U.S. Department
of Transportation

**Federal Highway
Administration**

**Federal Transit
Administration**

The Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance

1993

A Summary

Publication No. FHWA-PL-93-017

This publication is a summary of the 1993 report to Congress entitled *The Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance*. A copy of the complete report can be obtained by contacting the Federal Highway Administration, HPP-22, 400 Seventh Street, SW, Washington, DC 20590.

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INTRODUCTION

Our Nation's productivity and international competitiveness depends on fast and reliable transportation. As we move toward the 21st century, the status of our highways, bridges and transit is of paramount importance to the vitality of our economy.

Americans travel roads and highways more often than any other mode of transportation. Highways, along with the automobiles, buses and trucks they carry, have provided the United States with an efficient network for moving people and goods, carrying more than 90 percent of all travel, and three-quarters of the value of all goods and services produced. Growth and productivity in virtually every sector of the Nation's economy depend upon adequate transportation.

The United States has 3.9 million miles of public roadway, which accommodate 2.2 trillion vehicle miles of travel. Expenditures for transportation are equivalent to about 17 percent of the gross national product (GNP), with almost 83 percent of this, or about 14 percent of GNP, devoted to highway and transit transportation services.

- Highway vehicles carry more than 80 percent of domestic intercity passenger miles of travel, and they have done so since World War II.

- The trucking industry carries over 40 percent of all intercity freight tonnage, and earns 80 percent of all freight revenues.

- In urban areas, automobiles and transit account for over 92 percent of all work trips. About 87 percent of all passenger-miles of travel is highway dependent.

The U.S. population now enjoys the greatest level of mobility in our history. While this level of mobility is of great direct benefit to us as individuals, the impact of increased travel on traffic congestion and environmental quality is of growing concern.

The Congressionally required report series, *The Status of the Nation's Highways, Bridges and Transit*, provides decision makers with an ongoing appraisal of the current condition and performance of the U.S. highway and transit systems. These continual assessments provide valuable information on how highway and transit investment is used as well as the foundation for estimating investment levels needed to meet future demands of social and economic growth.

This booklet summarizes the 1993 Congressional Report, starting with a "Report Card" for highways, bridges, and transit in 1991. For the first time, the report includes information on transit and environmental impacts. In fact, the transit and highway investment assessment methodologies are linked. A portion of the forecasted increase in travel demand is accommodated not by the addition of new highway lane-miles but by an aggressive, coordinated demand management program that includes increased transit participation. This increased transit participation is included in the transit investment analysis. Future reports will expand on integrating multi-modal and environmental issues in the surface transportation investment analysis.

BOX A — REPORT CARD

Highway and Transit Characteristics

- Total public road mileage reached almost 3.9 million miles in 1991 — an increase of approximately 13,000 miles over 1989.

- Total highway travel reached almost 2.2 trillion vehicle miles in 1991 — a total increase of 3 percent over 1989. Although the recession in 1989 and 1990 significantly dampened highway travel, the travel growth rate in 1991 returned to a rate of 3.5 percent. This is consistent with the 3.5 percent average annual rate experienced since 1983.

- Transit passenger miles traveled increased by 8 percent from 1980 to 1990.

Highway and Transit Finance

- In 1991, disbursements for highway programs by all levels of government totaled $78.3 billion, with $3.8 billion spent for debt retirement and $74.5 billion for current operations. This expenditure for current operations equates to 3.4 cents per mile of travel, a decline in spending of more than 50 percent in constant dollars since 1960. In nominal dollars, however, 1991 spending for current operations increased more than $7 billion over 1989.

- Of the $74.5 billion for current operations, $36.1 billion were spent for highway and bridge capital improvements in 1991, compared to $33.1 billion in 1989; $38.3 billion were spent for noncapital purposes. The Federal share of capital investment was 41 percent in 1991, down from a high of 56 percent in 1980.

- In 1990, the cost to operate mass transit service in the United States was approximately $14.7 billion; capital expenditures accounted for $4.3 billion, for a total of $19.0 billion. In 1990, fares and other revenue collected from direct transit customers covered about 43 percent of operating costs with State and local subsidies covering 51 percent and Federal subsidy covering 6 percent. The Federal share of total reported capital activity declined from 78 percent in 1980 to 60 percent in 1990.

Condition and Performance

- Pavement condition improved throughout the 1980's and continues to do so into the 1990's. However, approximately 234,500 miles are rated as "poor" or "mediocre."

- Highway performance declined through most of the 1980's, especially in the larger urbanized areas. However, between 1989 and 1991, performance stabilized, as a result of the reduced rate of urban travel growth caused by the 1989-1990 economic slowdown. In 1989, the total annual cost of congestion in the 50 largest urban areas exceeded $39 billion.

- In 1992, about 118,500 of the Nation's 575,000 bridges were rated as structurally deficient.

- The fatalities rate on the Nation's highways continues to decrease, dropping from 2.6 fatalities per 100 million vehicle miles of travel in 1983 to a low of 1.9 in 1991. However, the total economic cost to the Nation of motor vehicle crashes in 1990 was more than $137 billion.

Highway, Bridge, and Transit Investment Requirements

- The cost to immediately eliminate all existing backlog highway deficiencies on all major highways as of December 31, 1991, was approximately $212 billion, $7 billion more than the backlog in 1989.

- The cost to eliminate all backlog bridge deficiencies is approximately $78 billion.

- The cost to eliminate the 1992 backlog of bus and rail transit deficiencies, including equipment and facilities, is estimated at $18 billion.

- The total annual investment needed to eliminate highway and bridge backlog deficiencies and to meet additional highway and bridge infrastructure requirements for developing urban and suburban areas is $67.3 billion through 2011. This would require an additional investment of about 1.6 cents per mile of travel.

- The total annual investment to maintain overall 1991 highway and bridge conditions and performance is $51.6 billion through 2011. This would require an additional investment of 0.9 cents per mile of travel.

- The cost to systematically improve transit condition and performance by (1) eliminating the backlog of bus and rail deficiencies and (2) adding additional service to accommodate anticipated urban demand not included in either the highway cost to maintain or improve assessments and increase transit's market share, is $6.6 billion annually through 2011.

- The cost to maintain transit condition and performance, including the cost to meet new statutory obligations to serve disabled Americans and improve vehicular emissions and continue recent growth, is estimated at $3.9 billion annually through 2011.

Highways

Functional Systems

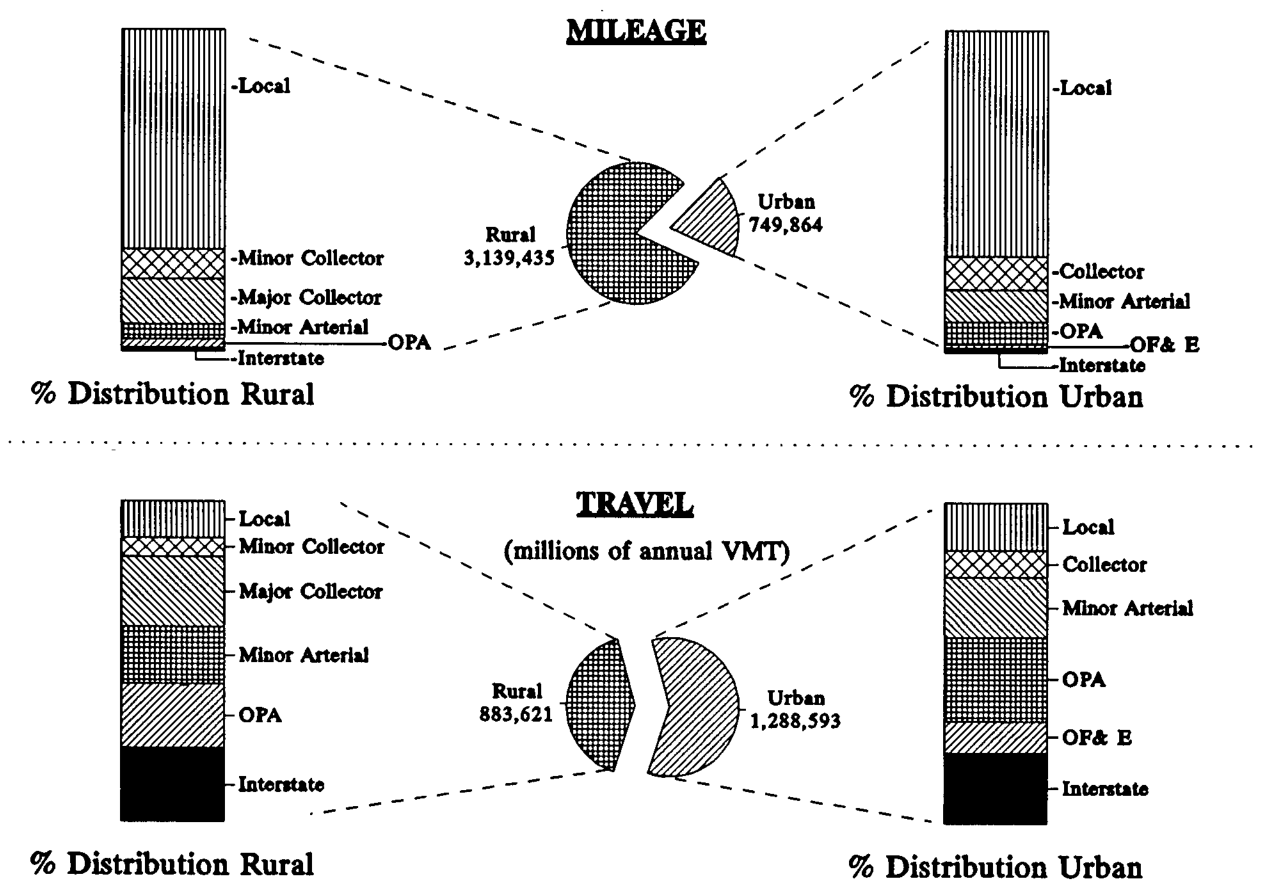
The almost 3.9 million miles of road in the United States are functionally classified as *arterials, collectors*, or *local roads*, depending on the type of service they provide. These general categories are subdivided in both rural and urban areas. Exhibit 1 displays mileage shares by functional system.

