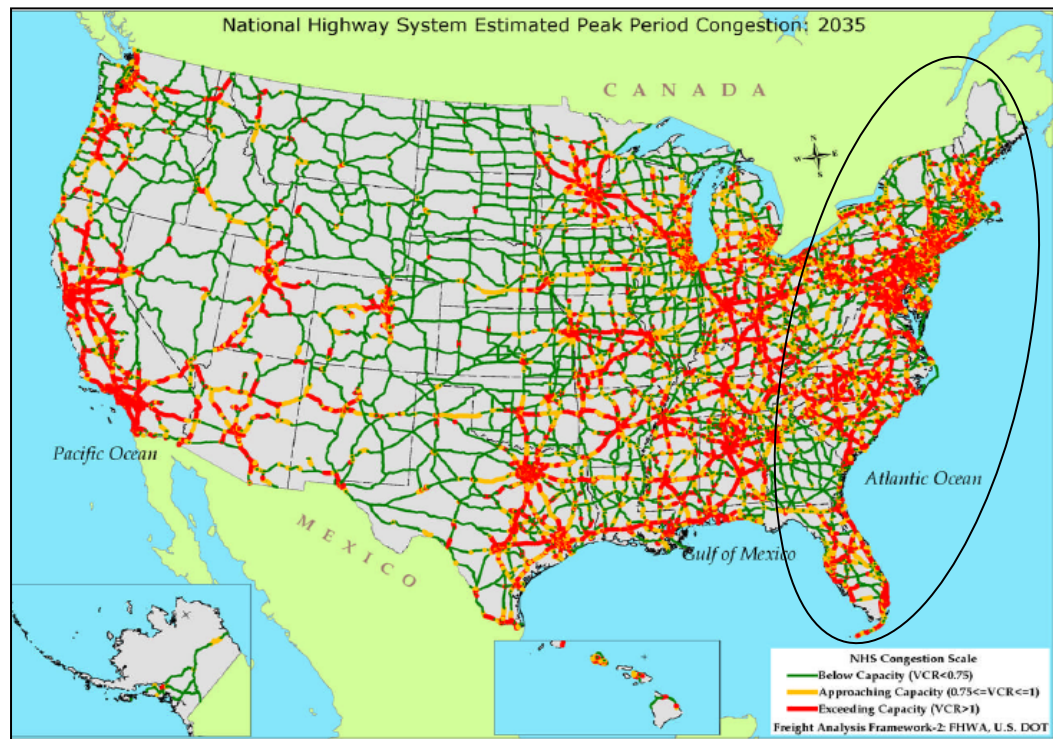
Source: Cambridge Systematics, Inc. based on data from “MetroNation: How U.S. Metropolitan Areas Fuel American Prosperity.” Metropolitan Policy Program, Brookings Institute, Washington, D.C.; and U.S. Census economic data.

CONTINUING A “BUSINESS AS USUAL” APPROACH TO TRANSPORTATION WILL LEAD TO DIRE CONSEQUENCES

Extrapolating current land-use, travel patterns, mode use, and vehicle miles of travel (VMT) trends out to 2040 would have the following major implications in the I-95 Coalition region:

- A 70 percent increase in VMT.
- An 84 percent increase in urban Interstate delay (hours per 1,000 VMT) and nearly 50 percent increase in delay across all Federal-aid systems. The results are illustrated in the FHWA FAF2 map in Figure ES.2 showing increased congestion spreading widely by 2035 (source FHWA FAF2) without significant capacity addition.
- Despite improving fuel economy in line with current CAFÉ requirements, highway fuel consumption and GHG emissions are estimated to increase 34 percent due to approximately 70 percent VMT increases and system performance degradation.
- Transit, intercity passenger, and freight rail struggle to hold market shares without greater investment.
- Truck volumes could nearly double according to FAF2 trend demand projections; these levels of truck volumes are probably not physically or environmentally sustainable in the region.
- Increasing highway and rail bottlenecks constrain interstate commerce and economic productivity.

Figure ES.3 Congestion Spreads Widely under “Business as Usual” Assumptions



Source: Federal Highway Administration, Office of Freight Management and Operations, Freight Analysis Framework (FAF-2).

AN ALTERNATIVE VISION FOR THE I-95 REGION

Building on the AASHTO Vision effort and other sources discussed above, a set of vision principles were developed by a collaborative process within the I-95 Coalition to guide an alternative vision for the region from that represented by current trends. A key feature of the principles was the goal of accommodating mobility and economic development while doing so within a smaller carbon footprint and with much less energy use while also promoting land use and quality of life objectives. The principles are summarized below:

Economic, Environmental, Energy Vision Principles:

- Sustain and enhance I-95 regional economic vitality and global competitiveness;
- Support a reduced carbon footprint for the I-95 region;
- Support a sustainable and secure energy future for the region; and
- Support transportation friendly land use development.

Transportation Vision Principles:

- Invest in a 21st Century multimodal transportation system for the I-95 region that provides mobility for an increasing population and supports economic growth;
- Support seamless integrated intermodal passenger and freight systems for I-95 corridor region travel;
- Increase the corridor share of passenger miles of travel and freight ton miles that are handled on non-highway modes;
- Support AASHTO's safety goal to reduce fatalities by one-half by 2030;
- Implement advanced operations and technology solutions to support these goals; and
- Increase investment in the I-95 region's transportation infrastructure utilizing all potential revenue and financing mechanisms.

WHAT WOULD IT TAKE TO ACHIEVE VISION?

Achievement of the 2040 Vision principles for the corridor region will require fairly dramatic changes (political, institutional, financial) from the business as usual approach implied by existing trends. Analyses for this study suggest it will require:

- Doubling the fuel efficiency of the region's vehicle fleet and increasing use of alternative fuels.
- Reducing the region's VMT growth to 1 percent per year in line with AASHTO's sustainability goal of cutting; this represents only a 40 percent growth as opposed to the trend projection of 70 percent growth to 2040.
- Implementing the Commission's most aggressive assumptions regarding use of nonhighway modes:
 - Tripling of transit ridership in region supported by transit oriented land use development patterns;
 - Increasing rail passenger ridership approximately eight fold in concert with implementing the 2050 passenger rail vision as presented by the Passenger Rail Working Group to the Commission;
 - Twenty percent increase in ton miles carried by freight rail; and
 - Aggressive short-sea shipping and seamless intermodal connections.
- Deploying aggressive operations with Vehicle-Infrastructure Integration (VII), including both in-vehicle and roadside technology deployment and implementing roadway pricing to manage demand.
- Even with an aggressive investment in the other modes, nearly 15,000 lanes of additional highway capacity needs to be added to improve system performance; much of this is assumed to be managed capacity (e.g., HOT lanes or truck lanes).

- More than doubling surface transportation investments – from about \$32 billion to \$71 billion annually. This assumes roughly doubling of transit investment in real terms, roughly doubling private and public freight rail investments, and a five- to six-fold increase in passenger rail capital investment in the corridor as shown in Table E.1.
- Transitioning to a new financing system as illustrated in Figure ES.4; a VMT fee replaces the fuel tax, congestion fees are added to manage demand, carbon fees are implemented to help stem rise in GHG emissions, and other fees are implemented as needed to increase infrastructure investment.

With the implementation of these bold transportation strategies, the region will also be on path to achieve GHG emissions reductions of 60 to 80 percent by 2050 as compared to 2005 levels by a combination of fleet fuel efficiency improvements, alternative fuels penetration, VMT growth moderation, and aggressive operations delay reduction strategies, as shown in Figure ES.5. The cumulative benefits of these transportation measures represent a 70 percent reduction in highway emissions by 2040, consistent with reaching the 60 to 80 percent GHG emission reduction goals by 2050 as sought in multiple state climate plans, proposed Federal cap-and-trade legislation, and international climate discussions.

Table ES.1 Investment Needed to Achieve Strategic Vision for I-95 Region

Mode	Annual Surface Transportation Capital Investment; I-95 Region (2005 Constant \$ Billions)	
	Current Trend	Vision
Transit	\$8	\$15-\$19
Passenger Rail	~ \$0.8	~ \$4-\$5
Freight Rail	~ \$1	~ \$2
Highway	\$22	\$47
Total	\$32	\$71

Figure ES.4 New Financing Model for Region

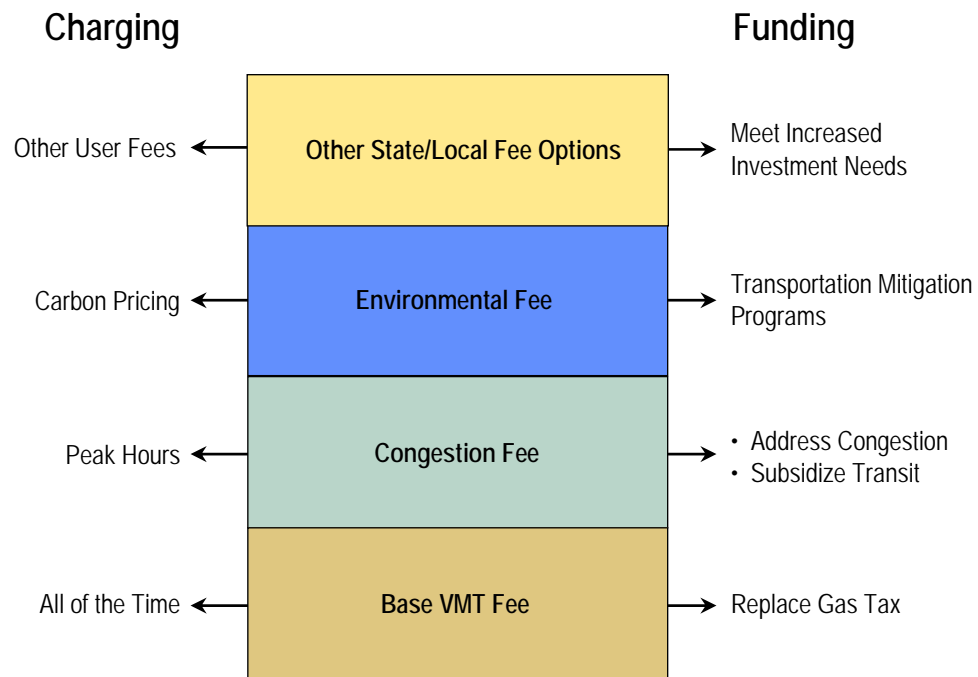
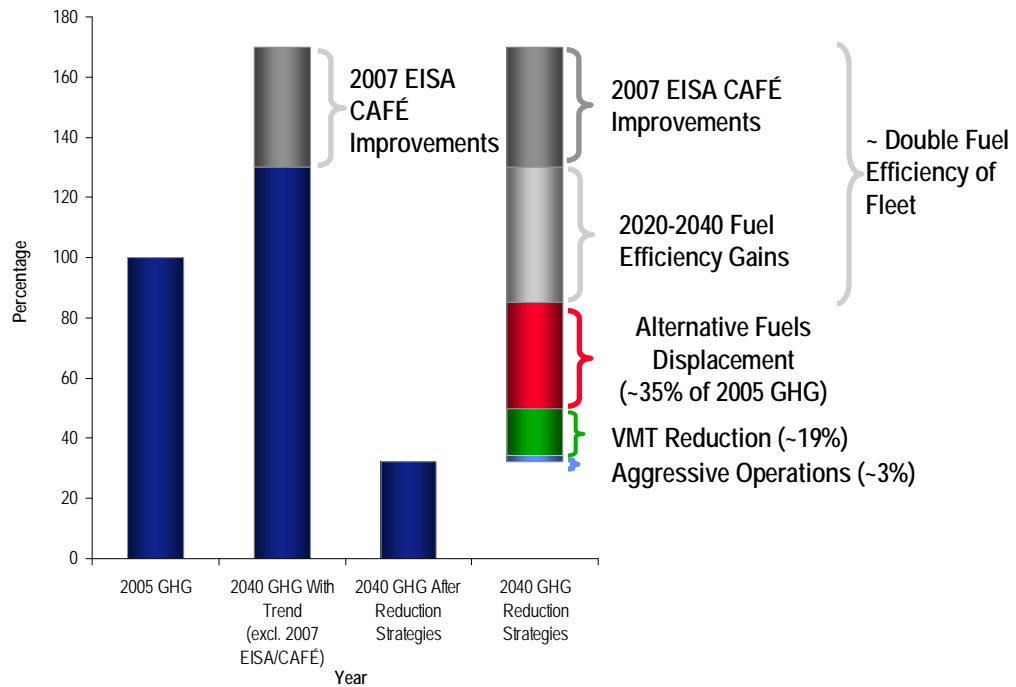


Figure ES.5 Potential Green House Gas Emission Reductions in I-95 Region from Transportation Strategies



VISION STUDY CONCLUSIONS AND OPPORTUNITIES

The I-95 Vision Study has underscored the broadening of the Coalition in terms of its geographic scope as well as its functional interests. What began with a Northeast focus on the real-time highway operations of I-95 has evolved to an East Coast regional umbrella addressing all modes of transportation as well as the economic vitality and environmental quality issues which are influenced by and which in turn affect transportation.

The I-95 Coalition has reached a new milestone with this 2040 Vision study in reaching a surprising degree of consensus on the transportation, energy, environmental and economic challenges, and opportunities confronting the eastern seaboard region of the United States. The 2040 vision principles and a vision driven scenario that were developed and analyzed for this study illustrate a multimodal path forward for transportation that supports regional economic growth while substantially contributing to emerging energy and GHG emission targets. This bold alternative (to current trends) vision for the corridor region would require implementation of aggressive multimodal investment, institutional, and operation and management strategies as described in the preceding sections. As a point of departure, the I-95 Vision Study offers the opportunity not only for a collaborative vision of the future but for advocating measures that would enhance the quality of transportation, the vitality of the economy, and the contribution of the broad corridor-wide region to issues of climate change and energy. Some of these opportunities may be corridor-wide and others may involve regional geographies or even traditionally competitive areas where a collaborative forum enhances not only the whole but each of the coalition entities individually as well. The most promising opportunities for the Coalition to advance the corridor vision seem to be in the following areas:

- Providing a **regional and systems perspective** that supports coordinated policy, planning, and investment decision-making by state DOT and member agencies.
- Advocating and facilitating **intermodal** approaches in the corridor for both passenger and freight movement.
- Developing **multistate funding approaches** for highway and rail corridor capacity and bottleneck relief. Strategies could range from streamlined pooled funding mechanisms to regional infrastructure banks.
- Providing a laboratory for development and testing of **advanced operations/VII concepts**.
- Hosting and coordinating a pilot/development program for an East Coast, multistate, **VMT user-fee revenue collection system**. The Commission recommended that the next surface transportation legislation provide funding for accelerated development of a VMT-based revenue system.
- Providing a forum for Coalition states to discuss, shape, and coordinate strategies addressing **climate mitigation and adaptation**.

Finally, although there is relatively little that the Coalition can do *on its own* in terms of implementing specific legislative or policy actions that will be necessary to advance this Vision, the Coalition's key role of alerting, informing, testing, and facilitating is not to be dismissed. It is a role that can well improve the likelihood that the established institutions of the region – governmental and nongovernmental alike – will take heed, will define the challenges, and formulate policies and plans of action consistent with the Vision articulated in this report, but at a scale and within a scope consistent with their own geographic and functional realms.

1.0 Introduction and Vision Study Approach

1.1 INTRODUCTION

The I-95 Corridor Coalitions Vision project is a departure from the Coalition's historic role that focused primarily on shorter-term operational improvements in the corridor. The Coalition which began with a Northeast focus on the real-time highway operations of I-95 has evolved to an East Coast regional umbrella addressing all modes of transportation as well as the economic vitality and environmental quality issues which are influenced by and which in turn affect transportation. In the past, most of the day-to-day issues confronting Coalition members have tended to be on a subregional scale. And some areas of concern – most notably encompassing ports, railroads, and airports – involve competitive forces within the Coalition's geography and among Coalition entities. Today, however, it is increasingly recognized that there are a range of issues at a larger scale, the most obvious being the movement of people and freight within the north-south transportation corridor along the east coast, involving common concerns ranging from real time operations to improved modal integration and the long-term system viability of the system in light of energy and climate concerns. The project therefore is designed to respond to an alternative vision of the future for the entire region – one which accommodates other key values and issues related to climate change, energy, a global economy, and quality of life, while reexamining the traditional modal mix and service options available for passenger and freight transportation in the corridor.

Study Objectives

The policy recommendation for this strategic vision study was made at an I-95 Strategic Planning Workshop held in September 2006. This strategic vision project is intended to describe what the Corridor's multimodal transportation patterns and performance outcomes may look like in 2040 utilizing a scenario approach. It identifies the key policy, technological, investment strategy, and institutional factors that will likely influence the future of the corridor and its multimodal transportation system.

The specific guidance for this project from the I-95 Coalition Policy and Strategic Planning (PSP) Committee and Executive Committee was that:

- A collaboratively developed set of I-95 Regional Vision Principles should provide a framework for scenario evaluation;
- This project is intended to be illustrative, not to develop policy conclusions;
- It should focus on high-level analysis for the entire corridor; and

- It is intended as a beginning step to:
 - Help dimension the challenge;
 - Identify Coalition opportunities to advance the vision; and
 - Spur discussion of implications and next steps among key stakeholders and decision-makers.

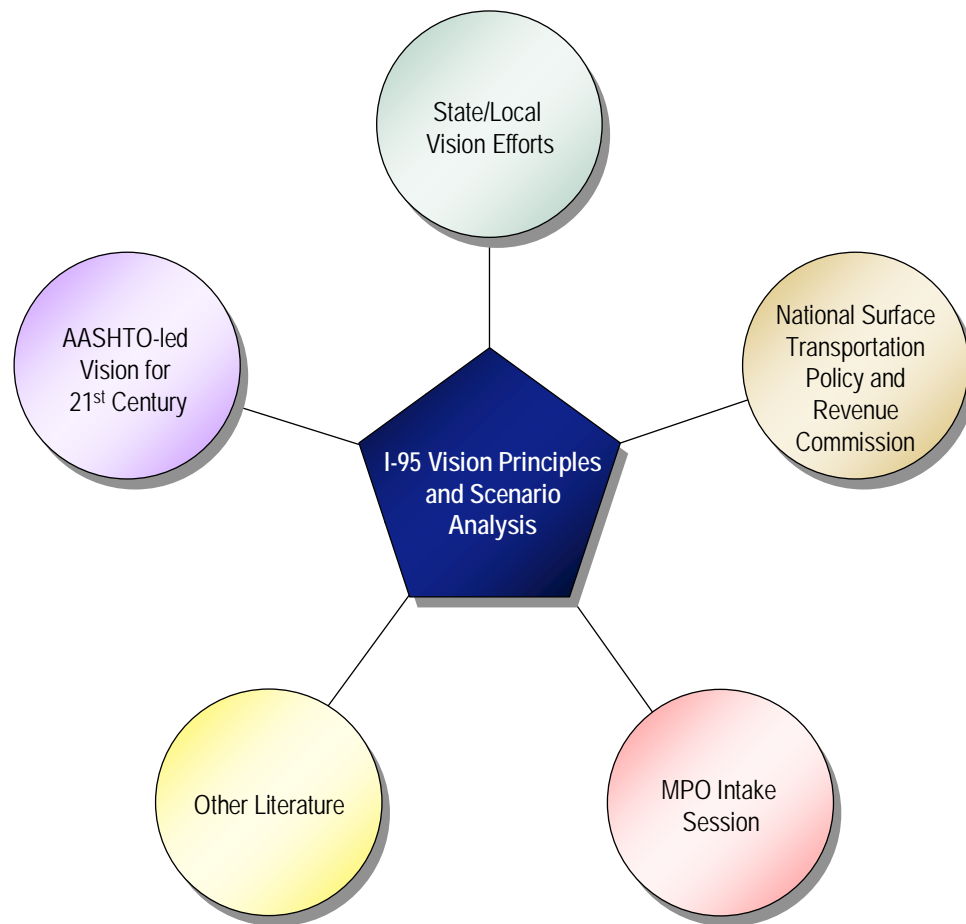
This general guidance was implemented in the study through a sequence of research steps as follows:

- Development of vision principles to guide the study;
- Forecasts of long-term demographic and economic factors and the implications for transportation demand by passengers and freight in the Coalition region across all modes;
- Development of scenarios, both trend (i.e., business-as-usual demand and investment trends) and a strategic vision scenario designed to respond to a broader set of challenges including emerging energy and climate change issues;
- Conduct of outreach meetings to get stakeholder input to the principles and scenarios;
- Analysis of the implementation issues and related costs and benefits associated with scenarios of capacity and operational improvements; and
- Discussion of a range of policy implementation issues associated with the management and investment strategies, with particular focus on financing and institutional issues.

1.2 SETTING A STRATEGIC VISION FOR THE I-95 REGION

This study has capitalized on a range of recent policy-driven transportation studies all of which have been oriented at defining a desirable future for the relationship between transportation, economic and community development, and environmental and energy concerns. In particular this study built on related vision and scenario efforts as noted in Figure 1.1.

Figure 1.1 I-95 Vision Principles and Scenario Analysis



The AASHTO led vision summit, National Transportation Vision and Strategy for the 21st Century, held May 2007 at Cambridge, Maryland culminated just at the time of scoping for the I-95 Vision project, so it was an important initial building block for the project. A number of the state CEOs participated in the AASHTO Vision effort including Neil Pedersen, I-95 Coalition Chair. Further the I-95 Executive Committee advised that wherever there was doubt about a Vision principle, the AASHTO led Vision should be used as a guide. So a number of important building blocks came from the Cambridge Vision summit and the subsequently published AASHTO 2040 Vision for the 21st Century.¹ A key AASHTO led Sustainability Panel (chaired by Hal Kassoff of the team) for the AASHTO visioning effort recommended:

“Adopt the triple bottom line as a yardstick for evaluating the sustainability of surface transportation system policies and performance and as a way of advancing projects”:

¹ Transportation, Invest in our Future: A New Vision for the 21st Century, AASHTO, July 2007.

- A robust economy served by expanded transportation capability;
- An environmental stewardship ethic that will improve the environment for all; and
- An enhanced quality of life through integrated community and transportation development.

At the direction of the Coalition Leadership, these sustainability themes were incorporated into the I-95 vision principles.

As part of Task 1, the team solicited Vision efforts from states and subsequently held an intake session with the larger MPOs in the region and got their input on related vision efforts and scenario testing in their respective regions. Appendix A summarizes state and local input received during the Task 1 intake process. Another key component was the National Surface Transportation Policy and Revenue Commission (Commission) work which was utilized for a number of our scenario inputs and technical assumptions.² Beyond that, a wide literature search on topics such as pricing, climate, energy, economy, land use, and mega-regions was conducted and is reflected in references throughout the publication.

Principles to Support a Transportation Vision for the I-95 Region

Building on the AASHTO Vision effort and other sources discussed above, the team drafted a set of vision principles to guide the I-95 vision study particularly with regard to structuring the scenarios. A key feature of the principles was the accommodation of mobility and economic development while doing so within a smaller carbon footprint and with much less energy use while also promoting land use and quality of life principles.

The vision principles were subject to a rigorous development and review process. The initial draft vision principles were circulated to the I-95 Coalition Policy and Strategic Planning Committee in the fall of 2007 for input and refinement and then to the Executive Committee in December 2007 for endorsement of the approach. The vision principles were subsequently circulated to the Strategic Vision Outreach Workshop in April and to I-95 Coalition Annual Meeting attendees in May 2008; thus the vision principles represent a broad consensus of I-95 members and stakeholders about the long-term vision for the corridor region. The final set of vision principles are presented below.

Economic Sustainability

- Sustain and enhance I-95 regional economic vitality and global competitiveness through key investments in multimodal transportation infrastructure and advanced technology.

² *Transportation for Tomorrow*, National Surface Transportation Policy and Revenue Study Commission, December 2007.

- Support corridor megaregion competitiveness in a global economy where metropolitan regions are increasingly competing not only with other domestic regions but with key metropolitan economic peers in other world trade blocks.

Environmental, Energy, and Quality of Life Sustainability

- In concert with AASHTO's Sustainable Transportation Vision, support a reduced carbon footprint for the I-95 region through reductions in greenhouse gas emissions by 20 percent (from 1990 levels) by 2020 and longer-term consistent with emerging national and corridor state reduction goals (e.g., 60 to 80 percent reductions from today's levels by 2050). Transportation sector contributes principally through vehicle technology, alternative fuels, and reductions in the rate of growth of motor vehicle travel.
- Incorporate climate change considerations into infrastructure investment plans and decisions. Inventory critical infrastructure, particularly in vulnerable locations and consider climate risk and adaptation as part of infrastructure reconstruction plans.
- Support a sustainable energy future for the region including a 2040 goal of doubling the fuel efficiency of the region's vehicle fleet and substantially diversifying fuel use.
- Support sustainable land use practices within I-95 states and metropolitan regions including: 1) transit-oriented development to support sustainable passenger transportation patterns, 2) freight village concepts to serve as important region hubs and points of distribution for local freight movements and 3) appropriate controls of access along highways and at interchanges to foster desirable development according to adopted growth plans, and to discourage unplanned sprawl and strip development which often undermine both planned land use and the highway system intended to serve it.
- Support alternatives to travel including telecommuting, video conferencing, and mixed use developments that reduce the need to drive to access services.

Transportation Sustainability

- Invest in a 21st Century Interstate system for the I-95 region. This implies investment in preservation as well as additional capacity to reduce congestion and support a sustainable economy. Incorporate the latest asset management principles and maintenance standards. Utilize new materials and construction technology that will speed construction time and extend facility life. Incorporate context-sensitive solutions and environmental stewardship along with beneficial reuse of materials for all new or rebuilt facilities in the region.
- Support an enhanced regional freight railroad system that accommodates an increased share of regional freight travel through a significant program of

private and public investment in regional freight rail infrastructure as proposed in the subregional rail studies MAROps, NEROps, and SEROps.

- Make a commitment to enhanced intercity passenger rail in the I-95 corridor to provide improved regional passenger options, including improved service and higher speeds, and to help mitigate the severe congestion that has emerged in the region's ground and air traffic systems.
- Facilitate growth in freight volumes through East Coast ports anticipating the completion of the widened Panama Canal in 2015 and the emergence of increased Asian trade via the Suez Canal; consider issues of mega-hubbing, emergence of niche ports, short-sea shipping, inland distribution, and other associated ground transport implications.
- Support multistate multimodal freight corridors including separation of freight and passenger vehicles where appropriate and application of state-of-the-art technology (e.g., Commercial Vehicle-Infrastructure Integration (VII) and positive train control).
- Support a seamless integrated passenger network for I-95 corridor region travel; e.g., intercity rail connects with metro region transit networks and the region's major airports interconnect with transit and/or high-speed rail. Public transportation facilities/terminals (air, commuter rail, intercity rail and bus, urban transit, BRT) will be adapted to integrated multimodal terminals allowing seamless, one-ticket, minimal-transfer transportation.
- Support AASHTO's goal of at least doubling transit ridership by 2030.
- Support systems of managed lanes in the I-95 region's major metro areas that can provide a higher quality service option through pricing and support higher occupancy vehicles including Bus Rapid Transit. Consider cordon or similar pricing regimes to manage central area congestion in the region's major metropolitan areas.
- Invest in a 21st Century aviation system that includes a multidimensional program to increase capacity of airports and air space, as well as improve the performance and reliability of the system. Actions required include: investment in additional airport capacity including the development of new reliever airports to serve key markets within the I-95 corridor; improved ground access to all airports; better management of airspace and implementation of underused technologies such as satellite-based air traffic control systems; improved procedures to maximize efficiencies in areas such as aircraft spacing, and adding departure routes to the busier airports within the corridor.
- Develop an architecture for state-of-the-art regional operations and management infrastructure including VII and assure interoperability of current and emerging technologies. 24/7 real time operations will be critical to sustaining mobility in the congested I-95 corridor. Real time information will allow regional users to plan their trips by any mode knowing that they can reliably reach passenger and freight destination points in a just-in-time environment.

