TRANSPORTATION

INVEST IN AMERICA

THE BOTTOM LINE

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS

AT A GLANCE

- An annual investment of **$92 billion** for highways and bridges, between 2004 and 2009, is necessary ***to maintain*** the physical condition and performance characteristics of the system.
- An annual investment of **$125.6 billion** for highways and bridges is necessary ***to improve*** the physical condition and performance characteristics of the system over 20 years.
- An annual capital investment of **$19 billion** is required, between 2004 and 2009, ***to maintain*** the physical condition and service performance of the nation's transit systems, if ridership only grows modestly at 1.6 percent per year.
- An annual capital investment of **$44 billion** is required ***to improve*** the physical condition and service performance of the nation's transit systems, if ridership continues to grow at 3.5 percent per year.
- In 2000, transit investment from all levels of government totaled **$33.8 billion**, with $9.5 billion going to capital investment.
- The 1999 FHWA Conditions and Performance Report placed the repair backlog at **$167 billion** for highways and **$87 billion** for bridges.
- In 2000, highway expenditures from all levels of government totaled **$127.5 billion**, with **$64.6 billion** going to capital investment.

- Highway vehicle miles traveled (VMT) increased 600 billion over the past decade from 2.15 to 2.75 trillion. VMT is expected to grow by another **600 billion** over the next 10 years, an annual VMT growth rate of 2.2 percent.

- At least **$18 billion** for highway infrastructure capital costs over six years and an additional **$1 billion** per year for operating costs will be needed to implement AASHTO's Strategic Highway Safety Plan, which has a goal of saving 5,000 to 7,000 lives each year.

- At least *$12 billion* in capital investment and **$1 billion** in annual operating assistance will be needed for highway and transit security over the next six years.

- Every billion dollars of federal highway investment generates **47,500 jobs**; for every billion dollars in transit investment, job generation is virtually the same.

- 11.3 million Americans — **one in 11** — are employed in transportation occupations.

- In 1997, the country's roads, railroads, airways, waterways and pipelines shipped 11 billion tons of freight valued at **$7 trillion**.

- International trade equivalent to a percentage of U.S. Gross Domestic Product increased from 13.4 percent in 1990 to **24.1 percent** in 2000.

- The federal-aid highway program creates **2.5 acres of wetlands** for every acre it takes for road construction.

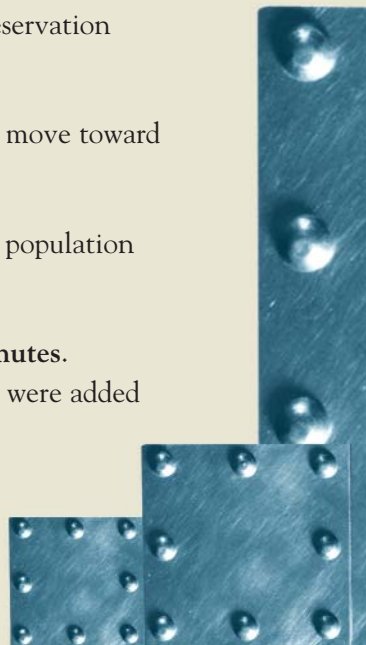
- Since 1970, states have built more than **1,600 miles of noise barriers** at a cost of over **$1.9 billion**.

- Over the past 11 years, **$4.9 billion** in enhancement projects — such as bike paths and the preservation of historic bridges and train stations — have been built in more than 14,000 communities.

- Today, **28 percent** of U.S. production is already based on just-in-time practices. As more firms move toward such practices, the economy becomes more dependent on a healthy transportation system.

- At the millennium, the U.S. population stood at **281 million**, up 100 million since 1960. Our population is expected to grow by at least 100 million in the next 40 years.

- Between 1980 and 2000, average commutes lengthened by four minutes nationally, to **25.5 minutes**. The fact that this increase was limited to four minutes even though 35 million new commuters were added to the rolls, is in part a tribute to our transportation system's flexibility.



ACKNOWLEDGEMENTS

This report is the result of the efforts of many people. The Bottom Line Work Group, which is one of six work groups under the guidance of the AASHTO TEA-21 Reauthorization Steering Committee, prepared this report. A Bottom Line Advisory Committee, chaired by past AASHTO President E. Dean Carlson with members including several state department of transportation chief executive officers, provided oversight on behalf of the AASHTO Board of Directors. The work of the Bottom Line Work Group was supported by Alan E. Pisarski, who as a consultant to AASHTO provided valuable assistance in compiling and writing the document.

Nancy Ross of the New York Department of Transportation, who chaired the Bottom Line Work Group, was instrumental in working with AASHTO staff, FHWA staff, consultants, and other state DOT representatives to lead this important effort, which has resulted in this significant input into the TEA-21 reauthorization process.

Ron Epstein of New York DOT and his team are also to be recognized for their work, in cooperation with the American Public Transportation Association (APTA) and the Community Transportation Association of America (CTAA) in developing the transit component of the Bottom Line Report.

Susan Binder, Ross Crichton and their colleagues at the Federal Highway Administration provided technical advice on the nature of the modeling, the interpretation of past results, and alternative scenarios. Richard Steinmann of the Federal Transit Administration provided similar assistance with comparable transit information.

Some of the information in this report was developed through research conducted as part of AASHTO's National Cooperative Highway Research Program (NCHRP) projects 8-36, 20-7, and 20-24 and Transit Cooperative Research Program (TCRP) Project J-6. The NCHRP research was managed by Ronald D. McCready, NCHRP's senior program officer, and the TCRP research was managed by Christopher W. Jenks, TCRP manager.

AASHTO wishes to express its profound appreciation to all of those individuals who devoted long hours and shared their special knowledge to produce the Bottom Line Report. We believe it will be a key document as legislation reauthorizing TEA-21 is considered in the coming year.

The following is a list of specific individuals who provided important assistance in the development of this report.

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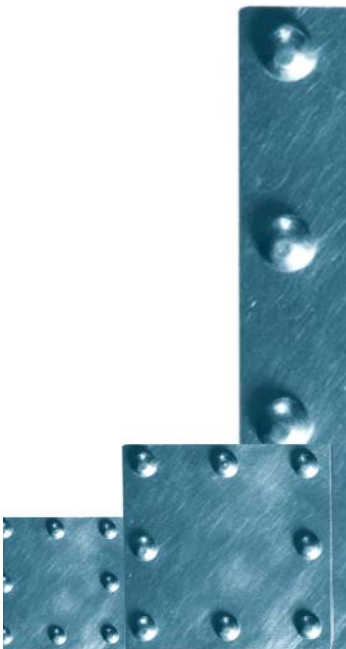

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FOREWORD

This document presents AASHTO's views of the nation's coming highway and transit investment needs. We trust it will be informative for those deciding our transportation future.

Today, our transportation system depends on a mix of decisions and investments by federal, state and local governments and the private sector. One of the most important drivers of these decisions is the reauthorization of federal surface transportation policies, programs and funding scheduled for 2003.

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) and the Transportation Equity Act for the 21st Century of 1998 (TEA-21) each had an enormous impact on the nation's transportation system. Together, they dramatically increased investment in roads and bridges, spurred a revival of public transportation, and helped create a more efficient and interconnected system.

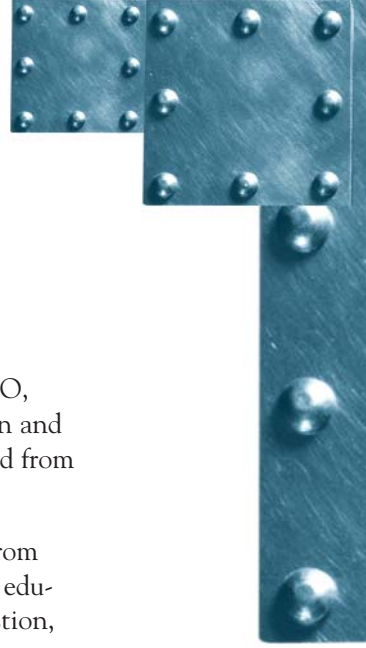
The first decade of the 20th century saw the invention of the airplane and the introduction of the automobile into daily life. The first decade of the 21st Century is not likely to see such dramatic transportation innovations. Changes that are likely to occur by the close of this decade, however, could cause decisions about our transportation system during these years to have an equally significant impact on our nation's future. By 2010:

- We likely will have added more than 25 million people and as many new vehicles;
- Baby boomers will enter their 60s, changing forever our view of what retirement means;
- Transit ridership may reach 12.5 billion;
- 30 percent of our Gross Domestic Product will depend on international trade; and
- Vehicle miles traveled annually will exceed three trillion miles.

The transportation plans and investment strategies we create now must respond to these changes and support our great nation's needs in an emerging new world.

John Horsley

Executive Director
American Association of State Highway and Transportation Officials



KEY FINDINGS

As Congress approaches the reauthorization of federal highway and transit programs, AASHTO, with the assistance of the Federal Highway Administration, the Federal Transit Administration and the Transportation Research Board, has taken a comprehensive look at the investments needed from 2004 through 2009 to maintain or to improve our nation's transportation system.

Transportation is vital to the national economy and to our quality of life. Its benefits extend from maintaining America's competitiveness in the global economy to providing access to jobs and education. Likewise, the costs of an inadequate transportation system are severe, including congestion, highway fatalities, and the inability to access health care.

The following are key findings of this analysis.

HIGHWAY INVESTMENT REQUIREMENTS

A Scenarios Approach to Future Investment

To estimate highway and bridge investment needs, two goal-based scenarios were employed. The goals of the "Maintain Conditions and Performance" scenario were to hold user costs constant, assure no increase in delay, maintain system physical condition and prevent further degradation. The goals of the "Improve Conditions and Performance" scenario were to make economically justifiable investments that improve pavement condition, increase average speeds, and reduce delay and user cost. The performance of these scenarios was compared to 2004 baseline conditions that measured four factors: pavement roughness, delay, average speed, and user cost. The analysis shows the following.

Cost to Maintain

An annual investment of **$92.0 billion** by all levels of government for highways and bridges is necessary to maintain **both** physical condition and performance characteristics of the system over 20 years and explicitly during the next reauthorization cycle. This scenario includes cost estimation for roads on new rights-of-way as well as capacity expansions through lane additions within existing facilities. This level of investment holds users' costs at less than a one percent increase. Pavement roughness and delay are also held constant. Levels of system reliability remain about the same as well. In FY 2000, $64.5 billion from all levels of government was invested in highway and bridge capital improvements.

Cost to Improve

An annual investment of **$125.6 billion** by all levels of government for highways and bridges is necessary to improve **both** physical condition and performance characteristics of the system over 20 years and explicitly during the next reauthorization cycle. This scenario is analogous to the Maximum Economic Investment scenario in the FHWA Condition and Performance Reports of recent years. The FHWA approach identifies beneficial investments that are possible within the constraints the modeling process used, and describes resulting performance effects.

This level of investment substantially improves the system by the end of the reauthorization period.

Pavement condition improves by almost 15 percent from the base period. Much of this improvement occurs in urban areas, where pavements are currently much poorer in quality than in rural areas. This reduces but does not eliminate that disparity. Delay falls by almost 13 percent despite the expected VMT growth. Average speeds also improve considerably with gains in both rural and urban areas. User costs drop from $937 per 1000 miles of travel to $913. This equates to roughly a $60-billion-a-year saving.

TRANSIT INVESTMENT REQUIREMENTS

Cost to Maintain

An annual capital investment of **$19 billion** is required between 2004 and 2009 from all levels of government just to maintain the existing physical condition and service performance of the nation's transit systems, if ridership only grows modestly at 1.6 percent per year. In FY2000, about $9.5 billion was spent on transit capital infrastructure investments, about one-half of the minimum requirement based on the lowest range of transit ridership growth.

Cost to Improve

An annual capital investment of **$44 billion** is required to improve the current physical condition and service performance of the nation's transit systems, if ridership continues to grow at 3.5 percent and if a decision is made to improve conditions and service quality for all assets and services.

The magnitude of transit capital needs will depend in large part on ridership growth, and on policy decisions regarding the desired physical condition and service performance of the system. Significant increases in current transit infrastructure investment levels will be required from federal, state, and local governments to address state-of-good-repair and normal replacement needs, just to maintain the physical condition and performance of the existing system. Continued growth in ridership will also require substantial capital investment to accommodate increased demand. Similarly, if the physical conditions and service standards are to improve, capital needs will be much higher than if the system is maintained in a condition similar to today's.

	Maintain Conditions and Performance Scenario	Improve Conditions and Performance Scenario
Highways and Bridges	**92.0 billion**	**125.6 billion**
Transit	**18.9 billion**	**44.0 billion**

OTHER KEY FINDINGS

Today, 11.3 million Americans are employed in transportation occupations. The country's roads, railroads, airways, waterways and pipelines shipped 11 billion tons of freight valued at $7 trillion. International trade has grown from the equivalent of 13 percent of the GDP in 1990 to 24 percent today. Freight will double in the next 20 years, straining our highways, ports and border gateways. Just-in-time deliveries are vital to business productivity and overnight freight to customer convenience.

Meeting the transportation needs of metropolitan areas, which generate 84 percent of our GDP, will require improving community connectivity through investment in transportation, and making the movement of goods and people more efficient. Transportation connects rural residents to jobs, shopping and health care, and can mean the difference between isolation and opportunity.

Travel and tourism is the number-one industry in several states and in the top three in almost every state, generating $580 billion in 2000.

Each billion of highway investment generates 47,500 jobs, and each billion of transit investment generates a similar number. More than 54 percent of all public transportation trips in the nation are reported to be work-related, confirming transit's importance to the economy.

HIGHWAY NEEDS

Repair Backlog

Over time, weather, wear and age take their toll on roads and bridges. The repairs, replacements and upgrades needed to bring the existing system up to standard have created a huge backlog of needed investments. These investments are justified immediately to capture benefits (relieving congestion or saving lives) or to prevent further deterioration that leads to higher investment needs. The 1999 FHWA Conditions and Performance Report placed the backlog at $167 billion for highways and $87 billion for bridges.

Travel Trends

The forecasts of vehicle miles traveled (VMT) growth are derived from state and local predictions based on factors such as population, incomes, household composition, and freight trends. They indicate that growth from 2004 to 2009 will average 2.2 percent per year, or 50 percent over 20 years. To put this in perspective, VMT increased approximately 75 percent over the past 20 years to 2.75 trillion vehicle miles traveled by 2000. Even with projected growth rates lower than those of the past 20 years, highway VMT may reach 3.35 trillion by 2010.

Physical Condition

Although expanded funding under ISTEA and TEA-21 has improved the nation's highways in recent years, much remains to be done. More than 80 percent of roads are in the "very good/good/fair" range. Interstate pavement conditions in both rural and urban areas are improving. The condition of rural roads, which comprise the great majority of roads but a much smaller share of travel, has been able to hold relatively steady. However, urban roads, in poorer condition to begin with, have deteriorated further. In 1999, FHWA estimated that just to maintain the 47,000 mile Interstate Highway System in its current condition would require an investment of $10 billion annually, over and above current investment.

System Performance

Evidence and specialized studies make it clear that congestion and declining performance are common in our nation's highway systems. Commute times have increased; congestion is increasing in all sizes of metropolitan areas; and according to a 2000 FHWA customer survey, the single largest source of motorist dissatisfaction is "traffic flow."

TRANSIT NEEDS

The nation's extensive public transportation network provides access to jobs, mobility for the young, elderly and disabled and helps reduce congestion, conserve fuel, enhance the efficiency of highway transportation, reduce air pollution and support security and emergency preparedness activities. An efficient, safe and environmentally sound public transportation system is essential to moving people in both rural and urban areas and to the health of the national economy.

Public transportation services are currently available in 319 urbanized areas, and every state has some level of public transportation service available to its rural areas. There are:

- 556 public transportation operators in urban areas;
- 1,260 organizations that provide public transportation services in rural areas; and,
- 3,660 organizations that provide public transportation services to the elderly and disabled people.

Increased federal, state and local investment in transit has helped spur a 22 percent ridership increase during the past six years, with the 9.5 billion passenger trips during 2001 — the highest level in 40 years. Continued ridership growth at levels comparable to those actually observed over the last six years would result in an average increase in passenger trips of approximately 3.5 percent annually, or a 100 percent increase over the next two decades.

Today, 22 percent of the nation's buses, and 43 percent of its rail rolling stock, exceed their recommended service life. An additional 47 percent of buses and 11 percent of rail rolling stock will exceed their recommended service life within the next six years.

Sizable infrastructure investment is required to accommodate increased ridership demands, including the construction of new transit systems and expansion of existing fixed-guideway transit systems. Underinvestment in rural and specialized transit services has resulted in substantial unmet needs and under-served areas.

Significant infrastructure investment is required to address the replacement and rehabilitation needs of other transit assets, including, but not limited to: bus and rail maintenance and yard facilities; stations, track, signals, switching systems, power generation and distribution facilities, structures, fare collection and communication systems, and other associated capital equipment.

Technical Approach

In preparing this assessment, AASHTO incorporated the Federal Highway Administration's Condition and Performance (C&P) process and other analytical tools developed by federal agencies to assess the needs of the highway, bridge and transit systems, supplementing them with the knowledge and experience of state departments of transportation.

It should be recognized that these AASHTO statements of need are being prepared in parallel with FHWA's preparation of its forthcoming 2002 Conditions and Performance Report, so AASHTO will not have the benefit of the C&P findings in its analysis.

This analysis incorporates FHWA and FTA methods and assumptions, with two notable differences:

- The C&P report employs a 20-year time frame, while AASHTO's Bottom Line Report focuses on the six-year reauthorization period of 2004-2009.
- The C&P report starts from year 2001, while AASHTO's report starts from 2004.

Based on these differences, it would be expected that AASHTO's assessment of needs, starting from a base point in the future with higher traffic volumes, a more deteriorated system and a greater backlog of investments to be made, would show greater investment requirements than the FHWA report.

Cost estimates in this report are expressed in year-2000 dollars.

THE VALUE OF TRANSPORTATION INVESTMENTS

INTRODUCTION

Transportation is vital to the national economy and to our quality of life. Its benefits extend from maintaining America's competitiveness in the global economy to providing access to jobs and education. This section addresses many of the interactions between Americans and their transportation system, and how that system affects people's lives. It demonstrates the value of transportation and transportation investments to every aspect of American life.