Arterials, which are classified as principal or minor, provide connectivity for longer trips. They generally have higher design standards than other roads, with wider and/or multiple lanes, often with some degree of access control.

In rural areas, principal arterials are subdivided into Interstate and other principal arterials (OPA). In urban areas, principal arterials are subdivided into Interstate, other freeways and expressways (OF&E), and other principal arterials (OPA).

Collectors are usually two-lane roads that serve shorter trips. They collect and distribute travel to and from the arterial systems. They often provide the highest

Exhibit 1
Highway System Mileage and Travel Comparison



BOX B — THE NATIONAL HIGHWAY SYSTEM

Prior to the passage of the Intermodal Surface Transportation Assistance Act (ISTEA) of 1991, a portion of highway mileage was also classified by Federal-aid systems: Interstate, primary, urban and secondary. ISTEA repealed these systems, except the Interstate System, and a new National Highway System, including the Interstate System, was established for the future. The National Highway System, as well as all other arterials, rural major collectors and urban collectors, are now the highways which are eligible for Federal aid. According to the ISTEA, designation of the National Highway System will be carried out by the States, in cooperation with the metropolitan planning organizations (MPOs) and the U.S. Department of Transportation, and submitted by the Secretary of Transportation to Congress by December 18, 1993. As a prelude to National Highway System designation, the States are functionally reclassifying their roads and streets in order to establish an updated principal arterial system.

The ISTEA mandates that the National Highway System consist of approximately 155,000 miles of highways. This designation can vary by 15 percent in either direction. Although the States will designate the majority of the National Highway System, the Interstate system (45,300 miles), the Strategic Highway Corridor Network (STRAHNET, 15,000 miles), major STRAHNET connectors (2,200 miles), and ISTEA specified high priority corridors (4,500 miles) must be included in the 155,000 mile National Highway System. The remaining "flexible" mileage, regional in character, will be designated by the States in cooperation with the local officials.

The National Highway System will be the major focus of Federal highway investments for the future. This system is expected to carry the bulk of interstate and interregional travel and commerce. The benefits of making these investments are manifold, including: economic growth, national security, intermodal connectivity, system connectivity, safety, the ability to accommodate expanded trade between Canada, the U.S. and Mexico, and the ability to sustain a growing tourism industry. Future editions of this report will include National Highway System statistics and investment analyses.

degree of mobility available or needed for a variety of local travel requirements. In rural areas, collectors are subdivided into major and minor collectors.

The majority of public road and street mileage is classified as local. Local roads provide the access between residential and commercial properties and the higher functional systems.

Jurisdictional Responsibility

Nationwide, States have jurisdictional responsibility for approximately 800,000 of the 3.9 million miles of road. The Federal Government has responsibility for approximately 183,000 miles, primarily in national parks, forests, and Indian reservations. Local governments retain control of, and responsibility for, the remaining 2.9 million miles. There is no consistent relationship between functional systems and jurisdictional responsibility, although, as a general rule, States control the higher functional systems and local governments manage the lower systems.

Highway Travel

Exhibit 1 also displays travel shares by functional system. Over the most recent eight year period, 1983 through 1991, travel has increased almost 3.5 percent annually. In 1991 there were almost 2.2 trillion vehicle miles-of-travel. About 60 percent of highway travel is in urban areas, with suburban portions continuing to grow very rapidly.

The urban Interstate System experienced the largest increase in travel from 1983 through 1991, averaging over 5 percent per year. Conversely, travel on both rural and urban collectors increased by less than 3.0 percent annually over the same period.

Truck travel is an important factor affecting highway needs. Combination trucks are used primarily for intercity freight transportation, and their travel is concentrated on rural arterials. In 1991, combination trucks accounted for 15 percent of total travel on rural Interstate highways, but only 6 percent of travel on urban Interstate highways.

The density of urban highway travel, defined as vehicle travel divided by lane-miles, is about five times the density of rural travel for similar functional systems. The rate of increase in density of travel has been higher in rural areas than in urban areas in recent years but, in absolute terms, urban roads remain much more heavily used. In urban areas, travel on the higher functional systems, Interstates and other freeways and expressways, has continued to increase more rapidly than on other urban roads.

The growth of rural travel demand has continued most prominently on the margins of urban areas and in the corridors connecting urban areas. Performance characteristics on these rural highways have begun to emulate urban highways, particularly regarding peak period congestion.

Bridges

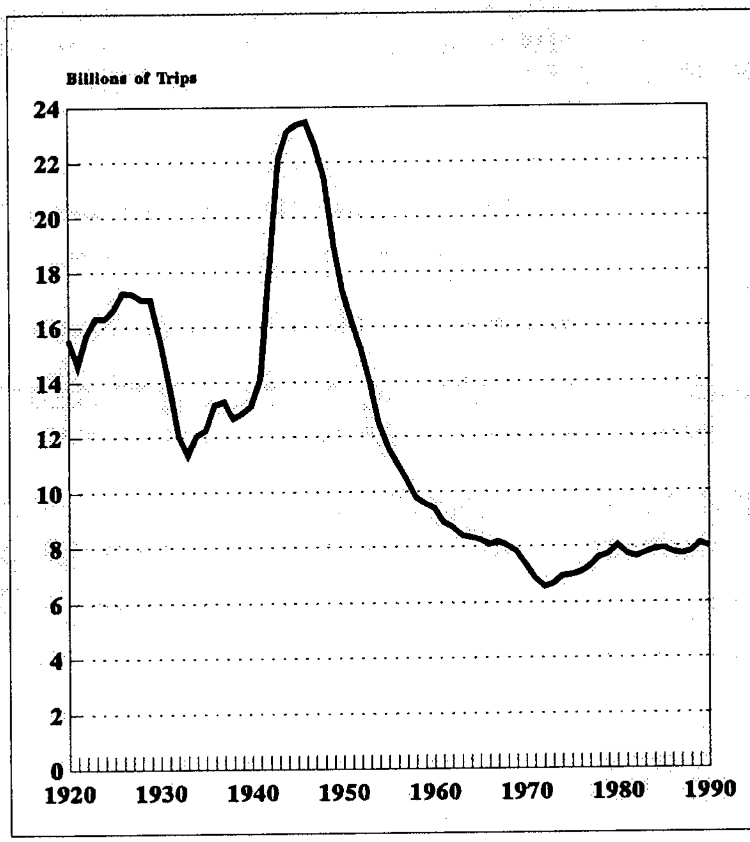
Nationwide, there are approximately 575,600 bridges of greater than 20 feet in length. Almost 80 percent of these are in rural areas. Of the total, almost 299,000 bridges, about 52 percent, are locally owned and maintained. The States own and maintain 269,000 bridges (47 percent).

Transit

In urban areas with populations of 50,000 or more, there are 498 providers of mass transit. However, mass transit systems in the larger urbanized areas carry the greatest proportion of total transit riders. For example, 35 percent of transit passengers and 41 percent of passenger miles of travel in 1990 were in the New York City area. The ten cities which had rapid rail services (New York City, Boston, Philadelphia, San Francisco, Chicago, Washington, D.C., Cleveland, Atlanta, Baltimore, and Miami) accounted for 71 percent of transit trips in 1991.

Transit passenger miles traveled increased by 8 percent between 1980 and 1990. However, the share of total travel accounted for by transit has decreased due to a much larger increase in travel by personal vehicles. Transit patronage has been relatively stable since 1980. Exhibit 2 shows the trend in transit patronage from 1920 through 1990.

Exhibit 2
U.S. Transit Patronage
1920 - 1990



SOURCE: ATA/APTA, TRANSIT FACT BOOKS
(1920-1979 DATA)
SECTION 15 (1980-1990 DATA)

Highway and Bridge

Financing for roads and highways comes from both the public and private sectors. All levels of government provide funding for highways and spend money to construct and maintain highways.