- Support a regional architecture and standards that allow transition to a new system of finance building on emerging technology (e.g., GPS). Such a system would allow states to smoothly convert from fuel tax-based revenue system to mileage-based fees and facilitate VMT congestion pricing applications. The architecture would also support toll agency conversion to the same mileage-based system, and facilitate pay-as-you-drive insurance or other appropriate commercial applications.
- Increase investment in the I-95 region's transportation infrastructure utilizing all potential mechanisms, including traditional government revenue sources, tax incentives, tolling, and other innovative approaches to leverage private capital.
- Support AASHTO's safety goal to reduce fatalities by one-half by 2030. Vehicle safety technology, highway safety, VII, and tougher enforcement and laws for high-risk behavior all can contribute to the goal.
- Adopt state-of-the-art emergency evacuation procedures. Incorporate considerations of increasing sea levels, storm frequency, and surge strength related to climate change.
- Address transportation security including considerations of bio-threats, dirty bombs and other potential terrorist threats throughout the multimodal systems in the region.
- Sustain and enhance the I-95 Corridor Coalition's multistate leadership role including advocating for these regional vision principles. Enhance the Coalition's leadership role in data and information sharing, training, public-private collaboration, multistate operations, and policy analysis.

2.0 Demographic and Economic Drivers of Transportation

2.1 DEMOGRAPHIC AND ECONOMIC PROFILE OF THE I-95 REGION

The Coalition region extends from the Canadian Atlantic provinces and Maine to Florida. Its population is growing and its economy is evolving in ways that will fundamentally impact the need for transportation services.

Population

According to 2006 Census population estimates nearly 110 million people lived in the Coalition region. The corridor region occupies 10 percent of the nation's land area but contains almost 37 percent of its population. The population density in all the I-95 corridor region states is higher than the average for the nation as shown in Table 2.1. At 256 people per square mile for the entire corridor region, it is over three times more densely populated than the United States as a whole, and notably, densities for many of the states are in the range of many Western European countries as shown in Table 2.1. Such densities should, in theory, be capable of supporting higher-speed ground transportation in the 100 to 500 mile market. In addition, in the context of the need for increased energy efficiency and reducing the carbon footprint of the transport sector, the corridor – because of its modal richness and high density – has inherent advantages within to be able to respond aggressively to these challenges without sacrificing mobility and economic goals.

Population within the Coalition region is projected to increase by approximately 36 million people between 2006 and 2040 which will create a Corridor population of 146 million. Bureau of Census projections suggest an average of 0.86 percent growth per year in the Coalition region – coincidentally the same annual population growth rate projected for the nation. Growth rates are higher in the earlier part of the period, gradually declining in later years. The 33 percent growth in Coalition region population varies considerably along the corridor. Coalition state population growth rates derived from interim U.S. Census projections show considerable variation with Florida projected to have the highest rate of growth followed by North Carolina and Georgia.³ The wide variance in population

³ Estimates by consulting team based on extension of Bureau of the Census interim state projections for 2000-2030 out to 2040.

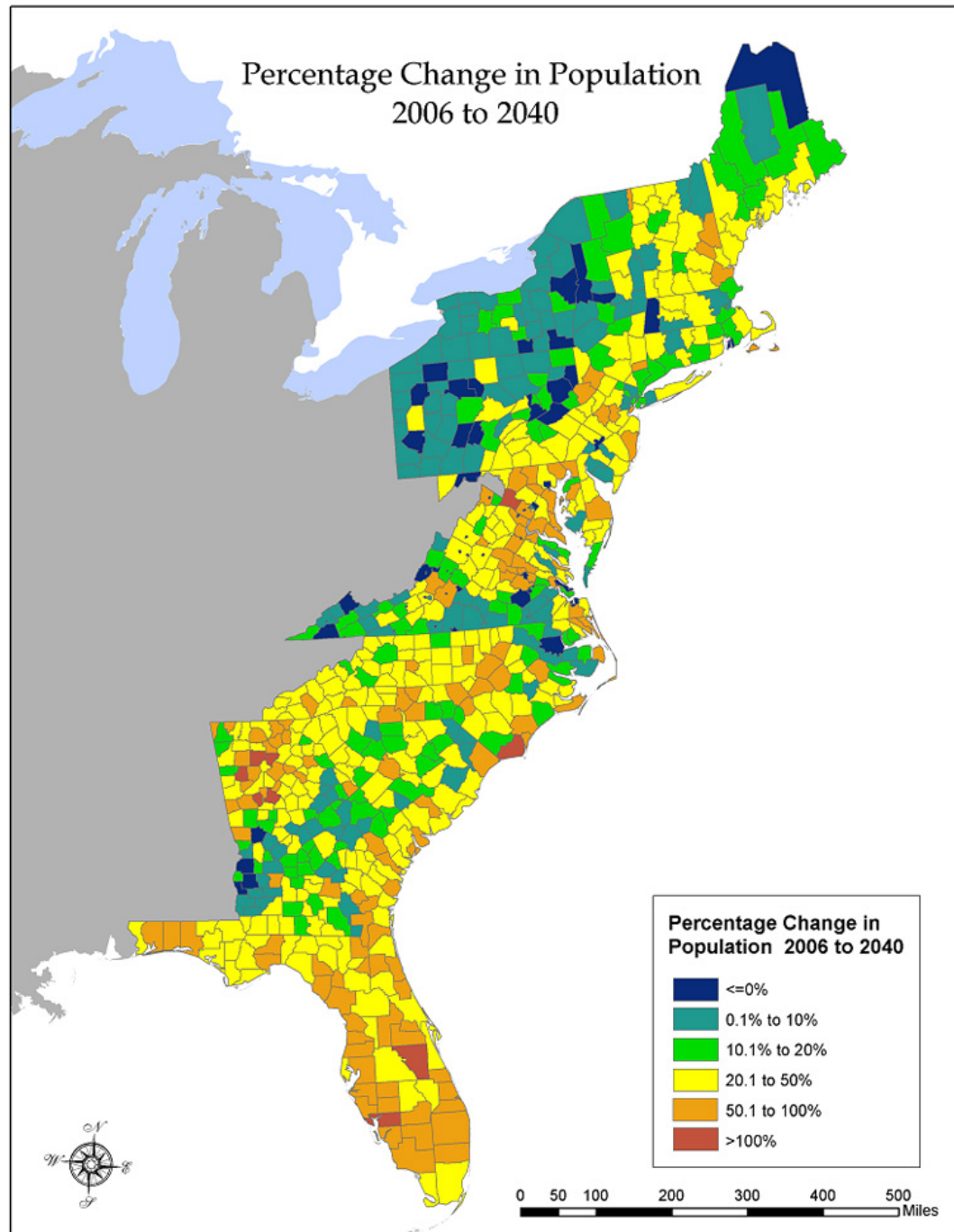
changes to 2040 at the county level can be seen in Figure 2.1.⁴ Not surprisingly, counties in the highest growth states and those around the major metropolitan areas tend to show the most rapid growth.

Table 2.1 Coalition State Population Density per Square Mile Compared to Western European Countries
2000 Census

State	Density per Square Mile
District of Columbia	9,316
New Jersey	1,134
Rhode Island	1,003
Massachusetts	810
Connecticut	703
<i>United Kingdom</i>	<i>650</i>
<i>Germany</i>	<i>609</i>
Maryland	542
New York	402
Delaware	401
Florida	296
<i>France</i>	<i>289</i>
Pennsylvania	274
Virginia	179
North Carolina	165
Georgia	141
New Hampshire	138
South Carolina	133
<i>United States</i>	<i>80</i>
Vermont	66
Maine	41

⁴ Based on CS team extension of Woods and Poole county data to 2040.

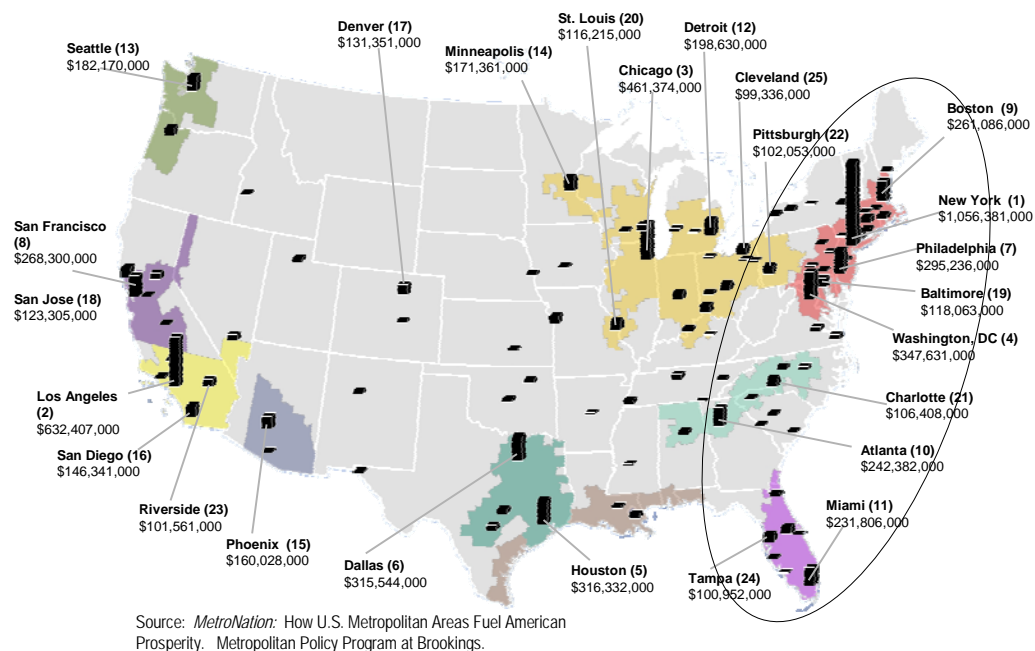
Figure 2.1 Percentage Change in Population by County within I-95 Region



Economic Profile and Transformation

The 16 Coalition states and the District of Columbia contributed \$5.1 trillion to the national gross domestic product (GDP) in 2006.⁵ This constitutes 38.7 percent of the nation's GDP. If the Coalition region were accounted as a separate country, it would constitute the third-largest economy in the world. The corridor has 42 of the nation's top 100 metropolitan areas based on population and economic activity. The nation's top 25 metro areas as measured by GDP are highlighted in Figure 2.2. Eleven of the top 25 and 5 of the top 10 metropolitan economies (i.e. New York, Washington, D.C., Philadelphia, Boston, and Atlanta) in the United States are in the I-95 region. Megaregion trade areas which are discussed later in this section are also shown in Figure 2.3.

Figure 2.2 Megaregion Trade Areas and GDP of Major U.S. Cities



Source: Cambridge Systematics, Inc. based on data from "MetroNation: How U.S. Metropolitan Areas Fuel American Prosperity." Metropolitan Policy Program, Brookings Institute, Washington, D.C.; and U.S. Census economic data. Megaregions are based on Regional Plan Association definitions.

The rate of population growth discussed above is matched only by the intensity of economic transformation. The economy of the United States – and its spatial configuration and related mobility needs – is evolving in a context of both regional and global competition. The regional economies within the Corridor compete with other regions around the United States for capital, labor, and markets – and increasingly compete with overseas economies as well. The

⁵ Bureau of Economic Analysis, U.S. Department of Commerce.

inherent economics and interdependencies in a post industrial economy both shape and are shaped by geography and infrastructure – including access to other key factors of productivity such as an educated work force, high-quality life styles, recreational opportunities, etc. Transportation – both goods and people – is an important component of this amenity mix and must be supportive of the pursuit of appropriate efficiencies that make it work. The Corridor continues to be in the forefront of such changes (that are taking place nationally) – from a manufacturing base to a knowledge-based, technology-driven, global society. These economic changes are accompanied by significant evolution in the Corridor’s patterns of growth. Some of these key changes include:

- *Interregional commutation reflecting “post-modern urbanization”* as residents seek affordable housing and housing with a varying mix of amenities responsive to lifestyle orientations – and made possible by improved transportation, flexible working hours, and teleworking patterns. Access to high-amenity housing locations and recreational environments is key to retaining the technically relevant but mobile workforce essential to a high-tech service economy.
- *New forms of headquarters and back office relationships* are developing to accommodate employee cost and affordability mixes suitable to a service economy. Improved communications and improved transportation access allows these relationships to take place further afield, where competitive cost differentials can be maintained. While the extreme of outsourcing is international, similar central office–back office relationships can take place within or between domestic regions in the Corridor where cost characteristics may vary widely.
- *Economies of scale and agglomeration for industry and corporate expansion* are a key factor in the competitiveness of states and regions – through capitalizing (and enhancing) the comparative advantages of specific settings (e.g., technology in Boston, finance in New York City, Federal government and supporting industries in the Washington, D.C. region, recreation and tourism in Central and South Florida). This includes the need to establish and maintain access to large pools of technically qualified workers, as well as the ability to build and maintain specific specialized business networks and close logistics contact with partners and markets afforded by high-quality transportation linkages.
- *Maintaining and strengthening national and global connections* – for both production and consumption purposes. Cost of living depends on the cost/quality of inward freight connections to support the Corridor population with nonlocal goods. Conversely, the cost for export and transshipment – especially for the high-value products that characterize the production of much of the Corridor – is becoming more important as the nation (and the Corridor economy) become increasingly global trade-dependent. The Corridor region includes three of the Nation’s 10 highest value ports which may become even more important with the proposed expansion projects of the Panama and Suez canals. At the landside, the increasingly high-value/low-bulk commodity mix is becoming even more truck dependent for which intermodal container and truck born just-in-time delivery – via reliable highways – is critical.

- *Metropolitan economies in a global marketplace* – Metropolitan areas tend to specialize in certain goods and service sectors. For example, finance, tilts enormously toward the New York metro region which includes nearly 43 percent of national output in that industry and ranking as a world leader in finance.⁶ A recent study classified metropolitan areas worldwide into five groups based on their relative role in the global economy.⁷ The authors ranked New York City and London as the world's most global cities, followed by a first band of 21 world cities that include Chicago, Los Angeles, and San Francisco. The next two bands included regionally significant cities in the I-95 Coalition region, i.e., Atlanta, Boston, Washington, and Miami. The final two bands include less integrated cities such as Baltimore. The authors concluded that there appears to be a gap in the globalization of United States cities, and that many U.S. cities compete in a very large continental market but they have not “gone global” to the extent of other world regions. Obviously, New York, as a truly world city, and Miami, with its link to Latin America, share significant linkages outside the continental United States, but overall, U.S. cities appear to have fewer global linkages than comparable size metropolitan competitors. Global transportation connectivity will play a key role in helping transition more U.S. cities into this type of global competitive environment.
- *Capitalizing on high urban densities for specialized and unique functions* – without paying the penalties of congestion and reduced mobility. The traditional and revitalizing central cores of the Corridor's major cities such as New York City and Washington D.C. contain activities that are unique on a national (and even international) scale – and which are dependent for efficient functioning on well managed transportation – for both passenger and freight transportation support. Accessing these core areas on a corridor-wide (and in many cases a nationwide) basis can be critical to their effective functioning.
- *Accessing unique regional amenities* such as tourism and recreation destinations on a quick and convenient turn around basis. All segments of the corridor from Northeast to Piedmont to Florida contain significant national tourism, recreation and second home attractions for both Corridor and external customers – that are dependent on high-quality (and often intermodal) access.

The Emergence of Megaregions

According to some analysts the influences cited above appear to be leading towards new agglomerations of development – within and beyond the metropolitan scale – and characterize an important dimension of Corridor change and one with significant transportation implications.

⁶ *MetroNation: How U.S. Metropolitan Areas Fuel American Prosperity*, The Brookings Institution, Metropolitan Policy Program, 2007.

⁷ *Hierarchical Tendencies and Regional Patterns in the World City Network: A Global Urban Analysis of 234 Cities*, Research Bulletin 88; Derudder, Taylor, Witlox, and Catalano; 2003.

The structure of the Corridor is now increasingly seen as an interlocking set of scales of economic and geographic organization that has been evolving ever since the post-WWII urbanization boom. The traditional cities and metropolitan areas have been the focus of conventional description and planning for over 50 years. But over the past several decades, a new set of forces has been at work, reshaping the economic and land use patterns of the Corridor and its consequent travel patterns.

Metropolitan development is well understood in terms of the complex and sprawling metropolitan areas and continued expanding into their hinterlands – both suburban, and exurban – and forming new edge cities and new types of semi-rural commuting villages and resulting in often continuous development between original metropolitan areas such as with the Baltimore-Washington region which is now classified by Census as a single consolidated metropolitan region containing nearly 8 million population.

Less well understood are the new patterns formed where such metropolitan areas tend to blur together into larger interconnected complexes. These complexes have recently been labeled as “megaregions.” Megaregions are defined as clusters of more than two contiguous metropolitan areas of at least 10 million population that have functional relationships through shared activity and geographic patterns and which form a functional network via goods and service flows within linked infrastructure. Megaregions – by definition – have an organization that is characterized by a combination of urbanized areas, their metropolitan regions include edge cities, and exurban commuter sheds. This phenomenon was first recognized in the 1960s focusing on the Northeast Megalopolis alone. Since then, it has occurred more broadly within the corridor – in both the Piedmont states and in Florida. The Regional Plan Association has identified 10 such megaregions in the United States as shown in Figure 2.3.

The Coalition states contain three of these megaregions. While all three are megaregions by definition, they have very different characteristics as noted below and in Table 2.2:

- The Northeast Megaregion is the oldest and largest megaregion, encompassing 13 states and seven major metropolitan areas between Portland and Richmond. With a population of over 50 million, it represents over 17 percent of the nation’s population and is growing at over 2 percent, spurred by its strong technology and service sectors. With an average density of over 830 persons per square mile, it is the densest region in the country.
- The Piedmont Megaregion encompasses three states between Charlotte and Birmingham (outside the Corridor). It is a rapidly growing megaregion growing at about 5 to 6 percent annually from its current population of about 20 million. It maintains a strong manufacturing sector in addition to its strength in the financial sector.

- The Peninsula Megaregion is focused on Central and South Florida from Tampa to Miami. With its well-known tourism and retirement focus, this is the fastest growing megaregion at over 6 percent annually.

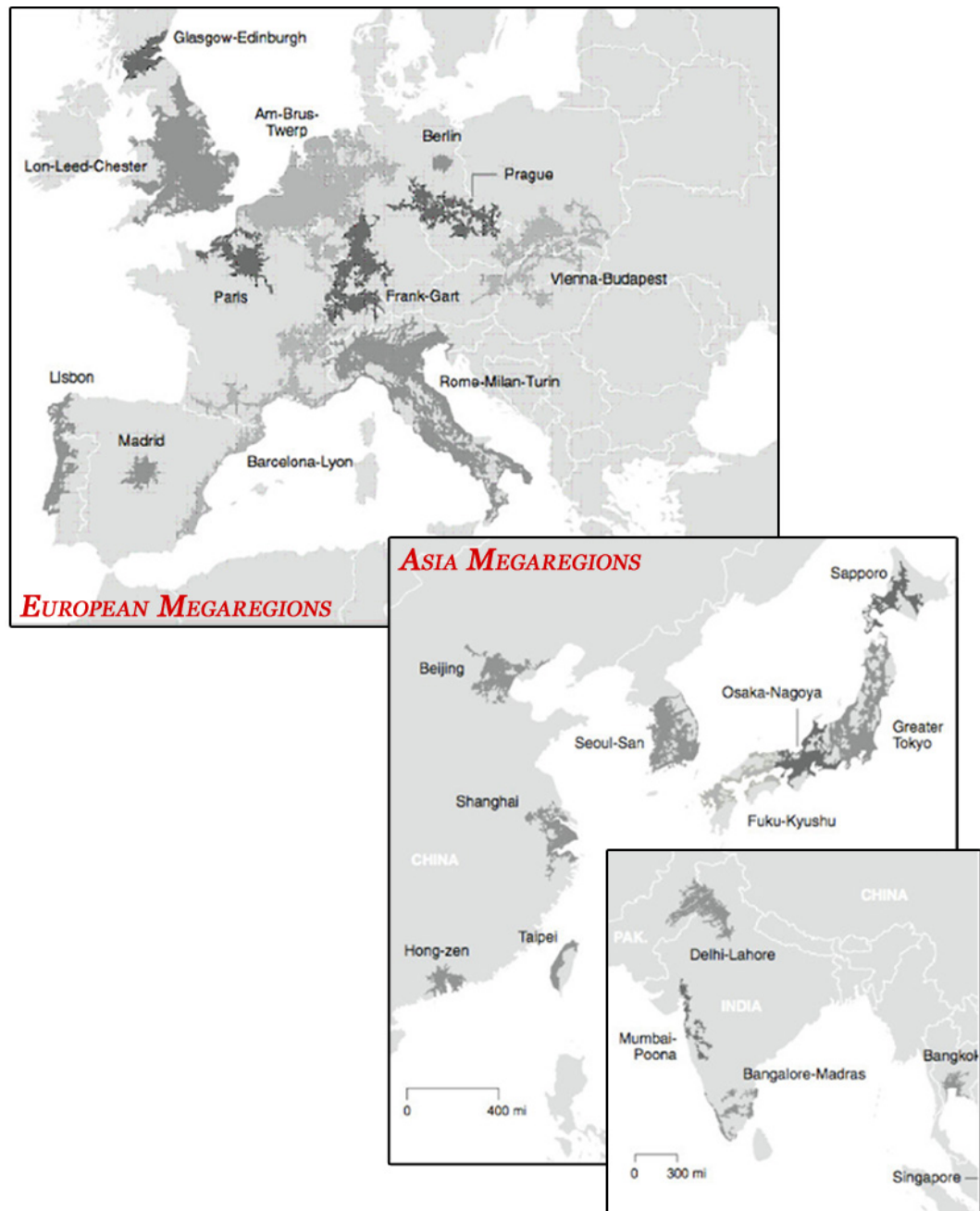
The I-95 megaregions increasingly compete globally with approximately 40 global megaregions as illustrated in Figure 2.3.

Table 2.2 Characteristics of I-95 Corridor Megaregions

	Economic Base	Income \$000	Population (Millions)	Percent of U.S. Population	Annual Growth (Percent)	Area (Square Meters)	Density (Population per Square Mile)	Commute (Minutes)
Northeast								
• Portland	• Finance	\$70,000	50	17.3	2.5	60,000	830	26
• Boston	• Professional Services							
• New York City	• Technology							
• Philadelphia								
• Baltimore								
• Washington								
• Richmond								
Piedmont								
• Charlotte	• Manufacturing	\$57,000	19	6.6	5.0	91,000	208	25
• Atlanta	• Banking							
• Birmingham								
Peninsula								
• Tampa	• Tourism	\$56,000	14	4.7	6.8	35,000	400	25
• Orlando	• Retirement							
• Miami								

Source: Steve Lockwood, PB; presentation to I-95 Coalition Policy and Strategic Planning Committee Meeting, April 2007.

Figure 2.3 Megaregions Around the World



Source: *The Rise of the Megaregion*; Richard Florida, Tim Gulden, Charlotta Mellander; October 2007.

Mobility Implications

Mobility will obviously be a key dimension of enabling growth and change for the I-95 corridor and its key megaregions. A significant increase in passenger and freight travel is inevitable – both within and among Corridor states in between the Corridor and other regions of the Country and globe. While this growth in travel may be dampened by deliberate policy, e.g., global climate change, the remaining increase in demand still creates a major challenge for a high-quality multimodal system.

The future economic competitiveness of the Corridor states and regions – both nationally and globally – will depend substantially on the quality of its multimodal transportation system, both directly and indirectly. The quality of transportation just-in-time and logistics reliability will have a direct impact on the Corridor’s ability to compete in a global marketplace. This is true of both the Corridor’s generic business bases, as well as the unique national business, governmental and cultural activities located in the Corridor. At the same time, the indirect value of transportation – in supporting daily household and business travel, in access to services and amenities – will play a critical role in maintaining an attractive quality of life as well as a vibrant economy.

International research documents the importance of transportation mobility to the economy of a nation or region. In a review for the United Kingdom government, Sir Rod Eddington found that “a 5 percent reduction in travel time for all business travel on the U.K. roads could generate around 2.5 billion pounds of cost savings – some 0.2 percent of GDP.”⁸ The Eddington report also highlighted positive economic effects that are not captured by most project benefit/cost assessments such as impacts on business location decisions. For some regionally significant projects, the Eddington report estimated that between 30 and 50 percent of economic benefits are not accounted in current benefit analyses.⁹ The research also stressed the importance of transportation networks and corridors to the productivity and success of metropolitan areas, in particular in providing access to larger labor and product markets. It also highlighted that transportation improvements are critical to trade flows and the competitiveness of a country or region’s exports and imports. Finally, the report importantly noted that “*the case for targeted transport intervention is compelling, even after taking account of environmental effects... Even in a world with carbon pricing and widespread congestion-targeted road pricing there seems to be a good case for more transport infrastructure.*”

In related international research, Rene Prud’homme and C.W. Lee described the link between transportation performance and the economies of metropolitan

⁸ The Eddington Transport Study, *Main Report: Transport’s Role in Sustaining the UK’s Productivity and Competitiveness*, December 2006.

⁹ Ibid.

areas. Increasing transportation speeds in a city by 10 percent increases productivity by 2.9 percent.¹⁰ Further, the study found that a 10 percent increase in travel speed leads to a 15 to 18 percent increase in the labor market size, benefiting both workers and regional economies.

Numerous studies have been conducted of the economic impacts of transportation investments on specific states and regions. One of the most comprehensive studies addressed the transportation needs of the Portland, Oregon metropolitan area, and found that without adequate investment in infrastructure, the regional economy could lose 6,500 jobs and \$844 million in output annually by 2025.¹¹ In addition, the study reported how industries have been negatively impacted by worsening travel conditions:

- Intel changed its chip shipment schedule in order to avoid peak-period congestion;
- Sysco Food opened a new regional food distribution center because the old central facility in Portland could not serve the entire area in a timely manner;
- OrePac increased inventory levels by seven to 8 percent to compensate for congestion delays; and
- Other companies are planning to either adopt different delivery schedules or acquire new warehousing facilities in order to offset the cost of delays on congested highways.

These delays impact the cost structure of businesses and ultimately prices for consumers. It is clear from these and other analyses that an important function of good transportation is expanding the effective size of a metropolitan region's labor market. Good access to workers is correlated with improved labor and business productivity.

2.2 TRANSPORTATION DEMAND

The level of travel growth required to support a growing I-95 corridor region population and economy is of crucial importance to this Vision study. Both growth in passenger and freight travel will be crucial to serve a vibrant/competitive regional economy and quality of life.