EMPLOYMENT AND OPPORTUNITY

Transportation has long been a leading generator of jobs, both directly through the construction, operation and maintenance of the nation's transportation system and indirectly through its support of the broader economy by making the movement of people and goods possible.

Today, 11.3 million Americans — one in 11 — are employed in transportation occupations. More than eight million of these workers are in industries directly linked to surface transportation reauthorization.

Transportation Jobs, 1999 (Millions)

Type of Employment	Surface Transportation	Aviation, Maritime	Total
Transportation Operations	2.3	2.1	4.4
Vehicles and Equipment Manufacturing	1.1	.8	1.9
Related (Highway Construction, Auto Dealers, Gas Stations)	4.4	0	4.4
Government Employment (Aviation Operations, Public Transit)	0.4	0.2	0.6
Total	8.2	3.1	11.3

Source: National Transportation Statistics, 2000.

All these occupations depend on a viable transportation system. They will continue to thrive only as long as strong investment in transportation infrastructure is sustained.

Benefits of Transportation Investment

The direct benefits of transportation investment have been thoroughly quantified. Each billion dollars of federal highway investment generates 47,500 jobs: 26,500 as roads and bridges are built and an additional 21,000 as those who earn their money directly from transportation activity buy goods and services. For every billion dollars in transit investment, job generation is virtually the same as that for highways.

TRANSPORTATION AND ECONOMIC ACTIVITY

Transportation is a pillar of the American economy. The ability to move people and goods quickly, cheaply, and efficiently has enabled the U.S. to sustain the world's largest and most successful economy. To understand the importance of transport in a nation the size of the United States, we need only know that the *average* freight shipment length in the United States is 472 miles — more than the distance between London, England and Hamburg, Germany, two of Europe's largest seaports.

Freight Movement

Freight movement uniquely underscores the importance of efficient transport to the national economy. In 1997, the country's roads, railroads, airways, waterways, and pipelines shipped 11.1 billion tons of freight valued at nearly $7 trillion.

Although transportation costs have declined significantly throughout the nation's history, they still make up an important part of the total cost of certain goods. Almost 10 percent of the value of agricultural products is consumed by transportation costs. Other industries — such as motor vehicles, iron, steel, and food products — also rely heavily on efficient transport, with transportation costs ranging between 3.7 cents and 6.1 cents per dollar of output.

Adoption of just-in-time logistics and the blossoming of technology industries has caused smaller, more frequent shipments of high-value, low-weight goods to lead the growth in U.S. freight shipments. Although shipments of below 1,000 pounds accounted for only 18 percent of the value of all shipments in 1977, they accounted for 32 percent by 1997.

The importance of efficient transportation to our economy is clear.

Transportation Investments Decrease Transit Time

Sound transportation investments reduce transit time — the time it takes a motor carrier to make a delivery. Reduced transit time means lower labor costs and more efficient use of truck fleets, both of which help carriers cut expenses. Reduced transit times also can extend the reach of companies to new markets and new suppliers.

Transportation Investments Increase Reliability of Shipments

Increased transportation reliability lowers the costs of business. When reliability improves, companies can reduce their inventories, spare parts and storage of finished goods. They no longer need to keep extra material on hand to guard against late deliveries. In some areas, companies now can plan for delivery of products within a 15-minute window even on runs of 10 or more hours.

Transportation Investments Reduce Inventory Costs

Improvements in transportation reliability have created the possibility for service innovations such as just-in-time logistics systems. These processes use information technology to optimize production and transportation, enabling customers to keep inventories at low levels and improving supply chain management. Today, 28 percent of United States production is already based on just-in-time practices. As more firms move toward such practices, an efficient transportation system becomes even more critical to a healthy economy.

Transportation Investments Make Business More Efficient

The integration of transportation, logistics and production is not only reducing costs, opening up new markets and making businesses more competitive but also spurring what has been called "the business reorganization effect." As companies integrate logistical gains into their operations, they are able to restructure themselves to seek additional productivity gains. The resultant economies of scale and cost reductions enhance the competitive advantage of those businesses. None of this can occur, however, if the speed and reliability of the freight transportation system is perceived as deteriorating.

Transportation Investments Preserve Productivity Gains

Congestion, with its resulting delays, is especially problematic for freight transportation. Continued deterioration of the reliability of the highway system threatens the productivity gains of businesses and their employees. A recent study indicated that, on average, carriers value an hour of transport time saved at $168. However, avoiding an hour of non-scheduled delay was valued at $371. In other words, system reliability is nearly twice as valuable as system speed.

Rate of Return of Highway Investment

The economic benefits of highway investment are substantial. In recent years, economists have been refining how they measure the impact of transportation investment on the economy. In the years immediately following the construction of the Interstate Highway System, the rate of return on public investment was dramatic: for every dollar of investment, there was an annual rate of return of 54 cents, which meant that investments recovered their costs in two years. As the system matured and the benefits of initial connectivity decreased, the annual return on investment was reduced, but still averaged 22 cents on the dollar during the 1980s. During the 1990s, the rate of return was about 17 percent; it has been rising since 1993.

Over the past 30 years, investments in the Interstate Highway System have produced an average rate of return two times that of private capital and four times that of bank commercial interest rates.

Average Net Rates of Return Per Dollar Invested in Highways

	1960-69	1970-79	1980-91	1960-91 Average
Highway Capital	**0.54**	**0.27**	**0.22**	**0.32**
Private Capital	**0.16**	**0.18**	**0.17**	**0.17**
Interest Rate	**0.05**	**0.08**	**0.10**	**0.08**

INTERNATIONAL TRADE AND TRANSPORTATION

International Trade and the Economy

Transportation costs significantly affect the competitiveness of our products in foreign markets and the prices of foreign goods. Transportation investments that make the flow of goods across our borders more efficient help control these costs.

The importance of international trade as a factor in our economy continues to grow. The value of international imports and exports grew at an annual rate of 9.3 percent during the 1990s, from $891 billion to $2.152 trillion, nearly double the 5.5 percent rate of GDP during the same period. This growth has increased the significance of international trade to our economy — equaling 24.1 percent of GDP in 2000, compared to 13.4 percent in 1990.

The agricultural sector — deeply concerned with U.S. international trade — provides a clear example of the importance of transportation to the U.S. economy. The agricultural sector generates about 8 percent of the Gross Domestic Product. Factoring in farmers, production and processing, this sector employs over 10 million people (about 8 percent of the labor force). The agricultural sector is the largest user of freight transportation services. Taking into account the movements of raw commodities, processed products and production inputs such as fertilizer and machinery, agriculture accounts for nearly one-third of all freight transportation services provided in this country.

Efficient, economical and competitive transportation makes possible the specialization in agricultural production that gives all Americans access to a wide variety of high-quality, reasonably priced food products. All modes of transportation are important to agriculture. Trucks are the most important, moving 45 percent of all agricultural products (measured in ton- miles), railroads follow with 32 percent and inland waterways, with 12 percent. The shares vary greatly by product.

Agriculture is a critical contributor to U.S. competitiveness in the world economy, in large part because of the efficiency of the U.S. domestic transportation system. Despite relatively high production costs, the U.S. maintains a positive trade balance in the sector, exporting agricultural products with a value of more than $200 billion a year. In the domestic market, a dollar of agricultural product requires — on average — about 10 cents of transportation services. In many foreign markets, the cost of transportation services can be twice as high.

To take a single example, the total production cost of a bushel of soybeans in the U.S. is well over a dollar higher than some South American producers — $5.11 compared to the cost in Brazil. However, the U.S. internal transport and marketing cost is 43 cents compared to $1.34 in Brazil, leading to a final price that makes U.S. soybeans competitive in world markets, which would not be the case without transportation efficiency. Competitors, however, do not sit still. Brazil is making inland-waterway improvements that will significantly reduce internal transportation costs for soybeans. To remain competitive, the U.S. must maintain and improve the efficiency of its transportation system.

International Trade — Implications for Freight Transportation

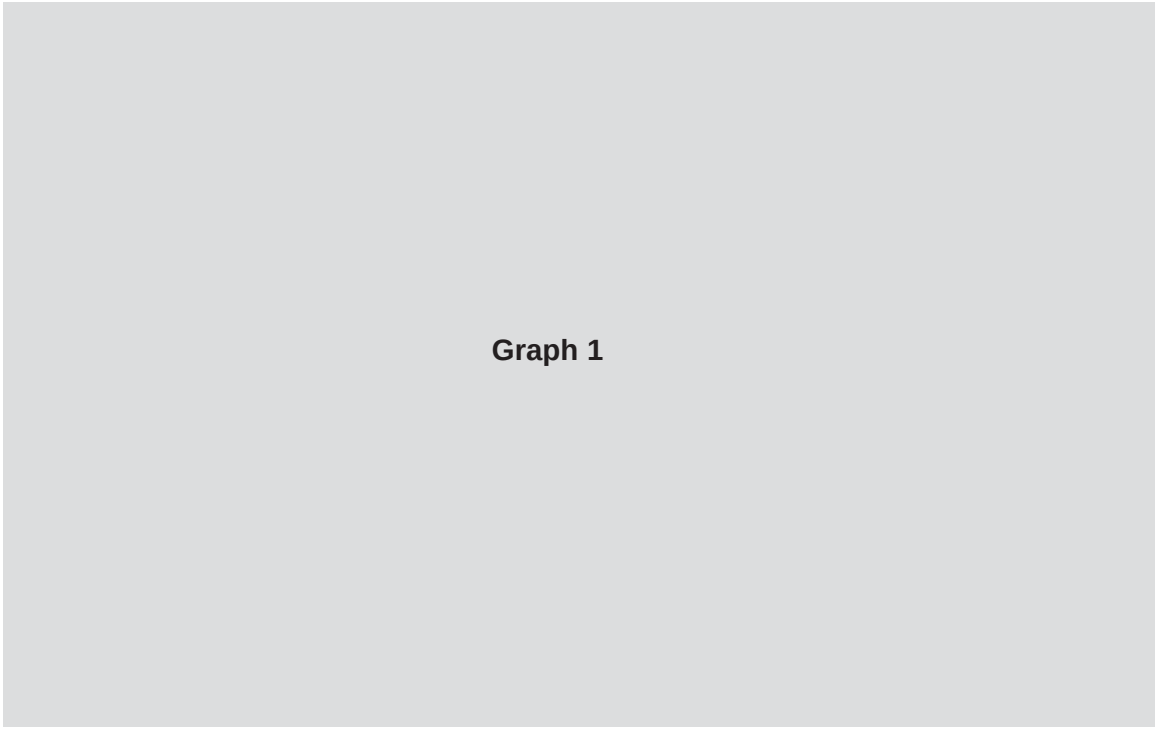
International trade by volume is expected to increase by more than 3 percent annually through 2020, and most of this will be transported within the United States by truck.

While international freight transport has been growing — bringing Americans and residents of many other nations access to more choices, often at lower cost over time — the infrastructure at our seaports has grown older and less efficient. At the same time, between 12 and 15 percent of the pavements on roads serving truck and rail terminals is in poor condition. Containerized shipping, large trailers and very large ships have created new challenges. Larger trucks operating on older access routes often have to deal with short traffic-signal cycles and deficient roadway designs. Larger containers result in even greater peak demand for truck and rail access on already-congested and poor-access routes.

Border Crossings

Increased investment in transportation can help reduce the cost of congestion caused by growth in international trade at our key border crossings. Although more than 200 border crossings move NAFTA trade among the United States, Canada and Mexico, the top 10 ports — led by Detroit and Laredo — accounted for 73 percent of all North American land trade. A 1999 study found an average delay of more than four hours at Canadian and Mexican border crossings.

Growth in Container Traffic — Twenty-foot Equivalent Unit (TEUs)



Overseas Inland Trade — Truck Traffic on U.S. Highway Network, in 2020

Source: "National Freight Movements: Trends/Issues/Forecasts/Policy Implication," Office of Freight Management and Operations, U.S. Department of Transportation, FHWA

Trade Corridors

Increased investment in maintaining and adding lanes to our trade corridors, and improving and replacing bridges on them, can speed the movement of international trade. Goods entering the United States in international trade move along highways, railroads or waterways toward their final destination. Inland trade corridors have traditionally followed the east-west development of our major population and industrial centers and reflected the importance of trade with Europe. With NAFTA, however, our north-south corridors have become increasingly significant. The future needs of these corridors are extensive, and their lack of capacity to accommodate future traffic is a major national challenge. Because these corridors involve multiple states, it is even more difficult to fully meet projected needs.

Other deficiencies in our trade transportation network include highway and rail access limits at ports, intermodal facility congestion, physical restrictions, and highway-railroad grade crossings.

Conclusion

International trade, expected to double by 2020, will strain highways, ports, and gateways. The level of investment required to meet projected needs is enormous. A recent study estimated that $92 billion would be required during the next 20 years just to meet desirable performance standards for highways, ports, and airports in 13 southeastern states and Puerto Rico. Studies in other regions of the country have identified a comparable level of investment needs to accommodate the projected growth in international trade.

Growing concern for these issues is reflected in the number of associations or alliances that have been formed to address the infrastructure needs of the future. The solution to these problems requires not only additional investment, but also public-private partnerships.

TRANSPORTATION AND SOCIETY

At the millennium, the U.S. population stood at 281 million, up 100 million since 1960.

The 1990s saw several surprising demographic trends, including higher-than-expected population increases. The South and West gained 77 percent of the nation's growth, down from 90 percent in the 1980s. Growth in major metropolitan areas was driven by immigration from abroad and a strong birthrate, rather than by migration from rural areas.

Today, 60 percent of Americans — 160 million people — live in the 50 metropolitan areas with populations of greater than one million; 20 percent live in smaller metropolitan areas with fewer than a million people; and the remaining 20 percent live in rural areas. Although most people live in the metropolises in which the greatest congestion occurs, the large numbers of people living in smaller cities and rural communities also have substantial, and growing, transportation needs as they exercise their choice of residential and work locations.

Suburban-Urban Balance

The long-term trend of the 20th century was toward the increasing number and size of metropolitan areas, and suburban growth within those metropolitan areas. Since 1950, metro areas have grown from 56 percent of national population to 80 percent. Suburban areas grew faster than their central cities.

Rural Challenges

Nearly 60 million Americans live in rural communities, and agriculture no longer dominates their economic life. Manufacturing, tourism and other services industries employ growing numbers in these areas, increasing the importance of effective transportation to link these dispersed communities. This will be problematic, because rural households already have by far the highest share of their spending going to transportation. However, lower housing costs more than compensate for these extra expenses.

Transitions

America over the past 30 years has experienced extraordinary growth in workers and in their travel. This era has been characterized by the baby boom generation's arrival in the work force, the surge of women into the workplace, sharp rises in driver licensing and auto ownership and a shift in lifestyles. There is immense time pressure in our society, perhaps best characterized by the fact that more than 40 percent of spending for food is for meals outside the home. In 1995, 24 percent of African American households and 12 percent of Hispanic households were without vehicles, compared to the average of 8 percent for all households. As minority incomes rise, it is expected that vehicle ownership and travel will increase as well.

An Aging Society

By the year 2030, the proportion of Americans over age 65 will increase from 12 percent to 20 percent. The number and kinds of trips made by, and for, the elderly will change dramatically. A healthier, more affluent elder populace accustomed to driving will add to vehicle trips. Already, retired citizens make almost as many non-work trips as the general population. Miles of travel by retired citizens have grown from less than half of that by all ages to about two-thirds of that.

An Immigrant Nation

As it was a century ago, America increasingly is once again a nation of immigrants. As many as 14 million people may have immigrated to the United States during the 1990s, generating about 40 percent of the decade's population growth. From a transportation standpoint, immigration often means immediate additions to the work force – and to the ranks of commuters. They have also concentrated in the areas of greatest growth – cities and the South and West.

TRAVEL PATTERNS

Although suburb-to-central city commutes were the primary concern of transportation planning for generations, two factors have changed. First, work trips have become more dispersed in time and geography, especially to suburban job sites, and therefore are more difficult to serve. Second, work trips account for no more than 20 percent of all trips, especially as women travel outside the house on family and personal business. Overall, travel has increased by over 160 percent since 1969.

Commuting

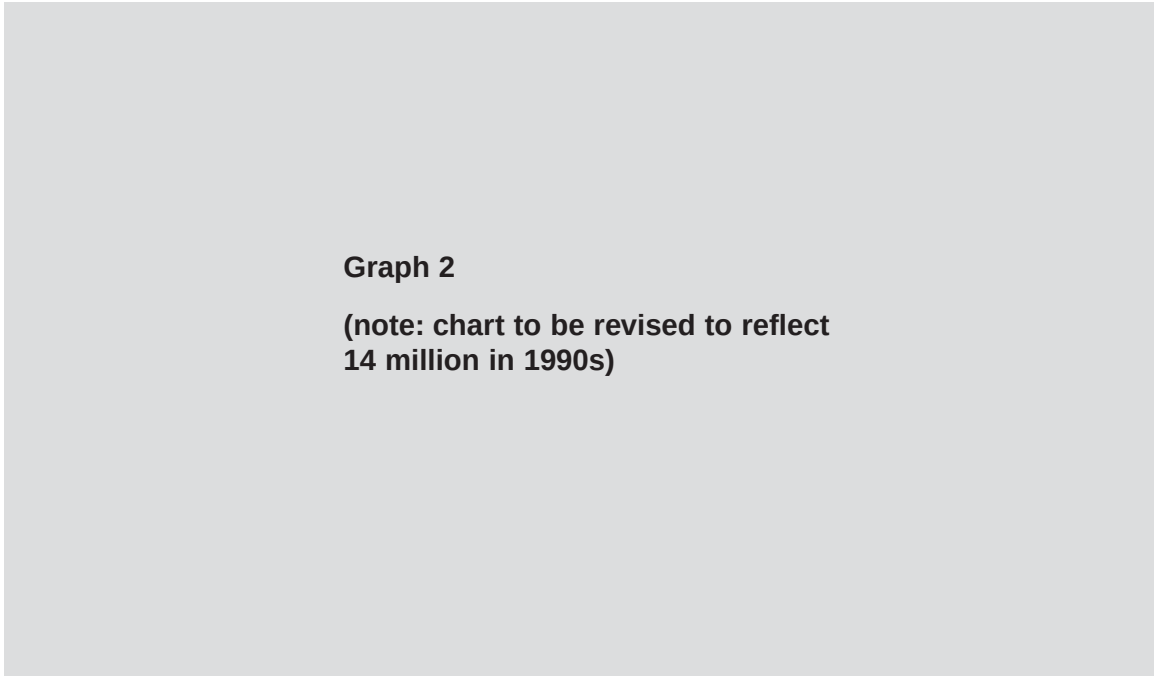
Over this past decade, commuters driving alone increased from 73 percent to 76 percent, carpooling and walking decreased, while transit's share remained at five percent. Over the six years since 1996, transit ridership surged by 22 percent, but its relative share of commuting held constant for the 1990s, because of an overall increase in workers of 11 percent.