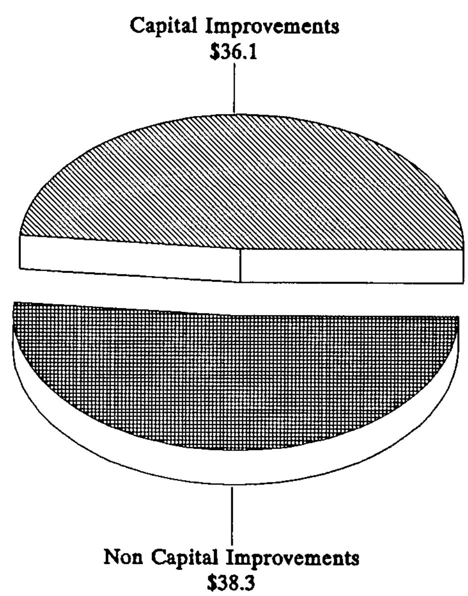
The private sector invests in roads to provide access to new development, to mitigate development impact, and for other profit-making purposes. Profit is the underlying reason for all private highway investment. Public sector financing includes all funding for highways that is managed by the public sector including projects built with revenue from exactions, development fees, and special district assessments.

In 1991, disbursements for highway programs totaled $78.3 billion with $3.8 billion being spent for debt retirement and $74.5 billion for current programs. Revenues to fund these expenditures came from a number of sources including user charges, general funds and other non-highway funding, benefit charges, investments and miscellaneous fees, and bond issues.

Current expenditures can be divided into two broad categories: non-capital and capital. Noncapital highway expenditures include maintenance and operations of highways, administration, highway law enforcement, safety, and interest on debt. Highway capital expenditures are those outlays associated with highway improvements, including right-of-way costs; preliminary and construction engineering; new construction and lane additions; pavement reconstruction; resurfacing, rehabilitation, and restoration (3R) costs of roadways and structures; and installation of traffic service facilities such as guard rails, fencing, signs, and signals.

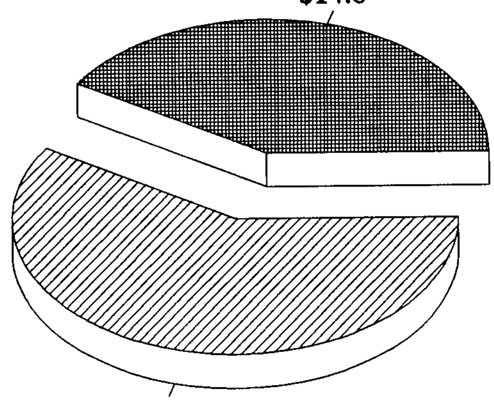
As shown in Exhibit 3, the noncapital share of disbursements for highways was $38.3 billion for 1991, or 51 percent of current disbursements. Spending for roadway maintenance and operations is the largest single component of noncapital highway expenditures. About $20.4 billion was spent by State, county, and municipal governments in 1991 to keep roads and streets in serviceable condition.

Exhibit 3
Current Spending for Highways - All Levels of Government
($ billions - 1991)



All governments spent over $36.1 billion on capital improvements in 1991. The Federal Government provided funds for 41 percent of the total highway capital outlay of $36.1 billion in 1991 (see Exhibit 4). With the exception of approximately $1 billion provided

Exhibit 4
Source of Funds for Highway Capital Outlay by Level of Government ($ billion - 1991)



by other Federal agencies, all of these funds came from programs administered by the FHWA.

State and local governments supplied 59 percent of all funds for highway capital improvements in 1991.

Capital outlay on the Interstate System was $8.3 billion in 1991. Capital outlays on arterials other than the Interstate system were $17.4 billion in 1991. As on the Interstate system, improvements were mainly for system preservation and capacity additions, with new construction accounting for approximately 23 percent of expenditures. Outlays on collectors were $4.5 billion in 1991. New construction accounted for only 11 percent of total expenditures on collectors, significantly less than expenditures for these types of improvements on the Interstate and Other Arterials.

Capital spending on highways can be categorized as follows:

- System Preservation: this category includes all improvements on existing roads and bridges including minor widening, restoration and rehabilitation, resurfacing, bridge replacement, bridge rehabilitation, and reconstruction that does not add additional lanes of capacity. This category includes improvements to the physical condition of a road or a bridge to improve safety, e.g., the elimination of unsafe highway curves and grades, or narrow width lanes. Spending for this category of improvements is related to investments required to maintain or improve pavement, and repair or replace bridges.

- Capacity Improvements: this category includes improvements that add capacity either by adding lane miles to existing facilities, or by the construction of new roads and bridges. Spending for this category of improvements is related to investments required to add capacity.

- Other Improvements: this category includes all improvements that are not directly related to the physical condition of a road or bridge, for example, the provision of features or devices to enhance safety, to improve traffic operations, or to reduce vehicle use, and environmentally related improvements such as noise barriers. *Spending for this category of improvements is not related to the investment requirements in this report.*

In 1991, system preservation improvements accounted for 42 percent of spending on non-local roads, capacity improvements accounted for 51 percent, and other improvements accounted for 7 percent.

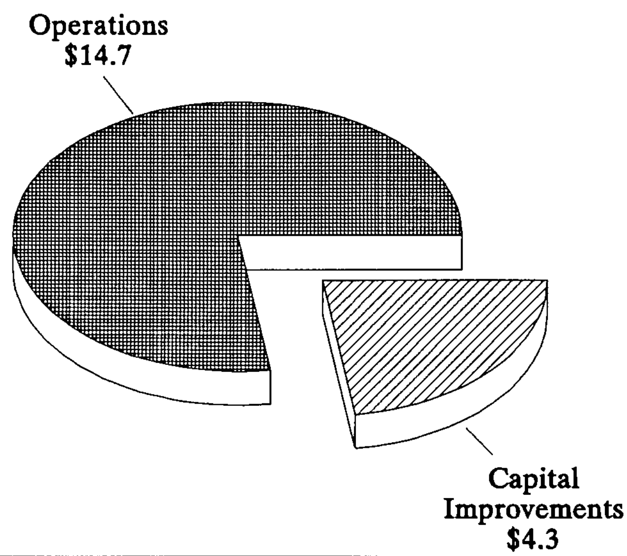
In order to compare capital spending for highways with the highway investment requirements included in this report, it is important to ensure that the same things are considered. Estimates of highway and bridge investment requirements are generated by FHWA simulation models, and are based on the cost of making physical improvements to the existing non-local highway network. Of the $35.9 billion spent on capital improvements by State and local governments in 1991, capital spending on local roads totaling $5.7 billion, the $2.1 billion spent for capital improvements included in the "Other" category defined above, and an estimated $1.7 billion of capacity improvements primarily for economic development rather than transportation purposes are not related to investment requirements estimated by FHWA models. Total spending by State and local governments, for comparison with investment requirements generated by the models, was $26.4 billion in 1991.

The term private sector financing as used in this report means financing for highway projects that are primarily developed by the private sector including construction of local roads in new developments, improvements to existing collector or arterial roads that provide access to new developments, improvements to existing facilities or the construction of new facilities to provide for the additional traffic generated by a new development or by a change in the way land is used, and toll facilities built as an investment. The ISTEA of 1991 allows the use of Federal-aid funds on privately owned facilities and is expected to increase the attractiveness of toll road development as an investment option. Private sector financing is the primary source of funding for most local development roads.

Transit

As shown in Exhibit 5, the cost to operate mass transit service in the United States was approximately $14.7 billion in 1991. Capital expenditures by Federal, State and local governments were reported as $4.3 billion resulting in an overall mass transit expenditure of $19.0 billion.

Exhibit 5
Current Spending for Transit - All Levels of Government
($ billion - 1991)



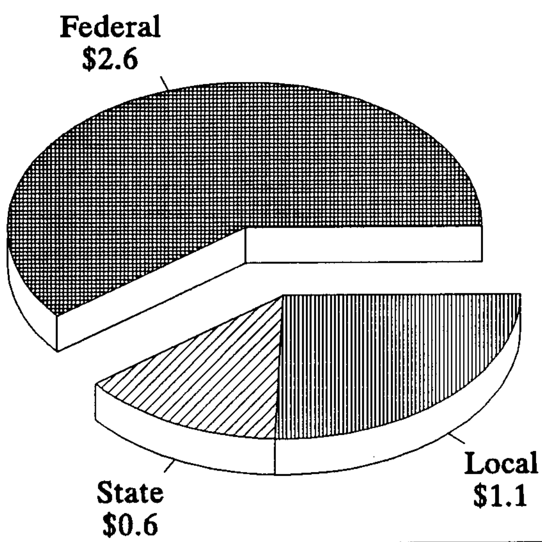
Fares and other revenue collected from transit customers covered about 43 percent of operating costs in 1990, with State and local subsidies of $7.6 billion covering 52 percent and a Federal subsidy of $823 million covering 6 percent.

Exhibit 6 displays the source of funds for transit capital outlay by level of government. Total transit capital spending in 1990 of almost $4.4 billion was made up of $2.6 billion (60 percent) from the Federal government, $641 million from State governments (15 percent) and almost $1.1 billion from local sources (25 percent).

The funding from the Federal Government was in the form of grants which require a contribution, referred to as a "Federal match," from the recipient. Total capital spending by State and local governments exceeded Federal match requirements by $1.0 billion. Overmatch funds are being used both to restore and to expand transit systems. In New York, New Jersey, and Chicago, most of the additional spending is dedicated to rail modernization. In Los Angeles, Baltimore, and Atlanta, additional State and local funds were used to build new rail transit systems.