Alternative VMT Projections – The study focuses on all surface modes of transportation but a vital question is future projections of vehicle miles of travel (VMT). Because of the predominance of vehicle travel nationally (auto and light

¹⁰Prud'homme, R. and Lee, C-W. *Size, Sprawl, Speed, and the Efficiency of Cities*, November 1998.

¹¹Economic Development Research Group, *The Cost of Congestion to the Economy of the Portland Region*, December 2005.

truck travel represents about 96 percent of personal miles of travel nationally), VMT growth assumptions have a huge impact on future transportation, energy and climate policy. From a current 3 trillion vehicle miles in 2005, future VMT projections to 2055 include a range from about 5 trillion to nearly 8 trillion vehicle miles.¹² The difference among these projections has huge implications for transportation, energy, and environmental policy.

Figure 2.4 displays some of the key recent national study assumptions about VMT growth.

- **U.S. DOT** – At the higher end of current VMT projections at nearly 2 percent compound growth per year is that used by U.S. DOT in its 2006 Conditions and Performance Report to Congress and is based on state-submitted forecasts as part of the HPMS and is shown extended to 2055 in Figure 2.4.¹³ This rate is lower than historic rates of growth that were in the range of 2.5 percent during the 1990s – as shown in Figure 2.5.
- **Commission** – A somewhat lower projection was used by the Commission; they assumed a VMT compound growth rate of 1.86 percent per year through 2035 (reducing to 1.72 percent per year from 2035 to 2055), to reflect expected saturation trends in the later years.¹⁴
- **NCHRP Interstate “Futures” Study** – Projections for the Interstate study were based on HPMS state forecasts for the initial 20 years, but then were dampened out to 2035 similar to what the Commission did in its longer-range projections due to expected saturation effects.¹⁵
- **The AASHTO Vision for the 21st Century** – The AASHTO sustainable VMT goal discussed earlier in this report represents the low end of projections reviewed for this study – it assumes halving the 2 percent VMT per year growth rate (as projected in the in 2006 C&P) to only 1 percent per year. It is based on the product of the AASHTO Sustainability Task Force chaired by Hal Kassoff of the vision study team as discussed in Section 1.0.

¹²Staff analyses for this study.

¹³2006 *Status of the Nation’s Highways, Bridges, and Transit: Conditions and Performance*; U.S. DOT, 2006.

¹⁴*Transportation for Tomorrow*, National Surface Transportation Policy and Revenue Study Commission, December 2007.

¹⁵*Future Options for the National System of Interstate and Defense Highways*, PB Consult for NCHRP 20-24 program, May 2007.

Figure 2.4 Alternative VMT Projections

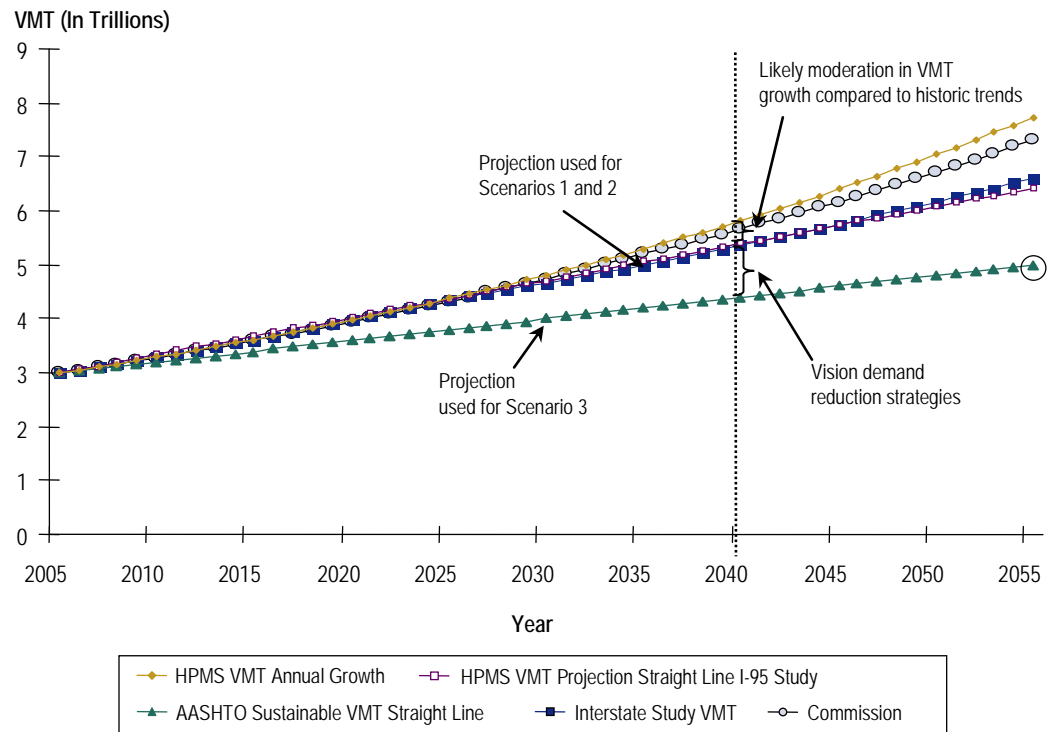
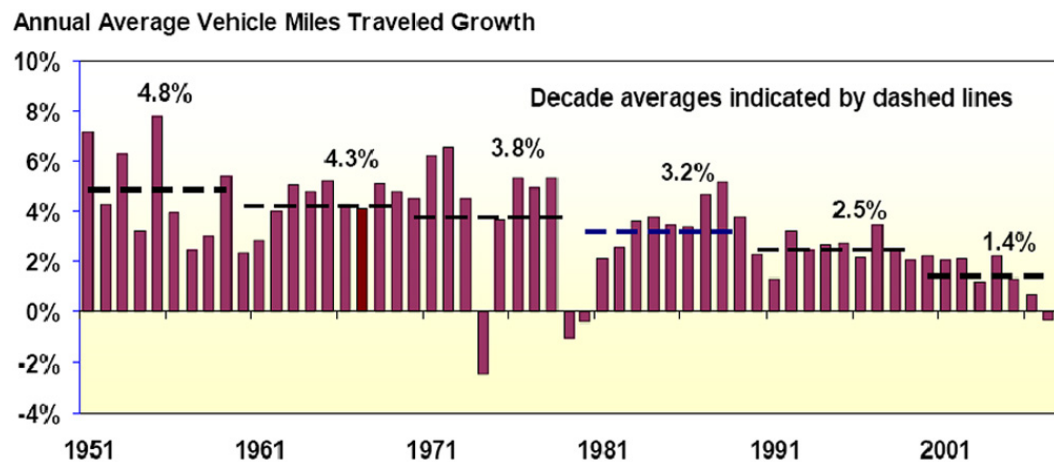


Figure 2.5 Historic VMT Growth Rates by Decade



Source: Federal Highway Administration.

VMT Assumptions for Vision Study

Based on review of this literature the team adopted the following VMT assumptions for the Vision Study as displayed in Figure 2.4.

Trend Scenario Projections

The Vision study trend scenarios use the same state HPMS forecasts underpinning the 2006 C&P report to Congress but assumes a straight line rather than a compounding VMT growth out to 2035 (this has the effect of reducing the effective compound rate of VMT growth to about 1.7 percent per year through 2040 (and to 1.5 percent through 2055) rather than the nearly 2 percent compound rate used in the 2006 C&P report to Congress). This coincidentally is similar to the long-term VMT growth used by the team in its recent projections for the AASHTO/NCHRP Interstate Futures Study as shown in Figure 2.4.¹⁶ The rationale for using a lower trend growth rate than used in the U.S. DOT 2006 C&P report and by the Commission is that VMT rates have been moderating due to a number of demographic and economic saturation factors as reflected in Figure 2.5. Steve Polzin has written most extensively on this topic and provided support to the Commission in development of their VMT forecasts.¹⁷ Among the trends that Polzin suggests that may have “played out” are female labor force participation, household vehicle availability, household size, household income growth, and female licensure rates. He also notes that the historic decline of the cost of vehicle travel may also be over as motorists experienced during the fuel price increases in midyear 2008. Finally, he notes the emerging premise that reserve capacity in our system has been largely used up and travelers have made the easy adjustments in travel departure times and route choices to utilize the high-performing roadway segments, thus suggesting that subsequent increases in demand may result in proportionally more severe consequences in terms of congestion levels and declining speeds.

VMT Projection for the Vision Driven Scenario – The I-95 Vision principles adopt the AASHTO goal of limiting VMT growth to 1 percent per year through 2055 as shown in Figure 2.4.¹⁸ A very important result is that this lower rate of VMT growth still preserves passenger and freight mobility to serve an expanding regional population and economy while contributing substantially to energy and

¹⁶*Future Options for the National System of Interstate and Defense Highways*, PB Consult for NCHRP 20-24 program, May 2007.

¹⁷Polzin, S.E. *The Case for Moderate Growth in Vehicle Miles of Travel: A Critical Juncture in U.S. Travel Behavior Trends*. Center for Urban Transportation Research, University of South Florida, Tampa, Florida, April 2006.

¹⁸The Vision Study team used the same VMT projection to 2055 as did the AASHTO Sustainability Panel (i.e. five trillion VMT) but the team assumed a straight line path (rather than compounding) as with the trend VMT growth assumption above.

climate goals. Personal VMT per capita would remain roughly constant over the period while freight VMT demand per capita would still show growth but lower than in the trend projection (see discussion below).

2.3 FREIGHT FORECASTS

The Commission used the FHWA Freight Analysis Framework (FAF2) forecasts through 2035, which are based on economic inputs that assume GDP growth in the range of 2.8 percent per year in real terms.¹⁹ The forecasts assume that the modal mix of each commodity type will remain constant into the future; thus, differential rates of growth among modes are assumed to solely result from different rates of commodity growth. These forecasts project average annual tonnage growth rates of 2.1 percent for trucking, 1.9 percent for rail shipments, and 1.2 percent for waterborne transportation. These tonnage estimates are further developed to project the growth in truck travel, resulting in an estimated growth rate of 2.5 percent per year in truck VMT over that time period. For purposes of the Vision study we assumed FAF2 as the trend forecast for freight demand and mode shares as modified to reflect slightly lower GDP forecasts from the Congressional Budget Office and the Energy Information Agency. Their GDP forecasts have lowered the projected average annual GDP growth rate over the next 30 years from 2.8 percent to 2.4 percent reflecting the impact of the current recession, increasing energy costs, and the potential transportation cost impacts of greenhouse gas emission regulations. However, the lower growth rate does not radically change the longer-term demand for freight transportation or the need for freight transportation capacity. At a 2.4 percent growth rate, freight tonnage will roughly double in 30 years compared to 25 years at 2.8 percent; thus freight roughly doubles by 2040 (coinciding with the horizon year for the Vision study) under the reduced GDP growth rate.

For the vision driven scenario, we assumed a reversal of the trend toward a greater share of freight moving by truck. The team assumed that freight rail would gain share against truck as analyzed by the Commission and that there would be greater use of short-sea shipping in the corridor region. These assumptions are further discussed in Section 3.3.

¹⁹http://www.ops.fhwa.dot.gov/freight/freight_analysis/faf/index.htm.

3.0 Scenario Analysis

The study utilized a scenario approach in its analysis of 2040 Vision implications. Three scenarios were defined for the study as highlighted below in Table 3.1 to represent a range of possible futures.

- Scenario 1 is intended to represent what happens if current trends prevail in demand, modal usage, and investment similar to the base case analyzed by the Commission.
- Scenario 2 assumes the same trend in demand but shifts investment more toward aggressive operations utilizing ITS technology including VII in support of the I-95 mission and Corridor of the Future designation.
- Scenario 3 is structured to illustrate what it would take to achieve the vision principles. It includes the Scenario 2 aggressive operations features but additionally pursues demand reduction through aggressive investment in other modes, transit-oriented development, and pricing.

Table 3.1 I-95 Vision Study Scenarios

Scenario 1 – Trend Scenario	Scenario 2 – Maximum Operations	Scenario 3 – Vision Driven Scenario: What Would It Take to Achieve Vision Principles?
Current trends in travel growth, modal usage, and investment (both capacity and operations) through 2040.	Current trends in travel demand, modal usage, and investment similar to Scenario 1 but with the application of aggressive operations enabled by ITS technologies to improve performance. This is supportive of the I-95 mission.	<p>This scenario is designed to mirror the set of draft Vision principles for the region that assumes lower highway travel growth, greater reliance on non-highway modes (e.g., intercity passenger rail), aggressive investment in transportation operations as in Scenario 2, congestion pricing via variable VMT fees, and more transportation-friendly land use patterns.</p> <p>Two suboptions are illustrated for Highways:</p> <ol style="list-style-type: none"> 1. Current investment trends; and 2. Higher investment level to improve performance.

All three scenarios presumed the same overall demographic and economic trends.

Scenarios 1 and 2 adopted Trend VMT projections discussed in Section 2.0 and trend investment levels based on analysis of Commission trend investment assumptions and the respective shares for the 16 states from FHWA and FTA sources.

Scenarios 2 and 3 both included aggressive operations. The only difference between Scenarios 1 and 2 is the rate of deployment of Operations/VII strategies.

The Vision driven Scenario 3 adopted a broad set of assumptions consistent with the vision principles developed in Section 1.0. This includes the AASHTO sustainable VMT goal of 1 percent growth per year and a series of assumptions regarding transportation systems supply, usage, operations, land use, energy efficiency, and climate policy.

These assumptions are presented in Table 3.2.

Table 3.2 Scenario Assumptions

	Scenario	Assumptions
Demographic and Economic Trends	All	<ul style="list-style-type: none"> • 33% population increase through 2040. • 2.4% real economic growth per year.
Operations	2 and 3	Aggressive operations with VII, including both in-vehicle and roadside technology deployment.
VMT Trends	3	1% VMT growth per year (down from near 2% a year and in line with AASHTO sustainable goal).
Modal Usage Trends	3	<ul style="list-style-type: none"> • In concert with Commission's most aggressive assumptions: <ul style="list-style-type: none"> – Tripling of transit ridership; – 2050 passenger rail vision from PRWG and Commission as revised by states; and – Most aggressive freight rail option analyzed by Commission. • Aggressive short-sea shipping and seamless intermodal connections.
Pricing	3	<ul style="list-style-type: none"> • Two-tiered VMT fee/pricing system in place by 2040: <ul style="list-style-type: none"> – States have replaced fuel taxes with VMT fee; and – Metropolitan areas piggyback with VMT congestion charges. • Driver fees increase substantially with VMT revenue increases, congestion charges, carbon fees, pay-as-you-drive insurance, etc.
GHG/Energy	3	<ul style="list-style-type: none"> • Transportation meets 60 to 80% reduction targets for 2050 GHG emissions as compared to 2005. • Energy prices increasing substantially in nominal terms to well over \$200 per barrel but in real dollar terms, more modest increases that in the long term allows transportation to adapt with technology improvement and alternative fuel source development.
Land Use	3	Aggressive trend toward compact, transit-oriented development.

The methodology for the study was based on nationally accepted tools developed and utilized by U.S. DOT for the biennial Conditions and Performance Report to Congress and as utilized for the Commission's work. Freight and passenger rail estimates built on National policy studies prepared for and utilized by the Commission as discussed under the detailed assumptions discussed in the following sections.

3.1 VMT

VMT for Scenarios 1 and 2 assumes the trend projection discussed in Section 2.3; for the vision driven Scenario 3, we assumed meeting the AASHTO 1 percent VMT growth target. This is a 19 percent reduction in the 2040 VMT level as compared to the trend VMT used in Scenarios 1 and 2. The likely strategies for meeting that goal are illustrated in Table 3.3. It is recognized that a somewhat different mix of these VMT reduction strategies may be used among the states and MPOs in the region as they respond to state policy directions for energy, climate, and transportation demand strategies. In aggregate, they are believed to represent an aggressive and feasible illustrative path toward the 2040 vision principles. These demand reduction strategies are set as goals, not predictions.

Table 3.3 Illustrative VMT Reduction Strategies for I-95 Region

Illustrative VMT Reduction Strategies	Estimated VMT Reduction Potential	Comments
Aggressive land use in-fill strategies including transit-oriented development	5-10%	Transit-oriented development fosters growth in transit ridership
Pricing approaches including congestion pricing, pay-as-you-drive insurance, carbon, etc.	5-10%	Assumes VMT charging. Shift of highway VMT to transit and nonmotorized modes
TDM, including commuter measures, HOV, telecommuting	2-3%	Assumes reversal of declines in vehicle occupancy over last 20 years
Increase shares for intercity passenger and freight rail and short-sea shipping	1-2%	Assumes reversal of freight rail declining share and aggressive passenger rail ridership increases
Scenario 3 Target	19% VMT reduction	Matches AASHTO sustainable target of 1% VMT growth per year

This distribution of VMT reduction estimates were applied in the investment analysis for Scenario 3. The VMT reductions were applied differently to urban and rural areas and to each functional system based on our estimate of the relative impact of the VMT reduction strategies. Because the VMT reductions are heavily targeted to congested metropolitan areas, VMT reductions ranged from a high of 29 percent on urban freeways to under 5 percent for rural collector and local systems. The assumptions are further discussed in the modal shift, land use, and pricing topics below.

3.2 SYSTEMS OPERATIONS AND MANAGEMENT

For Scenarios 2 and 3, aggressive systems operations were assumed – based on full application of the conventional strategies for both recurring and nonrecurring congestion where applicable across the corridor networks at a state-of-the-practice level of intensity and with full Corridor integration. These applications include:

- Ramp Metering;
- Variable Message Signs (VMS);
- Traveler Information;
- Active Traffic Management (Variable Speed Limits and lane management);
- Incident Management (IM);
- Road Weather Management;
- Advanced Traffic Signal Control;
- Integrated Corridor Management (ICM);
- Work Zone Management; and
- Special Event Management.

Given the long-term horizon of this study, the most advanced operations concepts were included in the form of full implementation of Vehicle-Infrastructure Integration (VII). The basic concept of integrating vehicles with roadway operations is to establish a real-time communications that connects all vehicles into a systemwide communications network in real time to provide a range of safety, mobility, and productivity/convenience service functions. As shown in Figure 3.1, these include:

- Transmitting information from the roadside to the vehicle – warning drivers that it is not safe to enter an intersection, to avoid mainline collisions and run off the road crashes;
- Utilizing vehicles as data collectors and anonymously transmitting traffic and road condition information from every major road for use in traffic management and information activities;
- Allowing automobile manufacturers to perform diagnostics and more quickly notify drivers of warranty or recall needs; and
- Providing a range of location-based commercial services and automated payment mechanisms to vehicle users.

As studied by U.S. DOT, implementation of VII would be based on an innovative form of public-private partnership involving Federal, state, and local governments working with vehicle manufacturers, communications entities, and third-party service providers.

The specific impact assumptions by strategy type (e.g., freeway versus arterial management) are shown in Appendix B. Table 3.4 shows the estimated percent reduction in delay for new applications of aggressive operations deployments (without and with VII) as compared to existing average state operations deployments as noted in the table.

Figure 3.1 VII Concepts

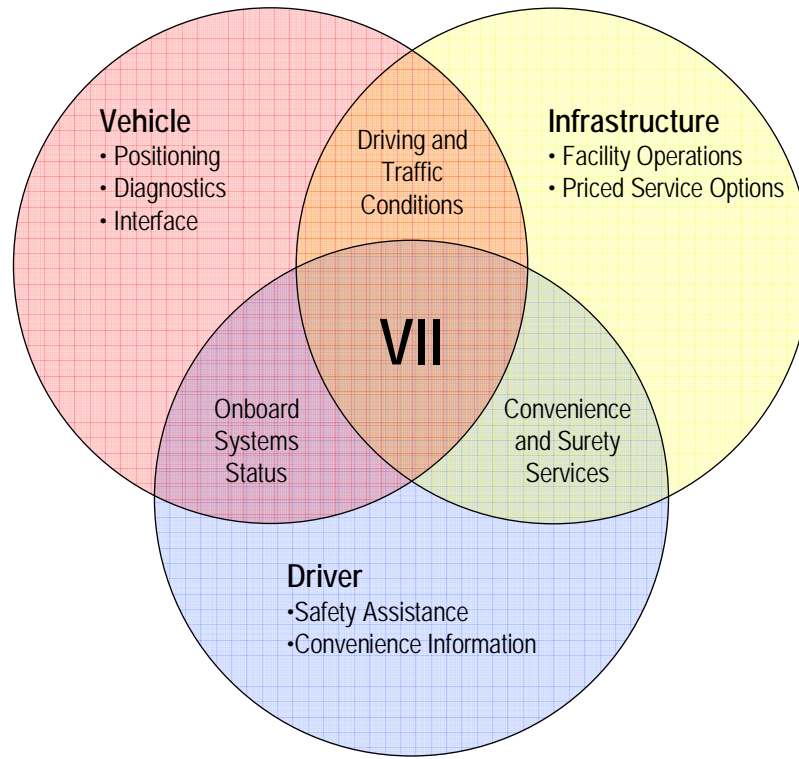


Table 3.4 Marginal Improvements in Total Delay on Freeways with New Applications of Aggressive Operations and VII

		Strategy	
		Addition of Aggressive Operations ^a	Addition of Aggressive Operations with VII ^b
Current Status	Average current applications in place (approximately 15 states) ^c	-18% ^d	-27%
	Aggressive applications in place (approximately 6 states) ^e	-15%	-24%

^a Aggressive IM + active traffic management + ICM.

^b Aggressive IM + active traffic management + ICM + VII applications (no AVCS). Note: reduced incident rate from VII safety improvements not currently handled by HERS, so delay benefits would be slightly larger than shown, especially for VII. (Delay reduction due to reduced incidents is assumed to be embedded in the other categories of delay reduction.)

^c VMS, ramp meters, “standard” incident management.

^d -9 percent incident duration ==> -17 percent inc. delay; inc. delay = 20 percent of total delay.

^e VMS, ramp meters, aggressive IM.

3.3 MODAL USAGE TRENDS

Limiting the growth in VMT to 1 percent per year while still maintaining the freight and passenger mobility necessary to support the projected population and economic growth implies the need for substantial changes in modal usage shares and patterns. The Commission's most aggressive modal shift assumptions for passenger and freight were therefore utilized for Scenario 3.

Passenger Travel and Mode Share Assumptions

Adopting the Commission's aggressive modal shift assumptions results in the following increases in corridor transit and rail passenger ridership:²⁰

- At least a tripling of transit ridership (requiring at least a doubling of transit investment as shown in Table 3.5); and
- 2050 passenger rail vision from the Passenger Rail Working Group (PRWG) and Commission (as subsequently revised by states; see Figure 3.2).²¹

The Commission's aggressive transit scenario was assumed by the Commission to be complemented by transit-oriented development, pricing, and other travel demand management strategies. The Vision study adopts those same assumptions.

The passenger rail network envisioned by the PRWG would include the current national system, planned state corridors, and additional segments connecting medium-sized cities and high-speed corridors in densely congested areas. The Commission adopted the PRWG plan and it was utilized for the vision study scenario analysis. Figure 3.2 represents the current thinking of States in the corridor. It includes some new service but mostly focuses on increasing speeds and frequencies of existing service.

²⁰*Transportation for Tomorrow*, National Surface Transportation Policy and Revenue Study Commission, December 2007.

²¹*Vision For The Future: U.S. Intercity Passenger Rail Network through 2050*; Passenger Rail Working Group, December 2007.

Table 3.5 High Transit Assumptions by Commission

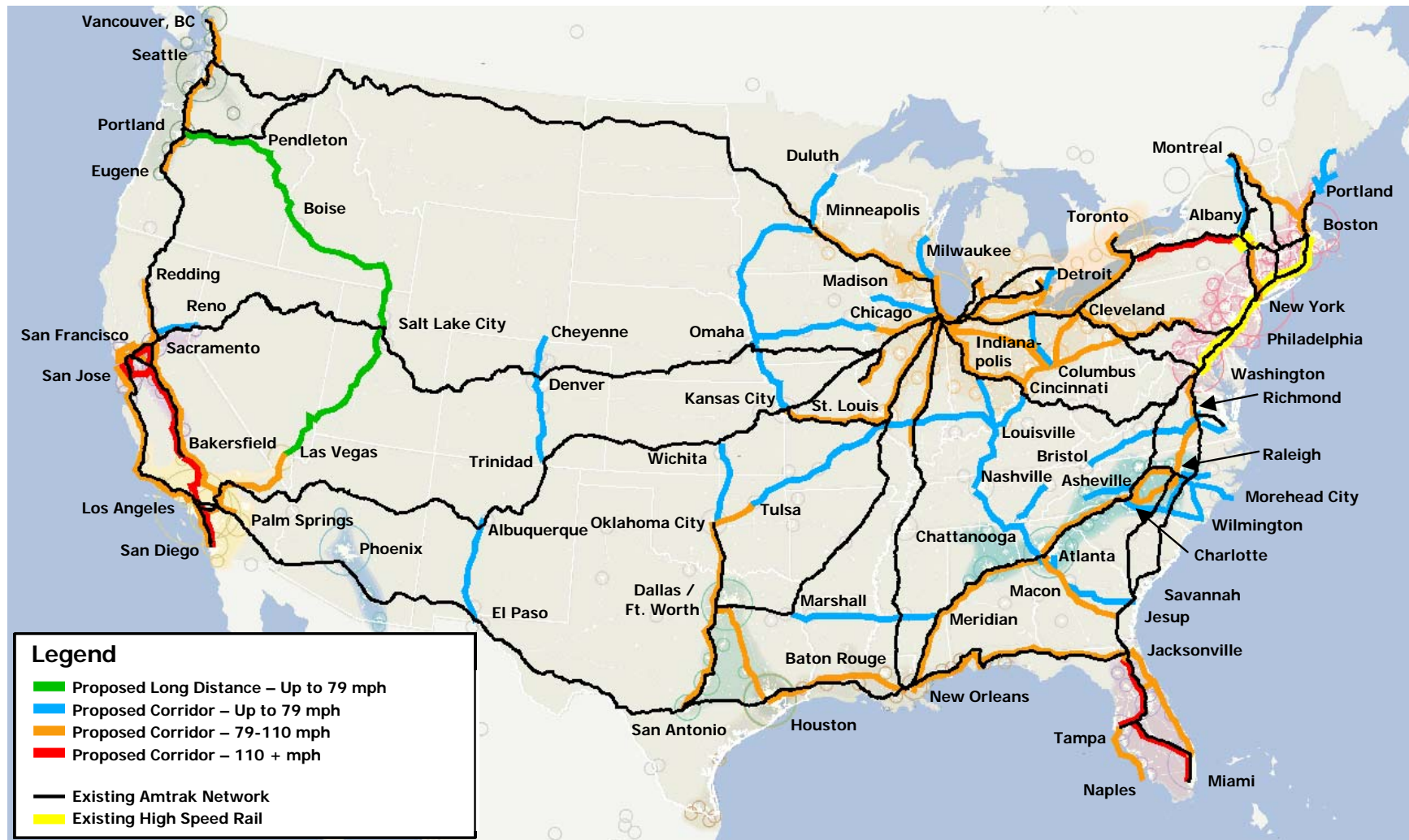
	Current	2020		2035		2055	
		Medium	High	Medium	High	Medium	High
Average Annual Transit Capital Investment (Billions of 2006 Dollars) [for 2005 through the year 2020, 2035, or 2055]	\$13	\$14-18	\$21-32	\$17-25	\$23-34 ^a	\$20-40	\$26-46
Transit Ridership (Billions)	9	12-14	13-17	15-25	17-35 ^a	20-66	24-71
New Vehicles Added (Thousands)	–	26-51	51-96	65-186	112-232	121-710	194-783
New Rail Route Miles (Thousands, Cumulative)	–	1.1-1.5	3.0-4.4	2.4-3.5	5.5-8.0	4.6-6.7	9.1-12.5
Average Asset Condition (Scale 1-5)	3.9	4.0-4.0	4.0-4.1	4.1-4.2	4.1-4.3	4.2-4.4	4.2-4.4

Source: Commission staff analysis.