Share of Commuting Travel — (percentages)

	1990	2000
Drive alone	73	76
Carpool	13	12
Transit	5	5
Taxi	0	0
Motorcycle	0	0
Bicycle	0	0
Other	1	1
Walked only	4	3
Worked at home	3	3

Source: 2000 U.S. Census, Journey to Work Statistics.

Immigration to the U.S. — 1900-1990



Between 1980 and 2000, average commutes lengthened by four minutes nationally, to 25.5 minutes. The fact that this increase was limited to four minutes, even though 35 million new commuters were added, is a tribute to our transportation system's flexibility. However, it is also evidence that we are reaching the upper limits of what the present system is capable of absorbing. While household size declined during this period, all major household related growth measures — vehicles, drivers, and workers — continued to grow.

America in the coming decades will be an aging society operating in a global economy. This will be a world in which skilled workers will have strong leverage in the marketplace. It will be a challenged affluent society in which mobility will be central to meeting our social and economic goals. Transportation investment must recognize these patterns and trends.

TRANSPORTATION AND COMMUNITY

In a nation as vast as the United States in area, population and economic productivity, "community" is defined in many ways. But whether we speak of the national community of American citizens, or the neighborhood communities in which we live and work, transportation helps define them and enables our participation.

Metropolitan Communities

Metropolitan areas are the economic engines of the nation with an even greater share of jobs and GDP, at 84 percent, than even their share of the population. Continuing to improve community connectivity in metropolitan areas means making public transportation a more convenient and affordable alternative. It also means making automobile use in metropolitan areas more efficient. Efforts to do so include intelligent transportation system investments such as "511" telephone-access traveler information systems, high-occupancy vehicle lanes and policies encouraging ride-sharing, bicycle use, and walking.

Rural Communities

For many rural regions, access to transportation networks can mean the difference between isolation and inclusion. Highways connect rural residents to jobs, shopping, health care and educational opportunities. For example, the Appalachian Development Highway System, a six-decade project now under construction, is providing rural portions of 13 southern and mid-Atlantic states with improved links between communities and access to other regions. These highways are more than roads — they are lifelines.

Environmental Stewardship Role for State DOTs

ISTEA forged the link between transportation and the environment. That linkage was sustained in TEA-21. Both laws have facilitated the evolution of a new role for state DOTs as environmental stewards. Such stewardship is an agency-wide commitment to integrating environmental values into all transportation work as a core business value. It means improving environmental conditions when possible, not just to comply with regulations.

The states — including their transportation departments — are proud of the progress made over the past three decades in clearing America's air of pollutants. Over that period, emissions from motor vehicles have dropped considerably, FHWA notes, including volatile organic compounds (down 59 percent) and carbon monoxide emissions (down 43 percent) despite a 143 percent growth over the same period in vehicle miles traveled.[1] Cleaner vehicles, clearance of traffic-congestion bottlenecks and other operations steps, and strong emissions inspection and enforcement — often administered through state DOTs — have had a positive impact.

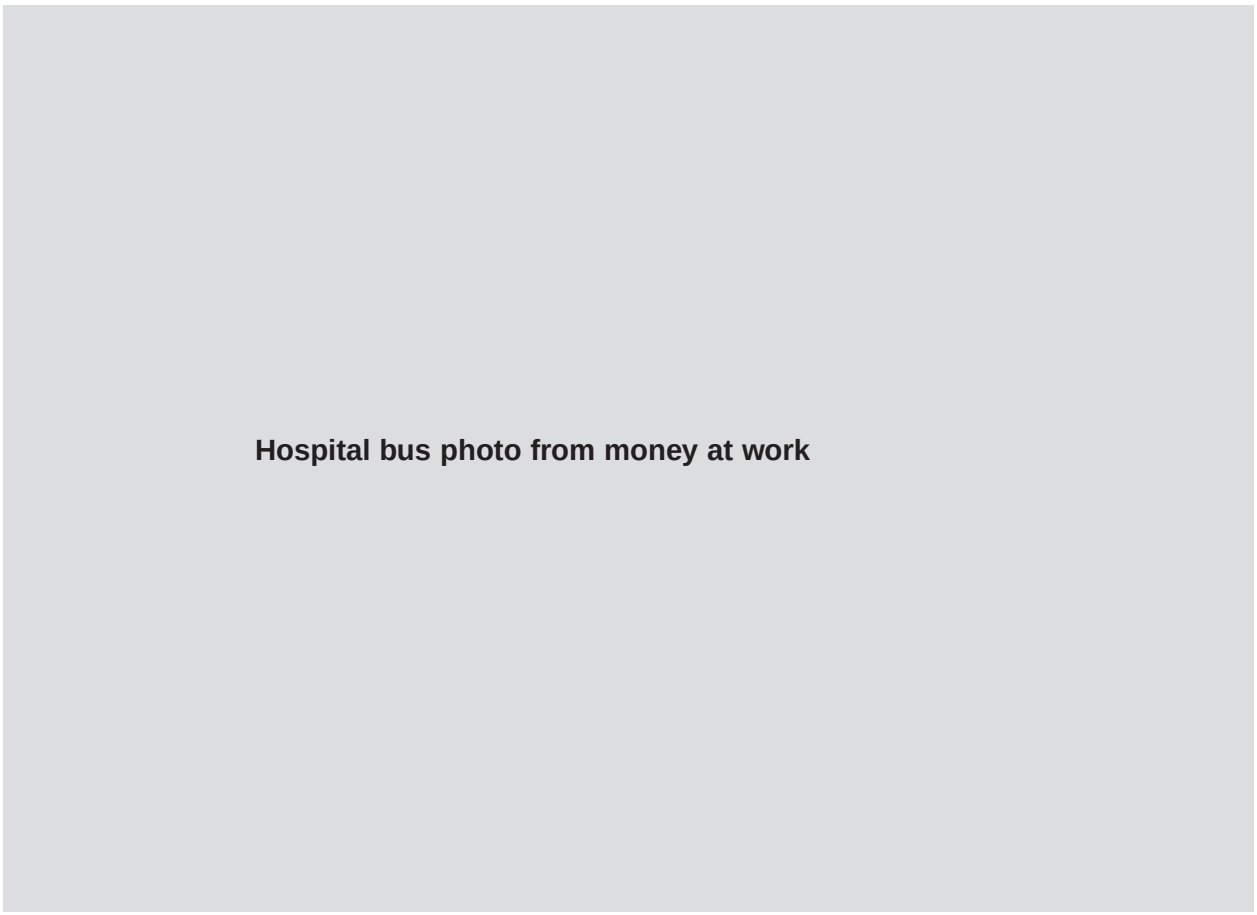
Many state DOTs go beyond merely securing the necessary permits from federal environmental resource agencies to partnering with communities and environmental stakeholders to achieve multiple objectives. In addition to solving a transportation problem, a transportation project may also address environmental issues through wetland restoration or address social issues by including features such as historic-style streetlights, boulevards, and plantings to create a park-like gateway to an historic neighborhood.

Transportation Investment can yield Environmental Benefits

While the ribbon cuttings of new transportation projects generally focus on mobility, reliability and safety benefits, we often overlook the 5 percent to 20 percent of project cost that is invested in environmental factors. Examples of environmental benefits are as follows:

- The federal-aid highway program is creating 2.5 acres of wetlands for every acre it takes for road construction.
- Since 1970, 44 states and Puerto Rico have constructed over 1,600 miles of noise barriers at a cost of over $1.9 billion, in 1998 dollars.
- Highways are among the biggest recyclers in America, through re-milling pavements, use of fly ash in concrete, and the use of crumb rubber as a component of road surfaces.
- Over the past 11 years, $4.9 billion in enhancement projects — such as bike paths and the preservation of historic bridges and train stations — have been built in more than 14,000 communities.

[1] **U.S. Department of Transportation, Federal Highway Administration, "Transportation Air Quality – Selected Facts and Figures," January 2002, page 8.**



Community Compatibility and Transportation

Integrating transportation and land-use planning can result in less traffic and more livable communities. Such programs as the Transportation and Community and System Preservation Pilot Program, established under TEA-21, identify pedestrian and traffic linkages, urban-design strategies and zoning changes that will better integrate planned transportation improvements with existing neighborhoods and new developments.

Transportation and Healthy Communities

Many casual observers of transportation are surprised to learn that trips to non-work destinations comprise the largest segment of travel today. Trips for medical care, while comparatively few in number, are significant because of their impact on health. However, affordable alternatives to driving are often limited. In areas of urban poverty, public transportation is often unreliable, inconvenient and underfunded. In many rural areas, public transportation is non-existent.

As a result of these constraints, 9 percent of children in American families with incomes under $50,000 are unable to access routine medical care because of a lack of transportation resources. For children in families with incomes at or below the poverty level, one in five misses routine visits to the doctor because of transportation problems.

TOURISM

The Power of Tourism

Travel and tourism are vital to our economy. In 2000, 51 million foreign visitors came to the United States, spending $100 billion, generating more than 1.1 million jobs and making tourism America's fourth largest export. But domestic travel and tourism dwarf international visits. Americans touring America spent $481 billion and generated an additional 6.5 million jobs during 2000.

However, the United States saw six million fewer international visitors in 2001, a 12 percent decrease from the previous year as tourists were deterred by the September 11 terrorist attacks in New York and Washington. The long-term impacts of these attacks on tourism are only now becoming apparent, and could include lower-than-expected tourist visits for the next several years.

International Travel and Tourism and Transportation

Travelers to the United States from outside North America spend an estimated $220 per visitor on transportation. Although many use transit or tour buses initially, significant numbers shift to private cars on second and third visits. This is especially true of Canadians and Mexicans, who dominate travel to the United States.

Federal Transportation Programs Supporting Tourism

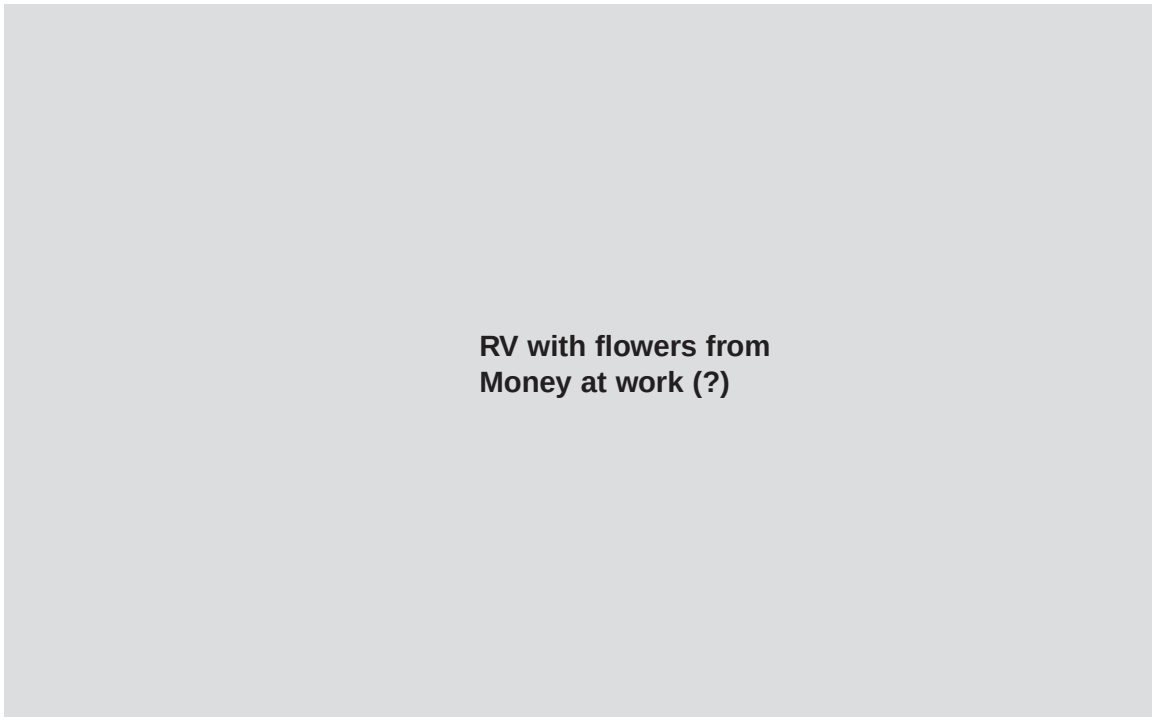
Several federal transportation programs support tourism, including:

Roads that have outstanding scenic, historic, cultural, natural, recreational, or archaeological qualities can be designated as All-American Roads or National Scenic Byways and receive federal funding for projects to enhance the travel experience.

- The Appalachian Development Highway System has opened up that region for the development of tourism.
- The National Historic Covered Bridge Preservation program assists states in rehabilitating or repairing and preserving historic covered bridges.
- The Federal Land Highways program is a major source of support for travel on public lands such as national parks and national forests.
- The Recreational Trails Program helps develop and maintain recreational trails.

Transportation and Recreation

Recreation is one of the fastest-growing sectors in the U.S. economy, expanding at 5 percent a year. The American Recreation Coalition notes that there are 8.6 million recreation vehicle-owning households now and 10.4 million expected by 2010. In addition, there are some 9 million towable boats, 1.7 million snowmobiles, nearly 3 million recreational horses, and 5 million all-terrain vehicles. The recreation sector is heavily dependent on federally owned lands that comprise 650 million acres, or about 29 percent of the total land area of the U.S. National Park Service areas get more than 273 million visitors annually, who bring more than $5.5 billion in spending a year to



nearby communities. U.S. Forest Service lands and campgrounds see even more visitors. The use of forest-service roads, which total over 400,000 miles, has increased 15-fold over the past 20 years. Their use now is 90 percent recreation-related. Recreation industries such as skiing have now become one of the prime economic drivers in rural communities previously dependent on timber, mining and agriculture.

TRANSPORTATION AND NATIONAL DEFENSE

The U.S. highway system plays a critical role in the movement of military equipment and personnel, particularly in wartime. In the event of a national military or security emergency, heavy military equipment, including oversized cargo vehicles and personnel must be deployed expeditiously with personnel from military installations to various seaports and airports. The ability to rapidly get to embarkation ports is critical to our nation's defense. The strategic routes used for these movements are defined as Strategic Highway Network (STRAHNET) routes and connectors.

STRAHNET is a system of public highways identified as crucial to U.S. strategic defense policy. The 61,000-mile system, designated by the Federal Highway Administration in partnership with the Department of Defense, comprises about 45,400 miles of Interstate and defense highways and 15,600 miles of other public highways. STRAHNET is complemented by about 1,700 miles of connectors — additional highway routes linking more than 200 military installations and ports to the network.

Transportation and Emergency Evacuation

The capability of the highway system to manage massive amounts of traffic in major emergency evacuations is critical to the safety and survival of threatened populations. Our national highway system — coupled with a coordinated roadway-information system to manage traffic and provide traveler information — is essential to rapid, efficient, and safe evacuation.

NATIONAL SURFACE TRANSPORTATION INVESTMENT REQUIREMENTS

HIGHWAYS

INTRODUCTION

In preparing a rigorous, quantitative evaluation of the nation's surface transportation needs, AASHTO worked in cooperation with the Federal Highway Administration, the Federal Transit Administration and the Transportation Research Board to address prior information gaps and expand existing capabilities.

This effort incorporated the FHWA/FTA Condition and Performance process and other analytical tools developed by federal agencies to assess the needs of the highway, bridge and transit systems, supplementing them with the knowledge and experience of state transportation agencies. This analysis incorporates methods and assumptions used by federal transportation agencies, with at least two notable differences:

- The federal Condition and Performance process employs a 20-year time frame divided into four five-year periods. Because this analysis is focused on reauthorization, it uses a six-year time frame, set in a 20-year context.
- The Condition and Performance process takes its time frame starting from an historical base. Therefore, the next Condition and Performance report, to be issued in 2002, will take a 20-year perspective starting from the year 2001. This report is focused on the next reauthorization time frame, beginning in 2004 and ending in 2009.

Based on these differences, it would be expected that AASHTO's assessment of needs, starting from a base point in the future with higher traffic volumes, a more deteriorated system and a greater backlog of investments to be made, would show greater investment requirements than the FHWA report.

Cost estimates in this report are expressed in year-2000 dollars.

The Backlog

Much of the growth in investment needs results from the aging of the transportation system. Over time, weather, wear and age take their toll on roads, bridges and transit facilities. The repairs, replacements and upgrades needed to bring the existing system up to standard have created a huge backlog of needed investment. These investments are justified immediately to capture benefits (relieving congestion, saving lives) or to prevent further deterioration that results in greater future investment needs.

Travel Trends

The forecasts of vehicle miles traveled growth used here are derived from state and local predictions. In addition to the traditional forces of change in travel, such as population, incomes, household composition, freight trends, etc., the changes in vehicle miles of travel employed are designed to be sensitive to the changes in the services provided by the system. The estimates employed here indicate that the annual growth in the six-year period from 2004 to 2009 will average between two percent and 2.2 percent, 50 percent over 20 years. Freight movement will be an increasingly significant factor because of growing NAFTA and other international trade, and the importance of just-in-time delivery to business productivity.