Exhibit 6

Source of Funds for Transit Capital Outlay by Level of Government ($ billions - 1990)



Highway condition and performance is defined by levels of service, representing operating characteristics; pavement conditions, representing overall physical characteristics; fatality rates, representing overall system safety; and a variety of environmental measures. Transit condition and performance is defined by age of transit facilities and equipment and service characteristics.

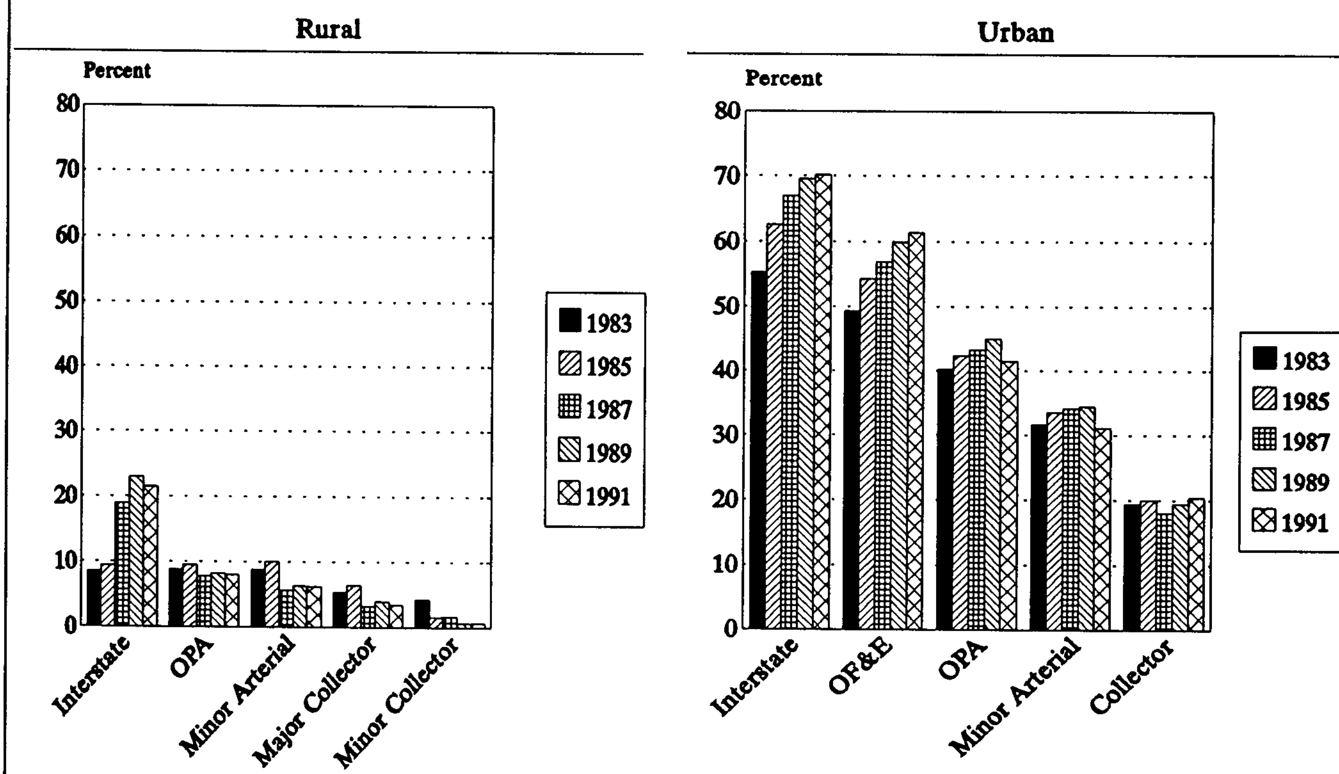
Highway Operating Characteristics

Continuing growth in travel has resulted in increasing highway congestion, particularly in urbanized areas. Exhibit 7 shows congested peak hour travel, which generally occurs during rush hour, by functional system.

The percent of peak-hour travel on urban Interstates that occurred under congested or severely congested conditions exceeded 70 percent in 1991, up from 55 percent in 1983. Urban Interstate peak-hour congestion has grown at an average annual rate of 3 percent since 1983.

For urban Interstate peak-hour travel, more than 55 percent of the congested travel and more than 73 percent of the highly congested travel occurs in the 33 most populous urbanized areas. Approximately 37 percent of the mileage, almost 41 percent of the lane-miles, and more than 53 percent of the travel on non-local urban roads occurs in these

Exhibit 7
Peak Hour Congestion



urbanized areas. More than 65 percent of the overall peak-hour congested urban travel, however, occurs in these same areas.

For the last two-year period, 1989-1991, the rate of increase in urban congestion slowed due to economic conditions. Although peak-hour congestion continued to increase for Interstate and other freeways and expressways (OF&Es), it decreased slightly for the other principle arterials (OPAs) and minor arterial categories as shown in Exhibit 7.

There are substantial costs to the economy of the Nation as a result of congestion. A report by the Texas Transportation Institute, 1989 Roadway Congestion Estimates and Trends, July 1992, states that in 1989, the total cost of congestion for the 50 urban areas studied was approximately $39.1 billion. Delay accounted for approximately 85 percent of this amount, while excess fuel consumption accounted for 15 percent. Eight of the top 10 urban areas had total congestion costs exceeding $1 million.

Highway Physical Characteristics

Pavement rated in poor condition needs improvement now. The mediocre pavement is expected to need improvement in the near future, generally within the next 5 years, depending on the pavement design, environmental factors, and the traffic loading. The pavement in fair condition will likely need improvement in the 5- to 10-year horizon. The pavement in good condition will not likely need improvement for 10 to 15 years or more. The pavement condition evaluations are based on the present serviceability rating (PSR) system. The PSR ratings range from 0-5, with 5 being new pavements. Pavements rated at or below 2.0 (2.5 for Interstate highways) are considered to be in poor condition.

Exhibit 8 contains a comparison of pavement by functional system. For the period 1983 to 1991, the percentage of pavements in poor condition decreased or maintained a stable condition on all functional systems, rural and urban. The total mileage in the mediocre pavement category has become relatively stable. For the Interstate systems, the mileage in the mediocre category is within 2 percent of the value for 1983. Except for rural other arterials, the percent of miles in the mediocre category for the lower functional systems is also within 2 percent of the 1983 value.

The mileage in poor condition in most States has declined over the past few years. This represents a real accomplishment in addressing the worst pavement needs. States have implemented pavement management systems that are, by identifying the highest priority pavements to rehabilitate, contributing to the decrease in the mileage of poor pavement. However, because of the traffic loads and the stresses on the environment, pavements will continue to deteriorate and substantial resurfacing and rehabilitation programs will be required to maintain the pavement structure in an acceptable condition.

Exhibit 8
Estimated Highway Mileage by Pavement Condition, Functional System, and Year

Functional System	Year	Poor	Mediocre	Fair	Good	Unpaved	Total
Rural Interstate	1983	13.3	13.8	14.3	58.6	0.0	100
	1985	10.8	14.1	15.4	59.7	0.0	100
	1987	11.6	15.5	14.4	58.4	0.0	100
	1989	9.1	15.4	17.1	58.4	0.0	100
	1991	7.6	15.6	15.9	60.8	0.0	100
Urban Interstate	1983	16.8	16.1	13.7	53.4	0.0	100
	1985	11.1	19.5	13.5	56.0	0.0	100
	1987	11.1	18.5	15.0	55.4	0.0	100
	1989	9.6	16.1	16.7	57.6	0.0	100
	1991	7.7	15.6	16.6	60.1	0.0	100
Rural Other Arterials	1983	11.1	11.8	35.3	41.8	0.1	100
	1985	8.3	10.0	36.7	44.9	0.1	100
	1987	6.6	11.0	37.3	45.0	0.1	100
	1989	4.8	9.9	37.4	47.8	0.0	100
	1991	3.9	8.0	38.3	49.8	0.0	100
Urban Other Arterials	1983	10.0	13.6	34.1	41.7	0.6	100
	1985	9.0	13.9	34.7	42.0	0.5	100
	1987	8.7	14.0	35.2	41.7	0.4	100
	1989	7.7	13.4	36.5	42.1	0.3	100
	1991	6.8	13.2	36.0	43.6	0.4	100
Rural Collectors	1983	15.0	12.1	25.5	24.7	22.8	100
	1985	12.8	13.4	27.2	24.2	22.3	100
	1987	12.0	13.0	26.9	26.5	21.7	100
	1989	10.5	12.7	27.9	28.6	20.3	100
	1991	8.2	12.0	29.8	30.1	19.9	100
Urban Collectors	1983	14.9	15.5	34.2	33.3	2.0	100
	1985	13.1	17.4	35.3	32.5	1.7	100
	1987	13.6	17.4	36.6	31.1	1.3	100
	1989	17.6	16.5	33.3	31.3	1.4	100
	1991	11.3	17.4	36.0	34.2	1.1	100