Note: This table identifies the projected impacts on certain key performance indicators of alternative transit capital investment levels. The high and low ends of the ranges shown represent the best case and worst case identified from a set of scenarios assuming alternative packages of future transportation policy options.

^a Commission's high transit ridership and investment assumptions to 2035.

Figure 3.2 Passenger Rail 2050 Vision



Background map based on "America 2050: A Prospectus", www.america2050.org, Regional Plan Association

Source: PRWG for Commission (as modified by states August 2008).

The Commission's specific ridership and capital cost assumptions for passenger rail are shown in Table 3.6. Those national Commission assumptions regarding ridership and costs were used in the study as a basis for estimating proportional ridership and costs for the I-95 region. The team assumed that the dramatic increase in passenger rail ridership comes primarily from shifts away from highway and aviation passenger modes (for purposes of the study, we simply assumed equal shifts from highway and air). There is a current Airport Cooperative Research Program (ACRP) study looking more specifically at the potential to shift short-haul aviation trips to rail to relieve aviation congestion in the northeast.²² That study will add clarity on the potential for mode shifts from aviation to passenger rail in this corridor.

Table 3.6 Commission Assumptions for Passenger Rail Ridership and Costs

	Current	Short-Term	Mid-Term	Long-Term
Intercity Passenger Rail Capital Costs (Billions of Constant Dollars), within Time Period		\$66	\$159	\$132
Average Annual Capital Costs (Billions of Constant Dollars), within Time Period		\$7.4	\$10.6	\$6.6
Capital Costs (Billions of Constant Dollars), Cumulative through End of Time Period		\$66	\$225	\$357
Average Annual Capital Costs (Billions of Constant Dollars), Based on Cumulative Costs		\$7.4	\$9.4	\$8.1 ^a
Annual Passenger Miles of Travel (Billions), Assuming 45 percent Load Factor	5.5	8.2	26.9	46.7 ^a

Source: *Vision for the Future: U.S. Intercity Passenger Rail Network through 2050*, prepared for the Commission by the Passenger Rail Working Group.

Note: This table identifies the projected impacts on certain key performance indicators of alternative transit capital investment levels. The high and low ends of the ranges shown represent the best case and worst case identified from a set of scenarios assuming alternative packages of future transportation policy options.

^a PRWG/Commission long-term assumptions (2030-2050).

Based on these assumptions regarding increased use of non-auto passenger modes, the team estimated that corridor region passenger miles of travel (PMT) would shift from the current 95 percent to about 91.8 percent auto and light truck by 2040 (see Table 3.7).

²²ACRP 03-10: Innovative Approaches to Addressing Aviation Capacity Issues in Coastal Megaregions.

Table 3.7 PMT Nationally and for I-95 Corridor Region

Surface Transportation Mode	National PMT Mode Shares, 2005 (Commission)	I-95 Region PMT Estimated Mode Shares, 2005	I-95 Region PMT Mode Shares, 2040 Scenario 3
Auto and Light Truck	96.2% (4366 Bll)	95.0% (1547 B)	91.8% (2251 B)
Transit Including Commuter Rail	1.0% (47B)	1.7% (28 B)	3.7% (92 B)
Intercity Rail	0.1% (5.5 B)	0.2% (3 B)	0.9% (22 B)
Intercity Bus	0.4% (17 B)	0.5% (8 B)	0.7% (18 B)
Other Bus	2.3% (104 B)	2.6% (42 B)	2.9% (70 B)
Total PMT	100.0 (4540 B)	100.0 (1628 B)	100.0 (2453 B)

Freight Modal Shift Assumptions

For freight, the study team assumed:

- The most aggressive freight rail option analyzed by the Commission; and
- Aggressive short-sea shipping (hereafter referred to as marine highway) and seamless intermodal connections to ports and other intermodal facilities.

We assumed that substantial public and private investment in freight rail reverses the projected declining trend and increases ton-mile market share by 20 percent according to the most aggressive Commission assumption as illustrated in Table 3.8. To accommodate this demand, an estimated national investment of \$7.1 billion annually or \$198 billion through 2035 (approximately \$2 billion annually for the corridor) would be needed as shown in Table 3.8 from the Commission report. This will require investments in line-haul capacity, bridges and tunnels, branch line upgrades, and terminal expansion. Specifically, the Commission assumption of 20 percent increase in rail ton-miles share results in a shift of 840 billion ton-miles from highways nationally by 2040.²³ The corridor portion of this shift is estimated at somewhat less than 100 billion annual rail ton-miles based on analysis of FAF-2 tonnage data for the corridor states. Given that a typical over-the-road truck carries about 17 tons, this results in five to six billion annual truck VMT reduced in the corridor. Although this represents a significant amount of freight commodity shift to rail, it represents less than one-half percent of total corridor passenger and freight VMT in 2040.

²³ *Transportation for Tomorrow*, National Surface Transportation Policy and Revenue Study Commission, December 2007.

Table 3.8 Commission Scenarios Regarding Future Freight Rail Market Share

	Rail Ton-Miles in 2035 (Trillions)	Annual Investment Required (Billions of Dollars)
Reduce Current Market Share	2.46	\$3.9
Maintain Current Market Share	2.75	\$5.3
Increase Market Share 5%	2.89	\$5.7
Increase Market Share 10%	3.03	\$6.0
Increase Market Share 20%	3.30	\$7.1

Source: Analysis conducted by Cambridge Systematics in support of AAR for the Commission.

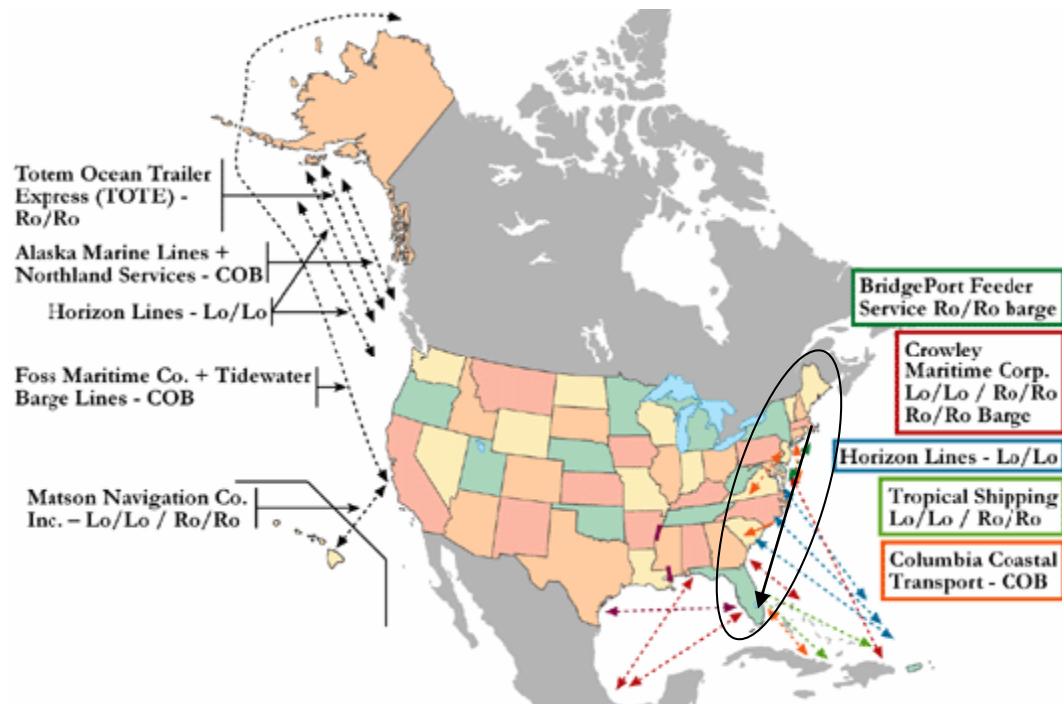
Note: This table projects the capital costs required to accommodate alternative levels of rail ton-miles consistent with changes in freight rail's market share.

Marine highway is a potentially underdeveloped market on the east coast as shown in Figure 3.3. The map indicates that there is considerable marine highway (short-sea) shipping from the continental 48 states to Alaska and to Hawaii, in the Gulf of Mexico, and from the east coast to the Caribbean but not along the Atlantic Coast. Much of this is of bulk commodities moving by barge. The previous I-95 Coalition report on short-sea shipping found there is a limited understanding of the costs and benefits associated with short-sea shipping. *“Many interviewees indicated that short-sea shipping studies targeted specifically at DOTs and MPOs need to be conducted and made available so that these stakeholders can gain a more thorough understanding of the costs and benefits associated with short-sea shipping. These studies should quantify short-sea shipping’s potential impacts on key DOT and MPO issues, such as congestion, port and terminal access, mobility, safety and security, and job creation and retention. Although Port Authorities do understand short-sea shipping from an operational standpoint, they (as well as planning organizations) often find it difficult to quantify the public benefits and costs derived from increased use of these services. Most interviewees agreed that increased use of short-sea shipping services would eliminate some traffic from regional highway networks, but do not have a good sense of the potential extent of this traffic reduction. This is critical, as potential short-sea shipping projects and studies must compete with other transportation improvements for funding from and the support of DOTs and MPOs. Many interviewees mentioned that the “case” for short-sea shipping would be much stronger if its full costs and benefits (to both the public and private sectors) could be better quantified.”*²⁴ The Coalition has subsequently undertaken a Phase II study to better quantify the costs and benefits of short-sea shipping.

²⁴ *Short-Sea and Coastal Shipping Options Study Final Report*, Cambridge Systematics for I-95 Corridor Coalition, November 2005.

To further encourage this market, U.S. DOT recently issued an interim final rule soliciting short-sea transportation routes to be designated as Marine Highway Corridors as provided by the Energy Independence and Security Act of 2007.

Figure 3.3 U.S. Coastal Marine Highway System



Source: MARAD.

Scenario 3 assumes aggressive marine highway implementation along the East Coast including port inland distribution linkages such as the recently implemented barge service in Virginia between the Ports of Hampton Roads and Richmond. It also assumes improved port intermodal connections (such as improved highway intermodal connectors and on-dock rail).

Specifically, the study assumed a tenfold increase in truck trip reduction beyond that estimated by Global Insight for Connecticut to Florida short-sea service in a recent case study for U.S. DOT.²⁵ The diversion from trucking is relatively small compared to the rail diversion potential discussed above but nevertheless is an important component of a more balanced multimodal freight system for the corridor region. No capital investment assumptions are available for short-sea development; they are expected to be relatively small in comparison to the total surface transportation capital investment estimated in this section. Further, intermodal

²⁵Four Corridor Case Studies of Short-Sea Shipping Services: Short-Sea Shipping Business Case Analysis, Global Insight for U.S. DOT, August 2006.

access improvements to ports are assumed imbedded in the respective highway and freight rail investment requirements estimated for this study.

3.4 PRICING AND FINANCING

Scenario 3 assumed aggressive pricing in the corridor by 2040 modeled on a concept recommended in recent national finance studies for the U.S. Chamber and TRB.^{26,27} Because of the vulnerability of fuel taxes to alternative fuels and vehicle technology, the studies recommended transition to a two-tiered VMT fee/pricing system over the next 15 to 20 years:

- Tier 1 – States replace fuel taxes with a base VMT fee in the form of a revenue neutral replacement of fuel taxes at the Federal and state level; and
- Tier 2 – Metropolitan areas utilize the VMT fees as the basis for variable VMT congestion charges during peak periods in the major metropolitan areas.

A possible scenario for transition to such a charging system is illustrated in Figure 3.4 adapted from the U.S. Chamber Finance Study.²⁸ Pilot VMT programs are assumed authorized in the next surface legislation in 2009 with gradual implementation by states over the next two to three authorization cycles. A Federal VMT fee is assumed to be added to a state-based VMT system similar to the current complementary Federal/state fuel tax systems. Oregon recently completed a successful VMT pilot test and is currently assessing recommendations to the state legislature regarding implementation.²⁹ Other states are considering pilot VMT programs.

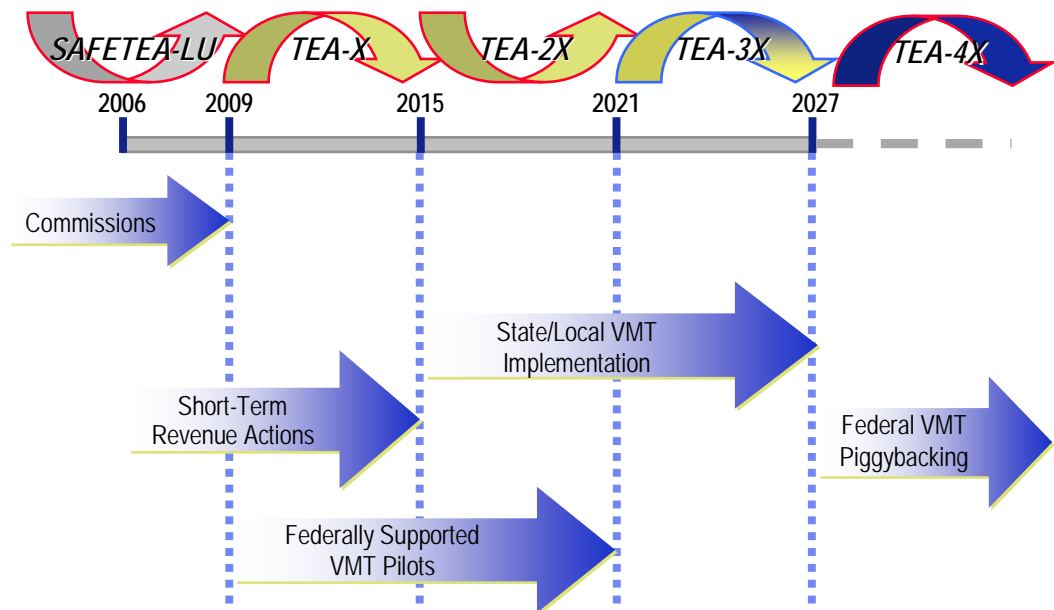
²⁶*Future Highway and Public Transportation Financing*, Cambridge Systematics for National Chamber Foundation, 2005.

²⁷*Future Financing Options to Meet Highway and Transit Needs*, Cambridge Systematics for NCHRP/TRB, December 2006.

²⁸*Future Highway and Public Transportation Financing*, Cambridge Systematics for National Chamber Foundation, 2005.

²⁹*Oregon's Mileage Fee Concept and Road User Fee Pilot Program – Final Report*, Oregon DOT, November 2007.

Figure 3.4 Illustrative Transition to VMT Fees as Replacement for Fuel Taxes

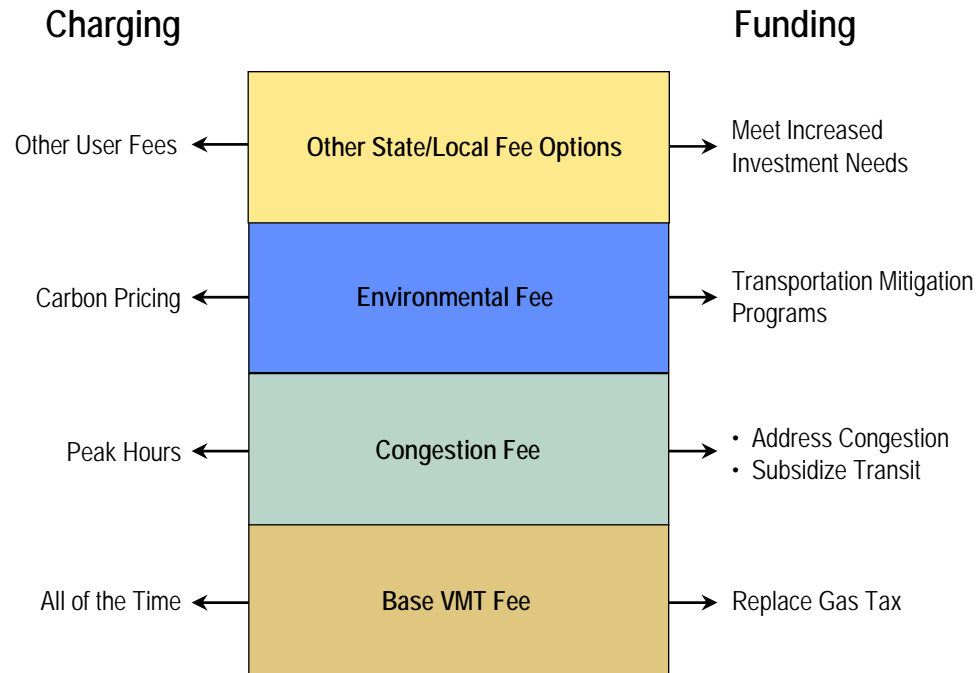


Source: U.S. Chamber Finance Study, 2005.

Building on the model described above, Figure 3.5 below illustrates the assumed future VMT-based revenue/pricing system for the I-95 region. Four tiers are assumed as follows:

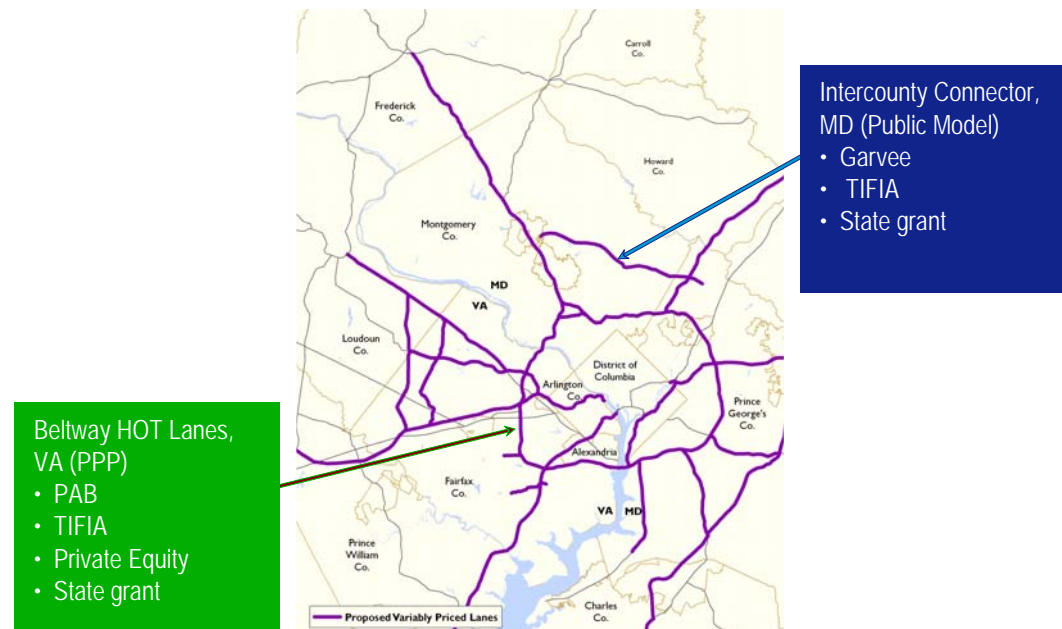
1. **Base VMT Fees** – To replace Federal and state fuel taxes, estimated at 2 cents per VMT initially.
2. **Congestion Charges** – Applied in major metropolitan areas to moderate peak demand with revenues helping to pay for other congestion relief strategies including alternative transit services. Fees could vary widely – but are assumed to be in the range of 25 to 50 cents or more per VMT during peak periods based on emerging pricing pilots and tolling experience in the United States.
3. **Carbon Fees** – To reduce GHG emissions and fund mitigation strategies, carbon/energy fees could add another several cents per VMT for all drivers.
4. **Other User Fees** – Such as pay-as-you-go insurance, freight fees, and other state/local option taxes could be added to meet growing transportation funding needs while improving equity and efficiency. For example, pay-as-you-go insurance has been tested where drivers are charged on a mileage basis for the variable component of car insurance; this could be in the range of 5 to 6 cents per VMT.

Figure 3.5 VMT Revenue/Pricing Model for the Future



Congestion charges in the United States are currently being applied primarily in the form of HOT lane networks. An example is the conceptual HOT lane plan for the Washington, D.C. metropolitan area as illustrated in Figure 3.6. Such systems help provide an evolutionary transition to more systemwide pricing envisioned for the future. As noted in Figure 3.6, new priced HOT lanes are under construction on the Virginia portion of the D.C. Beltway and the Intercounty Connector (ICC) in the Maryland suburbs of the D.C. region will be the first full facility dynamically priced transportation facility in the nation. Figure 3.6 also illustrates that such major projects often combine innovative financing (e.g., private equity, Private Activity Bonds, TIFIA loans, and Garvee bonds) with tolling/pricing and can be developed with a variety of public-private partnership arrangements. The Maryland ICC project is being built and operated by Maryland DOT whereas the Virginia Beltway HOT lanes are being built and operated by a private consortium.

Figure 3.6 Proposed Network of Variably Priced (e.g., HOT) Lanes in Washington, D.C. Metropolitan Area



Source: Metropolitan Washington Council of Governments (COG)/National Capital Region Transportation Planning Board.

While the pricing approach will vary somewhat by state and metropolitan area, there is a strong likelihood that pricing to meet financing, congestion, energy and climate goals is in our transportation future.

3.5 GHG/ENERGY

Perhaps the biggest challenges for this study are the topics of greenhouse gas emissions (GHG) and energy supply/price. The shift in emphasis just during the one-year period of this study has been dramatic. Most analysts at this point in time expect:

- Energy prices increasing substantially in nominal terms over the next decade, possibly to \$200 or more per barrel (note: as of December 2008, oil prices have dropped from a peak of \$147 per barrel in midyear to the \$40 dollar range as demand has moderated due to the global economic downturn). In the longer term, prices are likely to become increasingly volatile but inevitably trending higher as we approach world-peak production constraints illustrated in Figure 3.7. In real dollar terms, more modest oil price increases are assumed, that in the longer term, allow transportation to adapt with vehicle technology improvement and alternative fuel source development.
- Transportation will be expected to meet 60 to 80 percent reduction targets for 2050 GHG emissions as currently being discussed in emerging state and Federal legislation, and international climate goals.

Energy Implications

Many analysts believe that our energy future will be fundamentally different from that of recent decades where high energy prices of the late 1970s and early 80s fell back to historically low levels by the mid eighties and remained low until the run-up in the recent few years. The main reasons why response may be different this time is increased world demand from the likes of China and India at a time when we are seeing slowing growth in world production, and in fact a drop in some major oil fields such as in Mexico. Analysts differ on the timing of peak world production (some are suggesting we have already hit the peak) but it will likely occur within the 2040 horizon of this study. The U.S. Energy Information Agency world-peak production scenarios are shown in Figure 3.7 with peaking starting as early as 2031 well within the timeframe of this study. The important message here is that peaking of world production is likely within a generation and the fall in production levels (and accompanying price volatility) beyond that point could be fairly rapid. Transition to alternative sources could take 20 years or more, so it is urgent that we start now.³⁰

Technology will almost certainly be at the forefront of the response to our energy challenge. The I-95 vision principle of doubling fleet fuel efficiency is aggressive by today's view but given the potential as demonstrated by our global competitors, it has to be viewed as one of the key strategies for a lower carbon future and a path toward a more secure energy future. The goal is well within the range of existing and emerging technology. Our competitors (e.g., European Union, Japan, and even China) are leading the way as can be seen in Figure 3.8. The goal of doubling efficiency would assume extension and ratcheting up of currently legislated CAFÉ standards after 2020. The auto manufacturers are testing a wide range of alternative technologies (e.g., hybrids, plug-in electric, hydrogen) to bring on line in the next several years. Toyota, for example, is expecting 60 to 70 mpg on their third-generation Prius to be released in 2009.

High energy prices, if sustained longer term, could also have significant impact on global trade patterns and industry supply chain routings. Further many industries are starting to evaluate the carbon footprint of their supply chains. There are a broad range of potential response strategies to reducing energy costs and the carbon footprint of industry supply chains.

³⁰EIA Long-Term World Oil Supply Scenarios: *The Future Is Neither as Bleak or Rosy as Some Assert*, John H. Wood, Gary R. Long, David F. Morehouse; August 2004.