THE BASELINE FOR FUTURE SCENARIOS

System Physical Condition

Expanded funding under ISTEA and TEA-21 has improved the nation's highways in recent years, but much remains to be done. The percentage of roads rated "good" and "fair" has grown, but largely seems to be the result of roads rated "very good" deteriorating. More important is that more than 80 percent of all roads are in the "very good/good/fair" range.

Rural roads, which comprise the great majority of roads, but a much smaller share of travel, have been able to hold their condition relatively steady. Urban roads, in poorer condition to begin with, have deteriorated further. There is continuing improvement in the condition of Interstate pavements, both rural and urban.

System Performance

Although statistical monitoring of highway system performance is lacking, anecdotal evidence and specialized studies make it clear that congestion and declining performance is common.

- Average commute times, after a 40-second increase in the 1980s, jumped by more than three minutes during the 1990s to a national average of 25.5 minutes.
- Congestion is increasing not only in the major cities but in all sizes of metropolitan areas. The cost per peak period traveler is estimated at over $1,100 annually.
- 5.7 billion gallons of fuel are consumed by congestion annually, not only wasting money but adding to air pollution.

A Scenarios Approach to Future Investment

Two scenarios were designed to provide a comprehensive sense of the scale of investment needs and to help evaluate investments needed to support goals for the system.

The scenarios are:

Maintain Condition and Performance Scenario

- Hold user costs constant as travel demands grow.
- Assure that travelers experience no new delays.
- Maintain system physical condition and prevent further degradation.

Improve Condition and Performance Scenario

Make all economically justifiable investments that:

- Improve pavement condition;
- Increase average speeds;
- Reduce delay; and
- Reduce user cost.

SCENARIO ASSUMPTIONS

- The scenarios have 20-year perspectives, but focus on a six-year timeframe with a 14 percent travel growth.
- Reflect total capital program estimates by all levels of government for all highways and bridges.
- Both scenarios incorporate the costs for roads on new rights of way, as well as capacity expansions that are accomplished by lane additions within existing facilities.
- Only projects with benefits exceeding costs are included.

Condition and Performance in 2004

To set a baseline to measure performance of alternative investment scenarios, highway conditions in 2000 were projected to 2004 using FHWA's Highway Economic Requirements System model, applying actual and projected spending.

2004 Baseline Conditions

Measure	2004 Value	Notes
Physical Condition:		
Average International Roughness Index	**125**	**A range of 95 to 170 is "fair."**
Performance:		
Total Hours of Delay per 1,000 VMT	**4.3**	**VMT = Vehicle Miles of Travel**
Average Speed	**40.6**	**Miles per hour**
Costs:		
Total User Costs $/1,000 VMT	**$937**	**Includes operating, safety and travel time costs for both passenger vehicles and trucks.**

The Basis of System Performance Measurement

A substantial array of measures are generated by the HERS model* to describe the performance of the system under different programs of investment. This document focuses on four main measures:

- **Pavement Condition** — The International Roughness Index is used to measure the level of pavement service.
- **Delays** — The primary measure used is hours of delay per 1,000 miles of vehicle travel. Total delay is the sum of traffic signal effects, traffic incidents, and congestion.
- **Speed of travel** — Vehicle speed is used as the most straightforward measure of system performance quality.
- **Total user cost** — User costs include vehicle operating costs, crash costs, and travel time costs.

These four measures are employed to gain a sense of the effects of investment. No attempt has been made to incorporate them into a composite ranking system.

Maintain Conditions and Performance Scenario

An annual investment of **$92.0 billion** by all levels of government for highways and bridges is necessary to maintain both physical condition and performance characteristics of the system over 20 years and explicitly during the next reauthorization cycle. This scenario includes cost estimation for roads on new rights of way, or other higher-cost means, as well as capacity expansions that are readily accomplished by lane additions within existing facilities.

Maintain Conditions and Performance Scenario Effects and Costs — 20-Year Perspective

	2004	2009	2023
Measure	**Base Value**	**Maintain Conditions and Performance**	
Average International Roughness Index	**125**	**127**	**124**
Average Speed	**40.6**	**39.9**	**42.2**
Total hours of Delay /1000 VMT	**4.3**	**4.2**	**4.1**
Total User Costs $/1000 Vehicle Miles	**937**	**946**	920

***The HERS model, employing the Highway Performance Monitoring System (HPMS) data base, provided to FHWA by the states, performs analyses on 112,000 sample road segments and determines current needs and future requirements based on evaluations of each segment's present and future condition and performance. All prospective improvements on each sample segment are subjected to cost-benefit analysis and only those demonstrating a positive return are accepted.**

The scenario seeks to maintain conditions and performance for the reauthorization period, 2004-2009, and then considers the effects of the scenario out to 2023. The table above shows that this funding level succeeds broadly as defined by our measures and generates improvements in all of the measures in the year 2023.

The investments hold user costs at less than a 1 percent increase in the reauthorization period. Both rural and urban areas increase less than 1 percent in user costs, with rural areas rising somewhat faster in VMT growth. Pavement roughness and delay are also held relatively constant. Levels of systems reliability remain about the same as well.

An Improve Conditions and Performance Scenario

An annual investment of **$125.6 billion** by all levels of government for highways and bridges is necessary to improve both physical condition and performance characteristics of the system over 20 years and explicitly during the next reauthorization cycle. This scenario, analogous to the Maximum Economic Investment scenario in the FHWA Condition and Performance Reports of recent years, identifies investments with a benefit-to-cost ratio greater than 1 that can be made within the strictures of the modeling process, and describes the resulting performance characteristics.

This level of investment substantially improves the system by the end of the reauthorization period. Pavement condition improves by almost 15 percent from the base period. Much of this improvement occurs in urban areas, which are currently much poorer in quality than rural areas, reducing, but not eliminating, the disparity between urban pavement conditions and rural.

Improve Conditions and Performance Scenario Effects and Costs — 20-year Perspective

	2004	2009	2023
Measure	**Base Value**	**Maintain Conditions and Performance**	
Average International Roughness Index	**125**	**109**	**98**
Average Speed	**40.6**	**42.02**	**44.74**
Total hours of Delay /1000 VMT	**4.3**	**3.89**	**3.58**
Total User Costs $/1000 Vehicle Miles	**937**	**913**	**882**

The investments reduce delay by almost 13 percent despite the expected VMT growth. The investments focus heavily on reducing delays in urban systems, where most of the delay exists, although they also reduce, but not eliminate, delay in rural areas. Urban delays remain five times that of rural areas per mile of travel.

Average speeds also improve considerably with gains in both rural and urban areas.

There is a significant improvement in user costs, generating impressive benefits. The drop from $937 per 1000 miles of travel to $913 represents a 3.5 percent reduction. While this percentage seems small, when applied to 3 trillion miles of travel per year, a $20 per 1000 miles saving equates to roughly a $60 billion a year saving for users, more than compensating for the incremental costs of this scenario. The user savings result in increased productivity and job growth.

The expanded levels of investment have even a greater impact over a full 20-year span including:

- A more than 20 percent improvement in pavement conditions
- A greater than 10 percent improvement in average speeds
- A greater than 16 percent improvement in delay
- An almost 6 percent improvement in user costs, saving over $200 billion per year in user costs by 2009

All of this is attained despite at least 50 percent growth in travel over the 20-year period.

The Price of Inaction

To put the effects of these two scenarios in perspective, their benefits must be measured on a scale against current spending and what the future effects of that level of spending would be. The following measures express the state of the system at the end of the next reauthorization period if spending has been maintained at the current levels. By every measure, the quality of the current system will deteriorate, resulting in poorer pavement, slower speeds, increased driver delay and increased costs to the user.

FHWA reports that as of 2000, highway capital outlays by all levels of government were $64.6 billion.

Scenario Effects — Current Spending

Measure	Base Value 2004	New Value 2009	Change 2004-2009
Average International Roughness Index	125	147	18% degradation
Average Speed	40.6	35.9	12% degradation
Total hours of Delay /1000 VMT	4.3	4.64	8% degradation
Total User Costs $/1000 Vehicle Miles	937	1014	8% degradation

Factors Not Included in the Cost Estimates Produced through HERS Modeling

In addition to the needs estimates produced by the HERS modeling analysis, which included costs for highways, bridges and transit, there are other cost factors that must be considered. These include cost estimates for Safety, Security, Interstate Interchanges, and Increasing Program Delivery Costs, which together may equal as much as $11 billion annually:

Safety

Implementing AASHTO's Strategic Highway Safety Plan to save 5,000 to 7,000 lives annually is estimated at $3 billion annually in capital costs and $1 billion annually for operating costs.

Security

Enhancing highway and transit security is estimate to cost $2 billion annually in capital costs and $1 billion annually in operating costs.

Interstate Interchanges

If future Interstate interchanges constitute 20 percent of project costs in the next six years, rather than 10 percent as at present, this is estimated to increase capital costs by $3 billion annually.

Increasing Program Delivery Costs

The combination of environmental reviews, mitigation and right of way acquisition is adding time and cost to transportation projects. The increase nationally is conservatively estimated at $1 billion annually.

THE INTERSTATE HIGHWAY SYSTEM

The 46,677-mile Dwight D. Eisenhower System of Interstate and Defense Highways is the crown jewel of America's roads. From its inception in 1956, it has been transformational, connecting our nation as never before, opening up communities to new opportunities and truly nationalizing our economy.

The importance of the Interstate highways to transportation and the economy cannot be exaggerated. Comprising only a little more than one percent of our nation's roads, they carry more than 24 percent of travel, including 41 percent of total truck miles traveled. As the following table makes clear, the Interstates have value far out of proportion to their modest size.

Interstate Highway System — Key Statistics

	Interstate System	Total Highway System	Interstate System Share (%)
Interstates			
Road Miles	**46,677**	**3,951,098**	**1.2**
Lane Miles	**209,655**	**8,328,856**	**2.5**
VMT (billions)	**667**	**2,767**	**24.1**

Although the Interstates have always played a key role in intercity connectivity, military support and efficient long-distance travel, they increasingly are seen as also supporting local economic growth, moving freight within metropolitan areas, providing access to airports and speeding other metropolitan travel. Reflecting the evolving expectations that state and local officials have for the Interstates, growth in travel on their urban segments has been greater than on the rural portions, with a 41 percent overall increase during the 1990s.

Travel per lane mile in urban areas – perhaps the best indicator of potential congestion – has grown by roughly 25 percent during the same period. Urban Interstate congestion is currently high in nearly half of the states, and 41 states in a recent General Accounting Office survey predicted that it would be high or very high a decade from now.

Pavement Quality

While total travel on the rural system increased by about 35 percent during the 1990s, axle loadings increased by more than 88 percent, indicating the ever-growing importance of the Interstates for freight movement. Given a projected doubling of freight movement over the next 20 years, this indicates the potential for significant wear and tear on the system.

Despite this increasing load, the condition of pavement has actually improved in recent years, reflecting both greater federal funding and state commitment to maintaining these vital roads. In spite of the progress, 18 percent of Interstate pavements are in poor or mediocre condition, requiring immediate investment. The remainder of the system, because of increasingly heavy use, requires substantial routine maintenance to ensure that it remains in acceptable condition.

Safety

Investment in the Interstate system buys not only better performance but also superior safety. Safety-related improvements have dropped the fatality rate on the Interstates by half during the past 20 years, to 0.85 per 100 million VMT. The Interstates typically carry 26 times the traffic per mile as the rest of the system and so, even with a fatality rate roughly half that of other roads, sheer traffic volume means that the Interstates still see too many deaths.

Federal Rules Prevent Documentation of Actual Interstate Needs

At the request of the House Transportation and Infrastructure Committee the General Accounting Office completed a report in May, 2002, on the *Status of the Interstate Highway System*. GAO noted that because of the fiscal constraint restrictions imposed by current federal planning statutes, "states' plans might not identify the funding needed to address all of the pressures states expect on their Interstate highways." Those states, which found a way to report their true needs in spite of these restrictions, "showed a gap between expected revenue and what states would like to invest."

The Special Case of Interstate Interchanges

Many Interstate highway interchanges are coming due for renewal. Rebuilding them can be very costly, in part because interchanges often involve major safety and efficiency improvements. This is particularly true where Interstate facilities meet, where HOV lanes are operating, where substantial traffic growth has occurred or where there is heavy truck traffic.

Megaproject photo from Annual report

Night construction

Historically, interchanges have consumed about 10 percent of capital spending on Interstate highways. After seeing evidence that costs actually are higher, AASHTO and the National Cooperative Highway Research Program collaborated on a study to determine whether traditional budgeting for interchange improvements was still valid. Analysis showed that complex new interchanges are costing far more than in the past, and are consuming about 20 percent of Interstate capital spending. This is true even without the impact of megaprojects that are expected to cost well over a billion dollars.

A survey of the 12 states included in the analysis showed that the number of interchange megaprojects planned for the next 10 years is substantial and clearly more than in the '90s.

These findings have enormous implications for interchange project planning. States will need to allocate larger portions of their budgets to interchanges, which means that more funding will be needed overall to complete projects.

The survey showed that the 12 states planned to spend an average of 20 percent of total Interstate capital investment on interchanges in the next decade. But in some cases, the survey shows such needs may run as high as 30 percent. Past spending on interchanges has averaged about 10 percent of Interstate capital investment, but has rapidly risen in recent years. As a result, current models may understate such needs by as much as $3 billion annually.

BRIDGES

Progress to Date

The success of recent investments in our nation's highway bridges is clear. Increased investment has improved the structural condition of our bridges, making them safer and increasing their value and lifespan. A decade ago, 200,000 of America's 575,000 bridges were deficient. Of the 200,000 deficient bridges, about 120,000 were structurally deficient and 80,000 were functionally obsolete. In the years since, the nation has added fewer than 15,000 bridges. Instead of new construction, additional investment made possible through ISTEA and TEA-21 has been focused on rehabilitating bridges to meet safety and functional standards.

Investments made possible by ISTEA and TEA-21 have permitted great progress in reducing the number of deficient bridges from 35 percent of the total inventory down to about 28 percent. Today, the number of deficient bridges is down to 163,000 out of a total inventory of 590,000.

However, about half of the nation's 590,000 bridges were built before 1965, and a quarter are more than 50 years old. While properly cared-for bridges can be considered to be virtually permanent, their age at the very least means they need significant maintenance and may be functionally obsolete.

Highway Bridges by Year Built

(Graph 3)

Condition of Bridges

	1992	2002
Structurally Deficient	120,000	83,000
Functionally Deficient	80,000	80,000
Acceptable	375,000	427,000
Total	575,000	590,000

Addressing the Backlog of Bridge Needs

The investment costs needed to address the backlog of bridges needing repair has fallen in tandem with the reduction in bridge deficiencies. The bridge backlog now stands at $52 billion, based on an evaluation employing the new National Bridge Investment Analysis System.

No Name for this Table

Type of Investment	Costs (Billions)
Bridge Replacement Needs	$37.2
Bridge Improvement Needs (widening, raising, strengthening)	$3.1
Maintenance, Rehabilitation and Reconstruction Needs	$11.6
Total	$51.6

The $52 billion represents a considerable reduction from past assessments of the bridge investment backlog — in part because of progress made possible by the increased funding levels under ISTEA and TEA-21; partly due to priorities set at the state and other levels; and partly due to the reduced levels of investment needs that meet economic analysis criteria.

Examining the investment alternatives through the National Bridge Investment Analysis System indicates that an investment of **$48 billion** ($7.9 billion per year) can reduce the backlog by close to half by the conclusion of the next reauthorization cycle in 2009.

Alternatively, a base investment of **$43 billion** ($7.2 billion per year) would be sufficient to maintain the backlog at present levels. Investments below that level actually begin to create an increase in the backlog over time.

LOCAL ROADS AND BRIDGES

Road Networks

The 160,000-mile National Highway System, which includes the Interstates and principal state arterials, carries 40 percent of traffic nationally. A significant portion of the remaining traffic is carried on the three million mile network of arterials, collectors and local roads owned and operated by counties, cities and townships. These roads link rural and urban areas, carry freight, food, healthcare and other goods and services to our citizens, and provide access to the homes and communities in which we live. Seventy-eight percent of this national road network is in rural areas, and the remaining 22 percent is in urban areas.

Travel Volumes

Local roads and streets are the beginning and ending links for most trips, but these trips generally shift to the collector roads and, eventually, concentrate at the arterial system that carries over 72 percent of the total urban and rural traffic. Even though there are more rural miles of road, the urban roads carry approximately 61 percent of the traffic.

Safety on Local Roads

The General Accounting Office recently reported that, "Although only about 40 percent of all vehicle miles are traveled on rural roads, about 60 percent of the traffic accident fatalities that occurred in 1999 occurred on rural roads." This is even more pronounced on two-lane rural roads, which have fatality rates six times greater than those of urban Interstate highways. There are approximately twice as many fatal accidents on state rural roads than local rural roads, largely because of the higher traffic volumes on state highways.

