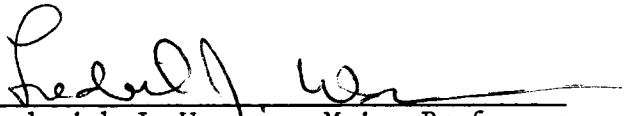
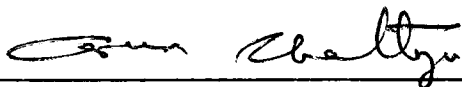


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STRATEGIC FUNDING  
OF  
TRANSPORTATION IMPROVEMENTS  
FOR  
LOCAL GOVERNMENTS

A Thesis  
Presented for the  
Master of Science  
Degree  
The University of Tennessee, Knoxville

R. Marshall Elizer, Jr.

May 1989

## DEDICATION

This thesis is dedicated to my parents Bob and Ailene Elizer, whose love, patience, and sacrifices have made this degree opportunity possible, and to my wife, Karen, whose neverending support provided the incentive to achieve this goal.

## ACKNOWLEDGEMENTS

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Special thanks are also due to Judy Buckler for her help in the preparation of this thesis. Her positive attitude and excellent typing skills are the primary reason that the author was able to submit this document in the proper format and within the required deadlines.

## ABSTRACT

This research investigated the problems, needs, and funding of street and highway infrastructure improvements at the local government level. To assist in this analysis a National survey was conducted to gain further insight into current local government practices on the following issues:

1. What are the typical elements of transportation infrastructure improvements provided by local government?
2. What level of private sector participation is normally required in the funding and construction of these improvements?
3. What role do traffic impact studies play in the identification of improvement needs and amount of private sector participation for individual developments?
4. What policies, regulations, and ordinances are used to guide private sector participation in transportation improvements and have they created any major legal or procedural problems?
5. Beyond private sector participation, what other new or innovative funding methods are utilized by local jurisdictions to fund transportation infrastructure improvements?

6. Do local jurisdictions deny or restrict new development based on the ability to provide adequate transportation system facilities?

In addition to the survey, an in-depth literature review was conducted to better understand how the National transportation system's problems and needs affect transportation services in local jurisdictions. A considerable amount of literature research on government financing options and issues was also performed and summarized in the report to identify a wide range of alternatives for meeting local government transportation funding needs. The major findings of this research were:

1. Traffic problems in many local jurisdictions, and especially those in the major urban areas, are becoming more widespread and growing in intensity.
2. Although several options exist to improve local jurisdiction traffic congestion, increased funding for transportation system improvements appears to be the most promising alternative.
3. Funding is inadequate to properly operate, maintain, and improve or expand the local, state, and Federal-Aid street and highway transportation systems, and will remain so into the foreseeable future.

4. Transportation funding needs are growing at the local government level while funding assistance from the Federal and state governments is generally declining.
5. Traditional public revenue sources for local jurisdiction transportation improvements are static or declining, and many jurisdictions are responding to this shortfall by increasing private sector participation.
6. Many local jurisdictions lack the incentive and data necessary to properly identify and plan for transportation system needs and funding to meet those needs.

A proposed procedure has been developed to assist local governments in identifying their long-range transportation system improvement needs and establishing a strategic financing plan to address those needs. The results of this procedural analysis can be used by local governments to justify the new and improved ordinances or regulations necessary to provide adequate transportation facilities for safe and efficient travel today and in the future.

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## CHAPTER I

### INTRODUCTION

In recent decades a declining portion of the Nation's governmental resources has been used to improve and maintain our transportation infrastructure. The resulting decay in the physical condition and capacity of our street system at all levels has been well documented in a number of reports published in recent years. Most of these, however, have only identified or quantified the basic problems and not recommended specific measures to address the problems, particularly at the local government level. This is obviously a critical need since more than 71% of the Nation's roads and street system, or 2,755,000 miles, is under the jurisdiction of local governments (1, 2).

In addition, communities across the country have been forced into experimenting with new ways of financing additions to, improvements in, and maintenance of their road and bridge systems. Forced by ever-increasing fiscal constraints to find new sources of funds, local governments, and especially those in rapidly growing areas of the country, are attempting to exercise new and innovative techniques that suit their particular economic and social circumstances. In most instances, however, adequate funds are still not being identified to address all needs.

Development of the plans to finance the capital intensive local transportation systems that are vital to our urban and suburban lifestyles is emerging as one of the primary goals of communities throughout the country. On the one hand, the continued suburban growth of population and employment (3) requires not only increased maintenance and replacement of existing local systems but also their expansion. These same needs also exist on those Federal and state highways supporting local travel, particularly the Interstate System in urbanized areas. On the other hand, investment in capital facilities by Federal, state, and local governments fell by 44% (in terms of constant dollars) between 1968 and 1982 (4). Government's enormous investment in infrastructure during the 1950's and 1960's is not being matched today (4); instead, it is increasingly evident that facilities built during that period are deteriorating because their maintenance is being deferred and because investment in new infrastructure to serve developing areas is not available to meet the demands. The resulting deficiencies in streets, bridges, drainage systems, sidewalks, traffic control systems and other transportation infrastructure limits the ability to adequately respond to new development and greatly impacts the motoring public's quality of life.

The shortage in funding for transportation needs is not a unique problem. Many communities are experiencing real financial problems in attempting to finance other capital needs such as water and sewer utilities, parks, police and fire stations, schools and other desired

public facilities. The National economic recession of the early 1980's severely strained public budgets, reducing expected revenues while expenses continued to rise. Adding to this problem has been the taxpayers' demand to reduce the expenditures that cause increased taxes. These pressures have often altered financial plans, discouraged new bond issues, and limited increases in general taxes and other revenue sources. With the phase-out of Federal revenue sharing and more stringent restraints on the tax exempt debt market through recent tax reform laws, the Federal government is greatly reducing financial assistance to local governments. The result is that local governments in particular have had to bear an increasing share of the costs of transportation and other public works facilities without any corresponding increase in financial assistance from traditional public revenue sources.

The prime target for overall reduction in local government spending has been capital expenditures, especially for the facilities needed to support future growth and development. In many communities the public has voted against budgeting funds or issuing bonds for widening major roads and extending utilities and other capital projects. Although this public reluctance to provide increased capital spending has been more dramatic in some areas than others--California's Proposition 13 for example--growth and new development is being affected in many parts of the Nation (4).

Communities have responded to their funding shortages in different ways. Some have continued to finance transportation improvements with general revenues and user's fees drawn from the entire community, an approach that has the least impact on new housing and development costs but which often results in the improvements lagging far behind the needs. At the other extreme, some have virtually abandoned general public responsibility for financing new or expanded transportation infrastructure by requiring new development to finance, or build, all necessary improvements as that need is created. In high-growth areas some jurisdictions are even using inadequate transportation infrastructure as a reason to slow or deny development. Other communities have taken an approach somewhere between these two and have attempted to fairly and equitably define the responsibilities of both the public and private sectors in financing transportation improvements and to find new ways to fund capital improvements necessary to support growth.

In order to understand the complete nature and full extent of this problem, it is important to first discuss the causes of decreasing urban mobility that have created these needs and stimulated a renewed public interest in addressing them. It is also important to understand that these transportation infrastructure problems and funding shortfalls exist not only at the local level, but also in most states and at the National level. This relationship is critical because most local government street systems depend on state and

Federal-Aid roadways to carry major percentages of their travel, particularly in the critical peak hours. The following sections discuss the causes of decreasing urban mobility, the magnitude of the problem, and potential strategies to correct, or at least improve, local transportation deficiencies.

#### TRENDS AFFECTING URBAN MOBILITY

Traffic congestion has become a critical concern in major urban areas across the United States. Many of these metropolitan areas are facing a significant transportation crisis: traffic congestion, particularly in the faster growing suburban areas, is both spreading and intensifying. The costs of this increased congestion include excessive vehicle operating cost, wasted personal time, higher accident rates, reduced industrial productivity, lost business efficiency, and stagnant or declining economic activity. While urban traffic congestion has increased over the years (5), the average citizen and many elected officials have just begun to understand the seriousness of the problem and the shortage of easily achievable solutions. In many communities traffic congestion has gone from being merely a nuisance to being a critical liability affecting both quality of life and economic development. A consensus in the highway profession is that with the continued downward trend in most transportation funding programs, the expected resurgence in the economy, stable fuel prices, and continued growth in most urban areas, traffic congestion will remain a serious problem and can be expected

to increase significantly in the future (3). Although congestion is a relative matter, and while the magnitude of congestion is generally less in smaller urban areas, the perception by its residents is often equal to or greater than those of communities in major urban areas. This relationship is especially critical in jurisdictions experiencing high growth rates where traffic congestion has appeared to evolve almost overnight.

Since World War II there have been a number of trends that have drastically altered the nature and magnitude of vehicular travel and greatly contributed to the decreasing urban mobility in local communities. Several of these are discussed below.

Decentralization of major cities (6). Between 1970 and 1980, the number of people living in suburban areas increased by 32%, while the country's inter-city population only increased by 5%. At the same time rural areas grew in population by 10% as urban and suburban residents searched for quieter lifestyles. Employment in suburban areas has tended to follow this shift in population. The recent development of suburban "megacenters," which include office towers, shops, hotels, and a variety of professional and service establishments, has also greatly contributed to this decentralization trend. Commercial and retail employment in the suburbs is also growing at a much faster rate than it is in the center city. The result has been significantly greater traffic growth in suburban areas where the road system is often inadequately planned and constructed.

This rapid suburban growth has left most local governments in a catch-up mode with many jurisdictions waiting for substantial increases in tax revenues before providing expanded transportation facilities.

Decreasing use of mass transit. Sprawling suburban development has contributed to mass transit carrying smaller and smaller percentages of overall urban travel. The U.S. Census Bureau reports that the average number of daily mass transit commuters dropped from 6.8 million in 1970 to 6.1 million in 1980, a 10.6% reduction (2). During the same time the number of persons commuting by motor vehicles rose from 59.7 million to 81.3 million, an increase of 36.2% (2). Traditional transit does not well serve the lower density disbursed patterns of origins and destinations found in the suburbs. As a result, almost all suburban travel is conducted by private automobile. Even now developments located along major transit corridors and at rail transit stations are overwhelmingly dependent on the automobile. Unless there is a significant shift in demographics or public sentiment towards transit there is little likelihood that mass transit will play a major role in providing suburban transportation in the foreseeable future.