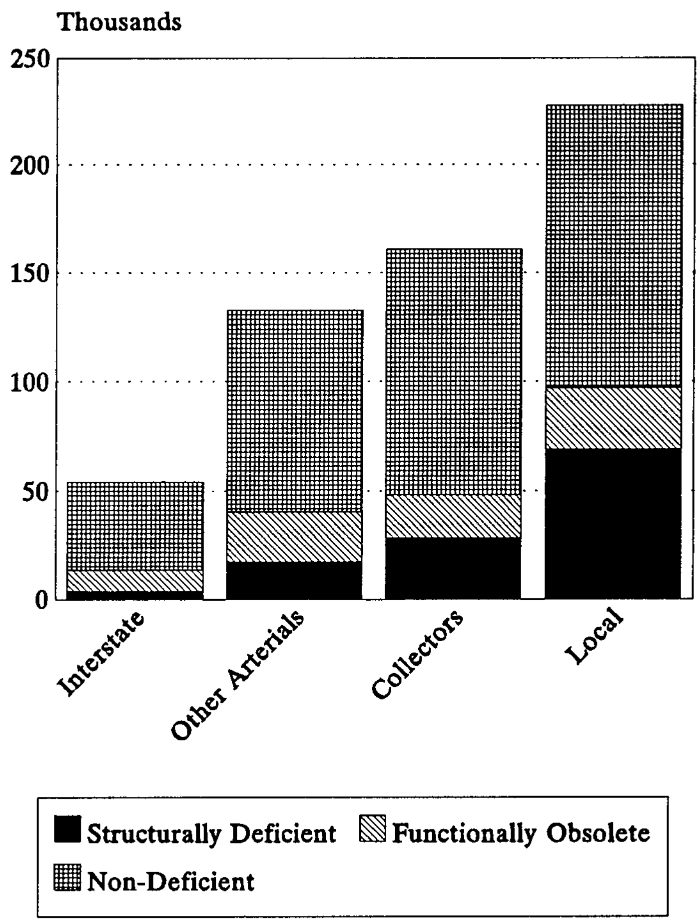
Bridges

The percentage of Interstate, arterial, and collector bridges classified as structurally deficient increased over the period from 1984 through 1992, from 13.2 percent to 14.3 percent. Generally, the higher functional systems have fewer deficient bridges than the lower systems. The proportion of Interstate bridges classified as being structurally deficient increased from 5.1 percent in 1984 to 6.8 percent in 1992. This is indicative of the heavy use of the Interstate System and of the fact that many of these bridges are nearing the point when rehabilitation will be required. Most bridges that are structurally deficient are not in danger of collapse, but they are likely to be load-posted so that heavier trucks will be required to take an alternative longer route. Functionally deficient bridges are those that do not have the lane widths, shoulder widths, or vertical clearances adequate to serve the traffic demand; or the waterway of the bridge may be inadequate and therefore allow occasional flooding of the roadway.

The major increase in functionally deficient bridges between 1988 to 1990, especially on the Interstate System bridges, resulted from changes in the *Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges*, December 1988. As a result of the new guide, more specific criteria are used to assess condition and identify deficient bridges. In 1992, 25.3 percent of the Interstate bridges were classified as being

Exhibit 9

Bridge Deficiencies, 1992

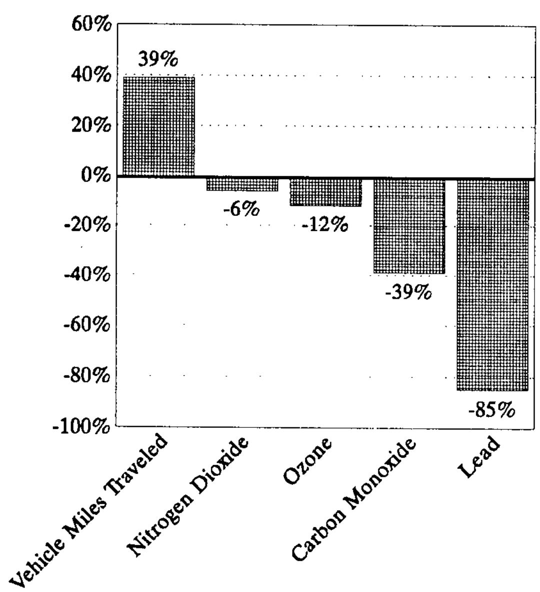


deficient, compared to 13.1 in 1984. Exhibit 9 displays bridge deficiencies for 1992.

Highway Safety

Fatality rates decreased from 1983 to 1991 for both rural and urban Interstate, other arterials, and collectors. The fatality rates ranged from a high of 3.27 per 100 million VMT on rural collectors to a low of 0.67 on urban Interstate highways. The fatality rates on the Interstate highways, the system with the lowest accident rate, decreased from 1.50 in 1983 to 1.25 in 1991 rural areas, and from 1.01 to 0.67 in urban areas. The overall fatality rates for 1991 were 2.76 for rural highways and 1.32 for urban highways, with an overall average of 1.91.

Exhibit 10
Transportation Emissions Trends
1981-1990



Source: EPA National Air Quality and Emissions Trend Report, 1990

While fatality rates decreased to an historic low in 1991, National Highway Traffic Safety Administration has estimated that the total economic cost to the Nation of motor vehicle crashes in 1990 was more than $137 billion. This cost was almost evenly distributed among three categories: property damage; lifetime productivity losses; and medical, insurance, legal and other expenses. Accident and fatality rates are affected by many factors other than highway condition and performance, including weather conditions, number of intoxicated drivers, extent of police exposure, law enforcement, vehicle speed variations, and driver performance.

Environmental Conditions and Performance

The environmental consequences of transportation arise from both construction and usage. Indices of performance pose both conceptual and practical challenges. However, an initial set of categories were identified:

- Air quality
- Water quality
- Wetlands
- Energy
- Noise
- Land and open space
- Threatened and endangered species
- Community impacts

Progress is being made in each of these categories. As an example, there was significant progress in reducing the overall levels of the major transportation related air pollutants over the last decade. These reductions are shown in Exhibit 10. As the exhibit illustrates, highway users contribute a large share of the reduction attained, even with increased travel.

Transit Service Quality

The perception of quality among customers and potential customers is an important determinant of transit use, often more important than fare level. According to Nationwide Personal Transportation Survey data, the majority of transit users spend very little time waiting for service. Well over half of all riders (58 percent) reported wait times of five minutes or less and more than 80 percent of riders wait no longer than ten minutes.

Approximately 47 percent of transit trips involve one or more transfers. In addition, approximately 17 percent of transit trips involve a transfer from a private vehicle, e.g., park and ride situations. According to data from the 1990 Nationwide Personal Transportation Survey, over 40 percent of all transit commuters reported trip times of ten minutes or less, and nearly 87 percent of transit riders arrive at work in less than half an hour.

such factors as industry practices, manufacturer recommendations, and studies of the trade-off between capital investments and operating costs. The minimum useful life guidelines and fleet characteristics for bus and paratransit service are shown in Exhibit 11.

If it were possible for transit agencies to replace vehicles on this schedule, the average age of type of vehicle would be one-half the useful life guideline. Exhibit 11 also displays the actual average age for the major categories of bus and paratransit vehicles, and the backlog of over age vehicles of each type in need of replacement.

Since 1990, the total fleet size has not noticeably changed, and the number of vehicles replaced has fallen below that required to maintain the average fleet age at the current average age.

Exhibit 11

Bus and Paratransit Fleet Characteristics

Type of Vehicle	Total Fleet	Useful Life	Average Age	Overage
Standard Size Full Transit Bus	48,325	12	8.2	9,011
Medium Duty Transit Bus	3,223	10	6.7	553
Small Transit Van	2,658	7	3.9	303
Urban Paratransit Van	3,768	4	2.8	827

Bus and Paratransit Condition

For the purposes of managing the Federal investment in transit, the Federal Transit Administration (FTA) has established minimum requirements for the period of time an asset must remain in mass transit service before it will be considered eligible for replacement. These guidelines are based on

Similar condition data are not currently available for the age or condition of bus and paratransit maintenance garages and other fixed facilities, such as terminals, stations, waiting areas, park-and-ride lots, etc.

Rail Conditions

Detailed information is available on the condition of the Nation's rail system from the Rail Modernization Study published in 1987.

This assessed the physical condition of the rail systems on the basis of consistent definitions and assessment procedures. Specific definitions were developed for each of five condition levels ("excellent," "good," "fair," "poor," and "bad"). The key condition level in this analysis was "good" which was defined as "good working order, requiring only nominal or infrequent minor repairs."

The Rail Modernization Study physical condition assessment, which is still considered valid, showed that maintenance yards and facilities were in the most need of improvement, since only 17 percent of the yards and 28 percent of the facilities were in good or better condition. Also in need of substantial improvement were elevated rapid rail structures (with only 19 percent in good or better condition), stations (29 percent) and bridges (32 percent). Substations were in the best overall shape with 66 percent in good or better condition, while commuter rail vehicles were also in general well off with 49 percent of locomotives and 55 percent of unpowered cars in good or better condition.

HIGHWAY, BRIDGE, AND TRANSIT INVESTMENT REQUIREMENTS, 1992-2011

This section provides estimates for total capital investments required by all units of government to achieve specified levels of overall system condition and performance for all highways, bridges, and transit systems for the period 1992-2011.

For the first time in this report series, transit is included in the Conditions and Performance Report. Although rigorous analytical procedures have not yet been developed to support a fully integrated approach to highway/transit investment analysis, this report is a first step in that direction. In subsequent reports, modal tradeoffs will be addressed more fully.