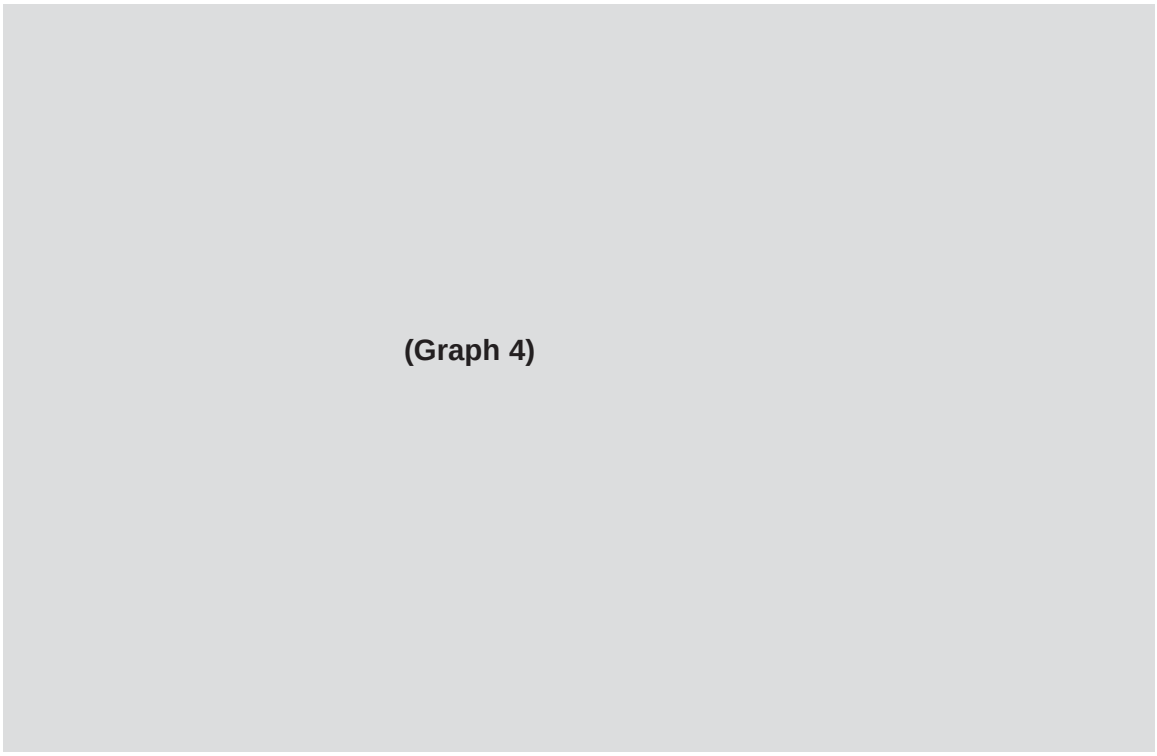
Bridges

Most of the 590,066 bridges in the United States are under local jurisdiction. Local bridges comprise 51 percent of the total, and counties own 78 percent of local bridges. Of the county bridges, 22 percent are structurally deficient and 11 percent are functionally obsolete. Cities have 13 percent of bridges structurally deficient and 20 percent that are functionally obsolete.

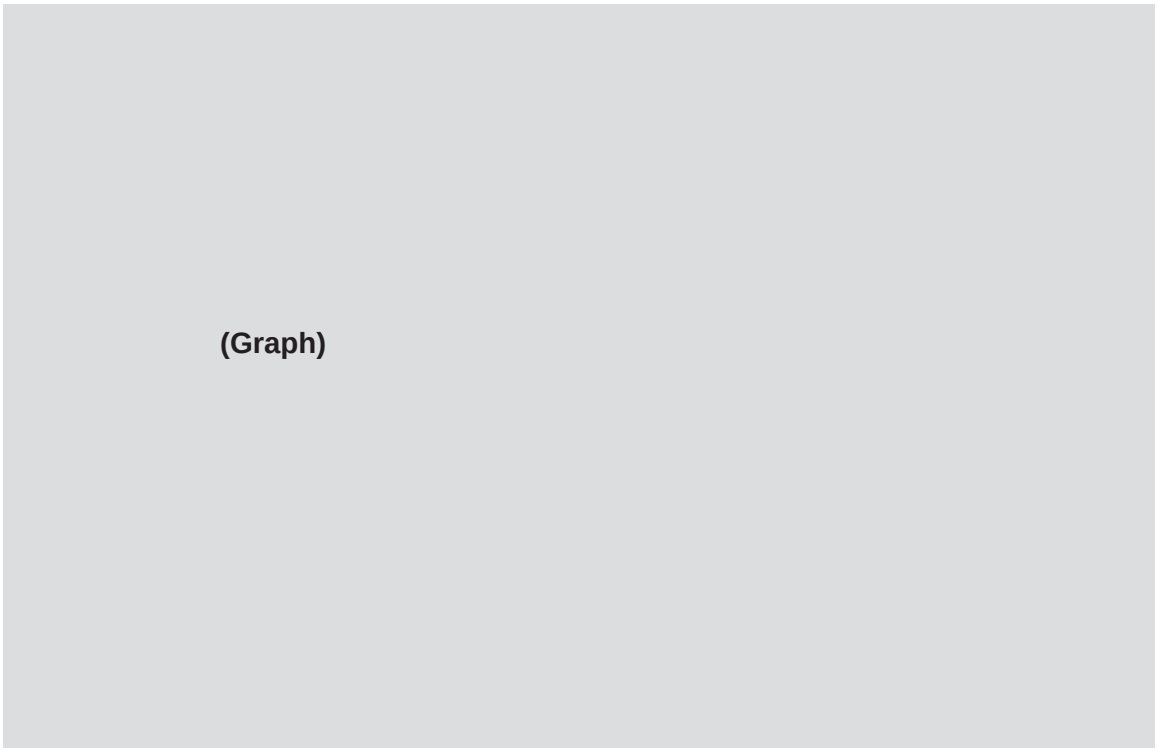
Expenditures on Local Roads

Across the country, states spend almost 60 percent of their federal funds on urban roads and bridges and the remainder on rural facilities. Roads under local jurisdiction often receive a share of federal road funds, but a significant portion of local funding comes from state and local taxes, not federal aid. Approximately 32 percent of all disbursements for highways are spent on locally owned roads.

Miles by Functional System



Fatalities



Sources: FARS, 2001, NHTSA, *Highway Statistics*, 2001, FHWA.

PRESERVATION AND ASSET MANAGEMENT

The Importance of Preserving Transportation Assets

Previous generations have made a tremendous investment in our transportation system. The total value of our roads and bridges has been estimated by U.S. DOT at $1.4 trillion, and transit assets are estimated to be at least $300 billion. This includes 8.2 million lane miles of highway, 590,000 bridges, approximately 150,000 transit vehicles, 10,000 miles of track, and 2,900 transit stations. If these facilities are to serve future generations, they must be preserved and modernized.

Expenditures for highway maintenance in 2000, after accounting for inflation, were 47.6 percent above the 1970 level, while capital expenditures were 33.7 percent above the 1970 level. GAO's May, 2002, Report on Highway Infrastructure, states with regard to Interstate Pavement Projects from 1992 through 2000, "the kinds of projects undertaken after 1991 show a shift from construction to maintenance … 93 percent was for projects to reconstruct, relocate, restore and rehabilitate, or resurface pavement." According to the analysis done by the FHWA in 1999, the cost to preserve just the 47,000 mile U.S. Interstate Highway System is $10 billion annually beyond current funding.

The timing of preservation investments over the life cycle of an asset is also critical. The right maintenance treatment at the right time can sustain the system in satisfactory condition. If funds are not made available for preventive maintenance, the facility will continue to deteriorate and ultimately fail. Replacement costs are often five to ten times greater than the amount required for timely preservation.

Asset Management

To help make more systematic management decisions in this area, state DOTs are partnering with industry to advance the concept of "Asset Management." Asset management is a systematic process for maintaining physical assets cost-effectively. Most states and local governments already use a series of management systems to support investment decisions for bridges, pavements, maintenance, congestion, transit and safety. Asset management takes concepts inherent in those individual management systems and raises them to a new level that integrates them and evaluates tradeoffs among asset classes.

The results include the preparation of budgets for state legislatures, counties, cities, and transit authorities which systematically explain what needs to be done, where, on what schedule, how much it will cost, and what the benefits will be. Better decisions are made which channel more resources to asset preservation. The useful life of many transportation assets can be extended at a lower cost.

pavement picture

INCREASING PROGRAM DELIVERY COSTS

Project Costs

The combination of environmental reviews and mitigation and the need to be responsive to community concerns is adding time and cost to transportation projects. The costs of preliminary engineering, to move a project from the planning stage through the environmental analysis process, including the associated public involvement, to the record of decision are not well-documented.* However, there are already indications of the challenges transportation officials face.

The best evidence: Only 16 percent of transportation projects required to complete an environmental impact statement completed the environmental review process in fewer than three years while 32 percent of projects took seven or more years.

The Environmental Review Process

In order to move from the planning phase to final design, all federally funded highway projects must go through one of three environmental review processes under the National Environmental Protection Act (NEPA): categorical exclusions, environmental assessments, or environmental impact statements. Until the process is complete, final design cannot begin, rights-of-way cannot be acquired and construction materials and transit rolling stock cannot be purchased. Once the NEPA process is complete, permits may also be required from federal agencies, such as Section 404 wetlands permits from EPA and the U.S. Army Corps of Engineers. These add additional time to the project-approval process.

An October, 2000, AASHTO National Cooperative Highway Research Program (NCHRP) study showed that 91 percent of federally-funded highway projects qualify for categorical exclusions, 7 percent qualify for environmental assessments and 2 percent require full-blown environmental impact statements. For those requiring an impact statement, an FHWA analysis prepared in 2001 by the Louis Berger Group shows that the average time to complete an EIS takes over five years, and for projects involving an EIS, the time from the inception of planning to the completion of construction averages 13 years.

For the 7 percent of projects requiring environmental assessments, AASHTO's NCHRP study of 30 state DOTs showed the review time to average 14 months. However, when delayed by Section 4(f) or 106 historical reviews, for example, the average processing time increased to 42 months.

And contrary to the assumption that the 91 percent of projects which qualify for categorical exclusions require little to no review, the NCHRP study found that the review time for these projects — bike paths, intersection improvements, bridge replacements, and the like – averaged eight months. For the 40 percent subject to delays due to historical and other reviews, project approvals averaged 22 months.

Public Involvement

All federally funded highway and transit projects must coordinate an extensive public- involvement process. It must provide early and continuing opportunities for the public to be involved in the

***NCHRP Study 20-24 (Task 25), currently underway, is attempting to document the costs associated with the preliminary design phase of highway projects. Its results should be instructive. Other analysis is being done on right-of-way acquisition and the costs of environmental mitigation.**

identification of social, economic, and environmental impacts and relocation issues. Through an emerging field called "context-sensitive design," state DOTs are attempting to be more responsive to a broader range of community concerns including those for preserving historic values, neighborhood character, and aesthetics.

The sheer complexity of the process by itself requires substantially more resources than it did 20 years ago. But states have found that it is better to commit the resources necessary to do the job well, than to skimp and be told by the courts to start over again. The point to be made is that the time and resources this extensive review requires has added substantially to project delivery costs. This must be factored into any comprehensive needs estimate.

Mitigation and Right-of-Way Costs

Wetland mitigation is among many types of mitigation that may be required for a project to proceed. Others include the construction of noise walls and replacement of wildlife habitat. A systematic study is required to update estimates of the costs mitigation typically adds to a project.

MANAGING THE SYSTEM

Over the past 20 years, growth in travel on the nation's highways has far exceeded growth in highway capacity. As a result, congestion is a critical problem for metro areas nationwide. Cities of all sizes are experiencing more severe congestion for longer periods of the day. Between 1982 and 1999, the average delay per person due to congestion jumped from 11 hours to 36 hours per year. As a result, traffic flow is the aspect of the nation's highway system that the public is least satisfied with, according to the FHWA Traveler's Satisfaction Survey.

More than 60 percent of all delays are the result of non-recurring congestion caused by crashes, weather, or other incidents. Such congestion is especially disruptive because drivers cannot fully anticipate or plan for it. Efficient management and operation strategies can reduce delays and improve reliability, while also providing such benefits as quicker response by emergency vehicles.

A Systems Management and Operation Approach

System management and operations covers a wide array of strategies including: incident detection and response; snow and ice management; emergency and disaster response; planned construction disruption; traffic and transit operations and management; and traveler/shipper information. Both capital and operating investments are needed to achieve the benefits of system management. Such investments are eligible for TEA-21 funding, and are an important element for reauthorization.

Benefits of Management/Operations Strategies

Investments in systems management and operations can be low cost and yield high benefits for travelers in reduced congestion, increased safety and improved quality of the travel experience. For example, improvement in routine traffic operations can efficiently improve travel time and reduce delays: signal improvements can reduce travel time eight to 25 percent; and ramp metering in Minnesota has increased travel speeds 16 percent, with fewer crashes.

Incident management strategies to identify and clear crashes more quickly can significantly reduce non-recurring congestion, as well as help prevent additional crashes. Evidence suggests that delays

due to crashes and other incidents can be reduced by up to 50 percent with active detection and response techniques, and may be the most effective stand-alone strategy for improving traffic flow.

Managing the transportation system at peak performance cannot eliminate congestion, but it can reduce delay, improve reliability, reduce injuries and fatalities and restore a sense of control to travelers.

TRANSIT

The nation's extensive public transportation network provides access to jobs; mobility for the young, elderly or disabled and helps reduce congestion, conserve fuel, enhance the efficiency of highway transportation, reduce air pollution and support security and emergency preparedness activities. An efficient, safe and environmentally sound public transportation system is essential to moving people in both rural and urban areas.

SYSTEM OVERVIEW

Public transportation services are currently available in 319 urbanized areas, and every state has some level of public transportation service available to its rural areas. There are:

- 556 public transportation operators in urban areas;
- 1,260 organizations that provide public transportation services in rural areas; and,
- 3,660 organizations that provide public transportation services to the elderly and people with disabilities.

Ridership

Increased federal, state and local investment in transit has helped spur a 22 percent ridership increase during the past six years, with the 9.5 billion passenger trips during 2001 being the highest level in 40 years. Continued ridership growth at levels comparable to those actually observed over the last six years would result in an average increase in passenger trips of approximately 3.5 percent annually, or a 100 percent increase over the next two decades.

Photo of blind kid boarding train.

CURRENT SYSTEM PHYSICAL CONDITION AND PERFORMANCE

Today, 22 percent of the nation's buses and 43 percent of its rail rolling stock exceed their recommended service life. An additional 47 percent of buses, and 11 percent of rail rolling stock, will exceed their recommended service life within the next six years.

Sizable infrastructure investment is required to accommodate increased ridership demands, including the construction of new transit systems and expansion of existing fixed-guideway transit systems. Underinvestment in rural and specialized transit services has resulted in substantial unmet needs and under-served areas.

More than 54 percent of all public transportation trips in the nation are reported to be work- related, confirming transit's importance to the economy.

Transit Trips by Purpose

Type of Trip	Percent of Total
Employment/Work	54
School	15
Shopping	9
Recreation/Social	9
Medical	6
Other	8

Average Weekday Transit Ridership by Mode (2000)

Mode	Average Weekday Unlinked Trips	Percentage of All Transit Trips
Bus	19,788,000	61.8
Heavy Rail	8,686,000	27.1
Commuter Rail	1,445,000	4.5
Light Rail	1,034,000	3.2
Trolleybus	388,000	1.2
Demand Response	372,000	1.2
Ferryboat	164,000	0.5
Other Rail	78,000	0.2
Vanpool	50,000	0.2
Totals	32,005,000	100.0

Urban Bus Systems

The nation's public transportation bus fleet now exceeds 80,000 vehicles, 69 percent of which are currently over-age or which will exceed their federally recommended replacement age during the next six years. Continuing to use over-age buses will affect passenger comfort, service reliability and maintenance costs. Most, if not all, of the remaining fleet will require a mid-life rehabilitation to maintain a proper and safe condition. Replacement of the entire fleet, at today's prices, would cost $20 billion.

Rail Systems

In many larger and even mid-sized cities across the country, fixed-guideway rail operations play a significant role in providing public transportation service. Today, 75 urban public rail systems are in place in 26 states and the District of Columbia.

The transit rail system has more than 10,000 track miles, almost 3,000 stations and more than 17,000 vehicles in revenue service.

Existing Public Transportation Rail Systems, by Mode

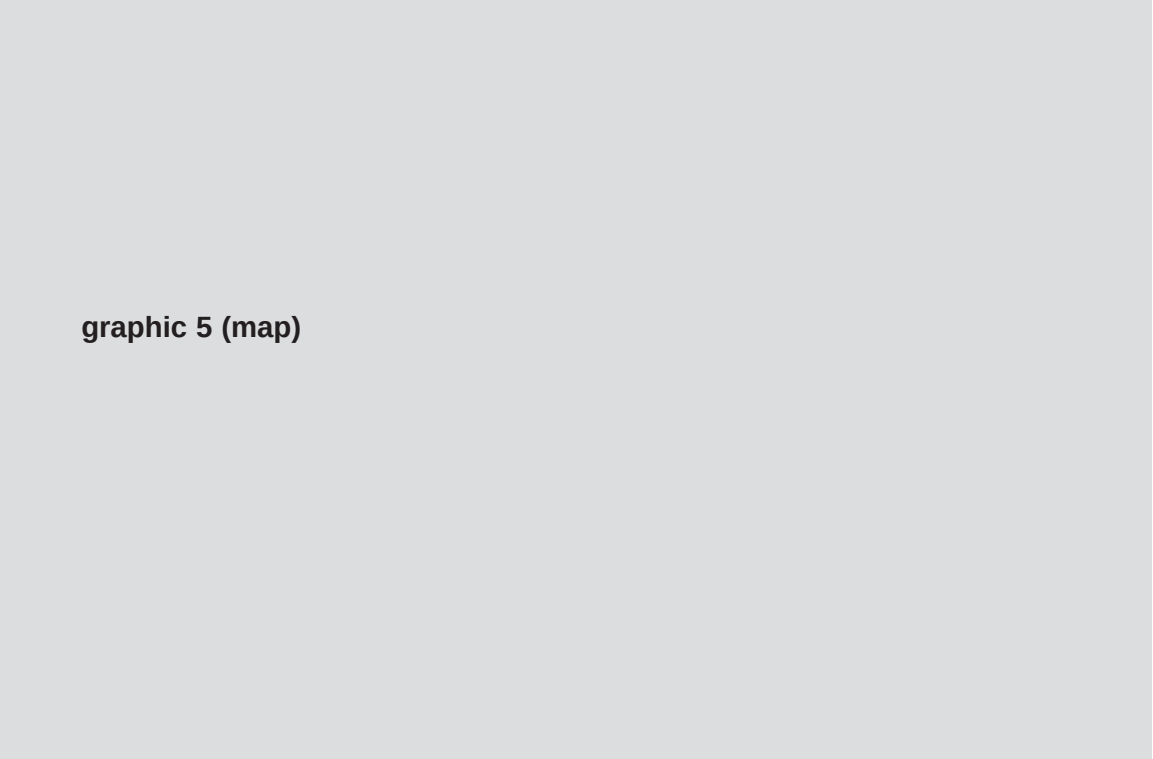
	Number of Systems	One-Way Track Miles	Number of Stations
Heavy Rail	**14**	**2,177.8**	**1,009**
Light Rail	**26**	**1,015.6**	**651**
Commuter Rail	**20**	**7,294.4**	**1,153**
Other Rail	**15**	**43.2**	**71**
Total	**75**	**10,531.0**	2,884

Just as with the nation's bus fleet, the average age and percentage of aging rail rolling stock indicates that transit systems have not been able to keep pace with the federally recommended replacement cycle. Fifty-four percent of all of the rail vehicles currently being operated in revenue service have exceeded their service life or will do so in the next six years. Almost all rail vehicle categories have an average age that exceeds the midpoint of their scheduled replacement cycle. Again as with buses, the continued use of over-age vehicles can be associated with passenger discomfort, less reliability and higher operating and maintenance costs.