Decreasing urban densities. The average population density of urbanized areas dropped from 3,442 persons per square mile in 1970 to 2,676 persons per square mile in 1980 (5). As residential and

business areas become more spread out, it becomes more difficult to maintain transit system efficiency and automobile travel increases. In addition, the quality of street travel becomes more essential in maintaining acceptable urban mobility, especially for home-to-work trips that often occur as suburb-to-suburb commuting.

National population shift (6). The demographic shift in population and employment from the industrial states of the northeast and midwest to the so-called sunbelt states of the south and southwest is expected to continue. The reasons for this shift are numerous and have been well documented. The majority of the population and employment shift is to urban areas where housing and jobs are located. The affect on the sunbelt states has been greatly expanding economies and vastly increased traffic loads. As a result, the lack of adequate transportation facilities has become the number one problem in several major sunbelt urban areas.

Smaller household size (2, 5, 6). The average family size has been decreasing for the last two decades and shows no signs of leveling off. Between 1970 and 1980 the average household size declined from 3.11 to 2.75 persons. During this same period the U.S. population grew by 12% while the number of households increased by 27%. According to recent reports by the U.S. Census Bureau, single female households are the major factor in household growth. These trends are contributing to the large increase in automobile ownership.

The automobile fleet is expected to increase from an estimated 100,000,000 vehicles in 1980 to 140,000,000 in the Year 2000. A majority of U.S. households now has two or more vehicles, and some western states contain more registered motor vehicles than people.

Aging shifts (6). The median age of an American citizen is now 30 (up from 28 in 1970), and the average American lives to be 74 years old. Coupled with a generally earlier retirement age, there are significantly more Americans today in the senior citizen category. These citizens are also generally better off financially than previous generations of senior citizens, mainly because of improved pension and social security benefits. They also tend to be healthier, and when combined with greater wealth they have more time for leisure activities. Much of this leisure activity involves travel, usually by automobile.

Increase in workforce (2, 6). The U.S. labor force grew from 58.9 million in 1950 to 110 million in 1980, a 65% increase, compared to a 50% increase in population. A major contributor to this growth has been a substantial increase in the number and percentage of working women. A recent study indicated that women and other minorities combined now outnumber white males in the workforce. Another factor is that women are no longer limited to the more traditional jobs such as nurses, teachers, and secretaries. There is

a growing percentage of women in professional and service industries which were traditionally male-oriented in the past.

Industry shift (2, 6). Since the early 1970's the Nation has been undergoing a basic transition in the nature of job markets. The number of blue-collar workers has decreased significantly while the service industries have expanded and "high-tech" industries have grown. The more traditional basic industries have been hurt by foreign competitors while impressive growth has occurred in the computer industry, telecommunications, and business service. This shift from blue-collar to white-collar jobs has effectively resulted in lower transit usage and increased commuting by a generally wealthier and more mobile suburban-oriented work force.

Stable fuel price and supply (6). The fuel situation in the United States has stabilized and price increases are expected to remain relatively modest in the years ahead. The public appears to have accepted the major increase in price that took place in the late 1970's and early 1980's and although there were some related changes in travel characteristics, the pre-existing travel patterns have generally returned. Since automobiles have become more efficient, fuel price and supply no longer seem to be a determinant in the amount of travel in today's economy.

Because of those factors outlined above and others, many local communities in urban and suburban areas are experiencing tremendous

growth in traffic volumes resulting in critical mobility problems. More and more trips begin and end in the suburbs and travel bound to downtown represents a decreasing proportion of overall urban travel movement (3). The trip from a suburban home to a suburban job and back was made by 24.5 million persons daily in 1980, up from 11.5 million in 1960 (2). In fact, the suburb-to-suburb commute is now the dominant type of work travel (2).

New and re-oriented traffic generated by suburban office, residential and commercial development is placing a tremendous strain on many existing local transportation systems, most of which have not been properly designed or planned for today's traffic volumes. The result is that traditional "downtown" traffic congestion has increasingly migrated to the suburban communities and is restricting the same mobility that has allowed the suburban economy and lifestyle to thrive. Severe traffic congestion is now a fact of life for the approximately 108 million people that live in the 35 fastest-growing metropolitan areas (2). The magnitude of this congestion problem and its impacts are addressed in the following section.

#### THE MAGNITUDE OF URBAN CONGESTION

Although a large number of documents have been published discussing the urban congestion problem and related transportation funding needs, little information has been found addressing the actual magnitude of the problem and its impacts on the motoring public. Of particular concern is the estimation of travel in urban areas

occurring under congested conditions and the resultant impacts such as vehicle delay, fuel consumption, and total user costs. There was, however, one useful research study conducted in 1986 by the Traffic Systems Division of the Federal Highway Administration's (FHWA) Office of Research, Development and Technology (7). This study dealt with the quantification of traffic congestion on urban freeways and its impact on transportation system users.

According to the study, urban freeways carry nearly 30% of all traffic in urban areas and are therefore likely to be a good indicator of the relative magnitude of urban congestion on all major street classifications in typical urban areas. In 1983, about 55% of urban freeway travel during the peak-hour occurred under congested conditions, according to a U.S. Department of Transportation Report (7). This figure is up from 41% in 1975 and is expected to increase even further as urban freeway volumes continue to increase. However, as mentioned above, one of the difficulties in determining the magnitude of urban traffic congestion and possible solutions is that the size of the problem and its projected growth has never been quantified.

The basic source of data for the FHWA study was the Highway Performance Monitoring System (HPMS). This database is maintained and updated annually by the Federal Highway Administration and consists of detailed geometric, traffic, and other data for representative roadway sections throughout the United States. The study used 1984 data for

freeways in urban areas with populations greater than 50,000. This resulted in data consisting of 8,036 sample sections totaling 15,335 miles of urban freeway.

As can be seen in Table I-1, urban freeway congestion is estimated to annually create over 1.2 billion vehicle-hours of delay, over 1.3 billion gallons of wasted fuel, and over \$9 billion in extra user costs per year (7). The study predicts that these figures will grow to nearly 6.9 billion vehicle-hours of delay, 7.3 billion gallons of wasted fuel, and \$50 billion in user costs (a more than 400% increase) by 2005. The study also expects that urban freeway travel will grow by nearly 49% (a conservative 1.9% per year) during this time period.

The FHWA study further estimates that almost 12% of all freeway travel in urban areas now occurs under recurring congested conditions and is predicted to rise to almost 24% by 2005. About 61% of all urban freeway delay is attributed to incidents such as accidents and breakdowns, a figure that the study expects may increase to approximately 70% by 2005 with increasing congestion and re-construction activities.

Results of the study analysis were broken out for the 37 urban areas within the United States with populations greater than one million persons (see Table I-2). The analysis indicated that approximately 91% of all urban freeway delay currently occurs in the 37 selected urban areas although this number is expected to drop to

TABLE I-1  
URBAN FREEWAY CONGESTION STATISTICS

|                                                           | 1984    | 2005    |
|-----------------------------------------------------------|---------|---------|
| Freeway Miles                                             | 15,335  | 15,335  |
| Vehicle-Miles of Travel (Millions)                        | 276,645 | 410,987 |
| Recurring Congested Vehicle-Miles<br>of Travel (Millions) | 31,486  | 98,280  |
| Recurring Delay<br>(Million Vehicle-Hours)                | 485.0   | 2,048.6 |
| Delay Due to Incidents<br>(Million Vehicle-Hours)         | 766.8   | 4,857.5 |
| Total Delay (Million Vehicle-Hours)                       | 1,251.8 | 6,906.1 |
| Total Excess Fuel Consumption<br>(Million Gallons)        | 1,377.5 | 7,317.1 |
| Total User Cost (Billion Dollars)                         | 9.2     | 50.5    |

Source: Lindley, Jeffrey A., "Urban Freeway Congestion: Quantification of the Problem and Effectiveness of Potential Solutions," ITE Journal, January 1987, pp. 27-32.

TABLE I-2  
CONGESTION SEVERITY INDEX\*, 1984 TO 2005

| URBAN AREA     | INDEX  |        | RANKING |      |
|----------------|--------|--------|---------|------|
|                | 1984   | 2005   | 1984    | 2005 |
| Houston        | 11,112 | 54,810 | 1       | 2    |
| New Orleans    | 10,576 | 27,641 | 2       | 7    |
| New York       | 8,168  | 12,282 | 3       | 14   |
| Detroit        | 7,757  | 42,394 | 4       | 3    |
| San Francisco  | 7,634  | 18,734 | 5       | 10   |
| Seattle        | 7,406  | 27,523 | 6       | 8    |
| Los Angeles    | 6,376  | 12,139 | 7       | 15   |
| Boston         | 5,538  | 21,237 | 8       | 9    |
| Charlotte      | 5,263  | 76,393 | 9       | 1    |
| Atlanta        | 5,034  | 11,205 | 10      | 18   |
| Minneapolis    | 4,704  | 9,529  | 11      | 21   |
| Dallas         | 4,630  | 36,938 | 12      | 5    |
| Norfolk        | 4,505  | 9,258  | 13      | 23   |
| Chicago        | 4,501  | 10,700 | 14      | 19   |
| Denver         | 4,454  | 9,828  | 15      | 20   |
| Washington     | 4,188  | 15,160 | 16      | 11   |
| Hartford       | 4,111  | 7,043  | 17      | 26   |
| San Antonio    | 3,938  | 37,831 | 18      | 4    |
| Pittsburgh     | 3,216  | 7,243  | 19      | 25   |
| San Diego      | 2,823  | 5,958  | 20      | 28   |
| Cincinnati     | 2,590  | 6,223  | 21      | 27   |
| Baltimore      | 2,441  | 15,037 | 22      | 12   |
| Philadelphia   | 2,421  | 11,376 | 23      | 17   |
| Kansas City    | 2,347  | 4,302  | 24      | 34   |
| Salt Lake City | 2,132  | 5,811  | 25      | 29   |
| Columbus       | 2,099  | 4,652  | 26      | 33   |
| Cleveland      | 2,061  | 4,099  | 27      | 35   |
| Sacramento     | 1,803  | 8,037  | 28      | 24   |
| Milwaukee      | 1,724  | 5,653  | 29      | 30   |
| Portland       | 1,696  | 9,372  | 30      | 22   |
| St. Louis      | 1,612  | 4,938  | 31      | 32   |
| Phoenix        | 987    | 12,717 | 32      | 13   |
| Providence     | 660    | 2,617  | 33      | 37   |
| Miami          | 609    | 28,549 | 34      | 6    |
| Buffalo        | 577    | 3,983  | 35      | 36   |
| Tampa          | 575    | 11,870 | 36      | 16   |
| Indianapolis   | 89     | 5,148  | 37      | 31   |

\*Congestion Severity Index = Total Delay in Hours/Million Vehicle-Miles of Travel.