Figure 3.7 World Peak Oil Production Scenarios

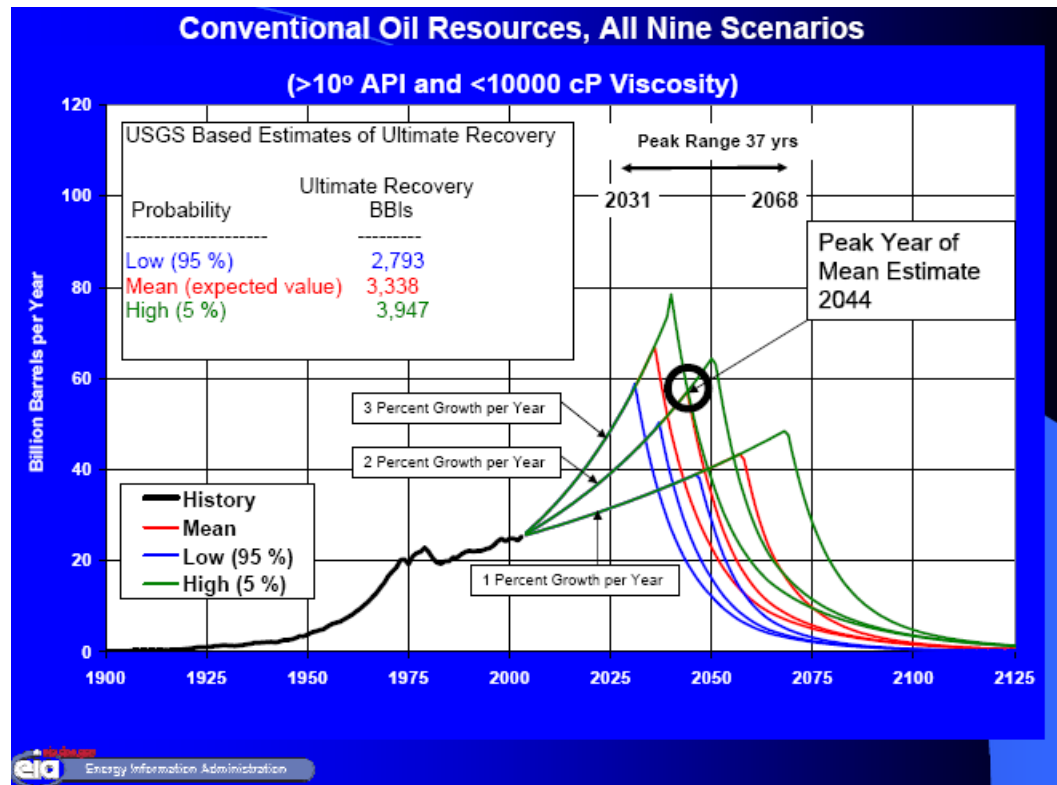
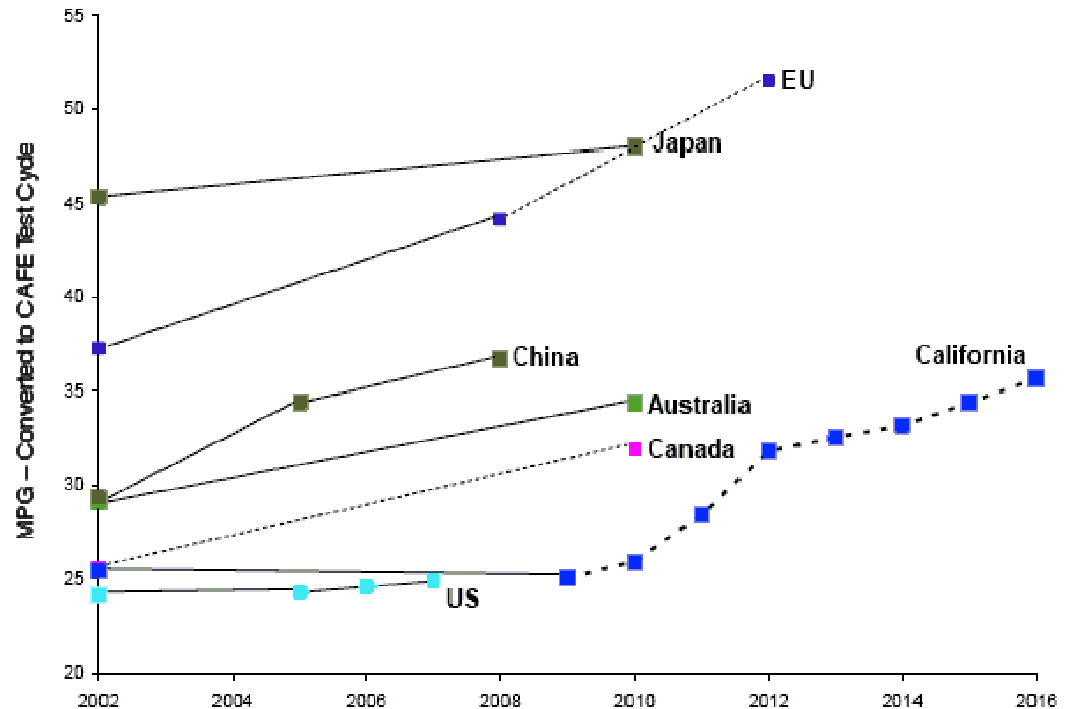


Figure 3.8 Comparison of Fleet Average Fuel Economy Standards for New-Sale Light-Duty Vehicles
Miles per Gallon



Source: UC Berkeley.

Although caution is advised regarding recent news articles about retrenchment in globalization and industry supply chains due to energy and climate issues, there seems to be anecdotal evidence that some supply chains may be adapting by utilizing suppliers or co-packaging facilities closer to production or distribution locations. Some manufacturing that gravitated to Asia from Mexico in recent years may shift back as higher transportation costs offset labor cost advantages. For other Asian originating supply chains, there is some indication that they are now favoring lower cost routings to the U.S. markets versus shortest time routing. Since it is cheaper/more fuel efficient to move containers by ship than land-bridge, the tendency will be to get as close to markets as possible by container ship, thus potentially favoring U.S. East Coast ports close to population centers rather than using the long land-bridge option from West Coast ports. Anecdotal evidence suggests that West Coast traffic is down and East Coast traffic is rising but there is no certainty as to whether this is a long-term trend or more of a short-term economic cyclical trend. Another option to shorten the land-bridge from the West Coast could be to ship from the Canadian ports of Vancouver and Prince Rupert directly into Chicago rather than by the longer southern California routing; the Canadian government is upgrading highway and rail corridor capacity for their Asian gateway.

Another potential trend is movement of retail distribution centers (DCs) closer to population centers. A recent analysis by Simchi-Levy's of MIT suggests that higher energy prices could cause shippers to modify DC locations, adding DCs to rebalance the costs of long and short hauls; e.g., instead of running many long-haul truck trips from a few very large DCs, shippers will make more use of long-haul rail to supply more (somewhat smaller) DCs in close proximity to population centers, thereby reducing the cost of the truck trips.³¹ Further, expansion of "freight villages" is a possible response. CSX's real estate group has been pushing for consolidation of rail shippers and DCs around fewer, but better served rail terminals. This would be consistent with relocation of DCs.

The fact that fuel cost increases tend to hit trucking proportionally harder than rail could mean that some truck freight shifts to rail, or that trucks are utilized more efficiently (heavier loadings, fewer empty moves), or that truck commodities are moved shorter distances, or that truck commodities increasingly utilize alternative modes such as rail or barge. Recent monthly and quarterly reports from the railroads show 5 to 10 percent increases in domestic loadings for inter-modal containers and TOFCs.

Fleet and vehicle management will become a higher priority. Substituting capital for energy may result in faster turnover of fleet (and infrastructure) to take advantage of newer engine and other technologies that reduce energy use and GHG emissions. This could perhaps occur faster in the commercial freight transportation sector than in the private automobile market. Urban delivery fleets present an obvious opportunity where centralized fleets and fueling sources can be modified fairly quickly to accommodate alternative fuels. Use of technology for on board monitoring of trucking fleets will become more prevalent; speed control for fuel saving is but one example. Wal-Mart has set a goal of doubling their fleet fuel efficiency by 2015; trucks are being equipped with speed governors and auxiliary power units and are being given daily tire-pressure checks. Positive train control and electric braking for trains may emerge to deal with both capacity and energy efficiency issues.

Climate Implications

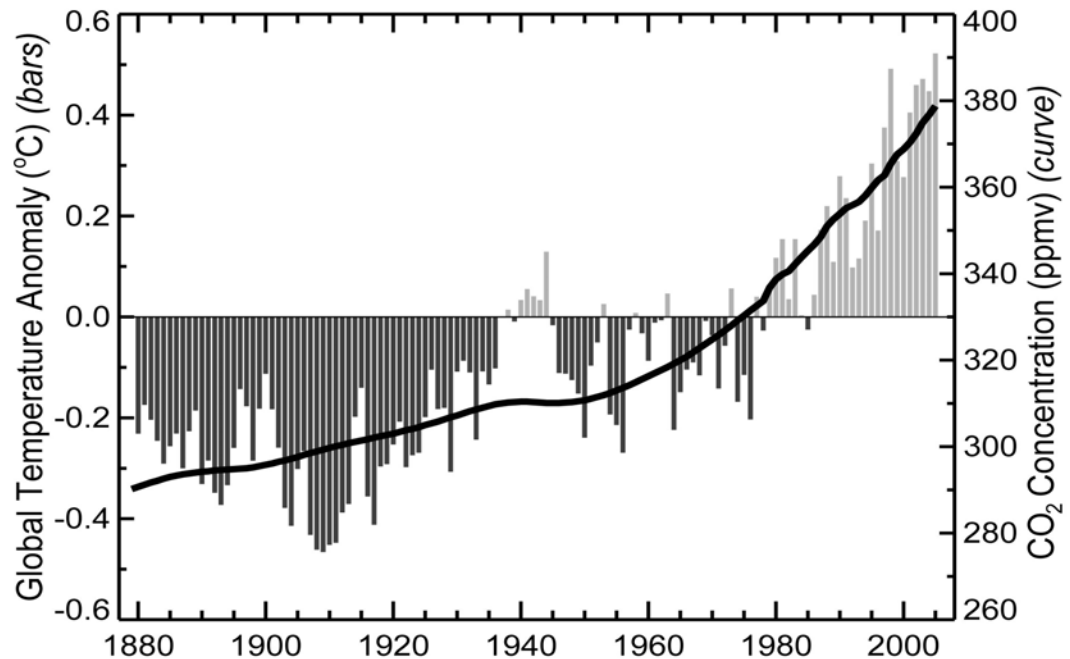
Clearly climate change will be one of the important driving issues of a future vision for the I-95 region. Scientists have reached pretty wide agreement on climate warming (not entire agreement on the causes) and the emerging impacts of CO₂ and temperature rise as illustrated in Figure 3.9 from the recently published TRB Special Report 290 on climate impacts.³² The left axis is deviation from mean temperature over the last century or so; the right axis shows CO₂ emissions now at about 380 ppm. Many scientists are suggesting a stabilization target for

³¹*Impact of Crude Oil Volatility on Network Design*, David Simchi-Levi, MIT, and ILOG.

³²*Potential Impacts of Climate Change on U.S. Transportation*, TRB Special Report 290, 2008.

CO₂ emissions as low as the 450 ppm range which does not give us much cushion from today's levels; this reality is driving the aggressive targets that are being set in emerging legislation at state, Federal, and international levels in the range of 60 to 80 percent reductions in GHG from 2005 levels; this is the target range assumed for the vision study principles and Scenario 3.

Figure 3.9 Globally Averaged Surface Air Temperature and CO₂ Concentrations Since 1880

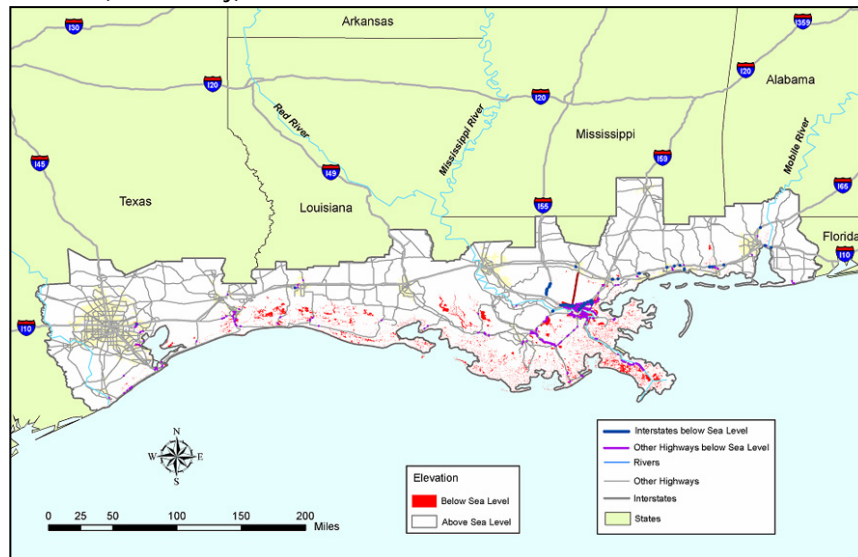


Source: TRB Special Report 290

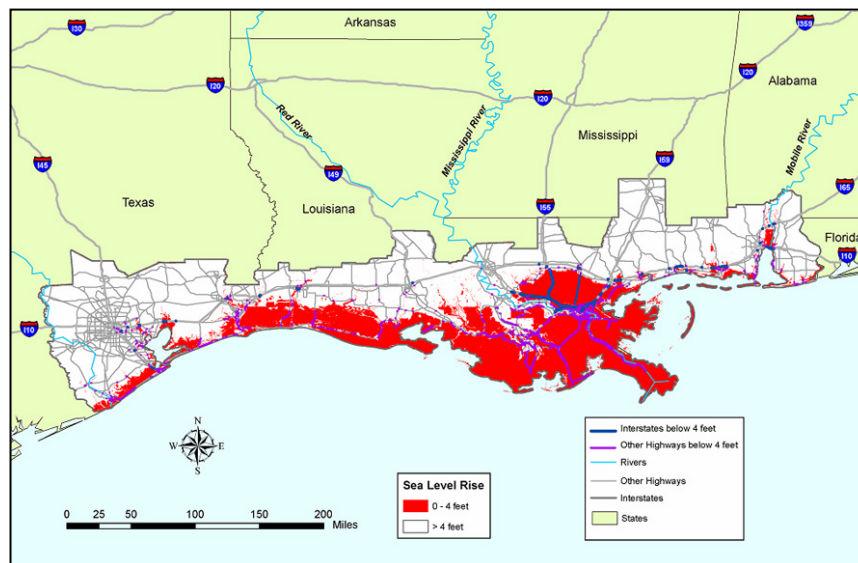
Figure 3.10 illustrates transportation system vulnerability from climate change over the next 50 to 100 years for the Gulf Coast region.³³ A combination of subsidence and sea level rise could result in 1- to 6-foot rise in effective sea levels; this slide shows implications for transportation infrastructure of a 4-foot relative rise. But in some ways, the bigger threat is the more severe storm surges; unfortunately we are likely to see more Katrina's than historically because of temperature rise. All coastal areas including I-95 region will need to assess vulnerable infrastructure. This is definitely one of the looming issues in a 2040 horizon.

³³*Impacts of Climate Change and Variability on Transportation Systems and Infrastructure: Gulf Coast Study, Phase I*; Cambridge Systematics for U.S. DOT Climate Center, March 2008.

Figure 3.10 Infrastructure Vulnerability in Gulf Coast Region
Baseline (Present Day)



Four Foot Relative Sea Level Rise



Source: Cambridge Systematics analysis of U.S. DOT Data.

The recent TRB Special Report 290 on climate change impacts suggests that states need to take the following actions:

- Inventory critical infrastructure, particularly in vulnerable locations;
- Incorporate climate change in investment plans and decisions;
- Adopt strategic, risk-based approaches to decision-making;

- Operations: Integrate emergency response into transportation operations (and vice versa) to handle weather and climate extremes;
- Design: Reevaluate design standards; and rebuild infrastructure in vulnerable locations to higher standards; and
- Monitoring: Develop new technologies to track conditions and warn of pending failure.

Scenario 3 Assumptions in Regard to Energy and Climate

Responding to our emerging energy and climate challenges will be a central focus of the Vision for the region.

Figure 3.11 illustrates the Vision study's scenario 3 assumptions with regard to highway-related GHG emissions changes out to 2040. Improvements come from four key components: 1) Fuel economy changes, 2) Alternative fuels penetration, 3) VMT reduction strategies, and 4) Highway operations improvements. Each is discussed in turn below:

1. **Fuel Economy** – Without changes in fuel economy or alternative fuels, greenhouse gases (GHG) are likely to increase proportional to vehicle miles traveled. Given trend VMT growth projections, this implies a 70 percent increase in VMT and GHGs by 2040. However, as shown in Figure 3.11, the Energy Independence and Security Act's (EISA; December 2007) directive regarding CAFÉ standards (35 mpg for new vehicles by 2020) are estimated to limit GHG emissions growth to about a 30 percent increase by 2040. It is anticipated in this example that further technological advances and tightening of CAFÉ and/or GHG emission standards in the period 2020 to 2040 will result in fuel efficiency gains that together with EISA will result in an average light-duty fuel economy level of approximately 50 mpg, approximately doubling today's fuel economy. This will result in halving of 2040 GHG emissions as compared to trends, to approximately 85 percent of 2005 GHG emissions.
2. **Alternative Fuels** – For the I-95 Vision, alternative fuels would contribute the next largest portion of GHG reductions contributing an estimated share in the range of 35 percent emissions reductions from replacement of fossil fuels from the 2005 base. In combination with fuel economy gains, this would result in approximately a 50 percent decrease from 2005 GHG emissions as shown in Figure 3.11. The Volpe Transportation Center Study of alternative fuels provides an illustration of replacement possibilities over the next 25 years and further improvement could be expected by 2040:

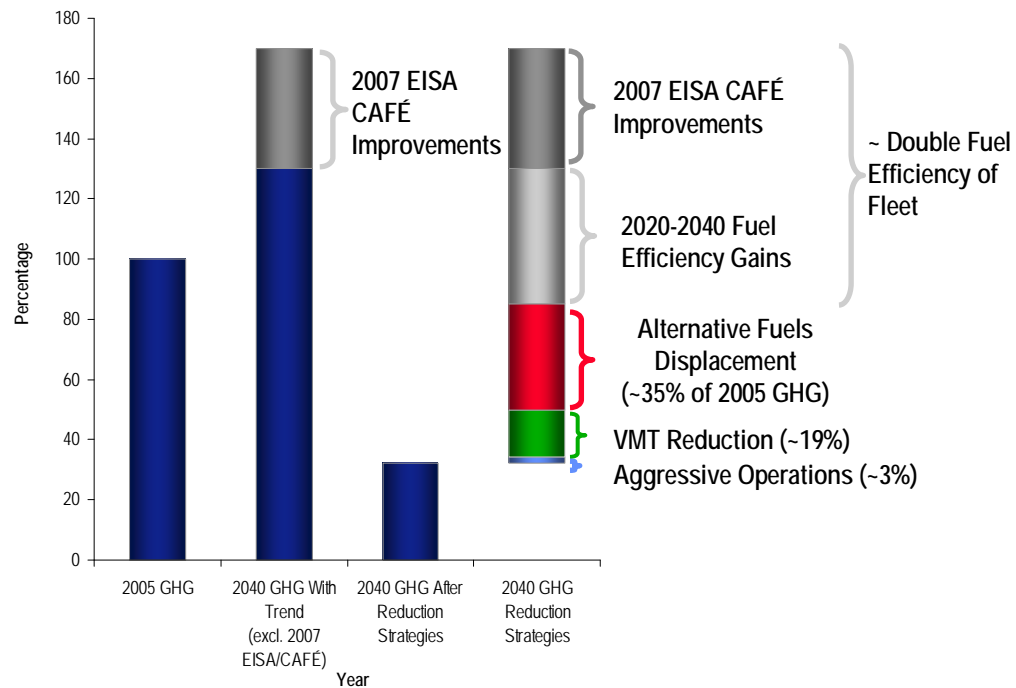
“Replacing one-quarter of projected gasoline consumption with petroleum diesel, bio-diesel, or electricity, which is assumed to be possible within a 25-year time horizon, could reduce combined GHG emissions from vehicle use and fuel production by about 8 to 11 percent. Net emissions reductions more than twice as large could be achieved if the technology for producing ethanol from cellulosic biomass rather than from corn (the current ethanol feedstock) could be commercialized. Emissions reductions from

replacing 25 percent of gasoline with CNG, LPG, or hydrogen would amount to 5 to 6 percent; emissions reductions during both vehicle use and fuel production are accounted for.)”

3. **VMT Reduction** – The third component of GHG emissions reductions is from the 19 percent lower VMT by 2040 as compared to trends. The VMT reduction measures include land use, transit, congestion pricing, pay-as-you-drive insurance, TDM and telecommuting measures, and freight modal shifts. Combining the VMT reductions with the above fuel efficiency and alternative fuel reductions, emissions are anticipated to be reduced to approximately 33 percent of 2005 levels as shown in Figure 3.11.
4. **Operations** – Finally, we are assuming a modest 2 to 3 percent GHG emissions reduction in 2040 from improved operations, particularly from the reduction in nonrecurring congestion associated with the implementation of aggressive operations. This is considered a conservative estimate of the marginal benefit of aggressive operations implementation, relative to benefits already assumed from continuing improvements in operations consistent with existing trends.

As shown in Figure 3.11, the cumulative benefits of the measures in this example represent an estimated 70 percent reduction in highway-related GHG emissions by 2040, consistent with reaching the 60 to 80 percent GHG emission reduction goals by 2050 as sought in multiple state climate plans, proposed Federal cap-and-trade legislation, and international climate discussions.

Figure 3.11 Potential Greenhouse Gas Emission Reductions in I-95 Region from Transportation Strategies



3.6 LAND USE

An aggressive trend toward compact, transit-oriented development is assumed for Scenario 3. Compact, transit-oriented development implies generally more density, a mix of land uses, strong population and employment centers or nodes, and interconnected development at a more human versus automobile scale. For example, as part of Orlando's 2050 Vision, they assumed a more compact development with higher density downtown and suburban nodes interconnected by transportation corridors illustrated by the arches as shown in Figure 3.12. Implementation strategies are now being discussed by the region.

States in the region have adopted a variety of initiatives to better guide regional growth. For example, Maryland's 'Smart Growth' legislation adopted by the 1997 General Assembly directs the State to target programs and funding to support established communities and locally designated growth areas, and to protect rural areas. Local governments throughout Maryland have either updated their zoning codes or expressed interest in doing so, and the State is working to provide assistance when requested. But progress is incremental and the Maryland "Smart Growth" web site acknowledges that sprawl is still occurring.

Nothing in the 1997 Act prevents sprawl and in fact many local zoning codes still prohibit dense, mixed-use development.³⁴

Figure 3.12 Orlando 2050 Regional Growth Vision



Source: Central Florida Regional Vision, myregion.org.

Outside the region, California recently enacted the first measure (S.B. 375) in the nation to link land use, transportation, housing, and climate change issues. The bill establishes a new “sustainability communities” strategy that promote smart

³⁴<http://www.mdp.state.md.us/smartintro.htm>.

growth principles such as getting people out of their cars, development near public transit, a mix of residential and commercial uses, and projects that provide affordable housing. It encourages development in existing neighborhoods to curb sprawl and development of open land and farmland. It also requires the California Air Resources Board to work with local governments to establish greenhouse gas emission targets for automobiles and light trucks for 2020 and 2035.

Fairly dramatic policy changes at all levels of government will be necessary to achieve the Coalition's Vision related to transportation-supportive land use policies. What is probably the upper end of the potential VMT reduction range from such alternative land use patterns over the coming several decades is represented by the findings of the recent Urban Land Institute *Growing Cooler* study.³⁵

The study was structured to answer the following three questions with the findings presented below each question:

- What reduction in vehicle miles traveled (VMT) is possible in the United States with compact development rather than continuing urban sprawl?
 - 20 to 40 percent reduction in VMT for each increment of new development or redevelopment.
- What reduction in CO₂ emissions will accompany such a reduction in VMT?
 - 10 percent reduction in total transportation CO₂ emissions by 2050 relative to continuing sprawl.
- What policy changes will be required to shift the dominant land development pattern from sprawl to compact development?
 - Set of dramatic policy changes at all three levels of government including regulatory reform, growth management strategies, transit-supportive policies, parking management, etc.

The *Growing Cooler* study contains a set of aggressive assumption and as mentioned earlier, represents the likely upper end of what may be possible; i.e., maximum total VMT and CO₂ reductions would be around 10 percent. So, for the Vision study, we estimated VMT reduction potential in the 5 to 10 percent range from regionwide targeted strategies toward compact, transit-oriented development.

3.7 SCENARIO RESULTS

The impacts of the three Scenarios built around the assumptions discussed above are summarized in Table 3.9 and discussed more fully in the subsequent sections.

³⁵*Growing Cooler*, University of Maryland for the Urban Land Institute (ULI), 2007.

Table 3.9 Summary of Scenario Results
2040 Compared to 2005

Scenario	Investment Assumptions, Implications	Modal Demand	Highway Performance and Capacity		Highway Fuel Consumption	Greenhouse Gas (GHG) Emissions
			Delay per 1,000 VMT	Ride quality = % VMT on acceptable roads Capacity = additional freeway lane-miles		
1	<ul style="list-style-type: none"> Current trend all modes; roughly \$32 billion in constant annual dollars Trend in Operations investments 	<ul style="list-style-type: none"> Freight rail and water modes lose share to highway/trucks as assumed in FHWA FAF 	<ul style="list-style-type: none"> 84% delay increase on urban Interstate, 49% all systems Ride quality deteriorates from 88 to 79% acceptable 17,700 additional freeway lane-miles of capacity 	<ul style="list-style-type: none"> Crashes and fatalities increase in concert with VMT growth 	<ul style="list-style-type: none"> Approximately 34% increase (assumes latest adopted CAFE changes) 	<ul style="list-style-type: none"> Approximately 34% increase
2	<ul style="list-style-type: none"> Current trend in investment of \$32 billion, but shift toward aggressive operations and technology for all modes 	<ul style="list-style-type: none"> Same as 1 	<ul style="list-style-type: none"> 74% delay increase on urban Interstate, 47% for all systems 21% reduction in incident component of urban Interstate delay as compared to Scenario 1 Ride quality same as Scenario 1 17,300 additional freeway lane-miles of capacity 	<ul style="list-style-type: none"> Aggressive Ops/VII improves safety as compared to Scenario 1 	<ul style="list-style-type: none"> Approximately 32% increase (assumes latest adopted CAFE changes; aggressive operations modestly lowers fuel consumption as compared to Scenario 1) 	<ul style="list-style-type: none"> Approximately 32% increase

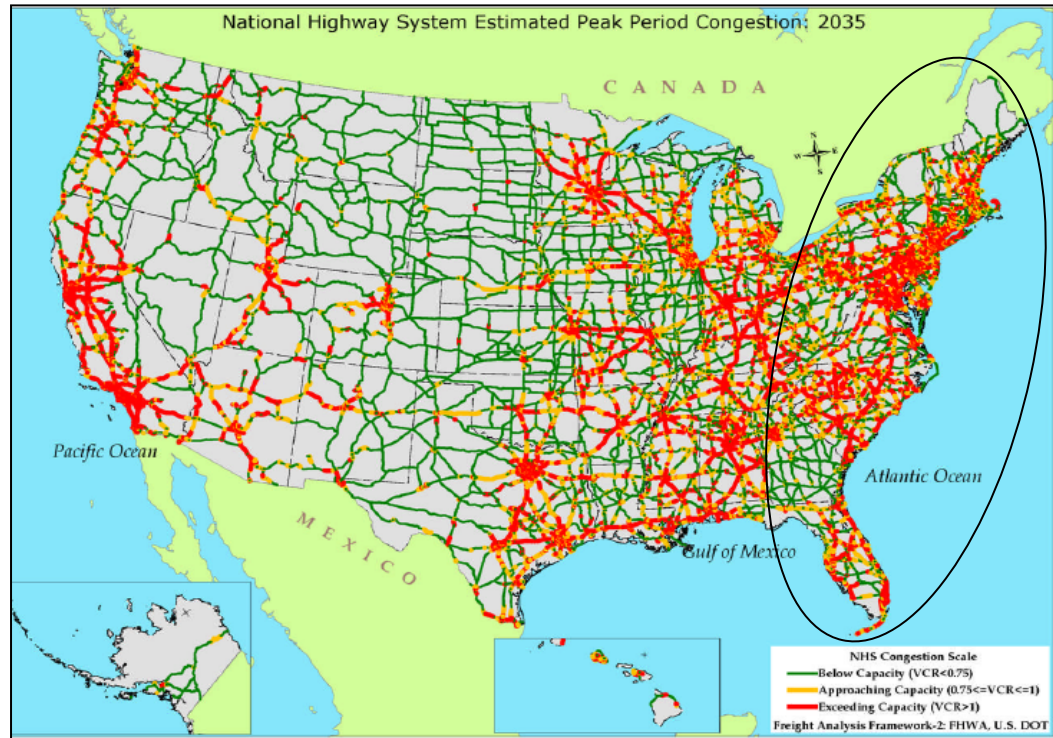
Scenario	Investment Assumptions, Implications	Modal Demand	Highway Performance and Capacity		Highway Fuel Consumption	Greenhouse Gas (GHG) Emissions
			Delay per 1,000 VMT	Ride quality = % VMT on acceptable roads Capacity = additional freeway lane-miles		
3a	<ul style="list-style-type: none"> Highway investment current trend as in Scenarios 1 and 2 (\$22 billion constant annual dollars) Significant increase for other modes as per Commission: <ul style="list-style-type: none"> Double transit investment (From \$8 billion to \$15 to \$19 range) Five to six-fold increase in passenger rail investment (from \$.8 billion to \$4 to 5 billion) Nearly double freight rail investment (from \$1 to \$2 billion) 	<ul style="list-style-type: none"> Non-highway modes increase shares consistent with input assumptions 	<ul style="list-style-type: none"> Maintains highway performance for both delay and ride quality Aggressive operations benefits as in Scenario 2 10,400 additional freeway lane-miles of capacity 	<ul style="list-style-type: none"> Substantial safety benefits from reduced VMT and aggressive operations/VII 	<ul style="list-style-type: none"> Approximately 29% reduction (Lower VMT and doubling of fleet fuel efficiency are the most important factors) 	<ul style="list-style-type: none"> Higher auto fuel efficiency, alternate fuel displacement, lower VMT, and aggressive operations can achieve up to 70% reduction from 2005 GHG emissions
3b	<ul style="list-style-type: none"> Highway investment significantly increased in concert with cost-effective investments to \$47 billion annually Significant increase in investment in other modes as in 3a 	<ul style="list-style-type: none"> Same as 3a 	<ul style="list-style-type: none"> Substantially improves highway performance: 46% reduction in delay on urban Interstate and 22 % all systems 7% increase in ride quality 14,900 additional freeway lane-miles of capacity 	<ul style="list-style-type: none"> Substantial safety benefits from reduced VMT and aggressive operations/VII 	<ul style="list-style-type: none"> Approximately 28% reduction (Lower VMT and doubling of fleet fuel efficiency most important factors) 	<ul style="list-style-type: none"> Higher auto fuel efficiency, alternate fuel displacement, lower VMT, and aggressive operations can achieve up to 70% reduction from 2005 GHG emissions