Rural Public Transportation Systems

Rural public transportation assistance programs can receive direct federal assistance, and currently 1,260 programs using 49,500 vehicles provide such services in rural America. An estimated 55 percent of the existing fleet has already exceeded the federally rated service life. Within the next reauthorization period, almost all of the nation's rural transit vehicles will need to be replaced.

States with Existing Transit Rail Service



About 9,200 vehicles per year will need replacement on an ongoing basis.

Rural Transit Fleet

System Expansion Needs

Meeting public transportation needs associated with projected ridership growth will require significant investment in system expansion beyond what will be needed for replacement. Much of the need for new service will be the result of continuing increased use of existing systems

Fleet Segment	Estimated Fleet
Rural General Public	19,000
Rural Specialized Operators	28,800
Rural Intercity	1,700
Total Fleet	49,500

throughout the country. Systems will be required to add vehicles, stations, maintenance facilities, and numerous supporting elements to meet this increasing demand.

Core Capacity of Existing Systems

In many of the nation's largest cities, transit ridership has significantly increased during the last six years. As a result, existing rail systems are operating near to or in excess of their physical capacity and above a level that provides acceptable passenger comfort and safety. Without significant capital investment to expand the core capacity of these systems, many of them will be unable to meet this demand. Among the kinds of upgrades that will be necessary are: new signal systems to allow more throughput of rail vehicles, double tracking of existing rail lines to provide for additional system capacity, and station platform extensions.

New Starts

Many metropolitan areas across the country have recently completed or are pursuing major rail transit capital improvements under the federal "New Starts" program. Between 1996 and 2001 alone, more than 350 miles of rail transit service were added in 20 cities, including Atlanta, Baltimore, Chicago, Dallas, Denver, Jacksonville, Los Angeles, Memphis, New York, New Jersey, Pittsburgh, Portland (Oregon), Sacramento, Salt Lake City, San Francisco, San Jose, Stockton, Seattle, St. Louis and Washington, D.C.

Currently, the New Starts program includes more than 78 projects in 26 states and the District of Columbia that have moved beyond initial stages of study, at an estimated $47 billion cost. In addition, more than 150 studies are underway around the country.

Many additional communities are exploring the possibility of meeting their transit needs through "bus rapid transit."

Rural Public Transportation Needs

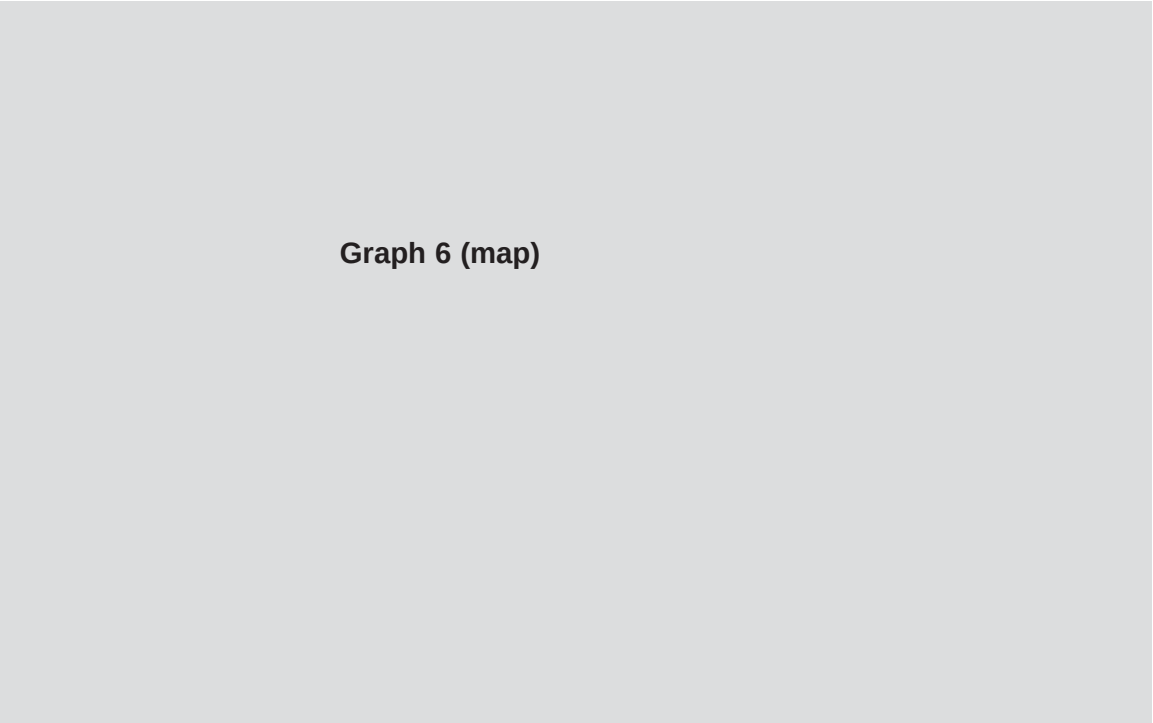
Although limited data are available to estimate unmet rural transit needs, states that have studied the issue have identified substantial unmet needs. The proportional increase in capital costs needed is high — ranging from about 80 percent in Minnesota to nearly 300 percent in Montana. This suggests that approximately a doubling is needed of the existing level of investment in the rural public transportation system.

Rural Transit Estimates

Rural transit needs consist of two major components — the maintenance of the existing system and the expansion of the system to address unmet needs. The total estimated annual need for rural transit is:

- Replacement/rehabilitation of existing general public vehicles — $191 million.
- Replacement/rehabilitation of specialized vehicles — $194 million.

New Starts Projects



- Replacement/rehabilitation of intercity vehicles — $50 million.
- Replacement/expansion of Rural General Public and Rural Specialized Maintenance and Administrative Facilities — $81 million.
- Expansion of Rural General Public, Rural Specialized, and Rural Facilities to improve service — $495 million.

In total, rural public transportation needs are estimated at $0.5 billion annually for the maintain conditions and performance scenarios and $1.0 billion annually for the improve service performance scenario.

TRANSIT NEEDS ASSESSMENT

Types of Transit Capital Needs

- Replacement of bus and rail vehicles (at the end of federally determined useful life).
- Major rehabilitation of bus and rail vehicles (mid-life rebuilds).
- Eliminate the backlog of vehicle needs to bring the nation's fleet into a state-of-good-repair.
- Replacement or rehabilitation of bus and rail maintenance and yard facilities, stations and tracks.
- Fleet expansion to accommodate increased ridership demands.
- Expansion of new rail systems to meet demand.

TRANSIT INVESTMENT SCENARIOS

Urban area capital investment needs were calculated using several alternative investment scenarios, then narrowed to two:

Maintain Physical Conditions and Performance, Constrained Rate of Growth

Assumes that transit capital assets will continue to be replaced as they are today, often later than is recommended; that service will be provided at existing levels with increases in service only to accommodate new riders and not to reduce crowding; Constrained rate of growth 1.6 percent Annual Ridership Increase (40 percent over 20 years); and

Improve Physical Conditions and Service Performance, Current Rate of Growth

Assumes that transit capital assets will be replaced according to recommended cycles, resulting in an overall improvement in conditions; that improvements are made to both reduce passenger densities on the most crowded systems and to improve the speed of service for systems where the average speed falls well below the national average; 3.5 percent annual ridership increase (100 percent over 20 years); based on growth rates since 1995; assumes 12.5 billion passengers by 2009.

TRANSIT CAPITAL INVESTMENT SCENARIOS

Alternative investment scenarios were identified by applying combinations of system physical conditions and performance. If the nation's urban and rural transit systems only maintain physical

Scenario 1: Average Annual Capital Cost — Maintain Physical Conditions, Maintain Service Performance, Constrained Rate of Growth

Transit Needs Component	Annual Cost (Billions)
Replacement/rehabilitation of existing vehicle fleet	$3.8
Replacement/rehabilitation of other transit assets	$4.8
Expansion of vehicle fleet and other transit assets to accommodate ridership growth	$9.8
Rural/small urban	$0.5
Total Need	$18.9

conditions and service performance at the levels that are being observed today, annual capital investment needs will be about **$19 billion** — assuming 1.6 percent annual ridership growth. If the decision is made to improve both the existing physical conditions and improve service performance at the current ridership growth rate of 3.5 percent, the annual transit capital need is about **$44 billion**.

The needs estimates imply a growing gap between historic levels of transit capital expenditures and required investment needs. Much of this increased need is a result of substantial and continuing transit ridership gains across the country.

Transit operating and capital expenditures from all sources totaled $33.8 billion in 2000, a 30 percent increase from 1995. Capital expenditures totaled $9.5 billion in 2000, representing half of the projected annual needs associated with the cost-to-maintain scenario and 20 percent of the projected annual needs associated with the cost-to-improve scenario. Federal transit assistance reached $7.2 billion in FY 2002.

State and local governments have already shouldered much of the burden for financing transit operations and many are reaching their limits, especially with budget shortfalls. Without increased levels of federal, state or local funding or new and innovative approaches to finance, the only way to pay for future transit costs is the fare box and other system revenue. However, without an increase in government assistance, transit fares would have to nearly double over the next five years alone to address projected currently unfunded operating deficits — much less additional capital needs. This does not appear to be viable.

Scenario 2: Average Annual Capital Cost — Improve Physical Conditions, Improve Service Performance, Current Rate of Growth

Transit Needs Component	Annual Cost (Billions)
Replacement/rehabilitation of existing vehicle fleet	$5.6
Replacement/rehabilitation of other transit assets	$5.1
Expansion of vehicle fleet and other transit assets to accommodate ridership growth	$32.2
Rural/small urban	$1.0
Total Need	$43.9

TRANSPORTATION AND SAFETY

TRENDS

During the past decade, the highway fatality rate per 100 million vehicle miles traveled has been reduced from 2.1 fatalities to 1.5. Unfortunately, the fact that more people traveled more miles –2.75 trillion in 2000 versus 2.15 trillion in 1990 – means that, overall, fatalities remain high. About 42,000 Americans die on our highways each year.

Highway fatalities are not limited to the occupants of cars and trucks. There were 299 transit fatalities in 1999, the most recent year for which data are available. In 2000, 4,739 pedestrians, 2,862 motorcycle riders, and 690 bicyclists were killed on the nation's roads.

Young adults, ages 16 to 24, represented 24 percent of all traffic fatalities in 2000, and drivers under 25 had the highest rate of involvement in fatal crashes of any age group. The highest intoxication rates were for drivers 21 to 24 years old. Passenger vehicle occupants 10 to 24 years old involved in fatal crashes had the lowest seatbelt use — just 49 percent.

From 1990 to 2000, the population over age 70 grew twice as fast as the rest of the population. Based on current levels of licensing, the population of older drivers is expected to quadruple in coming decades. Older drivers have a higher crash risk than other drivers because of vision problems, cognitive limitations, medication side effects, slower reaction time, muscular difficulties, and disease.

It is likely that older drivers will "age in place," meaning that they will generally remain in their pre-retirement housing. With the suburbanization of America, this means that older Americans will drive more. Between 1983 and 1995, older Americans had the largest increase in travel of any age group, and even drivers aged 85 or older continue to prefer driving their own vehicles. Unless alternatives, such as demand/response transit, are made available, this trend will continue.

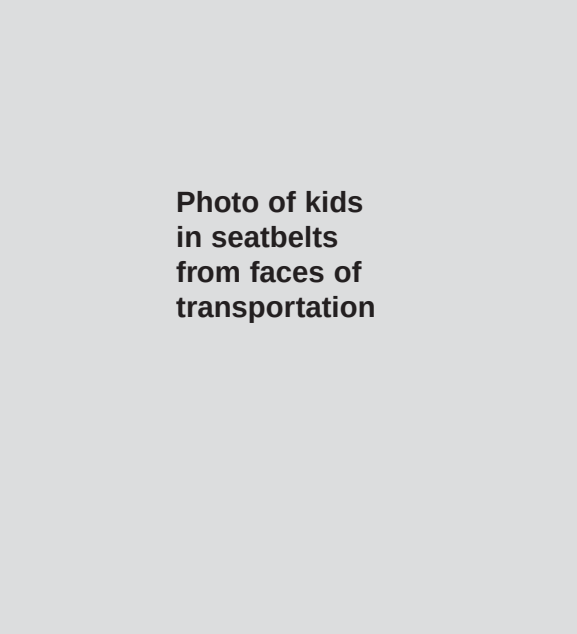
The AASHTO Strategic Highway Safety Plan

The AASHTO Strategic Highway Safety Plan sets an ambitious goal: save 5,000 to 7,000 lives each year and substantially reduce health-care costs due to vehicle-related injuries. The plan identifies 22 key emphasis areas targeted at drivers, vehicles, highways, enforcement, emergency medical services, and management. Implementing AASHTO's Strategic Highway Safety Plan would cost at least $18 billion in capital costs over six years, and require an additional $1 billion per year for operating costs.*

Strategies aimed at reducing impaired driving, encouraging use of seatbelts and child restraints, requiring or encouraging the use of helmets by motorcyclists and bicyclists and improving licensing procedures and reviews could save thousands of lives annually if legislation and policy actions are applied across the nation and effective public information and enforcement campaigns are implemented.

AASHTO believes each state should develop a goal-oriented, performance-based comprehensive highway safety component incorporating education and enforcement as part of their long-range

***$18 billion is required for highway infrastructure aspects of just six of the 22 goal areas. Capital costs for the various enforcement, medical services, driver and pedestrian areas have not been estimated, and are not included.**



transportation planning process and be given the flexibility to invest resources where the most lives can be saved. To do this, the overall federal-aid highway program must be increased. Each comprehensive state highway safety plan should reflect the conditions that exist in the state and could include:

- Programs aimed at changing driver behavior;
- Reducing crashes involving running off the road, hazards from trees and utility poles and dangerous intersections;
- Roadway-safety improvements such as rumble strips, brighter pavement markings, safer work zones and ITS technologies.

HIGHWAY AND TRANSIT SECURITY 

The terrorist attacks of September 11, 2001 have compelled us to consider how to secure America's highway and transit assets from such acts. Since then highway and transit agencies have mobilized to improve their abilities to protect the traveling public. They have done so in partnership with FHWA, FTA, and RSPA, and through the resources of TRB. They have built upon current work in operations technologies and natural disaster emergency planning, with added concern for the physical protection of key facilities.

States and local governments have conducted vulnerability assessments to define critical infrastructure in need of priority attention, such as bridges, tunnels, highway interchange structures and transit stations.

HIGHWAY SYSTEM SECURITY

System redundancy has proven to be a key planning factor. Current military and engineering judgment indicates that the complete protection of key facilities from destruction is not feasible or cost effective. In protecting assets states have been encouraged to follow the Department of Defense "4-D" approach: "deter, detect, defend and design." The overall practical objective of the counter-terrorism measures being pursued is not to provide full protection, but to reduce exposure through techniques such as:

- Denial of access to key structures through barriers and fencing;
- Minimizing time-on-target through surveillance cameras and patrolling;
- Hardening key facilities through blast shielding and strengthening of structures; and
- Reducing access to tunnel vents to protect them from biological/chemical attack.

Of the close to 600,000 bridges and tunnels nationwide, some 500 have been identified as critical based on facility size, traffic volume, and strategic importance.

ENHANCEMENT OF HIGHWAY EVACUATION AND EMERGENCY RESPONSE CAPABILITIES

The proposed overall security program has focused on the protection of threatened populations as well as assets. Improving the evacuation and emergency response capabilities of the urban roadway system is a key component of the national highway-related security program.

An evacuation network has been defined for the 78 largest metropolitan areas of the United States. This network incorporates about 10,500 miles of freeway and approximately 16,000 miles of arterials. An additional 600 miles of key higher volume Strategic Highway Network (STRAHNET) urban and rural routes identified by the Department of Defense would also be covered.

States and local governments managing these routes must be given the ability to track system use, performance, and incidents through accelerated deployment of vehicle detection technology, including closed circuit TV surveillance. Variable message sign installation will improve communication with the traveling public as will deployment of "511" traveler information systems.

The September 11 experience has indicated the need to update "all-hazard" statewide emergency response plans to include terrorism, and to train officials in their use. Interoperable and reliable communications capabilities need to be funded to link transportation agencies with the military, law enforcement, rescue services and the public.

The capital cost of upgrading highway security, for both hardening as well as emergency response capabilities is estimated at $6.1billion for the next six years, with $578 million required annually for operating expenses.

Annual and Six Year Total Costs Summary for Highway-Related Security Program

		Capital Costs (in millions)						Total 6 Year Capital Costs (in millions)	Total; Operating Costs (in millions)	Average Annual O & M Costs (in millions)
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6			
Strategy	**Elements**									
Protection of Critical Mobiliy Assets	**Retrofit Bridges**	**$245**	**$245**	**$245**	**$245**			**$980**	**$665**	**$110 per year**
	New Bridge Security-related Costs	**$70**	**$70**	**$70**	**$70**	**$70**	**$70**	**$420**	**$210**	**$35 per year**
	Tunnels		**$30**	**$30**				**$60**		**No cost attributable directly to security**
	TMCs		**$25**	**$25**				**$50**		**No cost attributable directly to security**
Enhancement of Emergency Management Systems	**Detection, Surveillance, VMS & Dynamic Routing**	**$609**	**$609**	**$609**	**$609**	**$609**	**$609**	**$3,654**	**$955**	**$160 per year attributable to security**
Improvement of Emergency Response	**Planning, Training, O & M, Communications**	**$156**	**$156**	**$156**	**$156**	**$156**	**$156**	**$936**	**$1,641**	**$273 per year**
TOTAL		**$1135**	**$1135**	**$1080**	**$1080**	**$835**	**$835**	**$6,100**	**$3,471 over six years**	**$578 per year**

TRANSIT SYSTEM SECURITY

In both New York and Washington, transit played a crucial role in the safe evacuation of millions of people directly affected by the terrorist attacks on September 11. In New York City, emergency ferry service provided a critical link to replace access that was cut when the PATH station at the World Trade Center was destroyed and the Holland, Lincoln, and Brooklyn-Battery Tunnels were closed for several days after the attack. The availability of transit service allowed New York City officials to impose a ban on single occupancy vehicles in midtown and downtown Manhattan for several months, greatly facilitating the recovery effort in lower Manhattan.