Source: Lindley, Jeffrey A., "Urban Freeway Congestion: Quantification of the Problem and Effectiveness of Potential Solutions," ITE Journal, January 1987, pp. 27-32.

approximately 84% as the magnitude of congestion in smaller urban areas increases. The study predicts that by 2005 all of these major urban areas will experience significant increases in freeway congestion. Table I-2 ranks each urban area in terms of a congestion severity index defined as total delay per million vehicle-miles of travel. This was done to eliminate the effects of varying urban area populations, freeway system sizes, and travel amounts in determining the urban areas where freeway congestion is currently at its worst. Finally, the study found that if no improvements are made in the system by the year 2005, freeway congestion in rapidly growing sunbelt cities, such as Charlotte, San Antonio, and Miami will become more severe than in the larger cities such as New York, Los Angeles, and Chicago.

This research effort clearly indicates the scope and magnitude of existing and predicted congestion on major urban freeways in the United States. While certainly not a direct correlation, it is assumed to be indicative of a similar problem on the remaining Federal-Aid, state and major local streets in urban areas. In fact, studies and reports addressing congestion and funding problems in the major metropolitan areas of Dallas/Fort Worth, Denver, and Houston indicate equal or greater increases in travel on urban thoroughfares than in the FHWA study (8, 9, 10, 11). Understandably, the prediction for congestion and user impacts on non-freeway facilities in these

urban areas is therefore similar to the conditions estimated for the urban freeway facilities.

New and innovative methods of improving urban transportation facilities must be identified to address the future system "supply" problems anticipated by the study. However, it is also possible to address this problem by altering the magnitude or schedule of "demand" requirements on the system. In all likelihood, a number of supply and demand strategies will be necessary to solve the urban congestion problems. The following section identifies and discusses several of these techniques.

#### OPTIONS TO IMPROVE URBAN MOBILITY

Local governments are not necessarily suffering from urban congestion problems because of a lack of identifiable and reasonable solutions to the problem. To the contrary, solutions do exist even though they may be difficult to implement for a number of reasons. Money, public and political support, regulatory limitations, institutional coordination, and professional staff limitations are all obstacles to solving the congestion problem. However, local governments can improve their transportation fortunes if they develop a comprehensive transportation improvement program encompassing both system demand and supply strategies. To attain maximum effectiveness such a program should attempt to include all of the following elements:

Provide Funding for new and improved transportation facilities.

Local governments are responsible for a number of routine transportation infrastructure expenditures. The major categories include on-going operating costs, routine and preventive maintenance costs, costs of constructing improvements to remedy existing deficiencies, and cost to construct new or expanded facilities to serve new traffic growth. Ideally, local governments should develop the proper inventories and growth forecasts to identify existing and future transportation expenditure needs, then establish a revenue generation and financing plan necessary to address those needs. This plan should be developed to maximize private sector participation based on the needs directly created by new development. All remaining costs should be funded through public revenue sources and user charges, where appropriate.

Transportation planning/land use regulation. In order to plan for adequate transportation facilities a jurisdiction must have long-range employment and population forecasts supported by existing and projected land use plans. This allows future traffic generation to be estimated with which a transportation needs plan can be developed. Effective transportation planning also requires that the necessary ordinances and regulations are in place to address items such as private access management and minimum thoroughfare design standards. These programs are mandatory to ensure the functional integrity of

each street classification which optimizes the safe and efficient movement of vehicles and pedestrians.

Transportation system management. Maximum efficiency of a particular street or street system is best obtained through implementation of a transportation system management (TSM) program. The TSM goal is to use existing transportation facilities efficiently through low cost improvements in traffic engineering, public transportation, regulatory actions, operational revisions, and other management enhancements. TSM projects are not intended to be capital intensive. Some specific examples of TSM projects are signal timing optimization, freeway surveillance and control, truck restrictions, high-occupancy vehicle (HOV) lanes, and parking removal.

Transportation demand management. More recently, a strategy identified as transportation demand management (TDM) has been created. As the name implies, this type of program primarily encourages changes in travel habits, resulting in overall travel reductions or reduced peak-hour demands on street facilities. Examples of TDM programs are ridesharing and vanpools, transit route and schedule improvements, providing enhanced bicycle and pedestrian facilities, variable work scheduling, local circulation systems, automobile use disincentives, and development phasing tied to available transportation system capacity. A new type of organization known as transportation

management associations (TMA's) is also being formed by the private sector to organize and monitor TDM programs.

Transit. Transit can play a significant role in improving urban mobility, especially in major travel corridors during peak travel periods. While traditional fixed-route transit has not fared well in the more suburban areas, para-transit such as vanpools, ridesharing, and park-and-ride lots are gaining in popularity and importance. Also, in larger metropolitan areas the "express" transit service is increasing in importance as these routes traverse relatively long suburban commuting distances in short time periods, thereby effectively competing with the use of personal vehicles for similar trips.

Of all the mobility improvement options discussed above, establishing adequate funding for new and improved transportation facilities is felt to be the most promising but elusive alternative for most local jurisdictions. With generally declining Federal and State revenues, local governments must increase revenue generation from both the public and private sectors to meet these needs. At the same time, aggressive transportation system and demand management strategies, effective transit programs, reasonable zoning regulations and long-range transportation planning should all be utilized to minimize the need for increased revenues. Local political, social, and economic concerns will certainly govern the extent to which these programs are achievable. However, it is the local transportation

professional's responsibility to pursue whatever programs are necessary to achieve professional engineering standards and the transportation goals and objectives established for the community.

#### STUDY OBJECTIVES

Transportation facilities in urban areas have traditionally been provided by local governments, most obviously the Nation's cities, towns and counties. In recent years, financial responsibility for transportation infrastructure has increasingly become their burden as well. Local governments now provide approximately 50% of the more than \$100 billion spent each year to build, maintain, and operate their public works infrastructure system--up from 38% twenty years ago (12). The budgetary pressures faced by Federal and state governments mean this financial burden will continue for the foreseeable future. This burden has encouraged jurisdictions to find new ways to finance transportation services demanded by their residential and business constituents.

The purpose of this study is to identify how local governments should identify and financially plan for needed transportation infrastructure costs to support their future growth while maintaining the desired service levels. Most governments can easily identify a major gap between projected transportation needs and available revenues. Obviously, this gap can be closed either by (a) identifying new transportation revenues, (b) decreasing future needs to match available revenues, or (c) accepting lower levels of

transportation service. This study anticipates that the elected officials and their constituents in most local jurisdictions will not knowingly accept significantly lower levels of transportation service and, as traffic congestion and system deterioration increases, will attempt to identify and implement the funding mechanisms necessary to obtain needed revenues. Specifically, the study objectives are:

1. To define the scope and magnitude of transportation problems affecting travel within local jurisdictions, primarily those jurisdictions in urban areas;
2. To identify the more common and traditional methods of revenue generation used to fund transportation improvements at the local level;
3. To identify and define new and innovative revenue generation methods for funding these transportation improvements; and
4. To recommend a procedure for local governments to identify future transportation infrastructure needs and establish a financing plan to meet those needs.

#### ORGANIZATION OF REPORT

This research has been developed in six chapters. Chapter I presents an introduction to the transportation mobility problems faced by urban jurisdictions today, and options to address those problems. Chapter II discusses the transportation revenue shortfall being encountered by Federal, state, and local governments attempting to fund their transportation infrastructure needs. Chapter III is a

review of pertinent research and publications on transportation financing alternatives available to local governments. The findings of a national survey on identifying and funding local transportation system improvements are discussed in Chapter IV. Chapter V contains a recommended procedure for local governments to use in planning and developing financial plans for their transportation infrastructure needs into the future. Finally, the major conclusions and recommendations of this study are outlined in Chapter VI.

## CHAPTER II

### THE TRANSPORTATION INFRASTRUCTURE

#### FUNDING CRISIS

This chapter identifies and discusses the scope and magnitude of the transportation infrastructure funding crisis at the Federal, state, and local government levels. It must be recognized that funding limitations at the Federal and state government levels are critically important to providing adequate transportation facilities in many local jurisdictions since the state and Federal-Aid systems comprise a heavy percentage of their major street mileage. This relationship is obviously more important in the Nation's urbanized areas (over 5000 population) where the Federal-Aid Urban System comprises less than 4% of the total street mileage but carries 22% of the travel (13).

The initial section of the chapter briefly identifies the state of the Nation's transportation infrastructure system and the obstacles to funding its needs. The following sections discuss the various infrastructure roadway categories and their use, the typical cost elements involved in maintaining and constructing the facilities, and the estimated system needs for the future. The final sections discuss recent trends in infrastructure spending and the outlook for future transportation revenues.

PROVIDING TRANSPORTATION INFRASTRUCTURE--A NATIONAL, STATE AND LOCAL  
PROBLEM

Closing the gap between transportation infrastructure needs and available funds is a National priority. Because it requires considerable spending, it opposes another National priority--a balanced Federal budget. The Rebuild American Coalition, an alliance of prominent professional associations and public interest groups, has as its goal in the 1988 election year to keep infrastructure repair and expansion near the top of the list of National priorities (14). In Congress, the coalition will be lobbying to at least maintain existing infrastructure spending levels and to free the \$15 billion surplus held in the highway, mass transit, and airport trust fund accounts (14). It will also be battling proposals to put user revenues traditionally reserved for infrastructure needs (such as an increase in the gasoline tax) in the general budget. The National Economic Commission, a ten-member panel appointed by Congress in December 1987 to make specific recommendations to reduce the Federal deficit, is expected to suggest a substantial rise in the Federal gasoline excise tax for general budget purposes (15).

A series of reports issued over the past two years by the National Council on Public Works Improvements (NCPWI), a body created by Congress, provides an up-to-date assessment of the state of the Nation's transportation system and other infrastructure elements (14). To address deficiencies, the NCPWI reports do not call for major new

Federal programs but rather for technological solutions, improvements in management, and more decisions based on hard facts and defined needs as opposed to decisions driven by political motives.

A survey of local officials sponsored by Touche Ross, the International City Management Association, and the Privatization Council, indicates that only 60% of U.S. cities and counties have a complete and current infrastructure inventory (16). Without such basic information, governments are hard-pressed to plan effectively for their capital improvement needs. Responding to recent local governmental abuses, the Federal Securities and Exchange Commission is considering requiring municipalities to disclose data on infrastructure conditions before issuing bonds (14). Such a requirement would be a powerful incentive for local governments to improve their infrastructure inventories and thus better identify their needs.