Scenario 1 – Trend Scenario

The trend scenario – extrapolating current land use, travel patterns, mode use, and VMT – would have the following principal implications in the I-95 Corridor:

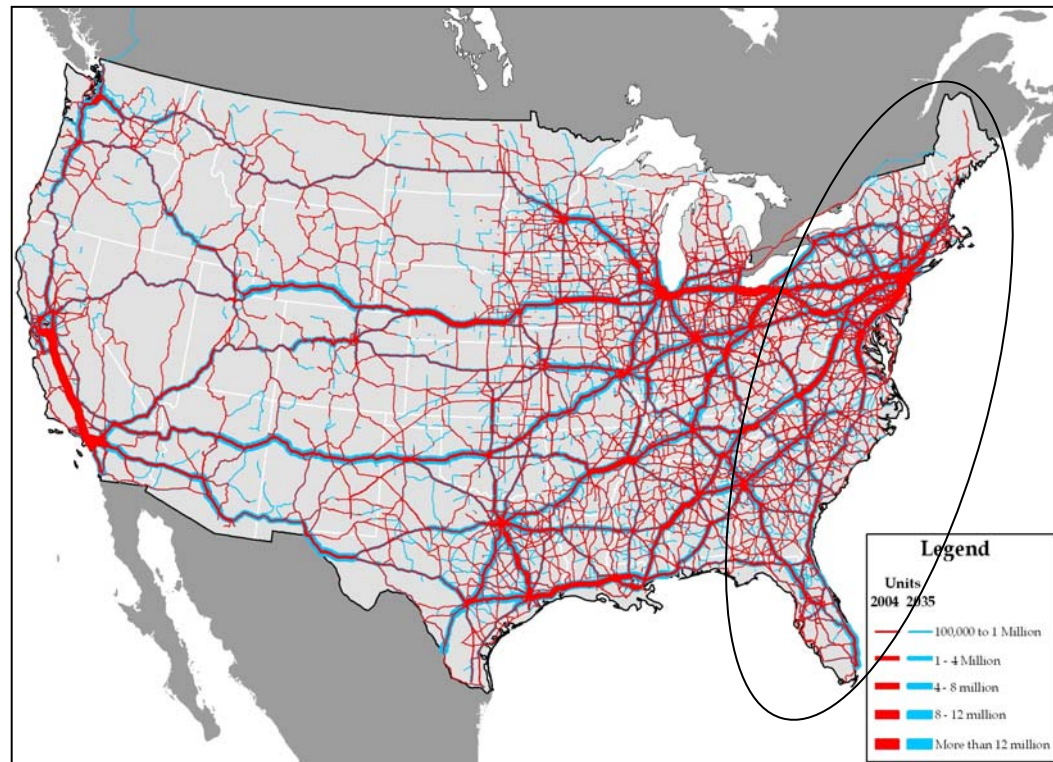
- An 84 percent increase in urban Interstate delay (hours per 1,000 VMT) and nearly 50 percent increase in delay across all Federal-aid systems. This phenomenon is illustrated in the FHWA FAF2 map in Figure 3.13 showing increased congestion spreading widely by 2035 (source FAF2) without significant capacity addition.
- Ride quality deteriorates from current 88 percent acceptable to 79 percent acceptable by 2040.
- Despite improving fuel economy in line with current CAFÉ requirements, highway fuel consumption and emissions are estimated to increase 34 percent due to approximately 70 percent VMT increases and performance degradation.
- Safety degradation will continue with VMT growth and trend technology deployment.
- Transit, intercity passenger, and freight struggle to hold market shares without greater investment. Freight rail, for example, according to the FHWA FAF2, is projected to lose market share (from 14 percent to 13 percent of the nation's tonnage) to 2035 given current trends.
- Truck volumes could nearly double according to FAF2 trend demand projections (Figure 3.14); these levels of truck volumes are probably not physically or environmentally sustainable in the region.
- Increasing highway and rail bottlenecks constrain interstate commerce.
- Slowing economic growth; the region simply cannot sustain real economic growth in the range of 2.4 percent per year with the levels of congestion predicted for the region vis-à-vis business as usual transportation policies.
- Increasing pressure for punitive VMT reduction measures to meet climate change, energy, and related societal goals.

Figure 3.13 Congestion Spreads Widely under Trend Assumptions



Source: Federal Highway Administration, Office of Freight Management and Operations, Freight Analysis Framework (FAF-2).

Figure 3.14 Truck Volumes Nearly Double by 2035



Source: Global Insight 2004 TRANSEARCH for AASHTO Freight Bottom Line Reports.

Scenario 2 – Maximum Operations

The Trend scenario modified with the assumption of aggressive systems operations and management results in a few differences from Scenario 1 as follows:

- An aggressive operations strategy including advanced VII concepts and assumptions of 24/7 real time operations results in reduction of delay;
 - 74 percent increase in delay on urban Interstate versus 84 percent in Scenario 1.
 - 21 percent reduction in incident component of urban Interstate delay as compared to Scenario 1.
- Ride quality same as Scenario 1.
- Fuel and emissions increase 32 percent versus 34 percent in Scenario 1 due to improved operations.
- Overall highway performance improves over Scenario 1 with aggressive operations but performance still deteriorates over time.

- Other modes invest in operations and technology and generally hold their shares of demand. For example, intercity passenger and freight rail increasingly move to positive train control for safety and operational efficiency.

Scenario 3 – Vision Scenario or “What Would It Take to Achieve Vision Principles”?

Scenario 3 moves aggressively toward achievement of the Vision principles for the corridor region but implementation implies fairly dramatic changes (political, institutional, financial) from the business as usual approach of Scenario 1.

Results suggest that:

- To achieve the vision, annual real surface transportation investments would need to increase in the range of 45 to 120 percent depending on performance levels desired. Overall transportation capital investment in corridor would need to increase from about \$32 billion to between \$46 to \$71 billion per year depending on performance level desired on highway system as shown in Table 3.10. This assumes roughly doubling of transit investment in real terms, roughly doubling private and public freight rail investments, and a five- to six-fold increase in passenger rail capital investment in the corridor.
- Even with an aggressive investment in the other modes, highway capacity needs to be added to either maintain (10,400 Freeway lane-miles) or improve performance (14,900 Freeway lane-miles). Much of this is assumed to be managed capacity; often in the form of separated lanes such as HOT lanes, truck lanes, or collector-distributor lanes.
- As in Scenario 2, aggressive operations strategies including VII concepts result in modest reduction of nonrecurring delay and associated safety benefits as compared to the Trend Scenario 1.
- With the lower VMT growth rate and significant reduction of incident-related delay, fuel consumption is reduced by 29 percent (3a) and 28 percent (3b) respectively as compared to the 34 percent increase under the Trend Scenario 1.
- The region will be on path to achieve GHG emissions reductions of 60 to 80 percent by 2050 as compared to 2005 levels by the combination of fleet fuel efficiency improvements, alternative fuels, VMT growth moderation, aggressive operations delay reduction strategies, as shown earlier in Figure 3.11.

Table 3.10 Summary of Scenario Capital Investment Requirements
National (Commission) and I-95 Region
(2005 Constant Dollars in Billions)

Mode	Scenarios 1 and 2 – Trend		Scenario 3 – Vision-Driven	
	National (Commission-Base)	I-95 Corridor	National (Commission-High)	I-95 Corridor
Transit	\$13	\$8	\$25 to \$31	\$15-\$19
Passenger Rail	\$1	Approximately \$0.8	\$8-9	Approximately \$4-5
Freight Rail	\$4	Approximately \$1	\$7	Approximately \$2
Highway	\$68	\$22	a) Current Trend (maintains performance)	
			\$68	\$22
			b) High Investment (substantially improves performance)	
			\$182	\$47
Total	\$86	\$32	b) \$228	a) \$46 b) \$71

3.8 FURTHER DISCUSSION OF INVESTMENT REQUIREMENTS

The investment requirements displayed in Table 3.10 build on work of the Commission (taken from Exhibit 4-22 Commission Report).³⁶ The Commission assumed a capital investment trend for all modes that was sustainable from current revenues. The total sustainable national capital investment in surface transportation was \$86 billion annually as shown in Table 3.10.

The next step for the study was to estimate I-95 shares of current national capital investment. The team had actual current corridor investment levels for highway and transit from FHWA and FTA data but not for intercity rail modes. Amtrak reported that at least 80 percent of current Amtrak annual investment of about \$1 billion per year is in the corridor so that estimate was used. For freight rail, the study team estimated from the AAR work for the Commission and the I-95 Coalition MAROps studies that freight rail capital investment in the corridor was roughly 25 to 30 percent of the national rail investment reported by the Commission or about \$1 billion. The total sustainable corridor multimodal transportation investment was therefore estimated by the team at \$32 billion as

³⁶*Transportation for Tomorrow, National Surface Transportation Policy and Revenue Study Commission, December 2007.*

compared to the \$86 billion nationally reported by the Commission as shown in Table 3.10. This was the trend investment level assumed for Scenarios 1 and 2.

For Scenario 3, we used the Commission high assumptions for the investments in transit and freight and passenger rail as shown in Table 3.10 and then estimated corridor shares as discussed above. Transit investment in the corridor would need to more than double, passenger rail investment would need to increase five- to six-fold, and freight rail investment would need to approximately double according to Commission estimates.

Highway investment levels for Scenario 3 were derived from performance assumptions using the FHWA Highway Economic Requirements Model (HERS). Under Scenario 3a, the goal was to preserve highway performance through 2040; by coincidence current highway investment levels of \$22 billion in real dollars would approximately maintain both operational and physical performance. To substantially improve highway performance (by making all cost-effective improvements), Scenario 3b, would require more than doubling of highway capital investment to \$47 billion per year in the corridor. One uncertainty about needed highway investment is the potentially large replacement needs of an aging infrastructure. Facilities such as the Pennsylvania Turnpike, forerunner of the Interstate System are being completely replaced down to sub-base; the replacement structure being put down is much more robust than the original design in order to provide for a much longer design life. Current needs modeling may well underestimate these emerging replacement costs for the aging Interstate system in the region.

Bottom-line is that overall transportation capital investment in the corridor would need to increase from about \$32 billion to between \$46 to \$71 billion per year depending on performance level desired on the highway system (note: replacement costs for the region's Interstate facilities may be underestimated in this figure). Investment of \$46 billion per year would fund needed rail and transit improvements but would just maintain today's less than desirable highway performance. This would continue to be a drain on the region's economy. Results suggest that investment would need to more than double to fully support the region's Vision.

4.0 Policy Implications for the Region and Opportunities for the I-95 Corridor Coalition

The six vision issues highlighted in Table 4.1 above have relevance for the whole corridor. In the sections that follow, each of the six issues are discussed in a common format including illustrative examples. A summary table is presented for each issue. The framework in the tables and discussion below provides more in-depth analysis of each of the six vision implication issues. The table for each issue illustrates case examples, lists key 2040 vision issues, identifies an array of potential solutions, and discusses possible Coalition opportunities to advance the issue through discussion forums, education, demonstration/testing, and architecture/standards development, etc.

Table 4.1 Key Vision Scenario Issues/Implications

Key Issues/Implications	Cross-Cutting Considerations
1. Higher-Speed Passenger Rail – For regional mobility in light of air and highway travel congestion	Funding sources, institutional roles, multistate planning and implementation, potential separation of freight and passenger functions in corridor.
2. Interstate/Intercity Freight Rail Systems and Short-Sea – To minimize highway freight congestion and support commerce	Funding sources to address capacity, public/private roles, multistate planning, and implementation.
3. Interstate/Intercity – Highway Systems – Given economic importance to regional passenger and freight mobility	Long-term replacement costs for aging system; capacity expansion in constrained ROW environment. Assurance of intercity commerce function through metro areas.
4. Aggressive Ops/VII – To capitalize on existing capacity in face of limited capacity additions	Public/private and multijurisdictional roles in advanced technology deployment and operation; cooperation with emergency response agencies and shared urgency to clear incidents.
5. Transition to VMT-Based Financing/Pricing – For revenue and demand management	Transition timing, technology, and administrative issues for financing; acceptance of pricing for full facility or area-wide application. Privacy issues and political will.
6. Role of Climate and Energy in shaping and executing the Vision	Transition timing for reducing transportation dependence on fossil fuels. Balancing climate, energy and, economic goals. Infrastructure adaptation.

It is important to note that the six issues have both common and unique dimensions. Common, cross-cutting consideration at the Corridor scale (as noted in Table 4.1) include:

- Both freight rail and highways are facing key congestion and capacity issues that were highlighted in the scenario analysis;
- The need for additional funding across all the modes to address both preservation and capacity expansion is a paramount concern; and
- Complex institutional issues including multistate and public-private roles emerge with each of the Vision Implications.

In addition, corridor subregions each have some unique aspects. For example, passenger and freight rail have somewhat different issues and opportunities in different subregions as has been recognized in the I-95 Coalition subregion rail studies, MAROps, NEROps, and SEROps. In moving forward with the Vision, there are potential opportunities for the Coalition as a whole or Coalition member states cooperating in subregions to advance these six key vision issues.

4.1 HIGHER-SPEED PASSENGER RAIL

The passenger rail 2040 vision issues, potential solutions and I-95 coalition opportunities identified in this study are briefly summarized here and detailed in Table 4.2, including both corridor-wide and regional issues. The objective is achieving higher speed rail along the corridor through upgrading, removal of at-grade intersections, chokepoint removal, and possible separation of passenger and freight rail.

The I-95 Corridor Vision driven scenario assumes an expanded and upgraded higher speed passenger rail network and significant increase in ridership in concert with the National Passenger Rail Working Group proposal to the National Surface Transportation Policy and Revenue Commission (Commission). This plan would improve modal balance in the corridor through shifts from highway and aviation to help relieve emerging regional congestion in those modes. But significant challenges exist. There is no reliable national funding mechanism for improving passenger rail service and no institutional mechanism for multistate development of the rail vision. The Commission proposed three sources of Federal funding for improved rail service: 1) ticket surcharges, 2) highway user revenues, 3) Federal general fund revenues as are used for some transit programs. The Commission recommended initial Federal funding of \$5 billion per year for grants to States, Amtrak, and/or other potential service providers. Congress recently passed Amtrak reauthorization legislation for the first time since 1999. It provides an authorization of \$13.06 billion over five years for Amtrak and other intercity rail. This includes over \$9 billion for Amtrak capital, operations, and debt reduction. Although Amtrak's yearly appropriations will be determined later in spending bills, the authorization allows Amtrak to make long-range capital-improvement plans. The bill also authorizes \$1.9 for state capital grants for intercity passenger rail, and \$1.5 billion for high-speed routes to be awarded by U.S. DOT on a competitive basis. The bill also authorizes \$1.6 billion for the Federal Railroad Administration and requires railroads to equip

trains with positive train control by 2015 to help avoid crashes; this technology can provide productivity advantages as well.

The key 2040 issues in arriving at the vision for passenger rail are:

- Getting higher speeds and reliability in the corridor;
- Dealing with passenger and freight rail conflicts;
- Integrating intercity rail services with intercity air and local bus and transit services; e.g., coordinating schedules and interlining fares;
- Determining appropriate financing mechanisms; and
- Creating multistate institutional mechanisms.

Key solutions are to:

- Achieve higher speed rail along the corridor through upgrading, removal of at-grade intersections, chokepoint removal, and possible separation of passenger and freight rail;
- Provide for improved interconnection of intercity and urban passenger modes, e.g., connect intercity air, bus and rail services with local transit services by linking trip planning information and moving toward coordinated transfers and interlined ticketing;
- Utilize passenger rail as reliever to air and highway congestion in corridor; and
- Adopt positive train control to improve safety and reliability.

Coalition Opportunities

- Provide a multistate system perspective;
- Formulate institutional strategies and arrangements to coordinate capital and operations planning;
- Host forums to explore and resolve passenger rail issues (e.g., MAROps, NEROps, SEROps); and
- Advance seamless intermodal passenger system as proposed in the I-95 Corridors of the Future (COF) application to U.S. DOT.

Table 4.2 Higher-Speed Passenger Rail

	Northeast	Mid-Atlantic	Piedmont	Florida
Example(s)	Amtrak NEC ACRP Study of NE short-haul air reliever strategies, e.g., rail.	MAROps shared rail network (intercity rail/commuter rail/freight).	Southeast high-speed rail network (proposed) SEROps.	Intrastate high-speed rail (proposed).
2040 Vision Issues	Reconstructing and upgrading tracks, bridges, etc., largely within existing, constrained ROWs. Improving intermodal terminals. Financing improvements. Dealing with passenger and freight rail conflicts including possibly separating intercity passenger and freight rail, especially in high-speed intercity passenger rail corridors; e.g., using dedicated tracks or moving from shared ROWs to separate ROWs. Integrating intercity rail services with intercity air and local bus and transit services; e.g., coordinating schedules and interlining fares.			
Potential Solutions	Achieve higher-speed rail along the corridor through upgrading, removal of at-grade intersections, chokepoint removal, and possible separation of passenger and freight rail. Provide for improved interconnection of intercity and urban passenger modes. Adopt positive train control. Utilize passenger rail as reliever to air and highway congestion in corridor. Connect intercity air, bus, and rail services with local transit services by linking trip planning information and moving toward coordinated transfers and interlined ticketing.			
Coalition Opportunities	Provide a multistate system perspective. Formulate institutional strategies and arrangements to coordinate capital and operations planning. Host forums to explore and resolve passenger rail issues (e.g., MAROps, NEROps, SEROps). Advance COF seamless intermodal passenger connection proposal.			

4.2 INTERSTATE/INTERCITY COMMERCE – FREIGHT RAIL AND MARINE HIGHWAY SYSTEMS

The Coalition's Vision goal, as stated in its COF application, is to reduce long-term congestion by providing a framework for public-public and public-private investment to eliminate or reduce the delays caused by nationally and regionally significant highway bottlenecks and rail chokepoints that affect travel across multiple states, but are too expensive for a single state to fix. One of the key 2040 vision issues is separation of intercity passenger and freight rail, especially where higher-speed intercity passenger rail is envisioned; e.g., using dedicated tracks or moving from shared ROWs to separate ROWs. Table 4.3 indicates both the corridor-wide and regional issues related to freight rail and marine highway.

The SAFETEA-LU program for Projects of National and Regional Significance funded the Heartland Corridor public-private rail project led by Norfolk Southern to upgrade the corridor for double-stack from the Virginia ports west through West Virginia and Ohio and into Chicago, saving nearly 250 miles over existing routing. Virginia, in cooperation with neighboring states and NS, has also been studying the potential for rail in the I-81 corridor and NS has identified their rail routes paralleling I-81 as the Crescent Corridor with the desire to improve service between the Northeast and southern states, including NAFTA trade, utilizing public private partnerships. CSX, in cooperation with the State of Florida, has reached agreement to develop a major intermodal hub in Winter Haven and to cooperate in the launch of new commuter rail service in the Orlando I-4 corridor. CSX has also announced the \$700 million “National Gateway” project as a proposed public private partnership to enhance service, including double-stack, to and from Virginia and North Carolina (including their ports) through the Washington-Baltimore area, and west to Ohio.

The I-95 Corridor Vision driven scenario assumes approximately a doubling of public and private investment to remove bottlenecks and help increase freight rail share in the corridor (in line with the Commission’s most aggressive scenario). However, other than the small, and fully earmarked, SAFETEA-LU program for Projects of National and Regional Significance, there is no national program to facilitate such public private partnerships. The railroads are seeking Federal investment tax credits for such capacity improving projects but there has been little movement on that proposal. The Commission recommended the tax credits as well as a National freight transportation program that would invest in high-cost multimodal freight infrastructure having national and regional benefits.

The Coalition, through MAROps, SEROps, and NEROps continues to support multistate efforts to identify freight and passenger rail bottlenecks and improvement needs and study potential institutional and funding mechanisms for implementation. Further, the Coalition is continuing to support study of Short-Sea Shipping (also known as Marine Highway) potential in the corridor.

Coalition Opportunities

- Provide a multistate system perspective on rail freight capacity and operations linked to economic, social, and environmental goals of Coalition members.
- Formulate institutional strategies and arrangements to coordinate capital and operations planning among railroads, states, and private sector investors.
- Build on MAROps II, SEROps, NEROps programs to advance capital, operating and regulatory solutions.
- Educate stakeholders on value of authorizing a national/regional infrastructure bank system to fund multistate projects of national and regional significance.

Table 4.3 Interstate/Intercity Commerce – Freight Rail Systems and Short-Sea Shipping

	Northeast	Mid-Atlantic	Piedmont	Florida
Examples	<p>“Harrisburg” emerging as rail intermodal center</p> <p>Port Authority New York/New Jersey PIDN.</p>	<p>NS Heartland Corridor.</p> <p>CSX National Gateway.</p> <p>Baltimore-Washington Tunnels.</p> <p>MAROps Program.</p>	<p>NS Crescent Corridor (parallels I-81).</p> <p>CSX National Gateway linkages to Charlotte to Wilmington port.</p>	<p>CSX Winter Haven (FL) Integrated Logistics Center.</p>
2040 Vision Issues	<p>Clearing rail chokepoints.</p> <p>Consolidating and updating urban rail terminals.</p> <p>Growing truck VMT generated by inland rail ports and terminals.</p>	<p>Clearing rail chokepoints.</p> <p>Intermodal access to ports.</p> <p>Defining public benefits of rail investment (e.g., relieving highway congestion, etc.).</p>	<p>Shifting freight traffic from truck to rail.</p>	<p>Ensuring short-line rail and truck access to major freight rail terminals at Winter Haven and Jacksonville.</p> <p>Finding viable coastal shipping markets.</p>
2040 Vision Issues (cont.)	<p>Financing improvements.</p> <p>Consolidating terminals and co-locating with major shippers.</p> <p>Separating intercity passenger and freight rail, especially in high-speed intercity passenger rail corridors; e.g., using dedicated tracks or moving from shared ROWs to separate ROWs.</p> <p>Anticipating changing demand for rail freight; e.g., What is the impact if more Asian freight is delivered to East Coast ports.</p> <p>Finding viable coastal shipping markets.</p> <p>Preserving competition; minimizing captive shipper situations.</p>			
Potential Solutions	<p>Upgrade rail network to achieve increased capacity and throughput, including double-stack capacity throughout corridor.</p> <p>Provide for increased on-dock rail at East Coast ports.</p> <p>Build East Coast short-sea market and service options.</p> <p>Create national/regional infrastructure financing mechanisms (e.g., infrastructure banks) and incentives to fund multistate projects of national and regional significance.</p> <p>Adopt positive train control and electronic braking to improve rail line productivity.</p>			
Coalition Opportunities	<p>Provide a multistate system perspective on rail freight capacity and operations linked to economic, social, and environmental goals of Coalition members.</p> <p>Formulate institutional strategies and arrangements to coordinate capital and operations planning among railroads, states, and private sector investors.</p> <p>Build on MAROps II, SEROps, NEROps programs to advance capital, operating and regulatory solutions.</p> <p>Educate stakeholders on value of authorizing a national/regional infrastructure bank system to fund multistate projects of national and regional significance.</p>			

4.3 INTERSTATE/INTERCITY COMMERCE – HIGHWAY SYSTEMS

Despite substantial shifts to other modes assumed in the Vision driven scenario, additional highway capacity will be needed in the corridor just to maintain today's performance and more to improve performance. There are growth regions within I-95 Corridor Coalition states in which highway capacity may be added in the form of new facilities on new location. However, for much of the corridor – particularly within the more highly developed and slower growth regions, adding greenfield highways will be a rare event. Yet, even in these areas the inevitable need for major reconstruction of bridges and pavements over a decades-long infrastructure life cycle will afford opportunities to selectively add highway lanes and transit lines, improve interchanges and intermodal connections, and install advanced multimodal technologies with the goal of improving capacity while rebuilding the facility. In fact, it will be unusual to rebuild a major transportation facility driven by physical condition issues without adding capacity where the combination of existing congestion and physical configuration provide both the justification and the opportunity to incorporate enhanced service possibilities – however they are manifested in terms of mode. This additional capacity will often be in the form of managed lanes facilitated by the advanced technologies; e.g., priced lanes (including possibility of bus rapid transit), truck lanes, and distributor-collector lanes. Table 4.4 highlights the issues and opportunities related to interstate/intercity highway commerce.

States are recognizing this need and are attempting to improve Interstate corridors in the region but funding and multistate planning and implementation continue to be challenges. Examples include:

- Virginia has been studying improvements to the I-81 corridor for a number of years. Earlier proposals for tolling with separated truck lanes have been put aside for now with a focus in the shorter term on the addition of truck climbing lanes and other operational improvements along various segments. FHWA is still advancing a toll pilot application for I-81 as a potential future option. A multistate group has formed to address interstate commerce needs in the entire I-81 corridor.
- The southeast states from Virginia to Florida joined together in a successful application to U.S. DOT for designation of I-95 through their states as a COF for multistate improvement.
- The dynamics of funding and institutionally managing such major projects is illustrated in Pennsylvania where the State is facing the need for additional revenues to fund major reconstruction of its key Interstate corridors as well as other vital highway and transit infrastructure around the State. In 2007, Pennsylvania's legislature authorized a plan for the Pennsylvania Turnpike Commission to increase tolls on the existing 531-mile facility as well as seek Federal approval to toll I-80, parallel to the Pennsylvania Turnpike to the

north, in order to raise additional revenue for major reconstructions and other surface transportation improvements. Given significant opposition and lack of progress on the 2007 proposal, the State pursued an alternative plan to seek a long-term private concession lease of the Turnpike; on May 15, 2008, Governor Rendell announced that the Commonwealth had selected a proposal for a 75-year concession of the 531-mile Pennsylvania Turnpike. In addition to taking over the operation and reconstruction of the Turnpike, the private consortium agreed to pay \$12.8 billion upfront for Pennsylvania to invest in a long-term fund that would generate significant annual payments to be used for Pennsylvania roads, bridges, and transit. Concurrently, the State modified and resubmitted its 2007 Federal request for a reconstruction toll pilot on I-80 thus keeping both options in play. Either option would ultimately require the approval of the state legislature; as of the fall of 2008, it looks like neither option will be advanced by the legislature.