Transit systems are also particularly vulnerable to terrorist attacks. Especially in large urban transit systems, large numbers of people are concentrated in relatively small spaces. Transit systems have been an inviting target for terrorists in other countries, such as the chemical attacks in the Tokyo subway in the early 1990s and the recent rash of bus-bombings in the Middle East.

PROTECTION OF CRITICAL TRANSIT ASSETS AND IMPROVED EMERGENCY RESPONSE

The needs for critical transit bridges and elevated structures and critical transit tunnels are similar in nature to highway needs. Capital costs, for both asset protection and emergency response capabilities, include detection and surveillance systems, such as closed-circuit TV in stations, and traveler information systems. The ongoing operations costs include staffing for increased security planning, surveillance, patrols, and response to alerts. Transit agencies must also improve their ability to respond in the event of a terrorist attack. Plans need to be developed, training provided, personal protective and detection equipment secured, and communications capabilities upgraded.

The capital cost of upgrading transit security is estimated at $6.2 billion for the next six years, with $500 million required annually for operating expenses.

Annual and Six-Year Total Costs Summary for Transit-Related Security Program

		Capital Costs (in millions)						Total 6 Year Capital Costs (in millions)	Average Annual O & M Costs (in millions)
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6		
Strategy	**Elements**								
Protection of Criticasl Mobility Assets*	**Infrastructure and Rolling Stock Security**	**$1,700**	**$1,700**	**$900**	**$900**			**$5200**	**$ per year**
Enhancement of Evacuation Capabilities	**Detection, Surveillance, Traveler Information Systems**	**$250**	**$250**					**$500**	**$ 500 per year**
Improvement of Emergency Response*	**Planning, Training, O & M, Communications**	**$150**	**$150**	**$50**	**$50**	**$50**	**$50**	**$500**	**$ per year**
TOTAL		**$2100**	**$2100**	**$950**	**$950**	**$50**	**$50**	**$6,200**	**$500 per year or $3,000 over six years**

LINKAGE TO OTHER MODES

Highways and transit do not exist and operate in isolation from each other or other modes of transportation. Passenger trips and freight deliveries frequently involve more than one mode and often there are choices of modes for both passenger and freight trips between two points.

Most transit commuter trips start with a trip on the highway by either car or bus. Virtually all passenger trips by rail or air require connections involving car, cab, transit or rail. For many travelers, congestion on the runways is preceded by congestion on the highways.

Merchandise manufactured and packed in a container in China may be imported to the U.S. through the Port of Long Beach, trucked to the nearby Intermodal Container Transfer Facility (or moved by rail through the Alameda Corridor), loaded onto a double-stack unit-train, moved by rail to Chicago, transferred across town by truck from a Western railroad to an Eastern railroad, moved by rail to New Jersey, transferred to a truck, taken to a nearby distribution center where the contents are transferred to smaller trucks, and finally delivered by van to a customer in Brooklyn. At every point in this chain delays and disruptions create costs for producers, transporters, sellers and consumers and the volume of freight movement may, in turn, cause delays and disruptions for passenger travel.

PASSENGER TRANSPORTATION LINKAGES

In the implementation of transportation programs, modal linkages are being developed in a much more systematic manner than was the case in the past, as illustrated by the following examples:

Intermodal Facility, Huntington, West Virginia

Huntington, West Virginia's TEA-21-funded Intermodal Transportation Facility will be in the center of the city, as a transfer point for local and interstate buses, taxis, private cars and bicycles. A new shuttle service will link the center with Marshall University. Financed with $26 million in federal funding, the facility will reduce traffic and increase economic development in the downtown.

J.F.K. AirTrain, New York

AirTrain, a light-rail system being built by the Port Authority of New York and New Jersey using funding from passenger facility charges, will provide fast, convenient and dependable surface access to and within John F. Kennedy International Airport. The 8.1-mile system will link J.F.K.'s airline terminals, car rental agencies and parking with commuter rail and subways.

California Capital Corridor

The passenger-rail corridor running from San Jose, California, to Auburn, California, through Sacramento, which has had a five-fold increase in ridership over one decade, benefits significantly from a feeder-bus network, which 29 percent of passengers utilize on one or both ends of their train ride.

The events of September 11 highlighted the importance of multiple modes of transportation and the need for a resilient system with built-in redundancy critical in times of emergency and necessary in the "new normal" era. While the airlines were out of operation, intercity passenger rail picked up

the slack. When evacuation from lower Manhattan was impossible by car or transit, the passenger ferry system moved more people than anyone could have predicted.

FREIGHT INTERMODAL LINKAGES

Intermodal terminals for freight modes may be highly specialized depending on the commodities being moved, or their packaging, e.g. containers, bulk grain, petroleum, vehicles, whereas on the passenger side the constant is that the commodity shipped is people and only small variations exist in their handling, typically a function of length of stay at the terminal, baggage requirements, border formalities, etc.

In 2001 the Intermodal Association of North America, IANA, reported detailed intermodal linkages that involved containerization, a rapidly growing and increasingly significant component of truck-rail linkages. In a down year in the aftermath of September 11 they measured over 10 million container moves in rail intermodal flows, up dramatically over 20 years from about 3 million containers in 1980. Of these, slightly more than half involved international container movements; the remaining half involved domestic movements, divided almost equally between containers and truck trailers on flat cars. The Association of American Railroads (AAR) has stated that intermodal flows are their industry's fastest-growing segment, constituting 20 percent of industry revenues. The AAR reported further that in the year ending in July, intermodal traffic has risen over 10 percent.

It is clear that the intermodal flows of goods over road, rail and other modes are increasingly central to key parts of the US and world economies and a major component of U.S. road activity.

Intermodal connectors, often called "the last mile," are a critical element of the freight transportation system. As part of the National Highway System designation process stemming from ISTEA,

Passenger and Freight Intermodal Connectors

Connector Type	Number
Passenger only	
Public Transit Stations	389
Intercity Bus Stations	99
Amtrak Stations	71
Ferry Terminals	59
Multimodal Passenger Sites[1]	42
Joint Terminals[2]	
Maritime Facilities	247
Airports	228
Freight Only	
Truck/Rail Terminals	211
Pipeline/Truck Terminals	61

criteria were developed in 1995 to identify key freight hubs terminals and their NHS intermodal connector routes, those segments of road that connect the hub to the core highway system. Over 1,400 connectors to terminals were identified and provided to the Congress in 1996 as summarized below, for both passenger and freight connectors.

In the category of freight connectors, the FHWA identified 616 freight terminals served by 1,222 miles of highway connectors as shown in the following table.

Freight Intermodal Connectors

Connector Type	Terminals	Miles
Ports (ocean and river)	253	532
Airports	99	221
Truck/Rail Terminals	203	354
Pipeline/Truck Terminals	61	115
Total Number of NHS Freight Terminals	616	1222

The FHWA survey found that pavement conditions on these connectors were more likely to be poor or very poor than were the full NHS system, particularly at ports and at truck rail/facilities and that relatively modest investment would yield substantial returns in terms of safety, freight movement speed and reliability, and reduced traffic disruptions for passenger cars, trucks and rail.

Rail-Highway Grade Crossings

The many intersection points between the rail and highway networks generate a special case of intermodal interaction. These points of intersection have been a serious concern for many years in regard to their potential threat to safety. As both rail and highway traffic increases rail-highway crossings become important barriers to the smooth flow of freight and passengers and the fuller utilization of available capacity. The Institute for Transportation Research and Education at North Carolina State University surveyed rail-safety needs in 2002, focusing on highway-rail at-grade crossings and identified needs covering freight- and passenger-rail lines totaling $13.8 billion. The needs ranged from new installations and upgrades of existing warning systems to grade separations and track relocations.

Modal Interactions

Congestion and capacity problems in other modes have direct impacts on highway congestion and capacity. To the degree that other modes — passenger and freight rail and the marine transportation system — can carry their weight, the burden on highways will be lessened. AASHTO's Freight Rail Bottom Line Report, for example, estimates that minimal investment and no growth in the freight rail industry between now and 2020 would "shift almost 900 million tons of freight and 31 billion truck miles of travel to the highways. The business cost to shippers is estimated at $326 billion; the cost in travel time, operating, and accident costs to highway users is pegged at

$492 billion, and the costs in added highway maintenance is $21 billion over the 20-year period.

In one state — Kansas — changes over the last 10 years, such as the construction of unit-train loading facilities on Class I main lines, the introduction of 286,000 pound (heavy axle load) grain hopper cars, the emergence of fewer and larger farms with increased scale of operations, and the increased farmer ownership of semi-tractor trailer trucks, have resulted in a shift from transporting grain via short-line railroads serving country elevators to increased trucking of grain.

While there has been a modal shift in the transportation of grain in Kansas, and Kansas short line railroads have abandoned non-profitable line segments within the system, the remaining Kansas short line infrastructure continues to play a vital role in the state's freight transportation infrastructure. According to *Impact of Kansas Grain Transportation on Kansas Highway Damage Costs (2002)* for the area studied, "the short-line rail system saves the state of Kansas $49.5 million in pavement damage costs annually, with the average damage cost of incremental truck traffic costing approximately $0.17 cents per truck mile."

Similarly, AASHTO's analysis of intercity passenger rail service shows benefits in reduced congestion for both highway and air transportation from increases in passenger rail ridership.

AASHTO PREPARING OTHER MODAL INVESTMENT REPORTS

- To address the investment needs of other transportation modes, AASHTO is preparing the following reports.
- Intercity Passenger Rail Report documents investment needs for existing and planned intercity passenger rail corridors.
- Freight Rail Bottom Line Report estimates freight rail investment needs.
- Aviation Bottom Line Report estimates future investment needs to maintain and expand the air transportation system.
- Ports and Waterways Bottom Line Report documents the investment needs for the nation's ports and waterways,

FUNDING ISSUES

FEDERAL, STATE AND LOCAL FUNDING ROLES:

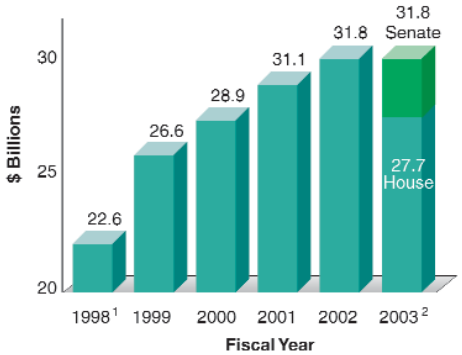
Total highway expenditures by all units of government reached $127.5 billion in 2000 — $64.6 billion in capital outlays. Federal assistance was $30.8 billion in FY 2000, and in FY 2003, will wind up somewhere between the figure of $27.7 billion pending in the U.S. House of Representatives, and $31.8 billion currently before the U.S. Senate.

In 2000, states, at 51.7 percent, provided the largest share of funding. Local governments were second at 24.3 percent and the federal government a close third, at 24 percent. Total funding of the highway program rose by 70 percent between 1990 and 2000, an increase of $53.1 billion to reach a level of $127.5 billion. As a result of enhanced ISTEA and TEA-21 funding, federal funding grew the fastest in percentage terms in the period, producing an increase in the federal share. However, the states grew the fastest in dollar terms, supplying half the increase in the period, with local governments providing 30 percent of the increase and the federal government, the remaining 20 percent.

With 46 out of 50 states facing a severe fiscal crisis in 2002, it is not clear what their abilities will be to increase funding for transportation over the next six years. There are some hopeful signs, however. In 2002, Maine joined 11 other states by indexing its fuel taxes to the Consumer Price Index. Kansas raised its gas tax by two cents. Indiana increased its fuel tax by three cents. Finally, transportation funding referendums will be voted on in Virginia and Washington State this year.

Total transit expenditures from all sources reached $33.8 billion in 2000 - $9.5 billion in capital outlays. Federal transit assistance increased from $5.8 billion in FY2000 to $7.2 billion in FY2003. FTA reports that $1.6 billion in federal highway funds were flexed to transit in FY2000. Cumulatively from FY1992 to FY2001, $7.7 billion was flexed from highways to transit. In addition to flexing federal funds to transit, many states provide a substantial amount of state funds to public transportation. State transit funding increased from $6 billion in 1999 to more than $6.6 billion in 2000. For example, last year, at the request of Governor Gray Davis, the California Legislature approved a $6.8 billion "Congestion Relief" program that channeled $3.5 billion to transit and transit-related activities.

Federal Aid Highway Obligations 1998-2003

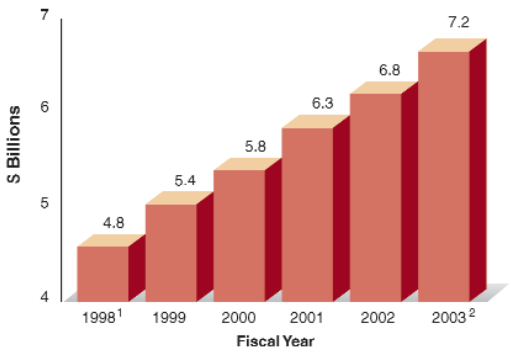


Source: FHWA

1 Includes guaranteed funding + exempt funding In the case of 2000-2002, also includes RABA.

2 Anticipated amount.

Guaranteed Transit Obligations 1998-2003



Source: FHWA

1 There is actually no firewall amount for 1998. The amount shown reflects the amount available either as contract authority or appropriated budget authority

2 Anticipated amount.

FY2000 Federal Highway Trust Fund receipts were $34.9 billion: $4.6 billion of this went to the Mass Transit Account and the remaining $30.3 billion to highways.

Federal Highway Trust Fund Net Receipts — FY2000

Source	Receipts ($1,000,000)	Percent of Total
Motor Fuel Gasoline Gasohol Diesel and Other	$30,288[1] 20,802 1,609 7,877	86.6
Trucks and Trailers	3,321	9.5
Heavy Vehicle Use	921	2.6
Tires	442	1.3
Total Tax Receipts	34,972	100.0
Interest Income	0[2]	
Total Receipts	$34,972	

[1]Includes transfers of $4625,403,000 to the Mass Transit Account.
[2]Includes no funds credited to the mass Transit Account.

State Disbursements for Highways 2000

Financing Opportunities

The tradition in American highway finance has been heavy reliance on pay-as-you-go, tying the rate of highway improvement to the rate of revenue generation from users. In the 1990s this expanded. New public toll roads were built. Public/private ventures were initiated such as the 15-mile Dulles Greenway, in northern Virginia and the Orange County, California Transportation Corridor Authority Projects. The use of federal funds to pay debt service costs was permitted. GARVEE bonds, state infrastructure banks, and TIFIA were authorized. As a result states, counties and cities have made use of these and other forms of highway debt finance on an increasing basis.

To get a better handle on developments in this area, a National Cooperative Highway Research Program (NCHRP) study was conducted among 38 states to review how state DOTs were using debt finance to better meet their needs. Some of the results are displayed in the following table:

Among the survey findings: general-obligation bond issues declined, as did toll revenue and sales tax revenue bonds. On the other hand, bonding activity backed by highway revenues increased by 16 percent annually.

1990s Federal Program Changes Expanded Debt Financing Options

In 1994, FHWA spearheaded an initiative to introduce new flexibility into financing the Federal-aid Highway Program. The test and evaluation research initiative TE-045 allowed states to submit proposals for alternatives to conventional pay-as-you-go, grant-based funding strategies.[4] As of fall 2001, 102 projects had been approved in 42 states.[5] More than 60 of these projects ultimately advanced to construction using various innovative tools later approved for general use under the federal-aid highway program. The combined value of these 60 projects is approximately $4 billion.[6]

Further diversification of debt financing in the 1990s was due to enactment of the National Highway System Designation Act (NHS) (1995) and TEA-21 (1998). The NHS Act authorized the use of federal funds to pay debt service costs and the establishment of the State Infrastructure Bank Program. TEA-21 gave states the opportunity to access federal loans and credit enhancements for projects meeting specific criteria.

SIBs are revolving fund mechanisms designed to finance a wide variety of highway and transit projects through loans and credit enhancements. Since 1996, 32 states have financed over 245 highway and transit projects with project costs of $2.9 billion.[7]

GARVEE Bonds

Grant Anticipation Revenue Vehicles - can be used for any Federal-aid highway or transit project. From 1998 to present, six states have issued over $2 billion in GARVEE bonds directly repaid by Federal funds.[8]

TIFIA

The Transportation Infrastructure Finance and Innovation Act, authorized loans and credit enhancements for major projects at a low cost to the government. Total program activity from TIFIA's inception includes five highway and bridge projects and six other projects with capital costs totaling more than $15 billion.[9]

Transportation Bond Activity Summary — 1998-2001 in millions

Bond Type	1998	1999	2000	2001	Total
Advancing Funds					
General Obligation Bond	978	809	697	239	2723
Highway Revenue Bond	1648	1611	2060	2719	8039
Federal Grant Anticipation Bond	614	20	1691	1253	3578
Lease Payment Bond	298	0	334	304	935
SUB-TOTAL	3538	2440	4782	4515	15275
New Funds					
Private/Public Partnership	554	75	752	466	1847
Toll Revenue Bond	3100	2089	1982	1393	8564
Fuel Tax Revenue Bond	903	1523	890	1110	4426
Sales Tax Revenue Bond	146	120	114	66	446
State Infrastructure Bank	293	309	269	370	1241
SUB-TOTAL	4996	4116	4007	3405	16524
TOTAL	8534	6556	8789	7920	31799
Issues Under $10 Million	507	445	462	513	1927
GRAND TOTAL[1]	9041	7001	9251	8433	33726

[1]Does not include refundings of $4131 for the four year period.