The physical condition of the Nation's current highway system started to improve significantly in 1983 (14). The Federal Highway Administration's recent biennial report to Congress, "The Status of the Nation's Highways: Conditions of Performance, 1987," notes that states have made pavement reconstruction and resurfacing a priority, reversing the deterioration that began in the early 1980's. Much of the credit for the improved conditions on many highways can be attributed to the nickel increase in the Federal gasoline tax legislated in the Surface Transportation Act of 1982. However, the

stimulus provided by the Federal tax increase appears to have run its course. Estimated highway spending in 1986 shows that Federal and local funds were virtually unchanged from 1985, while state highway revenues jumped 8% (14).

Since 1982 the percentage growth in highway revenues has generally outpaced inflation in construction costs, and the resulting increases in highway funds have typically been dedicated to building or expanding roads. The share of total highway spending dedicated to capital projects was 47% in 1986, up from 44% in 1983 (14). Also, the spending emphasis is shifting away from rural areas. In 1982 spending for new projects in rural areas outpaced that of urban areas by a ratio of 60-40 but by 1985 spending in urban areas equaled that in rural areas (14). Nevertheless, because travel growth has generally exceeded the growth in roadway capacity, congestion has increased significantly, especially on interstate highways and major thoroughfares in urban areas (3). The share of total travel occurring on congested interstate highways (defined as volume to capacity ratio at 0.77 or greater) in urban areas shot up dramatically from 55% in 1983 to 61% in 1985 (14). A parallel trend in congestion is occurring on the remaining urban street system, most of which is under the jurisdiction of local governments (2).

#### DEFINING THE NATIONAL TRANSPORTATION SYSTEM

The Nation's street and highway transportation network consists of several functional roadway classifications including freeways,

expressways, rural highways, principal and minor arterial streets, major and minor collector streets, local streets and roads, alleys, private streets, and other miscellaneous facilities such as park and forest access roads. Responsibility for constructing, maintaining and operating these facilities rests with a variety of agencies including the Federal government, state governments, city, county, and town governments, special transportation agencies (such as toll authorities and municipal road districts), and the private sector. For the purposes of this report, only the publicly owned and operated systems are being considered.

What is commonly referred to as the "National street and highway system" is broadly categorized as two basic systems: that part qualifying for Federal aid, and that part not qualifying for Federal aid. The Federal-Aid system is further divided into four sub-systems identified as interstate, primary, secondary, and urban facilities. The Non-Federal-Aid facilities are referred to as "off system" roadways. Table II-1 lists the 1987 rural and urban mileage and estimated annual travel for each category of Federal-Aid and Non-Federal-Aid system (2). As can be seen in the Table, the Federal-Aid roadway system comprises only about 22% of the total National mileage but carries an over 80% of all National travel.

A brief discussion of each system category and its needs is provided below. This information has been documented in a recent report by the Highway Users Federation (2).

TABLE II-1  
NATIONAL STREET AND HIGHWAY SYSTEM--  
1987 MILEAGE AND TRAVEL

| FEDERAL-AID SYSTEMS          | MILEAGE        |                |                | PERCENT<br>OF<br>MILEAGE | VEHICLE<br>MILES<br>(BILLIONS) | PERCENT<br>OF<br>TRAVEL |
|------------------------------|----------------|----------------|----------------|--------------------------|--------------------------------|-------------------------|
|                              | RURAL<br>MILES | URBAN<br>MILES | TOTAL<br>MILES |                          |                                |                         |
| Interstate                   | 32,761         | 10,832         | 43,593         | 1.1                      | 371                            | 20.8                    |
| Primary                      | 224,674        | 32,739         | 257,413        | 6.7                      | 518                            | 29.1                    |
| Secondary                    | 398,248        | -              | 398,248        | 10.3                     | 156                            | 8.7                     |
| Urban                        | -              | 144,055        | 144,055        | 3.7                      | 393                            | 22.0                    |
| Total Federal-Aid<br>Systems | 655,683        | 187,626        | 843,309        | 21.8                     | 1,438                          | 80.6                    |
| Non-Federal-Aid<br>Systems   | 2,515,304      | 503,321        | 3,018,625      | 78.1                     | 347                            | 19.4                    |
| TOTAL                        | 3,170,987      | 690,947        | 3,861,934      | 100                      | 1,785                          | 100                     |

Source: Highway Users Federation, Transportation Issues 1987. Washington, D.C., 1987.

NOTE: Federal-Aid Systems are 94% paved. Non-Federal-Aid Systems are 44% paved.

The Federal-Aid Interstate system (2). The National system of interstate and defense highways--the Interstate Highway System--is a 43,593 mile network of the Nation's most important highways. Although comprising only 1.1% of all public roads, it carries 20.8% of all passenger vehicle travel, and about 50% of heavy truck travel. The system has been under construction for more than 30 years and is approximately 97% complete.

Older sections of the Interstate System are wearing out, requiring a transition in program emphasis from the construction of new mileage to the resurfacing, restoration, rehabilitation, and reconstruction of old mileage. This maintenance effort is commonly referred to as the "4R" program. Much work needs to be done on sections of the Interstate that are open to traffic since many miles are at or near the end of their 20-year design life. Pavement condition reports show that 5,500 miles of Interstate pavement can be rated as poor or in need of resurfacing and may even need complete reconstruction. Another 6,600 miles are rated fair but are rapidly approaching the poor condition. It is estimated that 28,929 of the system's 51,823 bridges are deficient.

It is estimated that about \$52 billion, or \$3.2 billion annually, will be required through the Year 2000 for Interstate repairs. The Surface Transportation Assistance Act of 1987 authorized about \$2.8 billion per year through FY-1991 for Interstate "4R" program.

The Federal-Aid Primary system (2). The Federal-Aid primary system is a 257,413 mile network of connected main roads selected because of their importance to interstate, state-wide and regional travel. The system carries 29.1% of all travel on 6.7% of the Nation's road and street mileage. Approximately 138,000 miles of the system have been identified as a portion of the National network for longer and wider trucks.

At current funding levels, the Federal-Aid primary system will continue to deteriorate. More than 10%, or 26,500 miles, of the primary system is in poor condition and in need of immediate repair, and more than 31%, or 79,800 miles, will require reconstruction in the near future. As of December 31, 1986, 44,461 bridges on the primary system, or 48%, were deficient and eligible for replacement or rehabilitation with Federal funds.

To offset further deterioration, improve safety, and to keep overall improvements at the 1983 level of service will require an estimated capital investment of about \$88 billion to the Year 2000. This represents an annual investment need of \$4.9 billion in Federal and state funds compared to planned expenditures of about \$2.3 billion per year. The cost to replace or rehabilitate bridges during this same period is an additional \$13.3 billion.

The Federal-Aid Secondary system (2).The Federal-Aid Secondary System was officially established in 1944 as a farm-to-market system. The system was initially begun in the depression-era to put people to

work paving rural roads, but was realigned by Congress in 1976. Today it includes 389,248 miles of rural major collectors. These roads serve county seats not on an arterial route, other traffic generators of intracounty importance, link major county traffic generators with nearby larger towns, and serve more important intracounty travel corridors. Roads in the Secondary System comprise 10.3% of all system mileage and carry 8.7% of the travel.

Eighty-seven percent of the Secondary System mileage is paved. More than 16% of paved mileage is in poor condition, needing resurfacing or pavement replacement. Of the 91,016 bridges on the system, 29,449, or 32.4%, have deficiencies.

More than 80% of the Federal-Aid Secondary System has at least one condition or design problem and 40% has two or more. Most problems relate to either poor pavement, inadequate roadway cross-section features, or inadequate passing sight distances. Fatality rates have consistently been higher on the secondary system than on any other Federal-Aid system. The cost to maintain present conditions on the Secondary System will require about \$2.5 billion annually through the Year 2000. Bridge needs are an additional \$3.5 billion. The Surface Transportation Act of 1987 authorized an annual expenditure of \$600 million through FY-1991.

The Federal-Aid Urban system (2). The Federal-Aid Urban System was established in 1970 to meet unique transportation needs of the urban areas. The Urban System consists of arterial and collector

routes. They serve the heaviest urban population corridors in areas of population of 5,000 or more, and major activity centers. The system carries 22% of all travel on 3.7% of all system mileage.

In 1983, 12% of the system pavement was in poor condition. Of 35,227 bridges on the system, 16,967 bridges, or 48%, were rated in 1986 as deficient and eligible for replacement or rehabilitation.

Investment needs on the Urban System to maintain 1983 conditions will require about \$4 billion annually through the Year 2000. Congestion is expected to increase on substantial portions of this system because of right-of-way constraints. Bridge needs are an additional \$6.2 billion. The 1987 Surface Transportation Act authorized an annual expenditure of \$750 million for this program through FY-1991.

The Non-Federal-Aid system. Local roads and streets amount to over 78% of the total transportation system mileage in the United States although they account for only 19.4% of the travel. The 3,018,625 mile system is comprised of state highways, county roads, and local government streets. These facilities carry an estimated 347 billion vehicle-miles of travel per year. A report by the American Association of State and Highway Transportation Officials (AASHTO) (17) estimates that about 2.5 million miles of this system are used primarily for property access, circulation, and access to major streets. Approximately 44% of this Non-Federal Aid System is paved.

Off-system roadways are primarily owned and serviced by city and county agencies, but states also own roads of these types. As seen in Table II-2 (17), in 1985 state and local governments made capital investments on their road and bridge systems of about \$7.5 billion. This figure does not include facilities totally provided by the private developers, such as public residential streets in new subdivisions, and private roads within developments, forest and park areas, and agricultural areas.

Because of a lack of comprehensive inventories and projections in travel growth on most off-system roadways, it is not possible to accurately predict future capital investment needs on this system. Estimates have been developed, however, for the future costs necessary to maintain off-system roadways at their current levels. Table II-3 (17) indicates that state and local governments should spend a minimum of \$2.76 billion per year (in 1987 dollars) to achieve this goal. When considering inflation and the fact that current levels of maintenance spending are not adequate in many jurisdictions, AASHTO estimates that this figure could potentially rise to \$3.6 billion (17).