Highway, Bridge and Transit Investment Analysis Procedures

Investment requirements are presented in two scenarios:

- The **Cost to Improve** Overall Conditions and Performance
- The **Cost to Maintain** Current Overall Conditions and Performance

BOX C — INVESTMENT SCENARIOS

Scenario	Description: Highways and Bridge	Description: Transit
Cost-to-Improve Conditions and Performance	• GOAL: - Eliminate backlog and accruing performance and condition deficiencies. - Ensure that, by the year 2011, no highway or bridge section will be in poor condition.	• GOAL: - Eliminate backlog of transit equipment and facility deficiencies. - Increase rate of ridership growth and increase market share.
Cost-to-Maintain Conditions and Performance	• GOAL: - Maintain overall condition and performance through 2011, except in the largest cities, where performance can be expected to decline due to inadequate capacity.	• GOAL: - Maintain current levels of service. - Maintain current growth trends in transit patronage.

Highway Investment Requirements Estimation Methodology, Features, and Constraints

Estimates of future highway investment requirements are derived through application of the Highway Performance Monitoring System (HPMS) database and analytical modeling procedure. The HPMS database contains information about current physical conditions and usage for over 100,000 non-local highway segments. The HPMS analytical procedure uses this data to simulate highway investment decisions and predict system performance.

The analytical process begins by simulating system performance and condition deterioration given projected future travel and normal pavement aging. Highway deficiencies are identified when physical or operating conditions deteriorate below prescribed minimum condition standards.

Physical deterioration relates primarily to changes in pavement condition; whereas highway performance deterioration is a function of the relationship between highway capacity and traffic volume. In general, condition deficiencies will occasion resurfacing or pavement reconstruction while performance deficiencies result in the need for additional capacity on the existing roadway. Each improvement type has an associated cost per lane mile that varies by State. The HPMS investment/performance procedure prioritizes improvements based on the amount of funds available and their relative cost-effectiveness levels.

The analytical procedure includes a number of features to assure that HPMS recommended capacity additions reflect actual travel behavior and State and local agencys capital programming practices. For example, travel behavior under congested conditions, such as choosing an alternative route or time to commute, is simulated. In addition, the procedure recognizes that additional lanes will sometimes be added in corridors where extraordinary construction techniques at higher than normal costs are required. Further, travel growth that will not be satisfied due to prohibitive right-of-way acquisition, social dislocation, environmental considerations, or a host of other factors is reported as "unmet" demand and is omitted from the analysis.

The application of an extremely aggressive, fully coordinated traffic management program is assumed and a portion of the projected increase in travel demand is accommodated through traffic management strategies such as ridesharing, congestion pricing, Intelligent Vehicle Highway systems and enhancements to transit service. The HPMS derived estimate of lane-miles required to met increased demand is reduced by 34,000; equivalent to an annual savings of $4.8 billion in foregone highway construction. Ten percent of the passenger-miles associated with the 34,000 lane-mile traffic management savings is assumed to be satisfied by increased transit participation. The traffic management program simulated *far* exceeds any actual program implemented to date.

Procedures independent of the HPMS model are used to estimate local road and defense highway requirements. In addition, a separate procedure is used to estimate the increased capacity and new facilities needed to accommodate metropolitan expansion on rural land adjacent to urban areas.

The methodology used to estimate highway investment requirements makes every effort to make the best use of existing facilities before embarking on new or expanded construction programs. Further, this approach recognizes physical, social, and environmental constraints to the addition of new capacity.

Bridge Investment Requirements Estimation Methodology

The Bridge Needs and Investment Procedure (BNIP) is analogous to the HPMS procedure. It relies on information from the National Bridge Inventory which contains detailed information about all highway bridges in the country.

Using data from the National Bridge Inventory, the BNIP compares bridge conditions to a prescribed set of minimum bridge condition standards. Deficiencies are noted and the appropriate improvement is simulated. Bridge improvements are simulated when a bridge either cannot safely carry the size and weight of vehicles expected to use the bridge and/or when the width of a bridge is an impediment to smooth and safe traffic flow.

Transit Investment Requirements Estimation Methodology

Transit estimates include capital costs for both equipment and facilities. Equipment costs are based on replacement schedules from industry practices, manufacturer recommendations, and studies of the trade-off between capital investments and operating costs. In addition to estimates to achieve system performance objectives, costs are also included for regulatory and statutory compliance, primarily associated with the Americans with Disabilities and the Clean Air Acts.

As discussed above, a portion of the transit estimates are derived to replace new highway capacity, particularly in the largest urbanized areas. The coordinated traffic management strategy assumes that transit enhancements will accommodate a share of existing and future demand in highly congested urbanized areas. Transit improvements are reflected in the highway analysis as an increase in average vehicle occupancy, thereby reducing the number of vehicles that must be accommodated through additional highway capacity.

Travel Demand Assumptions

The national rate calculated from the 1991 HPMS data submittal suggests that highway travel will increase at an average annual rate of about 2.5 percent through 2011.

An annual average growth rate of 2.5 percent implies that travel growth from 2000-2011 will be well below historic levels. Assuming a linear reduction in the rate of travel growth from the actual 1991 rate, a 2.5 percent average annual growth rate suggests that the growth rate in 2011 would be about 1.1 percent. This observation assumes that future rates of growth in travel will decline gradually from current growth rates. If current rates of growth, averaging over 3.0 percent per year for the past decade, remain stable for several years before the expected reductions, the impact on future growth would be more dramatic if the overall 2.5 percent growth rate is to be realized. In addition, the exclusion of "unmet demand" from the highway analysis further reduces the demand for which investment estimates are made.

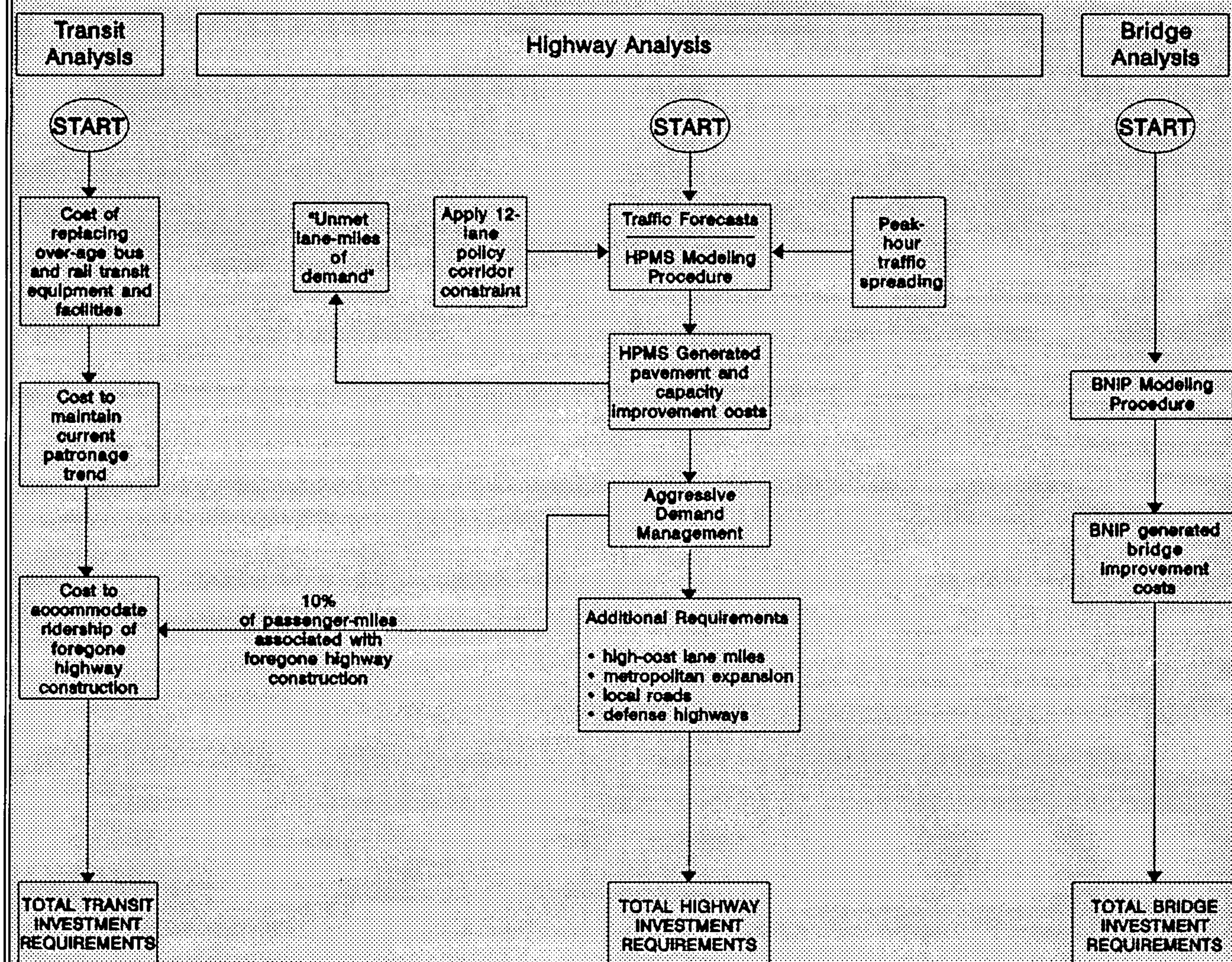
Highway and Bridge Investment Requirements, 1992-2011

The Backlog of Highway and Bridge Deficiencies

The backlog is the cost of bringing the current system up to at least minimum standards from its existing conditions and performance status. As of December 31, 1991, the cost of eliminating the backlog of highway deficiencies was estimated at $212 billion for all existing arterial and collectors. This is $7 billion more than the comparable figure from 1989. This increase is attributed to deterioration in overall average system performance.