Future Opportunities

Expansion of these financing techniques and development of new approaches will depend on three factors: resources, tools and institutional readiness. First, there is no free lunch with innovative financing — revenue sources, be they tolls, dedicated sales, fuel or property taxes, must be available to meet debt service requirements. Second, the transportation community must continue to push the envelope and stretch available resources through the development new financial tools.

Finally, institutional readiness needs to be improved. Some states have statutory limitations on the use of debt financing. In many other states, there are few in DOT management with the skills and experience in debt financing needed. AASHTO and FHWA, in partnership with the University of Southern California (USC) Graduate School of Finance, have created a Project Finance Institute. It will provide state and local transportation agencies the special training and technical assistance needed to improve their ability to master and implement the growing array of financial tools now available.

Private Sector Roles

There are at least two ways the private sector plays a significant role in adding to the stock of the nation's highways.

The first is in the development of toll roads and bridges. According to the International Bridge, Tunnel and Turnpike Association (IBTTA), there are currently 102 toll road and bridge authorities in the U.S. generating annual receipts of $11 billion. They manage 4,600 miles of roadways and 308 bridges. In 1999, total capital outlays for toll roads, bridges and tunnels were $3.9 billion.

The second is the construction of roads by developers of homes and commercial facilities. These improvements are divided into two classes:

- **On-site** — consisting of streets produced as part of a housing complex or commercial site to serve their buildings.
- **Off-site** — consisting of roads produced or improved to offset the transportation impacts of new developments.

These roads are typically built according to specifications provided and then turned over to local or state governments.

With 1.6 million units of new housing being produced per year, it is estimated that $5 billion annually is being invested by developers constructing almost 12,000 lane miles of road. With regard to commercial developments, it is estimated that $7 billion annually is being invested, accounting for 11,000 lane-miles.

It is clear that the private sector plays a major role in road development in America.

Appendix A

COMPARISON WITH FHWA'S CONDITION AND PERFORMANCE REPORTS

All U.S assessments of national highway need draw their fundamental understanding from the Condition and Performance Reports of the FHWA, and the data and modeling systems that support it. Typically conducted every two years, those studies provide the fundamental grounding in the state of the system and the state of travel that guides all such efforts. The FHWA is to be commended for the comprehensiveness and responsibility with which it approaches this undertaking. All those who are interested in a rational and quantified approach to investment analysis are in its debt.

The statements of investment needs that appear here are strongly grounded in the methods and information context of the C&P process. They utilize the same data and models as made available by FHWA and their research activities. Many of the improvements and extensions in analytical capabilities utilized here are products of FHWA/AASHTO/TRB joint research.

It should be recognized that these AASHTO statements of need are being prepared in parallel with FHWA's preparation of its forthcoming 2002 Condition and Performance Report, and will not have the benefit of that report in our efforts.

In that the AASHTO and FHWA statements of investment needs utilize the same data sets and models they should have similar results. There are significant differences between what is being reported by the two agencies that must be noted:

- The C&P takes its timeframe starting from an historical base, e.g. the 1999 report began from 1997 and looked out 20 years into the future. Their coming report will take a 20- year perspective starting from the year 2000. The Bottom Line Report is focused on the next reauthorization time frame, beginning in 2004 and ending in 2009, but embeds that near-term focus in the context of a 20-year view as well
- The C&P will describe its results in terms of an average value over 20 years; the AASHTO results are described in terms of an average over the six years of the next reauthorization.
- If it is accepted, as both the AASHTO and the C&P will show, that present investment levels fall short of meeting needs to maintain conditions, then it is to be expected that the AASHTO starting point of four years later would start its analysis with the need to address a more-deteriorated system, a greater backlog of investment requirements with greater traffic volumes and therefore needs levels that would have become greater over the period.
- Recognizing all these factors we would expect that the AASHTO levels of investment needs would be greater than those identified by FHWA in its report.

In order to compare the highway needs estimates contained in this report with estimates made in prior years by the Federal Highway Administration, the following factors must be considered.

Cost to Maintain.

In 1999, FHWA chose to feature a "cost to maintain" figure of **$56.6 billion** per year, in 1997 dollars which maintained physical condition, but not performance." It also showed a value of **$60.7 billion** for maintaining user costs which is more analogous to their present approach. In addition its report stated that, "turning on the high cost lane feature," of the HERS model as had been done, "in previous C&P reports … to add additional lanes in congested areas … would increase the cost to maintain highways and bridges by 28.7 percent" (or **$77 billion** per year).

When those values are brought forward to 2000 using appropriate inflation adjustments, and then extrapolated to 2004 using HERS model cost factors recognizing continued annual increases in travel and levels of funding below that needed to meet needs, this figure would be highly comparable to AASHTO's "cost to maintain" estimate of **$92 billion**.

Because of widespread concern over congestion, AASHTO found it necessary for 2004-2009, to use a scenario which addressed preserving *both condition and performance*, rather than just condition as FHWA chose to do in 1999. FHWA's customer survey in 2001, found "traffic flow" to be the biggest source of dissatisfaction nationally, and the Texas Transportation Institute's 2002 report on congestion shows it increasing in nearly every region.

Cost to Improve

FHWA's 1999, "cost to improve" figure was **$94 billion**. Its report stated that, "Turning on the high-cost lane feature would increase the cost to improve highways and bridges by 38 percent. This feature allows HERS to add additional lanes in areas where existing right of way is constrained. While these lanes are expensive, the model would consider them to be cost-beneficial in many situations." This change would increase FHWA's 1999 "cost to improve" figure to **$129.7 billion**. This is comparable in structure and in the same range as AASHTO's 2004-2009 cost to improve estimate of **$125.6 billion**.

Appendix B

NCHRP/TCRP RESEARCH ACTIVITIES IN SUPPORT OF AASHTO REAUTHORIZATION INITIATIVES

1. **NCHRP 20-7 (140)**, *TEA-21 Stewardship Report* — Cambridge Systematics, Inc.
2. **NCHRP 20-24(15)A**, *Scoping Study for Reauthorization Support* — Alan Pisarski
3. **NCHRP 20-24(15)B**, *Review of the FHWA Conditions & Performance Report and Process* — Alan Pisarski, Michael Bronzini, Kevin Heanue, Henry Peyrebrune, and Ronald Tweedie, Cambridge Systematics, Inc.
4. **NCHRP 20-24(26 A & B)**, *Finance Trends — Trends in Non-Federal Funding and Debt* — PB Consult & Urban Land Institute
5. **NCHRP 20-24(27)**, *Expanded State and National Investment Analysis Capability — Highway* — Cambridge Systematics, Inc.
6. **NCHRP 8-36(18)A**, *The Impact of Changing Demographics on Highway Safety* — AECOM Consulting
7. **NCHRP 8-36(22)**, *Demonstrating the Positive Impacts of Transportation Investments on Economic, Social, Environmental, Community, and Quality of Life Issues* — Cambridge Systematics, Inc., Benefits of Reductions in Fuel Use and Pollution-related Effects Associated with Highway Investment — Cambridge Systematics, Inc.
8. **NCHRP 8-36(23)**, *Review of the Potential Feasibility of Using Alternative Revenue Sources to Fund Future State Transportation Needs* — Cambridge Systematics, Inc.
9. **NCHRP 8-36(24)**, *Conditions & Performance Report Investment Requirements Scenario Development* — Alan Pisarski
10. **NCHRP 8-36(25)**, *Improved Geographic Clarity in Reporting of Road System Extent* — ICF, Inc
11. **NCHRP 8-36(26)**, *Surface Transportation Safety and Investment* — CH2M HILL
12. **NCHRP 8-36(27)**, *Interstate Interchange Review* — ICF, Inc.
13. **NCHRP 20-24(25)**, *Improving Project Costing and Incorporation of New Attributes — Highways and Transit* — AECOM Consulting
14. **NCHRP 20-24(26)**, *Finance Trends in Non-Federal Funding and Debt-$100,000* — PB Consult, Inc.; — Urban Land Institute

15. **NCHRP 20-24(27)**, *Expanded State and National Investment Analysis Capabilities — Highways* — Cambridge Systematics, Inc.

16. **TCRP J-6**, *Expanded State and National Investment Analysis Capability — Transit* — Cambridge Systematics, Inc.

17. Pending Tasks

    - **NCHRP 20-24(23)**, *Assessing the Importance of Transportation for Major Industries and Sectors of the U.S. Economy*
    - **NCHRP 20-24(24)**, *Transportation Mobility, Access, and Safety for an Aging Population — NCHRP (28), Rate of Return from Highway Investment*

Appendix C

ENDNOTES

i U.S. Department of Transportation (USDOT). *State of the Nation's Highways, Bridges, and Transit: Condition and Performance*. (Washington, D.C.: USDOT, 1999.)

ii USDOT. *State of the Nation's Highways,Bridges, and Transit: Condition and Performance*.

iii For further information, please refer to the USDOT's Federal Highway Administration (FHWA) 2001 report *Moving Ahead: The American Public Speaks on Roadways and Transportation in Communities*.

iv USDOT. 1997 Status of the Nation's Transportation Systems: Condition and Performance (Washington, D.C.: USDOT, 1997.); USDOT. State of the Nation's Highways, Bridges, and Transit: Condition and Performance.

v USDOT. *State of the Nation's Highways, Bridges, and Transit: Condition and Performance*, 10-5.

vi USDOT. *State of the Nation's Highways, Bridges, and Transit: Condition and Performance*.

vii The HERS model, employing the Highway Performance Monitoring System (HPMS) data base, provided to FHWA by the states, performs analyses on 160,000 sample road segments and determines current needs and future requirements based on evaluations of each segment's present and future condition and performance. All prospective improvements on each sample segment are subjected to cost-benefit analysis and only those demonstrating a positive return are accepted.

viii Cambridge Systematics, Inc. *Expanded State and National Transit Investment Analysis*. (Cambridge, MA: Cambridge Systematics, Inc., 2002): ES-1

ix Cambridge Systematics, Inc. *Expanded State and National Transit Investment Analysis*, ES-1, ES-2

x Cambridge Systematics, Inc. *Expanded State and National Transit Investment Analysis*, ES-2

xi Cambridge Systematics, Inc. *Expanded State and National Transit Investment Analysis*, ES-3, 2-5, 2-6

xii Cambridge Systematics, Inc. *National Transportation Needs*. (Cambridge, MA: Cambridge Systematics, Inc., 2002): ES-3, 2-5, 2-6

xiii The American Association of State Highway and Transportation Officials (AASHTO). *AASHTO Strategic Highway Safety Plan: A Comprehensive Plan to Substantially Reduce Vehicle-Related Fatalities and Inuries on the Nation's Highways*. (Washington, D.C.: AASHTO, 1998): 1

xiv USDOT, National Highway Traffic Safety Administration (NHTSA). *Traffic Safety Facts 2000: Overview*. (Washington, D.C.: USDOT, 2000): 2

xv USDOT, NHTSA. *Traffic Safety Facts 2000*. (Washington, D.C.: USDOT, 2000), 15.

xvi USDOT, FHWA, Office of Highway Policy Information. *Annual Vehicle — Miles of Travel*. **http://www.fhwa.dot.gov/ohim/onh00/graph1.htm**

xvii USDOT, NHTSA. *Traffic Safety Facts 2000*, 15.

xviii USDOT, Bureau of Transportation Statistics. *National Transportation Statistics 2000*. (USDOT: Washington, D.C., 2001): 147.

xix USDOT, NHTSA. *Traffic Safety Facts 2000*, 18.

xx USDOT, NHTSA. *Traffic Safety Facts 2000*, 86, 98, 112, 119.

xxi $18 billion is required for the highway infrastructure aspects of just six of the 22 goal areas. Capital costs for the various enforcement, medical services, driver and pedestrian areas have not been estimated and are not included.

xxii Further information about transportation employment facts and figures can be found at the web sites for FHWA, **http://www.fhwa.dot.gov/policy/empl.htm**, and the U.S. Department of Labor's Bureau of Labor Statistics, **http://www.bls.gov**.

xxiii Cambridge Systematics, Inc. *Public Transportation and the Nation's Economy: A Quantitative Analysis of Public Transportation's Economic Impact*. (Cambridge, MA: Cambridge Systematics, Inc., 1999): E-1.

xxiv U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau. *1997 Economic Census — Transportation: 1997 Commodity Flow Survey*. (Washington, D.C.: U.S. Department of Commerce, 1999), **http://www.census.gov/econ/www/cfsmain.html**.

xxv Unpublished findings from the National Cooperative Highway Research Program (NCHRP) Project 8-36, Task 22 (Demonstrating the Positive Impacts of Transportation Investments on Economic, Social, Environmental, Community, and Quality of Life Issues).

xxvi U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau. 199 7 *Economic Census — Transportation: 1997 Commodity Flow Survey*, **http://www.census.gov/econ/www/cfsmain.html**.

xxvii ICF Consulting and HLB Decision-Economics. *Economic Effects of Transportation: The Freight Story*. (Fairfax, VA: ICF Consulting, 2002): 16.

xxviii For additional information, please refer to the FHWA web site at **http://www.fhwa.dot.gov/policy/empl.htm**.

xxix For additional information, please refer to the web site link for the U.S. Department of Commerce's Bureau of Economic Analysis at **http://www.bea.doc.gov/**.

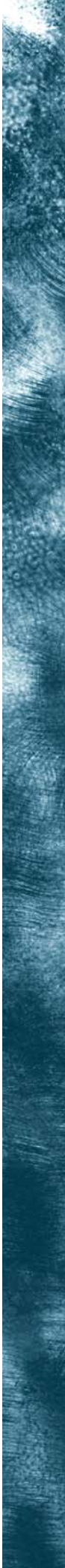
xxx For more information on these statistics and others, please refer to the web site for the U.S. Census Bureau at **http://www.census.gov**.

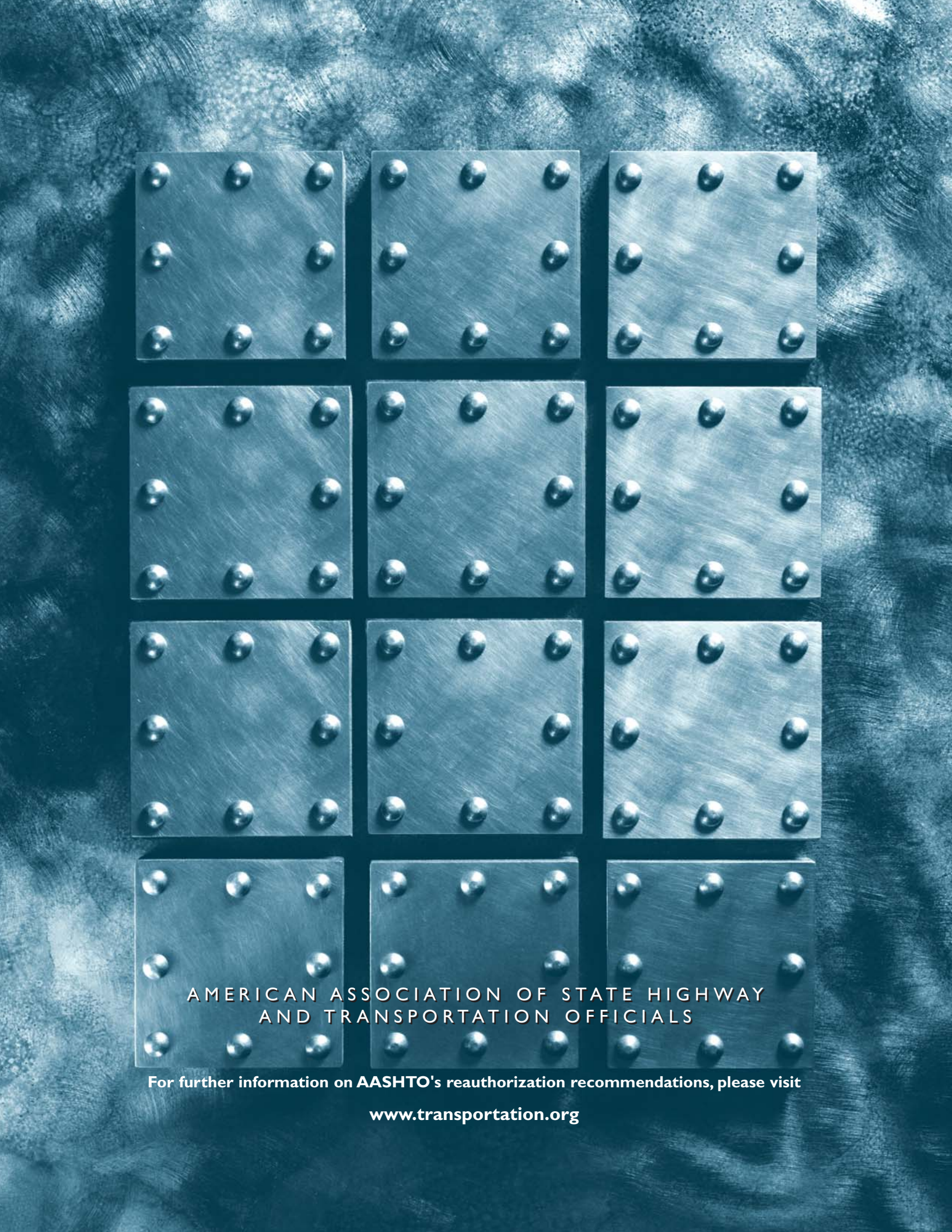
xxxi USDOT, FHWA. *Highway Statistics 2000*. (Washington, DC: USDOT, 2001), IV-16.

xxxii The findings of this study, conducted under the aegis of NCHRP Project 8-36, Task 27 (Interstate Interchange Review) , have not been published yet.

xxxiii For further information on this topic, please consult the web site link for FHWA's Office of Bridge Technology at *http://www.fhwa.dot.gov/bridge*.

xxxiv U.S. General Accounting Office (USGAO). *Federal Highway Funding by Program and Type of Roadway, With Related Safety Data.* (Washington, D.C.: USGAO, 2001): 8.





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