The Federal-Aid and Non-Federal-Aid systems discussed above include mileage for both toll roads and bridges. However, because of the increasing attention being given to toll roads, and the critical bridge needs on the entire system, both are discussed separately

TABLE II-2

1985 HIGHWAY AND ROAD RELATED SPENDING  
(Billions of Dollars)

| PURPOSE                             | STATE | COUNTY/<br>TOWN | MUNICIPAL | TOTAL |
|-------------------------------------|-------|-----------------|-----------|-------|
| CAPITAL OUTLAY                      |       |                 |           |       |
| Interstate                          | 6.15  |                 |           | 6.15  |
| Urban Arterials                     | 3.96  |                 | .33       | 4.29  |
| Rural Arterials                     | 3.94  |                 |           | 3.94  |
| Urban Collectors                    | .33   |                 | .41       | .74   |
| Rural Collectors                    | 1.43  | .36             |           | 1.79  |
| Local Roads/Bridges                 | 1.78  | 1.94            | 3.78      | 7.50  |
| Total Highways                      | 17.59 | 2.31            | 4.52      | 24.41 |
| Bridges                             | 2.70  | .06             | .07       | 2.83  |
| TOTAL CAPITAL OUTLAY                | 20.29 | 2.37            | 4.59      | 27.24 |
| OTHER EXPENDITURES                  |       |                 |           |       |
| Maintenance/Traffic Administration/ | 6.44  | 4.94            | 4.93      | 16.31 |
| Research                            | 2.41  | .68             | .75       | 3.84  |
| Law Enforcement/Safety              | 2.85  | .50             | 1.85      | 5.20  |
| Bond Interest/Repayment             | 2.87  | 1.02            | 1.79      | 5.68  |
| TOTAL OTHER EXPENDITURES            | 14.57 | 7.14            | 9.32      | 31.03 |
| TOTAL EXPENDITURES                  | 34.86 | 9.51            | 13.91     | 58.28 |

Source: American Association of State Highway and Transportation Officials, The Bottom Line - A Summary of Surface Transportation Investment Requirements 1988-2020. Washington, D.C., September 1988.

TABLE II-3  
ESTIMATED LOCAL ROAD ANNUAL OPERATIONS  
AND MAINTENANCE NEEDS  
(BASE YEAR 1987)

| ROAD OWNERSHIP | MILES OF ROAD (MILLIONS) | PERCENT OF MILES | COST TO MAINTAIN EXISTING CONDITIONS (BILLIONS) |
|----------------|--------------------------|------------------|-------------------------------------------------|
| Counties       | 1.7                      | 68.0             | 2.04                                            |
| Cities         | 0.42                     | 17.0             | 0.51                                            |
| States         | .18                      | 7.0              | 0.21                                            |
| Federal        | 0.2                      | 8.0              | 0.24                                            |
| TOTAL          | 2.5                      | 100.0            | 3.00                                            |

Source: American Association of State Highway and Transportation Officials, The Bottom Line - A Summary of Surface Transportation Investment Requirements 1988-2020. Washington, D.C., September 1988.

below. As in the preceding sections, this information has been developed by the Highway Users Federation (2).

Toll roads (2). There are approximately 4,800 miles of toll roads open to traffic in the United States, with another 500 miles of toll roads in the early planning and construction stages. This renewed emphasis in toll roads is occurring as the demand for new highways--particularly in urban areas--exceeds the ability of the federal, state, and local governments' ability to pay for them with traditional revenues.

Toll financing of highway construction gained favor after World War II as traffic demand grew rapidly. By 1950, 30 states had built or were planning to build toll roads. However, toll road construction slowed when construction of the interstate started in 1956. Many toll road segments were, in fact, incorporated into the interstate system. Approximately 2,400 miles of toll roads are now on the interstate system.

Toll financing expedites new highways and improvements, thereby stimulating projects that otherwise would be delayed or abandoned for lack of funds. However, toll road financing is expensive due to the cost of revenue bond financing, toll collection, and administrative overhead. The cost of toll collection is about twice as much as the cost of collecting the state taxes that are routinely paid by highway users. Few corridors contain enough traffic to make feasible a road financed totally by tolls. Assuming a typical toll of \$.08 per mile

and a 10% interest rate, a medium-cost urban freeway would need to average 116,000 daily trips to be self-financing. Only 7.5% of urban interstate mileage carries that level of traffic. However, the Congressional Budget Office estimates that a 25% Federal share for toll roads would double the number of feasible toll projects.

In general, Federal funds may not be used on toll projects. The Federal-Aid Highway Act of 1987 establishes the conditions of a pilot program of seven non-interstate toll projects on which up to 35% of costs may be supplied by Federal aid. Federal funds can be used, along with funds from bonds and other sources, for construction of toll bridges and tunnels, and approaches. Toll roads built without Federal funds and then incorporated into the interstate system are eligible for upgrading under the Federal "4-R" program. The Act also provides that bridge tolls be "just and reasonable" and removes Federal review and regulation requirements.

Bridges (2, 13, 17). The United States surface transportation system includes the world's largest stock of bridges (13). The National Bridge Inventory (NBI) conducts a comprehensive bridge inspection program that provides information on the status on all 571,308 bridges in the United States. As of December 31, 1986, the NBI identified 131,248 bridges as "structurally deficient" and 141,857 bridges as "functionally obsolete" (17). A "structurally deficient" bridge is defined as one that has been restricted to light vehicles only, is closed, or requires immediate rehabilitation to remain open.

A "functionally obsolete" bridge is one that no longer meets the usual design criteria of the roadway classification it serves. Table II-4 lists current bridge inventories and their sufficiency rating by Federal-Aid and Non-Federal-Aid classifications.

Approximately 40% of the bridge inventory was constructed prior to 1940, and many have not been maintained adequately since construction (2). For that reason, almost 42% of all bridges are in need of rehabilitation or replacement. Bridges on the Non-Federal-Aid system are generally in worse condition, and approximately 51% of those structures are considered deficient.

Of the 301,125 bridges not on the Federal-Aid system, some 40,173 are on the state system with the remaining 260,952 on the local street systems. A total of 21,295 of the off-system bridges are in urban areas where generally greater traffic volumes are served.

Table II-5 lists annual bridge investment requirements for the period 1986-2005 (17). These requirements are listed by Federal-Aid and Non-Federal-Aid systems by type of deficiency, either structurally deficient or functionally obsolete. As indicated in the Table, nearly \$4 billion dollars per year is needed over the next 18 years to address bridge system needs.

The Federal-Aid Highway Act of 1987 decreases the bridge replacement rehabilitation program about 20% from the FY-1986 level to an annual \$1.63 billion for five years, at the current 80/20 matching ratio. It also provides that between 15% and 35% of funds be spent on

TABLE II-4  
HIGHWAY BRIDGE DEFICIENCIES--  
1986 TO 2005

As of December 31, 1986

|                                              | ALL<br>BRIDGES | (DEFICIENT BRIDGES, 1986-2005) |          |         |
|----------------------------------------------|----------------|--------------------------------|----------|---------|
|                                              |                | CURRENT                        | ACCRUING | TOTAL   |
| Interstate                                   | 51,823         | 3,571                          | 25,358   | 28,929  |
| Primary                                      | 92,117         | 9,931                          | 34,530   | 44,461  |
| Secondary                                    | 91,016         | 13,013                         | 16,436   | 29,449  |
| Federal-Aid Urban                            | 35,227         | 4,735                          | 12,232   | 16,967  |
| All Bridges on the<br>Federal-Aid System     | 270,183        | 31,250                         | 88,556   | 119,806 |
| All Bridges not on<br>the Federal-Aid System | 301,125        | 99,998                         | 53,301   | 153,299 |
| TOTAL                                        | 571,308        | 131,248                        | 141,857  | 237,105 |

Source: American Association of State Highway and Transportation Officials, The Bottom Line - A Summary of Surface Transportation Investment Requirements 1988-2020. Washington, D.C., September 1988.

TABLE II-5  
ANNUAL BRIDGE INVESTMENT REQUIREMENTS--  
1986-2005  
(BILLIONS OF DOLLARS)

|                                          | BACKLOG | ACCRUING | TOTAL |
|------------------------------------------|---------|----------|-------|
| Interstate                               | .359    | .732     | 1.091 |
| Primary                                  | .457    | .627     | 1.084 |
| Secondary                                | .178    | .111     | .289  |
| Urban                                    | .266    | .250     | .515  |
| All Bridges on the<br>Federal-Aid System | 1.260   | 1.720    | 2.979 |
| All Bridges not on<br>Federal-Aid System | .697    | .271     | .968  |
| GRAND TOTAL                              | 1.957   | 1.991    | 3.947 |

Source: American Association of State Highways and Transportation Officials, The Bottom Line - A Summary of Surface Transportation Investment Requirements 1988-2020. Washington, D.C., September 1988.

bridges off the Federal-Aid highway system, and provides for the preservation of historic bridges which states must now inventory.

#### THE ELEMENTS OF TRANSPORTATION INFRASTRUCTURE COST

The term "infrastructure" can be defined in many ways. In basic terms, infrastructure is generally defined as those longer-term, higher-cost facilities provided by government to provide routine and expected public services. Therefore, a broad description of infrastructure facilities could include roadways, schools, parks, water systems, sewer systems, flood control improvements, public transportation systems, airports, hospitals, and other public use facilities. This report, however, is only concerned with the street and highway infrastructure facilities dedicated to providing transportation in local government jurisdictions. Obviously, the most critical infrastructure needs are located in the more urbanized areas, and especially in the faster-growing urban areas. Many jurisdictions in these areas are finding that their most critical need, and quite often the number one concern among elected officials and citizens alike, is the provision of a well-maintained and uncongested street system. Unfortunately, many local governments cannot solve these problems alone since a large percentage of their major traffic-carriers is typically state and Federal-Aid facilities.

Governments are normally responsible for providing a large number of elements for a wide range of street system facilities. While certainly not a comprehensive list, the items listed below represent

the routine elements of public roadway facilities that are required to provide and maintain a local jurisdiction's street network.

1. Right-of-way and/or easement for vehicular, bicycle, and pedestrian facilities. Utilities are also often accommodated within this area.
2. Standard cross-section pavement construction, including curb and gutter, for all roadway types (arterial, collector, local roads and frontage roads, alleys, freeway ramps, etc.).
3. Separate right and left turn lanes on major street facilities at major cross-streets and high-volume private drives.
4. Sidewalks and bicycle paths.
5. Bridges and tunnels (vehicular, pedestrian, bicycle).
6. Special structures such as retaining walls.
7. Storm drainage structures and facilities.
8. Traffic signals, signal systems, signs, and markings.
9. Lighting for streets, sidewalks, and bikeways.
10. Landscaping and irrigation for medians and street borders.
11. Fencing and noise attenuation.
12. Surveillance and information systems.
13. Guardrail and other safety appurtenances.
14. Utility relocations (typically electric, gas, telephone, cable).
15. Bus system improvements such as turnouts and pavement strengthening at stops.