Assuring interstate commerce into and around major metropolitan areas is a particular concern for the I-95 corridor. With 42 of the largest 100 metropolitan areas in this corridor, interstate commerce traffic typically navigates multiple metropolitan areas and many potential recurring and nonrecurring bottlenecks. A national Freight Bottleneck study for FHWA identified approximately 300 freight-oriented bottlenecks, most of which were major Interstate interchanges in and around large metropolitan areas. For example, completion of the Springfield Interchange and the Wilson Bridge in the Washington area will provide significant bottleneck relief for local and interstate commerce in the I-95 corridor. The I-95 Coalition is now conducting a more detailed truck bottleneck study (Matos) in the Mid-Atlantic area.

The I-95 Coalition provides an ongoing forum for interstate commerce issues. As part of its COF application, the Coalition also proposes to build on its recent studies and develop financing approaches, including possible model legislation for multistate transportation infrastructure banks and public-private partnerships that states could use to implement projects that address major Interstate commerce (highway or rail).

Coalition Opportunities

- Continue to advance multistate bottleneck analysis and potential implementation solutions.
- Develop options for multistate funding; e.g., multistate infrastructure banks.
- Advocate for attention to long-distance corridor movements through metro areas.
- Improve data on commodity and passenger flows through ICAT bottlenecks.

Table 4.4 Interstate/Intercity Commerce – Highway Systems

	Northeast/Mid-Atlantic	Piedmont	Florida
Examples	Urban interstate bottlenecks such as the Springfield Interchange and Wilson Bridge. MAROps truck bottleneck study. Separation of traffic functions on NJTPike. Major reconstruction (e.g., Pennsylvania Turnpike).	I-81/I-40 long-distance freight corridor. Consideration of truck bypass lanes in Atlanta. Southeast I-95 COF.	Southeast I-95 COF. Managed lanes in South Florida and potentially other segments of the I-95 corridor.
2040 Vision Issues	<p>Reducing highway congestion and bottlenecks.</p> <p>Assuring interstate commerce movement into, through, and out of metropolitan areas.</p> <p>Widening Interstate corridors concurrent with major reconstruction.</p> <p>Diverting longer-distance truck traffic to rail to help relieve truck pressure on congested highways.</p> <p>Financing highway maintenance, reconstruction, and widening.</p> <p>Improving highway safety/reducing fatalities.</p> <p>Supporting regional economy.</p> <p>Separation of interstate traffic from local metropolitan commuter and business traffic.</p> <p>Managing major reconstruction and expansion projects – mitigation of work zone congestion.</p> <p>Standardizing and improving effectiveness of CVO regulatory operations.</p>		
Potential Solutions	<p>Program for bottleneck mitigation.</p> <p>Plan for major asset reconstruction in corridor.</p> <p>Provide for interstate commerce through and around metro areas.</p> <p>Consider separate truck lanes in heavy freight corridors.</p> <p>Improve intermodal connectors.</p> <p>Consider freight village concepts to consolidate intermodal functions.</p> <p>Provide high-occupancy vehicle incentives.</p> <p>Expand use of tolling and pricing and facilitate PPPs for highway development and operation.</p> <p>Consider privatized rest areas.</p> <p>Adopt “Highways For Life” concepts; use advanced materials and construction technologies.</p> <p>Adopt context-sensitive design throughout corridor.</p> <p>Dramatically reduce fatalities through highway, driver, and vehicle strategies including advanced technology.</p> <p>Create institutional arrangements for multistate improvements.</p> <p>Reform U.S. DOT and Federal program delivery; establish national investment policy that facilitates multistate delivery.</p> <p>Improve passenger and freight data for multimodal corridor analysis.</p>		
Coalition Opportunities	<p>Continue to advance multistate bottleneck analysis and potential implementation solutions.</p> <p>Advocate for attention to long-distance corridor movements through metro areas.</p> <p>Develop options for multistate funding; e.g., multistate infrastructure banks.</p> <p>Assess major reconstruction needs on an aging I-95 corridor/regional Interstate infrastructure.</p> <p>Improve data on commodity and passenger flows through ICAT.</p>		

4.4 AGGRESSIVE OPS/VII

The Vision driven scenario assumes an aggressive Corridor operations strategy including the full corridor-wide deployment of ITS as warranted, and aggressive 24/7 traffic and disruption-responsive applications of state-of-the-practice procedures in metropolitan areas as described in Section 3.0. In addition, vehicle-infrastructure integration is assumed to have been implemented and full market penetration achieved. Table 4.5 indicates the key issues and opportunities both corridor-wide and for key subregions.

Since its inception, the Coalition has been instrumental in advancing incident management. This exemplified in three areas:

1. As proposed in its COF application, the Coalition will expedite the adoption of Quick Clearance/"Move It" incident management practices throughout the Coalition region. The Coalition's goal is to reduce congestion and increase safety by clearing incidents more quickly and more reliably through more consistent practices and better management.
2. One of the Coalition's early initiatives was to develop a pioneering electronic information sharing system called the Information Exchange Network (IEN). The IEN enabled police and transportation agency staff to send information about major incidents and construction zones to other jurisdictions so that travelers could be informed and plan alternate routes or take other appropriate actions. The Coalition has been working for several years to replace its IEN network with a new information exchange system. The new system, to be known as the Information Systems Network (ISN), will have the capability to automatically share information among member agency traffic management centers and with travel information service providers and the public.
3. The Coalition is looking for new ways to capitalize on private sector technology and initiative. Recently the Coalition has partnered with Inrix to provide improved quality probe data for traveler information. Also, the NY Thruway has initiated a Smart Roadway test of commercial VII applications.

2040 vision issues include overcoming both the technical and institutional barriers to fuller implementation of systems operations and management strategies, achieving full interstate and interregional integration along the corridor and closer relationships with partners in the public safety community. In addition – as in the case of VII – new and productive forms of public-private partnership are assumed.

Coalition Opportunities

The Coalition's COF application envisions the corridor as a continuing laboratory for advancing 21st Century operations and management concepts. Coalition opportunities include:

- Position systems operations institutionally as a core program within state DOT policy with formal program development procedures, line item budget, consolidating organization, formal PSA relationships;
- Greater focus on standards and consistency in multistate environment;
- Develop architecture and provide laboratory for tests of advanced operations/VII concepts;
- Foster regional approaches to traveler information, incident management, etc.;
- Foster cooperation with emergency response agencies as well as their support for the rapid clearing of incidents; and
- New forms of public-private partnerships.

Table 4.5 Aggressive Ops/VII

	Northeast	Mid-Atlantic	Piedmont	Florida
Examples	NY Thruway Smart Roadway test. NY INFORM VII demo. Incident management. 511. ISN/IEN.	Incident management. 511. Traveler information. Traffic travel time/ vehicle probes (Inrix).	Incident management. 511.	Incident management. 511.
2040 Vision Issues	Real-time information. VII implementation path including public and private roles. Standards and consistency.			
Potential Solutions	Comprehensive traveler information programs aided by “perfect” information. Multistate interoperability for fare payment, e.g., E-ZPass model. Consistent incident management across region. Joint multistate evacuation plans. Weigh in advance, virtual weigh station concepts. Standard RFID for freight. Seamless security provisions across modes aided by technology. Regional level TMCs. Reallocation of traffic management from public safety to DOTs. Dramatically reduce fatalities through a combination of roadway, vehicle, and driver behavior strategies.			
Coalition Opportunities	Develop architecture and provide laboratory for tests of advanced operations/VII concepts. Foster regional approaches to traveler information, incident management, etc. Foster cooperation with emergency response agencies as well as their support for the rapid clearing of incidents.			

4.5 FINANCING/PRICING TRANSITION

The potential of VMT charging – both for revenue raising – and for congestion management is increasingly recognized. The TRB, the Commission and others have identified the need to transition away from a fossil fuel-based financing system given emerging energy and climate policy. The Commission recommended that the next surface authorization bill include a major national study to develop a strategy for transition to an alternative to the fuel tax. The first phase would determine feasibility with a second phase to conduct wide-scale pilots of VMT fees or related feasible concepts with recommendations on specific timing and mechanisms for transition. Both technology and institutional issues will have to be addressed for a smooth transition to occur. Oregon is the only state to date that has completed a test of such a VMT fee concept. They found the concept feasible and are now considering next steps on the path toward implementation.³⁷

Some pioneering steps are already evident in the Corridor. Several toll facilities in the corridor have already adopted variable pricing on their facilities and new Federally enabled pricing projects are proceeding in the corridor including Miami I-95 HOT lane conversions and the Virginia/Washington metro area HOT lanes on the I-495 Beltway, a public private partnership and Maryland will have the first U.S. full facility dynamic pricing on the Intercounty Connector now under construction in the Washington metro area. U.S. DOT has also issued proposed rules for pricing of peak-period airport landing slots at JFK and Atlanta airports.

Virginia's highway pricing plans are perhaps the most aggressive in the I-95 region and mix aspects of PPPs and innovative finance with pricing innovations on major Interstate facilities. A network of high-occupancy toll lanes ("HOT lanes")³⁸ is being implemented in northern Virginia south and west of Washington, D.C. VDOT and a private sector consortium recently reached commercial and financial close for a concession to design, build, finance, operate

³⁷ *Oregon's Mileage Fee Concept and Road User Fee Pilot Program – Final Report*, Oregon DOT, November 2007.

³⁸ High-occupancy toll lanes, or "HOT lanes," are lanes that are open to buses and high-occupancy vehicles, just like traditional high-occupancy vehicle and carpool lanes, or "HOV lanes," but which are also available to single-occupant vehicles that pay a toll. Tolls charged in HOT lanes can be variable, meaning they are reduced when there is little or no traffic and they are increased when there is more traffic. Variable tolls encourage people to travel when there is less traffic and ensure that a reliable travel time is always available for drivers willing to pay a toll. HOT lanes implemented in the United States include the 91 Express Lanes in Orange County, California, the I-15 HOT Lanes in San Diego, California, the I-394 HOT Lanes in Minneapolis, Minnesota, and the I-25 HOV/Express Toll Lanes in Denver, Colorado.

and maintain two HOT lanes on an approximately 14-mile portion of the Capital Beltway (I-495) around southwest Washington, D.C. Virginia is also pursuing a PPP with the same private sector companies for a 56-mile HOT lanes corridor along I-95 and I-395 south of Washington, D.C. This is a heavily congested commuter corridor that links up with the Capital Beltway HOT Lanes Project in Springfield. VDOT expects these HOT lanes to provide an innovative solution to serious congestion problems and to provide new alternatives for carpoolers, vanpoolers, transit riders, motorists, slugs, businesses, and communities throughout the northern Virginia area.

The funding mix for the Beltway project provides an interesting model for the future. The concessionaire is using toll revenues to be collected on the HOT lanes to finance approximately \$1.4 billion of the project's expected cost of approximately \$1.8 billion. The mix includes a \$588 million loan from the U.S. DOT's TIFIA program, \$589 million of private activity bonds ("PAB") authorized by the U.S. DOT and issued on June 12, 2008, and private equity contributions totaling \$350 million from the members of the concessionaire. Approximately \$409 million will be funded from Federal-aid and state sources.

Key vision issues are building political consensus for a transition to VMT fees and pricing concepts, ensuring multistate continuity and interoperability, converting free to tolled/priced roads, strengthening institutional capacity, and addressing equity among income groups and interstate commerce versus local traffic. Table 4.6 highlights the key regional issues and opportunities.

Coalition Opportunity

The recent Oregon VMT pilot final report conclusion is instructive in regard to the need for a multistate partnership: "Oregon is unlikely to implement the Oregon Mileage Fee Concept alone. Refining the necessary technology requires investment of multiple millions of dollars. Embedding on-vehicle technology into new passenger vehicles requires the acceptance and cooperation of the world's politically influential automobile manufacturers. Applying collection equipment at service stations requires the acceptance and cooperation of the also influential gasoline distribution industry. In order to accomplish these things, Oregon must obtain the support of the Federal government, join a consortium of states, or work in partnership with a very large state with huge market influence such as California."³⁹

The key opportunity for the Coalition region appears to be in acting as a multi-state laboratory. Products might include a standard architecture for regional VMT fees, testing of a GPS-based VMT pilot (e.g., explore potential in next authorization for funding of pilot program; advance a Coalition Year 17 study to

³⁹*Oregon's Mileage Fee Concept and Road User Fee Pilot Program – Final Report*, Oregon DOT, November 2007.

prepare the groundwork for obtaining funding for such a test). The Coalition could then potentially be a test bed for future authorized VMT fee pilots building on its E-ZPass experience.

Table 4.6 Financing/Pricing Transition (e.g., VMT User Fees, etc.)

	Northeast	Mid-Atlantic	Piedmont	Florida
Examples	NYC Cordon (proposed, then deferred). Port Authority New York/New Jersey variable tolls. E-ZPass.	VA Beltway HOT lanes. D.C. metro area HOT lane network. Maryland Intercounty Connector fully priced.	Atlanta regional HOT lanes. Southeast I-95 COF tolling.	Miami I-95 HOT lanes (Urban Partnership). Southeast I-95 COF tolling.
2040 Vision Issues	Building political consensus. Establishing standards. Ensuring multistate continuity and balancing network operations. Converting free to priced roads. Restructuring regulatory policies and programs to match new transportation system needs. Reorganizing public sector institutional capacity. Balancing pricing of local and through traffic. Ensuring truck access. Converting free to tolled roads.			
Potential Solutions	Conduct VMT pilot in region to advance architecture, standards, technology, administrative mechanisms, and related issues. Advocate for liberalized tolling/pricing provisions.			
Coalition Opportunities	Use coalition region as laboratory for transition testing of multistate GPS-based VMT pilot (e.g., explore potential in next authorization for funding of pilot program; advance a Coalition Year 17 study to prepare the groundwork for obtaining funding for such a test).			

4.6 ROLE OF CLIMATE AND ENERGY IN SHAPING AND EXECUTING THE VISION

Climate and energy issues are emerging as key driving forces in a 2040 vision for the corridor. Table 4.7 highlights the regional issues and opportunities related to climate and energy. Many states and MPOs already have climate planning activities underway and in some cases states have legislated aggressive GHG reduction targets. The 2008 spike in energy prices impacted both passenger and freight trip chains and modal choices. It is too early to clearly see how the dual factors of energy and climate policy will affect transportation but it is clear that we have entered a new era that will require dramatically different policy choices than those of recent decades. Congress has already mandated more aggressive CAFÉ and alternative fuel standards and is considering comprehensive climate legislation. The new Administration has promised early action on energy policy as well.

The Vision driven scenario assumes implementation of aggressive energy and climate responsive transportation strategies. Most importantly, a doubling of fleet efficiency in the corridor is assumed by 2040 as well as a substantial shift to alternative fuels. In addition, a 19 percent VMT reduction from the 2040 trend forecast is assumed through a broad strategy of pricing, land use, mode shift, telecommuting, and other demand management strategies throughout the region. These strategies in combination can go a long way toward meeting emerging national and state greenhouse gas reduction targets but will likely require further analysis on a multistate basis.

National cap-and-trade legislation is being considered in parallel with surface transportation authorization and there may well be significant linkages between the two authorizations. Carbon fees in the form of higher fuel taxes are a likely component of any climate legislation; potential use of revenues for transportation could become a key issue in the coming authorization.

The other serious climate concern for transportation in the region is sea level rise and increasing storm surges in coastal areas as well as increased runoff and flooding inland attributable to more intense storms. Multistate climate impact studies by the U.S. DOT Climate Center and the recent TRB Climate Impact Study have identified the Atlantic and Gulf Coast regions as particularly vulnerable. More in depth inventory of potentially vulnerable transportation infrastructure is recommended in these studies. New York City for example just formed a task force to assess necessary infrastructure adaptation strategies for the region's infrastructure.

Coalition Opportunities

- Assess greenhouse gas emission reduction strategies for multistate corridors and megaregions;
- Pursue environmentally friendly truck parking, staging, and dray vehicle replacement (e.g., ports) pilots on behalf of members;
- Facilitate multistate emergency response capabilities to address increased storm frequency and intensity;
- Research use of national or multistate cap-and-trade revenues for state or multistate transportation-related GHG reduction efforts; and
- Explore multistate climate impact vulnerability/adaptation studies building on early work of U.S. DOT Climate Center in the Gulf and Atlantic regions.

Table 4.7 Regional Climate and Energy Implications

	Northeast	Mid-Atlantic	Piedmont	Florida
Examples	NE regional climate cap-and-trade for utilities (RCCI). MA, VT, NH, NJ – GHG reduction goals of 75 to 85% by 2050; various base years. NYC climate adaptation task force.	U.S. DOT Climate Center – study of sea level rise impacts on Atlantic Coast/Phase I.	U.S. DOT Climate Center – study of sea level rise impacts on Atlantic Coast/Phase 2.	U.S. DOT Climate Center – study of sea level rise impacts on Atlantic and Gulf Coasts/Phase 2. GHG reduction goal of 80% below 1990 levels by 2050.
2040 Vision Issues	Reducing greenhouse gas emissions by 60 to 80 percent by 2050 in concert with emerging state, Federal, and international goals. Identifying long-term infrastructure climate adaptation issues on Atlantic and Gulf coasts. Achieving energy/fuel efficiency goals.			
Potential Solutions	Large-scale telecommuting. Clean truck programs at ports and other intermodal terminals. Environmentally friendly truck parking and staging areas. Multistate infrastructure climate impact assessments and adaptation strategies. Alternative fuel infrastructure for corridor. Doubling fleet fuel efficiency. Expand regional cap and trade beyond utilities.			
Coalition Opportunities	Assess greenhouse gas emission reduction strategies for multistate corridors and megaregions. Pursue environmentally friendly truck parking, staging, and dray vehicle replacement (e.g., ports) pilots on behalf of members. Facilitate multistate coastal infrastructure vulnerability assessments to address sea level rise and assess emergency response capabilities to address increased storm frequency and intensity. Research use of national or multistate cap-and-trade revenues for state or multistate transportation-related GHG reduction efforts.			

5.0 Vision Study Conclusions and Opportunities

The 2040 vision principles and a vision driven scenario that were developed and analyzed for this study illustrate a multimodal path forward for transportation that supports regional economic growth while substantially contributing to emerging energy and GHG emission targets. This bold alternative (to current trends) vision for the corridor region would require implementation of aggressive multimodal investment, institutional, and operation and management strategies as described in the preceding sections.

5.1 SUMMARY OF KEY COALITION OPPORTUNITIES FOR ADVANCING THE VISION

The most promising opportunities for the Coalition to advance the corridor vision seem to be in the following areas:

1. Providing a **regional and systems perspective** that supports coordinated policy, planning, and investment decision-making by state DOT and member agencies.
2. Advocating and facilitating **intermodal** approaches in the corridor for both passenger and freight movement.
3. Developing **multistate funding approaches** for highway and rail corridor capacity and bottleneck relief. Strategies could range from streamlined pooled funding mechanisms to regional infrastructure banks.
4. Providing a laboratory for development and testing of **advanced operations/VII concepts**.
5. Hosting and coordinating a pilot/development program for an East Coast, multistate, **VMT user-fee revenue collection system**. The Commission recommended that the next surface transportation legislation provide funding for accelerated development of a VMT-based revenue system.
6. Providing a forum for Coalition states to discuss, shape, and coordinate strategies addressing **climate mitigation and adaptation**.

5.2 COLLABORATIVE ROLE OF THE COALITION IN ADVANCING THESE VISION POLICY ISSUES

The I-95 Vision Study has underscored the broadening of the Coalition in terms of its geographic scope as well as its functional interests. What began with a Northeast focus on the real-time highway operations of I-95 has evolved to an East Coast regional umbrella addressing all modes of transportation as well as the economic vitality and environmental quality issues which are influenced by and which in turn affect transportation.

In the past, most of the day-to-day issues confronting Coalition members have tended to be on a subregional scale. And some areas of concern – most notably encompassing ports, railroads, and airports – involve competitive forces within the Coalition’s geography and among Coalition entities. Today, however, it is increasingly recognized that there are a range of issues at a larger scale, the most obvious being the movement of people and freight within the north-south transportation corridor along the east coast, involving common concerns ranging from real time operations to long-term system viability and modal integration.

With multistate megaregions becoming the economic engines competing not just on a national scale but in a global context as well, the east coast of the United States and the several megaregions which it encompasses is competing with regions in the rest of the Country – and globally. For example, the need for improved passenger and freight rail service along the east coast connecting west, the combined attraction among east-coast ports as they compete for global shipping business, the need for unparalleled intermodal integration to dramatically improve transportation efficiencies, the need to address environmental and energy issues with a common set of goals and perhaps common approaches, the need to find new approaches to transportation financing that transcend political boundaries. These issues transcend matters of state or subregional competition and relate to broader and common concerns of all Coalition members.

However, the Coalition is neither a governmental entity nor an interstate compact. It has no independent powers of its own. Yet, what has become clear over the years is that there is a need for the Coalition to provide a collaborative forum to address issues of common interest where concerted actions could be mutually beneficial – both on a corridor-wide as well as a subregional basis. Here the Coalition can play an important role.

As a point of departure, the I-95 Vision Study offers the opportunity not only for a collaborative vision of the future but for advocating measures that would enhance the quality of transportation, the vitality of the economy, and the contribution of the broad corridor-wide region to issues of climate change and energy. Some of these may be corridor-wide and others may involve regional geographies or even traditionally competitive areas where a collaborative forum enhances not only the whole but each of the coalition entities individually as well.

A. Vision and Scenario Planning in Coalition States and Metropolitan Areas

Visioning and scenario techniques are increasingly being used to frame transportation planning and land use decisions. These techniques allow planners, policy-makers, and citizens to take a more proactive approach to planning their built and natural environments by working together to form a shared vision of a distant future. Numerous states and metropolitan regions in the I-95 corridor are engaged in visioning activities and submitted information regarding efforts they believed were pertinent to the I-95 visioning study. While this summary of state and regional visioning activities compiled in late 2007 is not comprehensive and may not reflect the latest activities among the states and MPOs, it does give a flavor of the wide array of visioning efforts occurring across the I-95 corridor. Indeed, it is apparent that states, metropolitan regions, and multistate corridors are increasingly experimenting with visioning techniques and scenario planning. Furthermore, visions are being formed for multistate megaregions and for the nation as a whole. As these visioning efforts proceed forward it will be important to understand where they intersect and how they could potentially complement each other.

A.1 STATE VISIONING EFFORTS

Many states in the I-95 corridor are either in the process of updating, or have recently updated, their State Long-Range Transportation Plans (SLRP). In doing so, they are taking more advanced approaches to their public outreach techniques. Often this has meant working collaboratively with local, regional, and Federal agencies, forming outreach groups to solicit ideas, holding public workshops, or surveying the general public. Examples of this type of outreach can be found in the SLRP processes of South Carolina, North Carolina, Maryland, Pennsylvania, Connecticut, and New York. It is likely that most, if not all, the states in the I-95 corridor are engaged in similar forms of public outreach.

Highlights from state SLRPs are outlined below. Special attention is given to Florida and Vermont's SLRPs and other states with progressive land use and corridor planning techniques.

South Carolina adopted its Statewide Multimodal Transportation Plan in 2004 and is currently in the process of updating it. The plan contains three main elements: the statewide strategic corridor plan, the statewide public transit plan, and the railroad right-of-way preservation inventory. While visioning was not at

the center of South Carolina's effort, the State did engage in a broad outreach effort to identify state transit needs from the bottom up. South Carolina Department of Transportation (SCDOT) formed a resource group, which included representatives from local, state, and Federal agencies, transportation advocacy groups, and environmental interest groups. One of the items the resource group was tasked with was to identify perceptions, needs, and a vision, for public transit services at the regional, interregional, and statewide level.⁴⁰

Likewise, **North Carolina's** 2004 SLRP included an extensive outreach effort North Carolina DOT held stakeholder interviews and outreach meetings, regional forums, a transportation summit, environmental outreach, and strategic highway regional forums. Again, while none of the outreach efforts were explicitly visioning efforts, the regional forums had a highly interactive, participatory format, which included facilitated breakout sessions. Similarly, the transportation summit allowed high-level policy-makers to discuss various investment strategies and policies.⁴¹

In **Connecticut's** 2007 SLRP, Interstate cooperation is a major element. According to the plan, "the Transportation Strategy Board believes that effective partnerships with [its] neighboring states and their respective transportation systems are essential to Connecticut's development of a sound and effective state transportation system."⁴² Also emphasized in the plan is Executive Order No. 15, signed in October of 2006, to form an Office of Responsible Growth within the Office of Policy and Management. The Office of Responsible Growth published its first report to the governor in February 2008.

The Massachusetts SLRP stresses three themes: fix it first, communities first, and smart growth/sustainable development.⁴³

- **Fix-It-First** emphasizes the importance of preserving the Commonwealth's existing infrastructure and using that infrastructure to support housing development, job creation, commercial activity, and enhanced quality of life.
- **Communities First** supports investment and development principles that are consistent with local priorities, preserve community character, and enhance the natural and built environments.

⁴⁰*South Carolina Statewide Comprehensive Multimodal Transportation Plan*, South Carolina DOT, 2004.

⁴¹*Charting a New Direction for NCDOT: North Carolina's Long-Range Statewide Transportation Plan*, North Carolina Department of Transportation, September 2004.

⁴²*State of Connecticut Long-Range Transportation Plan*, Connecticut Department of Transportation, 2004.

⁴³*Commonwealth of Massachusetts Long-Range Transportation Plan*, Massachusetts Executive Office of Transportation, 2006.

- **Smart Growth/Sustainable Development** promotes the creation of housing and employment opportunities that preserve our natural and cultural landscapes; recognizes the need for equity in the provision of transportation services; respects the mobility needs of all users; and couples community preservation with economic growth. The Commonwealth's Sustainable Development Principles are designed to translate traditional development patterns, such as the New England village, into 21st Century development strategies. Addresses transportation and sustainable development.

There has been strong executive support in recent years for strategic land use and transportation planning in Massachusetts. Governor Mitt Romney created the Office for Commonwealth Development to coordinate infrastructure development and promote smart growth. The office is guided by 10 principles: redevelop first, concentrate development, be fair, restore and enhance the environment, conserve natural resources, expand housing options, provide transportation choice, increase job opportunities, foster sustainable businesses, and plan regionally.

Furthermore, efforts were recently taken by Governor Deval Patrick to integrate and coordinate transportation planning in the State. In July 2007, the governor signed Executive Order 488, establishing a mobility compact in the Commonwealth. The compact was signed by the following transportation agencies:

- Executive Office of Transportation and Public Works (EOTPW);
- Department of Conservation and Recreation (DCR);
- Massachusetts Highway Department (MassHighway);
- Massachusetts Turnpike Authority (Masspike);
- Massachusetts Bay Transportation Authority (MBTA);
- Massachusetts Port Authority (Massport);
- Massachusetts Aeronautics Commission (MAC);
- Registry of Motor Vehicles (RMV); and
- Massachusetts Association of Regional Transit Authorities (MARTA).