Approximately 42 percent of the highway backlog is pavement cost; the remaining 58 percent is the cost of adding capacity to restore system performance to minimum capacity performance standards. The urban backlog is twice as high as rural backlog, reflective of capacity deficiencies in the larger urban areas. Backlog deficiencies are fairly evenly distributed among the functional highway systems.

BOX D — HIGHWAY, BRIDGE, AND TRANSIT INVESTMENT REQUIREMENTS ESTIMATION PROCEDURES



The backlog requirements on the Nation's highway bridges were $78 billion. The bridge backlog estimates have decreased significantly from the $91 billion estimate in the 1991 report because of bridge improvements and revisions in the rating criteria.

The Cost to Maintain Highway and Bridge 1991 Condition and Performance

The average annual **Cost to Maintain** existing highways through 2011 is estimated at $46.4 billion. This estimate also includes an annual savings of $4.8 billion from the coordinated traffic management program.

The average annual cost to maintain overall bridge conditions as they were reported on June 30, 1992 is estimated at $5.2 billion annually through 2011. This investment level would maintain the current total number and distribution of structurally deficient and functionally obsolete bridges.

Under the **Cost to Maintain** scenario, the backlog would remain essentially unchanged over the 20-year analysis period. Conditions and performance as described in the earlier section on conditions and performance would be maintained except in the larger urbanized areas, where further deterioration in performance can be expected because of the capacity constraints imposed in the analysis.

Total Highway and Bridge Investment Requirements

Exhibit 12 summarizes annual investment requirements to meet each scenario for all urban and rural areas. Costs derived from the highway and bridge analyses are presented for each functional system.

The Exhibit shows total 20-year investment requirements categorized as pavement and capacity improvements, with annualized totals. The annualized total is the 20-year total divided equally. Under the **Cost to Improve** scenario, two-thirds of total investment would occur in urban areas; capacity improvements would account for about 48 percent of total investment.

Under the **Cost to Maintain** scenario, 66 percent of total investment would occur in urban areas; capacity improvements would account for about 47 percent of total investment.

The Cost to Improve Highway and Bridge Conditions and Performance

The average annual roadway cost to repair all backlog deficiencies and keep all highway segments above the specified minimum condition and performance level standards through 2011, referred to as the **Cost to Improve** scenario, is $59.1 billion. These estimates include an estimated $4.8 billion annual capital savings from the coordinated traffic management program.

The average annual investment required to repair, replace, or widen all backlog and accruing bridge deficiencies on all highway bridges through 2011 is $8.2 billion.

The **Cost to Improve** scenario results in modest improvements in overall pavement conditions on the higher functional systems. This scenario would increase the average pavement condition to approximately a 3.5 pavement serviceability rating. This would result in an overall condition such that pavements, on average, would have between 8 and 12 years of remaining design life. No section of road would be in "poor" condition. System performance on rural and many urban highways would also improve under this scenario by eliminating most highly congested conditions and improve performance on high-volume highways soon to be congested.

Conditions and performance would be superior to today, but substantially below the design and performance standards expected of new, or nearly new roads.

Exhibit 12
Investment Requirements for Highways and Bridges vs. Related Capital Outlay
2.5% VMT Growth Rate
1992-2011
(all estimates expressed in billions of 1991 dollars and do not reflect inflation)

Functional System	ANNUALIZED COST TO IMPROVE			ANNUALIZED COST TO MAINTAIN			
	System Preservation	Capacity	TOTAL	System Preservation	Capacity	TOTAL	1991 Related Capital Outlay
RURAL							
Interstate	2.4	1.8	4.2	2.0	1.7	3.7	2.5
Other Principal Arterial	2.5	1.7	4.3	1.9	1.1	3.0	3.6
Minor Arterial	2.9	1.3	4.2	2.2	1.0	3.2	2.1
Major Collector	5.3	0.7	6.0	4.2	0.7	4.9	2.3
Minor Collector	3.4	0.1	3.5	2.0	0.1	2.1	0.8
Local	0.7	-	0.7	0.5	-	0.5	[2]
SUBTOTAL RURAL	17.2	5.6	22.9	12.8	4.6	17.4	11.3
URBAN							
Interstate	4.9	5.3	10.1	4.1	4.4	8.5	4.7
Other Freeway and Expressway	1.9	2.6	4.5	1.5	1.9	3.4	2.4
Other Principal Arterial	4.8	7.3	12.1	3.7	4.3	8.1	4.8
Minor Arterial	3.5	5.3	8.7	2.8	3.6	6.4	2.2
Collector	2.6	2.4	5.0	2.1	1.8	3.9	1.0
Local	0.2	3.8	4.0	0.1	3.8	3.9	[2]
SUBTOTAL URBAN	17.9	26.5	44.4	14.3	19.9	34.2	15.1
TOTAL	**35.1**	**32.2**	**67.3**	**27.1**	**24.5**	**51.6**	**32.1**
1992 Estimate (1)	35.1	25.0	60.0	27.1	19.1	46.2	
2011 Projected (1)	35.1	40.2	75.2	27.1	30.7	57.8	

[1] See Exhibit 13, page 22.

[2] Data is not available to disaggregate "local" capital outlay by urban and rural categories, therefore the total 1991 related capital outlay included spending while the rural and urban subtotals do not include this spending. Local spending in 1991 was $5.7 billion.

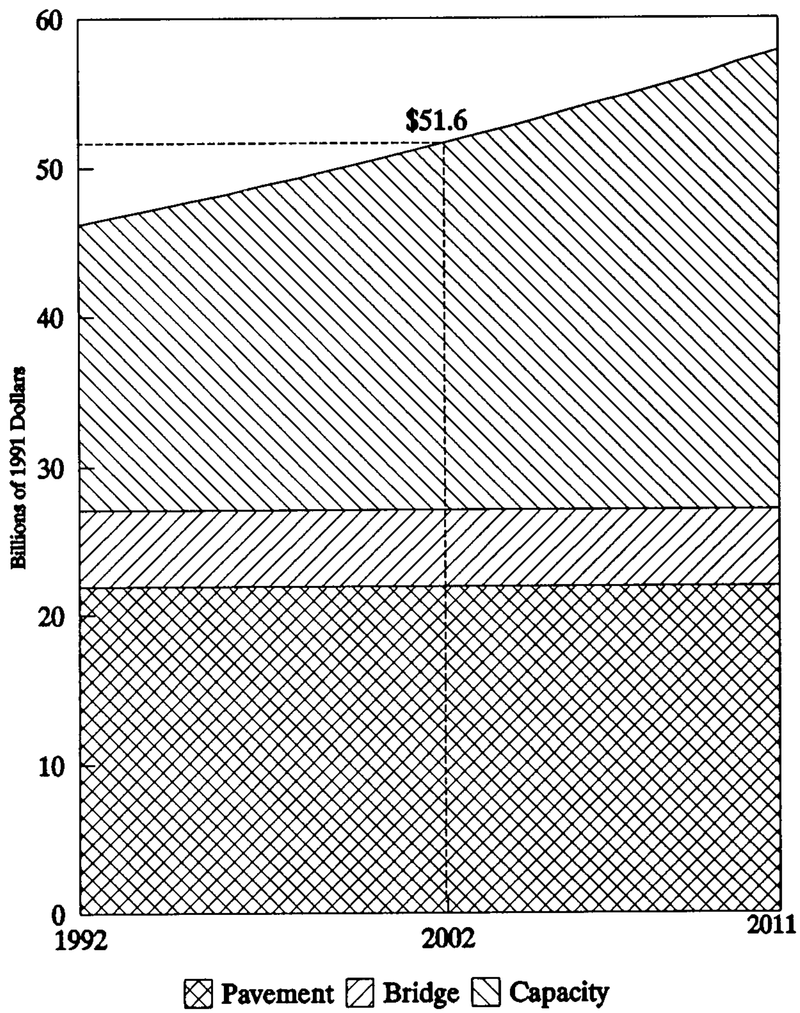
Current Spending Related to Highway and Bridge Investment Requirements

Exhibit 12 compares highway and bridge capital investment requirements for 1992-2011 with actual 1991 capital expenditure by State and local governments. The **Cost to Improve** scenario would require a total annual investment in highway infrastructure of $67.3 billion, more than twice what was spent in 1991 for corresponding capital improvements. Increasing investment in infrastructure from its 1991 level of $32.1 billion to $67.3 billion would require additional spending 1.6 cents per mile of travel. The **Cost to Maintain** scenario would require additional investment of .9 cents per mile of travel.