16. Maintenance and operations of the preceding facilities.
17. Environmental impact and other major studies.
18. Engineering design, inspection, project management.

The previous items are the basic infrastructure elements provided by local governments in their respective street systems. Governments provide various combinations of these elements for both the existing infrastructure and any newly constructed improvements. The normal categories of infrastructure maintenance and construction activities programmed by most governments to support these facilities are as follows:

1. Provide routine maintenance for existing infrastructure facilities.
2. Conduct preventive maintenance activities to maximize the life of the infrastructure investment.
3. Initiate major reconstruction, rehabilitation, and restoration of existing facilities.
4. Construction on existing facilities to correct deficiencies, add capacity and address safety problems.
5. Construct new facilities or extend existing facilities.

#### FUTURE TRANSPORTATION INFRASTRUCTURE NEEDS

Addressing the future needs of the Nation's transportation infrastructure will require a number of different types of roadway investments. As briefly outlined in the preceding section, this

investment will include maintenance programs, operations activities, major reconstruction and widening projects, major maintenance projects such as resurfacing, deficiency correction such as alignment and shoulder improvements, and construction of new and extended facilities to respond to growth in travel demand. Regardless of the type of improvement project, future capital investment requirements in the transportation infrastructure will fall into one of three basic categories:

1. Responding to the backlog of needed improvements on the existing system.
2. Expanding capacity to meet current and expected future needs.
3. Maintaining the existing and future system's condition.

Table II-6 estimates the costs for providing these services through the year 2020 (17). The first column in the Table provides an estimate of the current investment in rural and urban roadway systems. Additional columns for both rural and urban systems are shown to address the following four scenarios:

1. A "maintain pavement" scenario in which the goal is to keep all existing roadways in acceptable condition.
2. A "maintain service" scenario which attempts to maintain both the physical highway condition and operating level of service at current levels.

TABLE II-6

ANNUAL INVESTMENT NEEDS BY SCENARIO  
(Billions of Dollars)

| ROADWAY<br>SYSTEM                      | CURRENT<br>INVESTMENT |       | MAINTAIN<br>PAVEMENT |       | MAINTAIN<br>SERVICE |       | CONSTRAINED<br>IMPROVED SERVICE |       | IMPROVED<br>SERVICE |       |
|----------------------------------------|-----------------------|-------|----------------------|-------|---------------------|-------|---------------------------------|-------|---------------------|-------|
|                                        | RURAL                 | URBAN | RURAL                | URBAN | RURAL               | URBAN | RURAL                           | URBAN | RURAL               | URBAN |
| Interstate                             | 1.62                  | 2.39  | 1.23                 | 1.51  | 1.92                | 2.97  | 1.91                            | 1.85  | 2.30                | 8.76  |
| Other Freeway                          | X                     | 0.59  | X                    | 0.64  | X                   | 1.41  | X                               | 1.28  | X                   | 3.51  |
| Other Principal<br>Arterials           | 1.61                  | 1.74  | 1.41                 | 2.76  | 2.27                | 4.59  | 3.11                            | 4.63  | 3.67                | 7.35  |
| Minor Arterials                        | 1.39                  | 1.64  | 1.88                 | 2.34  | 2.26                | 3.88  | 2.72                            | 3.86  | 3.02                | 5.91  |
| Major Collector                        | 1.83                  | 1.36  | 4.19                 | 1.99  | 3.20                | 2.85  | 4.99                            | 2.67  | 5.29                | 3.55  |
| Minor Collector                        | 0.47                  |       | 2.58                 |       | 1.10                |       | 2.92                            |       | 3.05                |       |
| Subtotal                               | 6.92                  | 7.73  | 11.29                | 9.24  | 10.75               | 15.70 | 15.64                           | 15.29 | 17.32               | 29.09 |
| ANNUAL INVESTMENT<br>(Rural and Urban) | 14.6                  |       | 20.5                 |       | 26.5                |       | 30.9                            |       | 46.4                |       |

Source: American Association of State Highway and Transportation Officials,  
The Bottom Line - A Summary of Surface Transportation Investment Requirements  
1988-2020. Washington, D.C., September 1988.

3. A "constrained improved service" scenario which attempts to maintain the system adequately and meet new capacity needs but is limited to adding improvements in the existing right-of-way.
4. An "improved service" scenario which addresses all needs including full maintenance of existing facilities and expanding capacity to meet current and expected demands, regardless of right-of-way constraints.

The level of funding estimated for each investment scenario, expressed in 1985 dollars, is also shown in Table II-6. All four improvement scenarios represent a considerable increase over the annual investment now being made. The "maintain pavement" scenario is nearly \$6 billion dollars greater per year while the "improved service" scenario requires an additional \$31.8 billion dollars per year over the current level. To establish the costs for constructing new facilities in the "constrained improved service" and "improved service" scenarios, the new lane-miles estimated for various classes of urban roads as listed in Table II-7 were used (17).

#### TRENDS IN INFRASTRUCTURE SPENDING

As shown in Table II-8, Federal, state, and local governments combined invested four times more in transportation infrastructure improvements in 1982 than they did in 1960 (6). The increase is not so impressive, however, when those investments are viewed in terms of

TABLE II-7  
NATIONAL LANE MILE REQUIREMENTS  
FOR URBANIZED AREAS, 2005\*

| HIGHWAY CLASS                | EXISTING<br>LANE MILES<br>1985 | NEW LANE<br>MILES IN<br>EXISTING<br>RIGHTS-OF-<br>WAY | NEW LANE<br>MILES IN<br>NEW RIGHTS-<br>OF-WAY | TOTAL<br>MILES |
|------------------------------|--------------------------------|-------------------------------------------------------|-----------------------------------------------|----------------|
| Interstate                   | 47,200                         | 8,300                                                 | 31,400                                        | 86,900         |
| Other Freeways               | 25,800                         | 4,900                                                 | 11,700                                        | 42,400         |
| Other Principal<br>Arterials | 111,000                        | 26,600                                                | 26,000                                        | 163,600        |
| Minor Arterials              | 128,500                        | 25,600                                                | 23,300                                        | 177,400        |
| Collectors                   | 111,500                        | 10,000                                                | 9,800                                         | 131,300        |
| TOTAL                        | 424,000                        | 75,400                                                | 102,200                                       | 601,600        |

\*Does not include Indiana, Louisiana, Michigan and Oklahoma

Source: American Association of State Highway and Transportation Officials, The Bottom Line - A Summary of Surface Transportation Investment Requirements 1988-2020. Washington, D.C., September 1988.

TABLE II-8  
GOVERNMENT HIGHWAY EXPENDITURES  
IN RELATION TO THE FEDERAL  
BUDGET AND THE GROSS  
NATIONAL PRODUCT

| YEAR | FEDERAL<br>BUDGET* | GROSS<br>NATIONAL<br>PRODUCT* | FEDERAL<br>STATE AND<br>LOCAL HIGH-<br>WAY EXPENDI-<br>TURES | % OF<br>FEDERAL<br>BUDGET | % OF GNP |
|------|--------------------|-------------------------------|--------------------------------------------------------------|---------------------------|----------|
| 1960 | 92.2               | 506.5                         | 10.7                                                         | 11.6                      | 2.1      |
| 1965 | 118.4              | 691.1                         | 14.3                                                         | 12.1                      | 2.1      |
| 1970 | 195.7              | 992.7                         | 20.8                                                         | 10.6                      | 2.1      |
| 1975 | 324.2              | 1549.2                        | 28.1                                                         | 8.7                       | 1.8      |
| 1980 | 276.7              | 2633.1                        | 41.0                                                         | 7.1                       | 1.6      |
| 1981 | 657.2              | 2937.7                        | 41.2                                                         | 6.3                       | 1.4      |
| 1982 | 725.3              | 3108.2                        | 43.0                                                         | 5.9                       | 1.4      |

\*Billions of Dollars

Source: Porter, Douglas R., and Peiser, Richard B., Financing Infrastructure to Support Community Growth. Washington, D.C.: ULI - The Urban Land Institute, 1984.

constant dollars. With the effects of inflation eliminated, it is apparent that overall investment peaked around 1965 and has fallen steadily ever since (4). The decline is also apparent when investment is compared to economic growth. As a percentage of the Gross National Product, investment fell from 2.1% in 1970 to 1.4% in 1982.

Although total public spending on transportation infrastructure has grown steadily since 1960, these trends alone do not illustrate the ultimate distribution of the increase in the financial burden. In fact, when analyzed by level of government, only one level has borne an increasing burden--the local level (12).

Two trends demonstrate the gradual shift in financial responsibility to one dominated by local governments in general and cities in particular. The first trend is simply that of total outlays for all public works facilities by level of government. Since 1977, these local government outlays have continued to rise, while those of state and Federal governments have remained constant or fallen (12). The result has been an increasing shift in responsibility from the state and Federal level toward local levels (12).

The second trend identifies a broader shift in public works investment that has important ramifications for localities. While funds devoted to capital investment have not kept pace with increases either in economic activity or in population, public spending to maintain and operate the public works infrastructure has grown in line with the growth of the economy as a whole and has increased almost

twice as fast in the growth in population (12). This increasing emphasis on operations and maintenance leaves little room for increases in spending for constructing new and expanded facilities.

The nature and magnitude of investment at all levels of government has shifted dramatically since 1960. These shifts, however, hold the same implication for local governments, which have had to assume an increasing degree of responsibility for infrastructure investment. Yet, with this responsibility comes the need for a larger revenue base and therefore, the need for new techniques to generate revenue.

Many explanations have been suggested for the reduction in governmental expenditures for new infrastructure. The near-completion of the Interstate Highway Construction Program has certainly played a part. Federal investments in highways and streets dwindled from \$340 million in 1967 to \$186 million (constant dollars) in 1981 (4). To some extent, however, reduced investments in highways are offset by increases in state and local expenditures for water and sewer facilities which rose from \$3.3 billion in 1967 to \$5.4 billion (in constant dollars) in 1978 (4).

Another contributor to the problem has been the Federal role in financing infrastructure which grew considerably during the 1970's from increases in the Federal share of funding capital projects and from the availability of funds from Revenue Sharing. The net effect of this growth in Federal spending, however, was to reduce capital

expenditures by state and local governments (4). Not only did Federal funds displace state and local capital expenditures (which were then channeled to other capital needs and operating budgets), but the uncertain nature of the Federal funding programs typically caused state and local governments to postpone spending in anticipation of Federal grants (4).