Pennsylvania's SLRP was updated in 2006. As part of the SLRP, an extensive public outreach campaign was undertaken. A 75-member development team, representing state and local government, businesses, and other organizations was formed; the general public was asked to provide their views through telephone, on-line, and written surveys, and workshops; and 20 workshops were held with representatives that shared a common focus, i.e., bicycling, real estate

developers, environmental groups were held to develop actions to implement the plan.⁴⁴

Pennsylvania is also taking steps to better integrate land use and transportation planning. In 2007, it released its *Sound Land Use Implementation Plan: Translating Smart Transportation Principles to Reality*. The plan identified 10 interrelated Smart Transportation principles for sustainability. They include: money counts, choose projects with high value-to-price ratio, enhance the local network, look beyond level-of-service, safety first, and maybe safety only, accommodate all modes, leverage and preserve existing investments, build towns and not sprawl, understand the context/plan and design within context, and develop local governments as strong land use partners.⁴⁵

Furthermore, in 2005, the Pennsylvania Economic Development adopted a set of key principles and criteria for growth in the State. They are referred to as the Keystone Principles for Growth, Investment, and Resource Conservation. Each were designed to measure projects in relation to the following 10 goals: redevelop first, provide efficient infrastructure, concentrate development, increase job opportunities, foster sustainable businesses, restore and enhance the environment, enhance recreational and heritage resources, expand housing opportunities, plan regionally/implement locally, and be fair.⁴⁶

Similarly, New York engaged in an extensive public outreach campaign when they updated their State Transportation Plan. Nine public hearings were held throughout the State, where citizens, interest groups, agency representatives, and legislators could voice their opinions.⁴⁷ Beyond the SLRP, New York has been actively planning for its multimodal corridors through its New York Corridors Initiative. Corridors are being identified and defined as being either a trade corridor, intercity passenger travel corridor, tourism corridor, or New York State commuter corridor. Thus far, the State has studied the I-87 and I-90 corridors, looking at how they function from a state, regional, and global economics standpoint. A Statewide Trade Overview Study will soon be underway and will provide Trade Corridor freight strategies that emphasize capacity optimization and economic development.

New York is just beginning its study of the Mohawk Erie Corridor. The corridor is a major east-west route that links New York to four international gateways:

⁴⁴*Pennsylvania Mobility Plan*, Pennsylvania Department of Transportation, June 2007.

⁴⁵*Sound Land Use Implementation Plan: Translating Smart Transportation Principles into Reality*, Pennsylvania Department of Transportation, 2007.

⁴⁶*Commonwealth of Pennsylvania Keystone Principles of Growth, Investment, and Resource Conservation*, <http://www.phmc.state.pa.us/bhp/pkp.pdf>.

⁴⁷*Strategies for a New Age: New York State's Transportation Master Plan for 2030*, New York Department of Transportation, 2006.

Toronto, Montreal, New York City, and Boston. The study will formulate a long-term vision and consider economic development opportunities for the corridor.

In its most recent, 2007 update of its SLRP, the **Maine** Department of Transportation took a new approach to its outreach efforts. The DOT worked collaboratively with the State's Economic Development Districts and Regional Councils to identify corridors of regional and economic significance. Transportation, land use, and economic objectives were developed for each corridor.⁴⁸

One of the more unique corridor planning efforts in the I-95 corridor is Maine's *Gateway 1 – Collaborative Planning for Mid-Coast Maine Study*. The Gateway 1 initiative is looking at how to collaboratively plan for transportation and land use along Maine's Route 1 corridor.⁴⁹ The study evaluates three scenarios:

1. **Riding the Currents** – The Corridor develops at the same pace as existing trends;
2. **Full Wind** – The economy ramps up – full steam ahead; and
3. **Perfect Storm** – Events outside the Corridor's control mean the economy goes downhill – fast.

According to the Maine Department of Transportation, ultimately, the agreed upon solutions will include a mix of three things:

1. Priorities for investments in and modification of the transportation system;
2. Transportation management techniques; and
3. Land use management techniques that affect Route 1, including design standards, regulation, acquisition of land, easements, etc.

Visioning efforts are increasingly popular in **Florida**. The 2025 Florida Transportation Plan, the State's current SLRP adopted in 2005, included several recommendations supporting the development of regional visions in the State.⁵⁰ The 2025 FTP set a long-range objective to "develop regional visions and action plans that integrate transportation, land use, economic, community, and environmental systems to guide transportation decision-making and investment." The 2025 also states that:

⁴⁸*Highlights from Maine's Long-Range Transportation Plan "Connecting Maine,"* Maine Department of Transportation, December 2007.

⁴⁹*Gateway 1: An Innovative, Community-led Land Use and Transportation Planning Project for Maine's Mid-Coast,* Maine Department of Transportation, www.gateway1.org.

⁵⁰*Moving Together: 2025 Florida's Transportation Plan,* Florida Department of Transportation, 2005.

- Regional visions should be developed for relatively large geographic areas throughout the State through a bottom up process in which all jurisdictions join one or more regions;
- Regional visions and action plans should be the result of close coordination and harmonization among currently separate planning processes related to transportation, land use, economic development, community development, and environmental stewardship;
- Regional visions and action plans should augment and build upon institutions, processes, and plans where they already exist, and form new institutions, processes, and plans where they do not;
- The regional planning process should result in key outcomes, including priorities for investments in a regional transportation network that includes multimodal options and reflects the balance between efficient regional travel and community and environmental resources within each region;
- Transportation funding from various sources should be identified to help provide significant, recurring, and reliable support for developing and implementing regional visions and action plans throughout the State; and
- The network of regional leaders should identify major existing legislative, administrative, and other impediments to the regional coordination process and make recommendations to applicable governmental entities on how to resolve them.

Furthermore, FDOT, in its *Draft Florida's Future Corridors Implementation Guidance: Regional Visioning* sets clear minimum guidelines for what they believe comprises a regional vision.⁵¹ According to the report, a regional vision:

- 1. Defines a clear regional geography and identity.**
- 2. Is led by a network of regional leaders from the public, private, business, and civic sectors.**
 - Includes local elected officials, MPOs and other key transportation partners, as well as key partners involved in other planning processes; and
 - Includes a mechanism for ongoing regional dialogue and planning.
- 3. Reflects the input of the region's residents and other stakeholders.**
 - Documents citizen engagement; and
 - Has continuous availability of information (e.g., web site).

⁵¹Florida's Future Corridor's Implementation Guidance: Regional Visioning DRAFT, Florida Department of Transportation, November 16, 2006.

4. Reflects agreement on the key priorities facing the region.

- Demonstrates consensus on goals and outcomes.

5. Coordinates and harmonizes planning for transportation, land use, economic development, community development, and environmental investment.

- Provides context for planning major transportation investments, including acceptable impacts on other systems;
- Provides context for the creation, review, and reconsideration of all other regional and local plans; and
- Provides very long-term (i.e., 50-year) scenarios for future land development, economic development, environmental investment, and infrastructure investment.

6. Includes an implementation strategy.

- Includes a Memorandum of Agreement (MOA) or other partnership agreement to work toward implementation of vision;
- Includes a process for reconciling differences between the regional vision and community visions and, ultimately, between local government comprehensive plans;
- Includes a process for future updates to the vision and the implementation plan;
- Includes an action plan outlining partner roles and responsibilities; and
- Includes a process for measuring and evaluating progress toward implementation.

In parallel with FDOT's efforts, other statewide organizations also have been engaged in long-range visioning activities.

In 2003, the Florida Chamber Foundation published the *New Cornerstone* report.⁵² The report provides a vision for Florida's economic future, which emphasize what the Foundation refers to as the "Four T's – Trade, Tourism, Technology, and Talent." Also, related to trade, the Florida Ports Council engaged in a ports visioning session in 2006, looking at the future of Florida's ports out to 2016.⁵³

Central to Florida's visioning conversation is the Century Commission. In 2005, Florida's legislature created the Century Commission to develop a 50-year vision

⁵²*New Cornerstone Revisited*, Florida Chamber Foundation, 2007.

⁵³*Florida Seaports' Statewide and Regional Visioning Exercise-PowerPoint Presentation*, Florida Ports Council, 2006.

for the State. There are 15 appointed members to the Century Commission. By law the commission must:

- Annually envision the future for the State;
- Continually consider laws and regulations and make recommendations as to how we can best accommodate population growth while maintaining our “quality of life”;
- Serve as a repository for our best “community-building” ideas and as a resource for all Floridians; and
- Beginning in 2007, provide a written report to the Legislature and Governor addressing specific growth management issues.

The Commission is focused around three essential state interests: providing for Floridians’ needs; preparing Floridians’ for careers; and, protecting Florida’s lands and water. Specifically, related to protecting Florida’s lands and water, the Century Commission focuses on the environment (land, water, and air), energy and climate change, land use/community design, and transportation and other crucial public infrastructure. It is currently reviewing ways in which to conduct statewide, coordinated regional visioning in Florida.⁵⁴ In February 2008, the commission published a report *A Coordinated, Statewide Regional Visioning Initiative for Florida*.⁵⁵ The report makes seven recommendations:

1. Support a Coordinated, Statewide Regional Visioning Agenda;
2. Support the Development of Regional Visions for All Areas of the State;
3. Develop “Quality Growth Principles” for the State of Florida;
4. Establish Regional Visioning as a Funded Initiative;
5. Require that Regional Visions Guide Local and Regional Plans;
6. Identify Opportunities to Incentivize Implementation Recommendation; and
7. Commitment of State Agency Support for Regional Visions.

Furthermore, it lays out a framework for how to integrate visioning into Florida’s intergovernmental planning and implementation process.

New Jersey has a unique comprehensive state plan. The New Jersey State Development and Redevelopment Plan provides a comprehensive vision for the State. It divides the State into five planning areas and provides a policy roadmap based on planning areas. According to the New Jersey Office of Smart Growth, “simply stated the State Development and Redevelopment Plan with the State

⁵⁴Century Commission for a Sustainable Florida, www.centurycommission.org.

⁵⁵*A Coordinated, Statewide Regional Visioning Initiative for Florida*. Prepared for Century Commission for a Sustainable Florida; Chapin, Tim; February 1, 2008.

Plan Policy Map is a dynamic vision of New Jersey's development and conservation patterns."⁵⁶ Types of growth and associated planning areas are outlined below:

- **Areas for Growth** – Metropolitan Planning areas (Planning Area 1), Suburban Planning Areas (Planning Area 2), and Designated Centers in any planning area.
- **Areas for Limited Growth** – Fringe Planning Areas (Planning Area 3), Rural Planning Areas (Planning Area 4), and Environmentally Sensitive Planning Areas (Planning Area 5). In these planning areas, planning should promote a balance of conservation and limited growth – environmental constraints affect development and preservation is encouraged in large contiguous tracts.
- **Areas for Conservation** – Fringe Planning Areas (Planning Area 3), Rural Planning Areas (Planning Area 4), and Environmentally Sensitive Planning Areas (Planning Area 5).

The plan must go through a cross-acceptance process that includes public forums and extensive citizen participation.

Vermont's Long-Range Transportation Plan is currently being updated, with an estimated completion date of May 2008.⁵⁷ Vermont is taking a new approach to updating its plan by using scenario planning techniques. Four scenarios are being evaluated:

1. **Business as Usual** – Existing trends continue through the 2030 planning horizon. The most significant characteristics are slow/moderate population growth, aging of the population, land use decentralization, shift to a service economy, and a projected gap between the costs of transportation needs and funding. The threat posed by devolution of Federal user tax distributions is also included in the scenario. Additional trends identified by the New England Futures include a youth drain, energy vulnerability, and decline in higher education enrollment. All of these trends suggest slow or stagnant economic growth.
2. **Environmental Change** – Air quality deteriorates and Vermont becomes a nonattainment area. In addition to negative impacts to our health and loss of Vermont's clean environment "brand," this unfortunate designation leads to regulatory requirements that affect project programming and selection. This scenario could also be characterized by additional measures designed to

⁵⁶New Jersey State Development and Redevelopment Plan, New Jersey Office of Smart Growth, 2000.

⁵⁷Vermont Long-Range Transportation Plan Working Paper 7: Summary of Scenario Planning Session, Vermont Agency of Transportation, August 2007.

reduce greenhouse gas emissions, which could be triggered by changes in national policies or implementation of state programs and policies (even if national policies are not implemented).

3. **Energy Crunch** – The global supply of oil peaks or is interrupted for other reasons. There is a permanent and significant rise in the cost of fossil fuels. In addition, the Vermont Yankee nuclear power plant, which provides 30 percent of the State’s electricity, is decommissioned and a replacement source has not yet been secured. As a result, electricity is more expensive and not competitive as an energy source for electric or hybrid vehicles that use electricity from batteries charged over night. Higher oil, gas, and electrical costs make Vermont less attractive to new businesses and existing businesses begin to leave for locations with lower-cost and more reliable energy.
4. **Growth Scenario** – A new employer locates a major new manufacturing facility in one area of the State outside of Chittenden County (e.g., in Rutland or St. Johnsbury). There will be many jobs (by Vermont standards) available at the facility which in turn spurs additional services and retail growth in the surrounding region. In addition, a major event occurs globally or nationally that causes a significant increase in in-migration. Migration currently accounts for about half of the projected population change in Vermont. As a result, Vermont’s population grows faster and is more diverse. The migration includes people with growing families that fuel population growth into the next generation.

Under each of the scenarios, strategies need to be developed to meet five goals:

1. Provide a safe and secure transportation system;
2. Preserve the condition of and manage the State’s existing transportation system to provide capacity, safety, flexibility, and reliability in the most effective and efficient manner;
3. Improve and connect all modes of Vermont’s transportation system to provide Vermonters with choices;
4. Strengthen the economy, protect and enhance the quality of the natural environment, promote energy conservation, and improve Vermonters’ quality of life; and
5. Support and reinforce Vermont’s historic settlement pattern of compact village and urban centers separated by rural countryside.

Vermont also recently published a Corridor Management Handbook.⁵⁸ According to the Handbook, a corridor vision and goal should:

⁵⁸ *Vermont Corridor Management Handbook*, Vermont Agency of Transportation, July 2005.

- Establish a unified vision across jurisdictional boundaries, even while recognizing different corridor development contexts (e.g., urban versus rural);
- Consider the range of social, economic, and environmental issues;
- Reflect existing roadway designations (e.g., functional class, access management category, NHS, truck route, scenic byway);
- Reflect existing policy documents such as local comprehensive plans and statewide and regional transportation plans;
- Incorporate and reflect current public input about how local residents view their communities and the transportation corridor; and
- Recognize the needs of those who may not be well-represented within the corridor planning process, such as through travelers from outside the study corridor or visitors from other states.

A.2 METROPOLITAN REGIONAL VISIONING EFFORTS

Recently a number of regional metropolitan planning organizations in the I-95 corridor are employing visioning and scenario techniques to engage its population in thinking about the future of the region. Eight regional visioning efforts are highlighted below, including past efforts by the Philadelphia, Boston, and Orlando regions, and upcoming regional metropolitan visioning efforts in New York, North Jersey, Atlanta, Miami, and Washington, D.C.

In 2005 the **Delaware Valley Regional Planning Commission** (DVRPC) adopted its current Long-Range Transportation Plan (LRTP), *Destination 2030: The Year 2030 Plan for the Delaware Valley*; Vermont Agency of Transportation; *Vermont Corridor Management Handbook*; July 2005.⁵⁹ To assist with its update, the agency used a “what if” scenario method to evaluate potential futures for the region. DVRPC began the process by developing goals for the region. The goals centered around eight critical areas: urban revitalization, growth management, economic development, the environment, equity and opportunity, transportation facilities, transportation operations, and transportation finance. With these goals in mind, DVRPC developed several alternative “what if” scenarios and analyzed what impact the scenarios could have on the region’s urban form. From the results of an original 12 scenarios, a combination of assumptions were formed to create 5 new scenarios, which were tested quantitatively.

The 5 scenarios tested included: Out-Migration, Sprawl, In-Migration, 2025 Plan, and Recentralization. Multiple indicators were used to evaluate the scenarios.

⁵⁹*Regional Analysis of What-If Transportation Scenarios Final Report*, Delaware Valley Regional Planning Association, July 2003.

The results of the 5 scenarios were used as a base for conversation when soliciting input from the public.

The **Metropolitan Planning Council of Boston** began their initiative MetroFuture in 2002. Over the past six years, MetroFuture has solicited input from the public, developed alternative growth scenarios for the Boston region, and received feedback on the scenarios. Initially the organization solicited input and formed a vision for the region through workshops, surveys, and a review of municipal plans. Later, MAPC projected what the region would look like in 2030 if current trends continued. The organization conducted 60 briefings around the region to get feedback on what people thought about the current trend. In 2006, MAPC held two workshops and asked 400 people to help create alternatives for the future. Four alternative scenarios were evaluated that have varying assumptions for regional growth patterns, housing choices, labor and prosperity, community vitality, air, water and wildlife, and getting around. After an extensive public outreach campaign, on May 1, 2007, a recommended plan was developed with input from more than 1,000 people.⁶⁰

Coalitions of counties and cities in at least **nine multicounty regions of Florida** are collaborating today on long-term growth visions (see table below). Such visions can indicate how regions desire to grow in the future, and provide important information about likely long-term development patterns. These visions and related action plans also may provide guidance about critical environmental, community, and economic assets, including those that would benefit from enhanced transportation access, and those where transportation impacts should be avoided or minimized.

Region/Initiative	Counties	Lead Organization	Status
Central Florida Regional Growth Vision – “How Shall We Grow?”	Brevard, Lake, Orange, Osceola, Polk, Seminole, Volusia	myregion.org	Vision adopted in August 2007; implementation underway.
Committee for a Sustainable Emerald Coast	Escambia, Okaloosa, Santa Rosa, Walton	Committee established by Governor Bush by Executive Order	Regional goals and policies identified; implementation strategy being developed through West Florida Regional Planning Council.
Committee for a Sustainable Treasure Coast	Indian River, Martin, St. Lucie	Committee established by Governor Bush through Executive Order	Regional goals and priorities established; implementation strategy being developed through Sustainable Treasure Coast, Inc.
Heartland 2060	Desoto, Glades, Hardee, Hendry, Highlands, Okeechobee, Polk	Central Florida Regional Planning Council	Initial meetings underway.

⁶⁰Metropolitan Area Planning Council MetroFuture, <http://www.metrofuture.org>.

Region/Initiative	Counties	Lead Organization	Status
First Coast Vision	Baker, Clay, Duval, Flagler, Nassau, Putnam, St. Johns	Northeast Florida Regional Council	Developing scope of work and identifying funding partners.
One Bay	Citrus, Hernando, Hillsborough, Manatee, Pasco, Pinellas, Polk, Sarasota	Tampa Bay Partnership	Future land use scenarios developed through regional and county meetings; implementation strategy being developed.
Our Region Tomorrow	Franklin, Gadsden, Jefferson, Leon, Madison, Taylor, Wakulla, Thomas (GA)	Greater Tallahassee Chamber of Commerce	Initial meetings and work plan development underway.
Southeast Florida 2060	Broward, Indian River, Martin, Miami-Dade, Monroe, Palm Beach, St. Lucie	South Florida Regional Planning Council and Treasure Coast Regional Planning Council	Scope of work being developed; partners being identified.
Southwest Florida 2060	Charlotte, Collier, Desoto, Glades, Hendry, Lee, Sarasota	Southwest Florida Regional Planning Council	Initial work to develop regional indicators and alternative land use maps; broader scope and partners being identified.

As one example, the seven-county Central Florida region is projected to double in population by the year 2050. A public/private/civic coalition, myregion.org, spearheaded an intensive 18-month effort to give Central Florida residents the opportunity to answer the question, “How Shall We Grow?” The result was an 18-month endeavor that engaged residents, community leaders, and elected officials from throughout the Central Florida region (defined as Brevard, Lake, Orange, Osceola, Polk, Seminole, and Volusia counties) to create a 50-year shared vision and policy framework to guide future growth in Central Florida. More than 20,000 citizens were involved over a 18-month period in a series of community and regional workshops, and elected officials from the seven counties and 86 cities met on a regular basis to develop a policy framework and action plan to guide implementation of the vision.

The key outcomes of this process included the development of the following:

- A high-level, 50-year vision embracing a future different than the current growth trend focusing on four key themes (conservation, countryside, centers, and corridors), including principles that should guide future growth decisions;
- A policy framework as well as an implementation plan to guide state, regional, and local agencies to ensure that their future decisions are consistent with the vision;
- Continued collaboration among the 10 organizations that partnered during this process to discuss issues and next steps for implementing the vision; and
- Formation of the Central Florida Congress of Regional Leaders (which includes 16 elected officials representing city and county governments and the school boards of the seven counties) that will help encourage

implementation of the growth vision by developing common policies and practices around regional principles adopted in the Central Florida growth vision.

The Florida Department of Transportation will continue to provide technical and/or financial support for such regional visioning efforts. It is expected that these regional visions will provide a context for making future statewide and regional transportation decisions, including major corridor investments. In addition, it is expected that these regional visions will be integrated into the next round of metropolitan planning organization long-range transportation plan updates, as well as the identification of regional priorities for state transportation funding programs.

The **North Jersey Transportation Planning Authority** (NJTPA) is taking steps to incorporate visioning and scenario planning techniques into their upcoming 2035 LRTP process [41].⁶¹ As a part of the update, NJTPA is making three key adjustments to their long-range planning process. These adjustments include:

- Broad visioning and scenario-testing efforts with NJTPA Board of Trustees guidance. This will offer opportunities for input from state, county, and municipal officials, planners, engineers, stakeholders, and the general public;
- Discussion of the impact on transportation needs and investments of factors beyond the control of the state or region, such as global warming, rising energy prices, changes in the global economy, broad demographic shifts, or sweeping changes in technology; and
- Exploration of opportunities for innovatively funding transportation projects, particularly those needing large capital investments or presenting long-term operational funding needs.

The **New York Metropolitan Transportation Council** recently completed a visioning process for the region in March 2008. The council took more top down approach than the above mentioned regions. The vision was developed and set forth by the principal members of NYMTC. Underlying the regional vision were three shared goals: 1) improve the regional economy; 2) enhance the regional environment; 3) improve the regional quality of life. With those three goals in mind, the council designated 10 growth areas and recognized the need for cooperative planning.⁶²

In December 2007, the **Metropolitan Washington Council of Governments** launched their *Greater Washington 2050 Initiative*. The initiative is centered

⁶¹2035 *Regional Transportation Plan*, North Jersey Transportation Planning Authority, www.njtpa.org/Plan/LRP2035/default.aspx.

⁶²*Our Vision for a Growing Region*, New York Metropolitan Transportation Council, March 2008.

around a multi-agency, multi-sector coalition. The coalition will include representatives from the National Capital Region Planning Board, Metropolitan Washington Air Quality Committee, and other COG Policy Committees, the Federal government, and key regional business, civic and environmental stakeholders. Once the coalition is formed, the first task will be to inventory and review local and regional plans, goals, and vision statement. Next, the initiative will conduct a survey to understand citizens' attitudes concerning growth and quality life issues in the region. The final outcome will be a compact signed by the signatory jurisdiction members, acknowledging the need to plan for the long-range and giving their support to long-range transportation planning efforts. The compact will then be used to promote regional planning and to start people thinking about how to implement the vision.⁶³

The **Atlanta Regional Council** is just beginning a process they are calling *Fifty Forward*. There will be a series of public, open-house style forums held quarterly for the next two years. Topics such as sustainability, population and employment shifts, economic trends and future development patterns will be discussed and each forum will feature keynote speakers. The Fifty Forward initiative, like the Florida initiatives, has strong support from the private sector.⁶⁴

⁶³*Greater Washington 2050 Work Program*; Metropolitan Washington Council of Governments; December 12, 2007.

⁶⁴*Fifty Forward: Metro Atlanta Futures Forum*; <http://www.atlantafiftyforward.com>.

B. Operations Deployment Impact Assumptions

The specific impact assumptions by operations strategy type are shown in Table B.1 (e.g., freeway versus arterial management). VII impacts are reflected through the following strategies:

- Improved ICM (allows better real-time adjustments of diversions and traffic device control;
- Reduced signalized intersection “straight crossing path” crashes;
- Reduced rear-end crashes; and
- Improved traveler information.

Table B.1 Operations Impact Relationships

ITS Component	Congestion/Delay	Event Characteristics	Safety
Arterial Management			
Signal Control	Standard HERS relationships		
VII-Enabled			-3.8% total signalized arterial crashes ^a
Electronic Roadway Monitoring	Supporting deployment for corridor signal control (two highest levels) and Traveler Info		
EM Vehicle Signal Preemption			
VMS	-0.5% incident delay ^b		
Freeway Management			
Ramp Metering			
Preset	New delay = ((1-0.13)(original delay)) + 0.16 hrs per 1,000 VMT ^c		
Traffic Actuated			-3% number of injuries and PDO accidents ^c
Electronic Roadway Monitoring	Supporting deployment for ramp metering and Traveler Info		
VMS	-0.5% incident delay ^b		
Active Traffic Management (Speed Harmonization + Lane Control + Queue Warning)	-7.5% total delay ^d		-15% total crashes ^f
Integrated Corridor Management			
Deployed with ramp meters and RTTAC signal control	-7.5% total delay (assumed to be incurred on freeways) ^e		
VII-enabled	-5% total delay (additional; on top of base ICM)		
Automated Vehicle Control Systems (inc. VII) ^f	Special sensitivity runs: +10%, +25%, +50% increase in capacity; not currently assumed to occur with VII, so not handled with Preprocessor		-2.2% total crashes, ^g all free-ways and signalized arterials
Incident Management		All factors based on IDAS relationships	
Detection Algor/Free Cell		-4.5% incident duration	-5% fatalities
Surveillance Cameras		-4.5% incident duration	-5% fatalities
On-Call Service Patrols		-25% incident duration (typical) -35% incident duration (aggressive)	-10% fatalities
All Combined		Multiplicative reduction	-10% fatalities

ITS Component	Congestion/Delay	Event Characteristics	Safety
Road Weather Management			
Faster snow/ice control	3% total delay in northern states (snow/ice covered highways) ^h		
Traveler Information (Public/Private)			
511 only	-1.5% total delay, rural only ^e		
511 + Private ISPs	-1.5% total delay, all freeways and signalized arterials ^e		
VII	-3% total delay, all freeways and signalized arterials ^e		

^a Not included in Operations Preprocessor; must be analyzed offline.

^b VII BCA Report states 133,000 rear end crashes reduced (5,973,000 total crashes); “brakelight warning.”

^c Best guess.

^d Aggressive IM + active traffic management + ICM.

^e Aggressive IM + active traffic management + ICM + VII applications (no AVCS). Note: reduced incident rate from VII safety improvements not currently handled by HERS, so delay benefits would be slightly larger than shown, especially for VII. (Delay reduction due to reduced incidents is assumed to be embedded in the other categories of delay reduction.

^f VMS, ramp meters, “standard” incident management.

^g -9 percent incident duration ==→ -17 percent inc. delay; inc. delay = 20 percent of total delay.

^h VMS, ramp meters, aggressive IM.