Total spending capital for highways and bridges would need to increase by $35.2 billion annually in 1991 dollars to improve 1991 overall conditions and performance. If funded by motor-fuel taxes, this increase in spending would require fuel-tax increases of approximately 27 cents per gallon, or the equivalent by other revenue instruments. The spending increase required to maintain 1991 conditions ($19.5 billion, annually) would require fuel-tax increases of 15 cents per gallon, or the equivalent by other instruments.

Exhibit 12 also shows estimated investment requirements for 1992 and 2011. The annual increase in investment requirements from 1991 to 2011 is attributable to the cost of providing increased capacity to meet growth in travel demand over the 20-year period. Investment requirements for system preservation and bridge rehabilitation (expressed in 1991 dollars) are assumed to remain constant over the 20-year period. None of the increase is due to inflation in highway construction costs over the period.

Exhibit 13
Annual Cost to Maintain Scenario
1991 Highway and Bridge
Condition and Performance



Capacity improvements include additional lanes on existing facilities plus additional infrastructure to support anticipated suburban growth

Exhibit 13 graphically illustrates the investment stream on a year-to-year basis for the **Cost to Maintain** scenario. The "ramping" of total investment requirements to meet existing and anticipated growth in travel is illustrated by the increasing investment required for capacity shown in the exhibit.

Transit Investment Requirements

Transit Backlog

The transit backlog includes the estimated costs of replacing all bus and rail transit equipment that has exceeded its usable design life. Eliminating the backlog would bring the average fleet age down to the minimum useful life standards and bring rail equipment and facilities to good condition. Estimates for eliminating the backlog over a 20-year period are included. The total transit backlog, including rail and bus facilities and equipment, is estimated at $17.6 billion, or $0.9 billion per year if eliminated over the same 20-year period assumed in the highway and bridge analysis.

The Cost to Improve Transit Conditions and Performance

The **Cost to Improve** is estimated at $131.8 billion for the period 1992-2011. This would require an annual investment of $6.6 billion, assuming that the backlog would be eliminated over the 20-year analysis period. Of these amounts, $18 billion is required to retire the backlog, $77.8 billion to maintain current growth trends, and $36 billion to accommodate the added ridership of the foregone 3,400 lane-miles of new highway construction.

At this investment level, transit services will increase over a 20-year period, to about 283 million revenue vehicle hours per year, thereby providing capacity to accommodate about 64 billion passenger miles per year, compared with 38 billion passenger miles today. In addition, the backlog of deferred rail and bus modernization and rehabilitation needs would be eliminated, restoring those systems to good condition and bringing them up to modern transit standards.

The Cost to Maintain Transit Conditions and Performance

The **Cost to Maintain** conditions is estimated at $77.8 billion through 2011, or $3.9 billion per year. This is the investment needed to maintain current levels of service. This scenario assumes: that facilities and equipment would be maintained in their current state of repair; coverage would be extended and service levels improved to maintain current growth trends in transit patronage; low capital demand management; and new starts at historic levels.
At this level of investment, the amount of transit service provided would increase at a rate of 0.8 percent per year, consistent with the total rate of increase in transit patronage of the last 10 years. In 20 years, this would result in an increase in capacity of 17 percent, raising the total amount of transit service from the present 169 million revenue vehicle hours to about 198 million revenue vehicle hours. This increase in capacity could accommodate an increase in passenger miles carried from the present 38 billion to about 44 billion.

Under this scenario, transit vehicles would be replaced at about the current rate, which is slightly slower than what is generally regarded as optimal. Existing rail systems would be maintained in about their current condition, with no major improvements. Investments on existing rail systems would occur at about the rate needed to ensure that equipment and facilities are replaced as they wear out. New rail systems would be constructed at a rate sufficient to accommodate the present rate of transit patronage growth. Exhibit 14 summarizes 1992-2011 transit investment requirements.

Exhibit 14
Summary of Annualized Transit Investment Requirements
1992-2011
(all estimates expressed in billions of 1991 dollars and do not reflect inflation)

Scenario	Explanation	Annual Cost
Improve Condition and Performance	• Eliminate backlog • Increase transit market share by 25% over 20 years • Service expansion to meet 10% of 34,000 lane-miles of highways not built • Improve stations to current standards • Include ADA* requirements	$6.6
Maintain Condition and Performance	• Include ADA* requirements • $3.1 billion/year to maintain transit conditions • $0.8 billion/year to maintain trends in patronage	$3.9
* Americans with Disabilities Act		

GLOSSARY

Accruing Deficiency - A highway or bridge condition that will exceed the minimum condition standards in a future year. Accruing deficiencies are a function of normal pavement and bridge deterioration, travel demand, age, capital investment, and the adequacy of maintenance.

Backlog Deficiency - A highway or bridge condition that violated one or more minimum condition standard at the beginning of the analysis period; in this report, 1991 for highways and 1992 for bridges.

Benefit Charges - Charges on activities, usually related to land use, that derive a benefit from highways. Examples are real property taxes imposed by Single Function Highway Districts, impact fees and assessments levied for construction and maintenance of roads and streets.

Bridge, Functionally Deficient - A bridge on which the deck width, vertical clearance, or waterway is not adequate to accommodate the traffic demand on the bridge or the volume of water under the bridge.

Bridge, Structurally Deficient - A bridge that is not able to carry the truck loads expected of the highway system of which the bridge is a part.

Capacity - The theoretical maximum number of vehicles that has a reasonable expectation of passing over a given section of lane or roadway in one direction (or in both directions for a two-lane or three-lane highway) during a given time period under prevailing roadway and traffic conditions.

Condition, Highway - Refers to the physical condition of the highway (e.g., pavement condition, roadway alignment, lane width and bridge deficiencies and condition).

Condition, Transit - Refers to the condition of capital assets including the condition of busses, paratransit vehicles, and rail cars, as well as the condition of rails, maintenance yards, and other facilities.

Constant Dollar - Revenues and expenditures expressed in "constant dollars" reflect relative purchasing power. Converting current dollars to constant dollars allows for comparisons among different years without the distortion caused by the changes in the value of money. [Note: Constant dollar values used in the Finance section are all in 1987 constant dollars, i.e., they are expressed in terms of the buying power of the dollar in 1987, which is the most recent year available.]

Cost to Improve Overall Conditions - The average annual total capital cost in this report, expressed in 1991 constant dollars, of eliminating the backlog of highway and bridge deficiencies over the analysis period, as well as meeting accruing requirements.

Cost to Maintain Overall Conditions - The average annual total capital cost in this report, expressed in 1991 constant dollars, of keeping the highway or bridge system as good or bad, overall, as it was in the base year, 1991 for highways, 1992 for bridges. Some facilities will be better and some worse than today but, overall, the condition and performance will remain approximately the same. Conditions in the largest urbanized areas cannot be maintained at the investment levels shown because there is insufficient right-of-way to build the capacity called for by existing and expected travel demand.

Deficiency - A highway condition or performance element that is below a specified acceptable level. These minimum levels represent a consensus of technical expertise within the highway engineering discipline.

(Expenditures, disbursements, costs) - Used interchangeably.

Highway Capital Outlay - Includes right-of-way and related costs, preliminary and construction engineering, and construction.

Highway Construction - Includes new roads/bridges, road and bridge relocation, highway rehabilitation, restoration, and resurfacing traffic service facilities, safety construction, and environment improvements.

Highway Maintenance and Operation - Costs to keep roads/bridges in serviceable condition, plus roadway lighting, traffic control systems, snow removal, toll collection, etc.

Lane-Mile - A measure of highway distance that takes into account the number of lanes. The amount of lane-miles for a given highway section is equal to the length of the section (in miles) multiplied by its number of lanes.

Minimum Condition Standards - A series of physical and operating system performance indicators used to determine acceptable and unacceptable highway conditions. These standards are determined consensually by Federal and State highway engineers, and represent cost-effective minimum standards.

Nominal or current dollars - Actual amounts without any adjustment for inflation.

Noncapital Expenditures, Highway - Outlays for maintenance and operations of highways, administration, highway law enforcement, safety, and interest on debt.

Performance, Highway - Refers to the degree of mobility (level of service) provided to the highway user.

Performance, Transit - Refers to the economic performance and appraisal of service to the public.

Present Serviceability Rating (PSR) - An index used to rate the quality of the pavement surface. The rating is based on a visual inspection of the surface and an assessment of ride quality compared to an established scale that ranges from 0 to 5, where 0 indicates the worst possible pavement condition and 5 represents pavement that is in perfect condition.

Public-Sector Financing - Includes all funding for highways that is managed by the public sector including projects built with revenue from exaction, development fees, and special district assessments.

RRR (Highways) - System preservation type improvements including reconstruction and restoration, rehabilitation and resurfacing.

VMT - Vehicle-miles of travel, i.e., one vehicle traveling one mile.

Vehicle-Miles-Traveled (VMT) - A measure of travel taking place on a specified highway system or systems. VMT is the sum of all miles traveled by all vehicles during a fixed period of time, usually for a year. DVMT is daily vehicle miles of travel.

Vehicle Miles Traveled (VMT) - An aggregate measure of travel taking place on all or part of highway system. It is the summation of all miles traveled by all vehicles during a fixed period of time on a fixed expanse of highway.

Volume - The number of vehicles that pass over a given point of lane or roadway during a specified time period.

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