The tremendous investment in capital facilities by all levels of government in the decades before 1980 is partly responsible for today's infrastructure funding difficulties. Maintenance of these existing facilities has raised routine operating expenditures. As an example, governmental operating budgets which now comprise 80-90% of total local outlays have increased far more rapidly than capital budgets, in large part because of soaring wages and pension costs (4). Evidently, little thought was given in the past to the long-term cost of providing infrastructure for the low density suburban developments occurring since the 1950's. Some experts believe that communities were essentially subsidizing land costs by committing themselves to high capital and operating costs for infrastructure (4). At any rate, the consequences of rapid capital investment are high maintenance costs and large capital debts to repay.

The rising cost of debt service, in fact, have made many communities more cautious about capital expenditures. In many jurisdictions capital improvements have been financed, in addition to Federal aid, through long-term tax-exempt bond issues. From 1960 to

1980 the outstanding debt of state and local governments rose from \$70 billion to \$336 billion, a four-fold increase (4). In recent years, however, public resistance of increased bond debt has grown and many communities chose to postpone debt issues, seek other sources of funds, or delay needed projects. Local governments are now experimenting with all sorts of alternatives to standard bond issues.

Another explanation for the drop in governmental expenditures for new infrastructure is supported by the significant changes in revenue patterns affecting public budgets. Property taxes supplied less than 25% of municipal revenues in 1980, down from 44% in 1962 (18). Replacing this traditional source of revenue have been intergovernmental transfers (up from 20% of all revenues in 1962 to 37% in 1980) and other taxes, such as income and sales taxes (18). Cities fiscal powers are being altered by limitations on taxes and spending, and revenue sources are being affected by cut-backs in state and Federal aid. The result is that many local governments are not able to raise revenues rapidly enough to keep pace with mounting costs and inflation. Tax collections of city government increased by 8.7% during fiscal 1980, but expenditures rose by 12.1% in the same period (18). Although the financial problems of many larger cities and counties has been well publicized, recent surveys indicate that many small and medium size cities are experiencing serious operating deficits and many more are expected to experience them in the near future (18).

Decreases in public expenditures for infrastructure also resulted from greater dependence on the private sector. Many communities are turning to the private sector to provide much of the infrastructure associated with new development, either through direct construction and dedication or by the payment of fees. In some rapidly growing communities, it is estimated that as much as half of the investment in public works comes from private sources (4). One estimate in 1978 placed the amount nation-wide in the range of \$4-5 billion per year (4). Taking inflation and tighter local budgets into account, the amount is undoubtedly much higher now.

Whatever the reasons, the fact remains that Federal, state, and local governments have reduced real dollar spending for transportation facilities, especially from 1978 to today, while the needs continue to grow. The requirements for streets, highways, and other related infrastructure facilities have increased, not decreased, as the number of people, households, automobiles and travel have increased. Economic growth has required more transportation facilities. Unit costs of many public facilities have also increased as standards have been raised to meet the expectations of today's citizens. Thus, as state and local expenditures for transportation have been effectively decreasing, needs have been increasing. This widening gap accounts for the inadequate infrastructure visible in many cities today.

## THE OUTLOOK FOR FUTURE TRANSPORTATION REVENUE

The transportation revenue shortfall problem is part of the larger revenue shortfall problem pervasive throughout the public works field (19). As discussed in the preceding section, this decreasing investment in transportation infrastructure began in the 1960's and continues today. With the continuing effects of inflation and the current economy, there is little hope of a major shift in this trend.

The revenue shortfall problem for streets and highways results from a number of factors contributing to higher costs and declining revenues (19). As discussed in the previous section, some of the factors contributing to higher costs include:

1. Higher standards for roadway and traffic design.
2. Increased inflation and spiraling wages for construction, reconstruction, and maintenance.
3. Increased interest rates and increased time and the cost associated with obtaining government approvals.
4. The shift to more costly re-construction of roadways as opposed to new construction.

Some of the causes of declining revenues include:

1. Improved auto efficiency resulting in less fuel consumption per vehicle mile.
2. The fixed gasoline tax rates without adjustment for inflation.
3. Diversion of highway funds for non-highway purposes.

4. Exemption of gasohol from two-thirds of the Federal Motor Fuel Tax.
5. Inability to advance programs aimed to increasing revenue from public and private sources.

Assuming that the above factors remain relatively constant, revenue for transportation from existing sources is expected to remain static, and possibly decrease, while transportation needs and costs have more than doubled in the past ten years and can be expected to increase with continued economic growth and inflation (19). These problems are either caused or affected by several National trends concerning both revenues and costs.

The Federal and state governments have traditionally been heavily dependent on revenue sources that were directly related to fuel and motor vehicles. The most important revenue source has obviously been the gasoline tax which is normally collected on a per gallon basis. The demand for gasoline grew at a much slower rate in the late 1970's than in the past and has remained relatively stable during the mid-1980's (19). This reduced demand is partly due to the Nation's energy conservation programs, but more importantly because of the newer more fuel efficient cars.

As effective revenues have remained stable or actually decreased, the cost of implementing transportation facilities and services have increased. These cost increases have been mainly the result of increases in the National inflation rate but have also been caused by

increasing levels of service and standards, increasing maintenance needs associated with older facilities, and increasing costs to meet environmental and other special requirements.

Inadequate revenues are limiting transportation programs at all levels of government. Although gasoline taxes are collected primarily at the Federal and state levels, local agencies often depend on grants and allocations from these revenues. While the gasoline tax was initially intended as a "user" tax to fund highway programs, it is now used to fund other, although valuable, transportation projects such as traffic operations, ride sharing programs, and transit capital and operating programs. As these other programs have been funded, elected representatives have been generally unwilling to support major increases in revenue for the routine transportation programs. Consequently, transportation agencies and professionals need to increase their efforts to educate the public at large and their elected representatives of the commitments and actions needed to solve the revenue shortfall problem.

The following sections discuss in more detail the future outlook for transportation revenues at the Federal, state, and local levels.

Federal. If no action is taken to increase the Federal-Aid program, state and local government expenditures will have to more than double to maintain existing highway condition and performance levels (19). If the Federal contribution to transportation improvements continues to decline and the states and localities are

unable to finance the remaining needs, most urbanized areas are likely to experience serious congestion and maintenance problems. This trend could potentially be accelerated if levels of Federal-Aid spending are cut back as being currently discussed in Congress.

The current levels of Federal-Aid have been established in the Federal-Aid Highway Act of 1987 as shown in Table II-9 (20). The revenue sources for the Highway Trust Fund from which this program is funded are listed in Table II-10 (2).

State. Increasing maintenance requirements are limiting the ability to program capital improvements at the state level. Some portions of the Interstate system are more than 20 years old, and a major portion of the system is in need of resurfacing and rehabilitation, resulting from aging and from the initial design volumes and loadings being exceeded (19). Also, most states have been losing ground on highways improvements, again because of inadequate funds, inflation, and an aging network resulting in an increasing backlog of maintenance and construction improvements (19).

Many states have been studying their revenue problems and considering options for additional revenues. It is generally recognized that the maintenance of the existing system is top priority. Failure to adequately maintain the system results in deteriorating facilities that would cost much more to replace. Safety requirements are also an important consideration in most state transportation programs. Meeting these two obligations results in

TABLE II-9

FEDERAL-AID HIGHWAY ACT OF 1987  
(Covering Fiscal Years 1987-1991)  
(Millions of Dollars)

| HIGHWAY DEVELOPMENT                 | FY 1987    | FY 1988    | FY 1989  | FY 1990  | FY 1991  | FIVE-YEAR<br>TOTAL |
|-------------------------------------|------------|------------|----------|----------|----------|--------------------|
| Interstate Construction             | \$ 3,000   | \$ 3,150   | \$ 3,150 | \$ 3,150 | \$ 3,150 | \$15,600           |
| Interstate 4-R                      | 2,815      | 2,815      | 2,815    | 2,815    | 2,815    | 14,075             |
| Interstate Substitute Highways      | 740        | 740        | 740      | 740      | 740      | 3,700              |
| Primary System                      | 2,325      | 2,325      | 2,325    | 2,325    | 2,325    | 11,625             |
| Primary Minimum                     | 48         | 48         | 48       | 48       | 48       | 240                |
| Secondary (Rural)                   | 600        | 600        | 600      | 600      | 600      | 3,000              |
| Urban System                        | 750        | 750        | 750      | 750      | 750      | 3,750              |
| Bridge Replacement & Rehabilitation | 1,630      | 1,630      | 1,630    | 1,630    | 1,630    | 8,150              |
| Forest Highways                     | 55         | 55         | 55       | 55       | 55       | 275                |
| Public Lands Highways               | 40         | 40         | 40       | 40       | 40       | 200                |
| Parkways and Park Highways          | 60         | 60         | 60       | 60       | 60       | 300                |
| Indian Reservation Roads            | 80         | 80         | 80       | 80       | 80       | 400                |
| Minimum Allocation                  | 725.3      | 800        | 800      | 950      | 950      | 4,225.3            |
| Emergency Relief                    | 100        | 100        | 100      | 100      | 100      | 500                |
| New Demonstration Projects          | 178        | 178        | 178      | 178      | 178      | 890                |
| RR Relocation Demo. Projects        | 15         | 15         | 15       | 15       | 15       | 75                 |
| Transp. of Nuclear Waste            | 58         |            |          |          |          | 58                 |
| Urban High Density Project          | 2.8        | 1.5        | 1        |          |          | 2.8                |
| Studies                             | 2.8        |            |          |          |          | 5.3                |
| Other Demo. Projects                | 45.6       |            |          |          |          | 45.6               |
| Access To Lakes                     | 5          |            |          |          |          | 5                  |
| B-W Parkway                         | 10         |            |          |          |          | 10                 |
| TOTAL FISCAL YEAR AUTHORIZATIONS    | \$13,285.5 | \$13,387.5 | \$13,387 | \$13,536 | \$13,536 | \$67,132.0         |
| HIGHWAY DEVELOPMENT                 |            |            |          |          |          |                    |

Source: Highway Users Federation, The Surface Transportation and Uniform Relocation Assistance Act of 1987: A Summary. Washington, D.C., April 1987.

TABLE II-10  
SOURCES OF FEDERAL HIGHWAY  
TRUST FUND MONEY--  
FY 1986

| HIGHWAY ACCOUNT |                  |            | MASS TRANSIT ACCOUNT**                                                                                                                            |                    |            |
|-----------------|------------------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------|
|                 | \$ THOUSANDS     | %          |                                                                                                                                                   | \$ THOUSANDS       | %          |
| Motor Fuel      |                  |            | Motor Fuel                                                                                                                                        |                    |            |
| Gasoline        | \$7,655,588      | 52.1       | Gasoline                                                                                                                                          | \$852,855          | 5.8        |
| Gasohol         | 145,523          | 1.0        | Gasohol                                                                                                                                           | 71,727             | 0.5        |
| Diesel and      |                  |            | Diesel and                                                                                                                                        |                    |            |
| Other           | 2,452,925        | 16.7       | Other                                                                                                                                             | <u>188,072</u>     | <u>1.3</u> |
| Trucks and      |                  |            | Total from                                                                                                                                        |                    |            |
| Trailers        | 1,144,459        | 7.8        | Taxes                                                                                                                                             | \$1,112,654        | 7.6        |
| Tires           | 319,544          | 2.1        | Interest                                                                                                                                          |                    |            |
| Heavy Truck     |                  |            | Earned                                                                                                                                            | <u>282,769</u>     | <u>1.9</u> |
| Use             | 532,790          | 3.6        | TOTAL MASS                                                                                                                                        |                    |            |
| Truck Parts     |                  |            | TRANSIT                                                                                                                                           |                    |            |
| and Acces-      |                  |            | ACCT.                                                                                                                                             | <u>\$1,395,423</u> | <u>9.5</u> |
| sories          | 756              | -          |                                                                                                                                                   |                    |            |
| Tubes and       |                  |            |                                                                                                                                                   |                    |            |
| Tread Rubber    | 448              | -          |                                                                                                                                                   |                    |            |
| Lubricating     |                  |            | **The Mass Transit Account of the Highway Trust Fund is supported by revenue from one cent of the 9-cents-per-gallon federal motor fuel user tax. |                    |            |
| Oil*            | <u>- 622</u>     |            |                                                                                                                                                   |                    |            |
| Total from      |                  |            |                                                                                                                                                   |                    |            |
| Taxes           | \$12,251,415     | 83.3       |                                                                                                                                                   |                    |            |
| Interest        |                  |            |                                                                                                                                                   |                    |            |
| Earned          | <u>1,054,143</u> | <u>7.2</u> |                                                                                                                                                   |                    |            |
| TOTAL HIGHWAY   |                  |            |                                                                                                                                                   |                    |            |
| ACCOUNT         | \$13,305,558     | 90.5       |                                                                                                                                                   |                    |            |
| GRAND TOTAL     |                  |            |                                                                                                                                                   | \$14,700,981       | 100.0%     |

\*Rebated excise taxes.

Source: Highway Users Federation, Transportation Issues 1987.  
Washington, D.C., 1987.

diminishing revenues to construct or match available Federal funds for other types of system improvements.

State highway funding depends largely (over 90%) on user charges, taxes, and fees (21). Most of this user funding comes from gasoline taxes, which range from five cents per gallon to fourteen cents per gallon (22). Other sources of state highway funds include sales tax on motor fuel, tolls, general fund appropriations, budgeting indexing, licensing registration fees, taxes on oil companies, special vehicle taxes, dealers fees, title and transfer fees, special taxes on motor carriers, fines and penalties, and other special fees and taxes. Additional user fees being considered in some states include special taxes on auto parts and taxes on tires (21). For the near future there is little expectation that major new revenue sources will be identified at the state level.

Local. In many respects, local jurisdictions face an greater revenue problem than that faced at the Federal and state level. As Federal and state revenues decrease, local jurisdictions can expect to receive less assistance for both Federal-Aid and local roads. Local governments, primarily counties and municipalities, are responsible for more than 71% of the total highway mileage in the Nation (1). However, highway user revenues have never paid for the total cost of building and maintaining local roads (19). In several respects this is appropriate since many local roads only provide necessary access to various properties and do not serve longer distance travel.

As revenues go down and taxes remain stable, the user will be paying less of the cost of highway maintenance and construction at the local level. In many jurisdictions highway user revenues are already paying less than half the cost of highway maintenance and construction (19). The remaining portion is financed from a variety of other sources including local property and sales taxes, and miscellaneous local revenues. Federal revenue-sharing is no longer available to local governments.

New revenue sources must be found if local jurisdictions are to avoid dedicating ever-increasing portions of their property and sales taxes to transportation improvements (19). In 1984, a Nationwide survey of government officials was conducted to learn more about how jurisdictions perceive their infrastructure needs and how they expect to raise the money they need to repair and expand these facilities (16). Of the 5,019 questionnaires sent, 961 complete responses were received for a 19% return rate. Included among the respondents were representatives from agencies in 23 of the 50 states and from governments in every state. Eighty-three percent of the responses were from local government with 96.5% of those responses being from local governments with less than 150,000 population. The highlights of the survey were as follows:

1. One-third of the respondents claimed that one or more of their infrastructure systems posed a serious threat to the health and safety of their citizens. Over 50% of the

respondents indicated that their road, bridge, and streetlight systems were in fair to poor condition, and typically in worse shape than other infrastructure systems.

2. Expenditures for infrastructure are likely to at least double over the next five years. Sixty percent of the respondents indicated they hope to spend at least twice as much for infrastructure in the next five years as they have in the last five years, and 24% hope to spend three times as much.
3. Of the major infrastructure systems, mass transportation and roads, bridges, and streetlights are in the worst condition according to survey respondents.
4. General Obligation Bonds and Federal grants are the "best ways" to fund infrastructure, but many governments will actually fund infrastructure by increasing local tax rates.
5. Privatization is considered a viable funding option by approximately one-half of the respondents. However, only 25% have used privatization.
6. Taxpayers do not understand the cost of infrastructure repair and expansion, according to nearly 85% of the respondents. Governments need to develop programs for educating and communicating with the constituents.

#### SUMMARY

The information contained in this chapter clearly signals difficult times for local governments attempting to fund

transportation infrastructure improvements in the future. With traditional transportation revenues remaining static or declining, construction and maintenance costs increasing, demands from new growth and expanded infrastructure increasing, and a strong public sentiment against raising taxes to support additional revenues, transportation revenue problems are expected to exist well into the future.

Options for increasing revenues at the local government level are limited. Many local governments are embarking on a search for new, previously untapped revenue to maintain and improve their transportation systems. A promising source of new revenues, especially in areas undergoing major development or redevelopment, is through private sector involvement. The intent is simple: to shift more of the cost of transportation infrastructure from the public, and therefore general revenue sources, to those who create the need and directly benefit from those public investments. Chapter III discusses traditional local government revenue sources and several alternative financing techniques, many of which require the private sector to fund or construct transportation improvements.

## CHAPTER III

### LITERATURE REVIEW

As a result of growing urban traffic congestion and the inability of state and local governments to identify funding to address this problem, a number of studies and publications addressing this subject have been prepared in the past few years. Much of this literature identifies alternative financing techniques for new transportation infrastructure while another major portion identifies methods to maximize private sector funding for transportation needs. The primary purpose of this literature review is to first identify the more normal and traditional methods of funding sources for local transportation improvements, and then to identify new and innovative alternative financing techniques aimed at increasing total revenue sources for those improvements.

This research has shown that most of the new ideas in financing transportation infrastructure have been gradual and limited primarily to a few growing areas of the country. Most of this movement has occurred in either rapidly growing regions of the sunbelt or in jurisdictions that have some form of tax or expenditure limitations. This shift has taken two general forms. First, among public revenue sources there has been a shift away from general taxes and toward special taxes and user charges. Second, there has been general movement away from public revenue sources to private revenue sources.

These shifts in local public and private financing methods are beginning to supplement and, in some cases, replace general revenue financing of new transportation infrastructure.

The purpose of the literature review was to identify a comprehensive list of alternative financing techniques currently in use across the United States or under consideration. Traditionally, local governments have financed transportation improvements from general fund revenues--not user fees (23). The taxing philosophy has been that local roads were used primarily by local residents and therefore should be financed from the general fund. However, with increasing pressures on general funds and declining state and Federal aid, many cities are reassessing the traditional use of general fund financing for local roads and beginning to explore greater use of direct-benefit user fees and charges.

#### PUBLIC REVENUE SOURCES

Revenues and methods used by local governments to finance transportation infrastructure can be grouped into two distinct categories: public revenue sources and private revenue sources. While many communities in the sunbelt states and other high-growth areas of the Nation have become more efficient at identifying private revenue sources for local transportation needs, the majority of local governments still rely primarily on public revenue sources to finance their transportation capital improvement and maintenance programs. In

most cases, general fund revenues from property and sales taxes represent the largest percentage of program funding (21).

Listed below are a number of public revenue sources identified in the literature review. These sources can be generally classified in the categories of general taxes, special taxes, and user charges. General taxes have a wide base in the community and do not single out any specific type of economic activity. Special taxes differ in the regard that they typically have a narrow tax base that does impact one specific type of economic activity. User charges and fees are imposed on individuals who use a government service in order to help defray the cost, including capital costs, of providing that service. Typically, the use of the service is denied unless a user pays the cost of the services he/she receives. User charges are considered most appropriate for financing services that local citizens think should be the financial responsibility of the people who directly cause the need or benefit from them.

Specific public revenue sources are as follows:

1. General Taxes--Property tax, general sales tax, and income or payroll taxes are considered the most typical sources of general taxation. Most local communities use property tax as the primary source of local financing for transportation infrastructure (23). Sales and income tax revenues usually go into the general funds for use in several programs. There has, however, been a recent trend toward the dedication of

specific amounts of local sales or income tax as the principal source of funding for infrastructure (23). Most of this movement has been toward the use of a sales tax by transit districts although communities in California now have the ability to impose additional sales tax dedicated to the transportation infrastructure in general.

2. Special Taxes--The most commonly used special taxes are selective sales taxes on motor fuel, alcoholic beverages and tobacco, public utilities, and hotel/motel taxes (24). Very few of the selective sales taxes are actually used as sources of financing for transportation infrastructure. Most go to finance general fund expenditures although some percentages can be reasonably dedicated to transportation needs. Additional types of special taxes would be a vehicle license tax and parking tax.
3. User Charges and Fees--Local governments assess user charges to those people who directly use and benefit from a government service. Those charges are used to pay for that service. Some of the most common user charges used by local governments to pay for infrastructure are water and sewer charges, bridge and highway tolls, bus and subway fares, green fees for golf courses, swimming pool fees, and parking fees (4). For user charges to be effective, governments must generally be able to exclude people who do not pay for the

service from using it. For public facilities such as roads and parks, exclusion of non-payers is either physically impossible or prohibitively expensive so user charges are not typically used for these services.

Tolls are widely used in some localities to finance expensive transportation facilities (3). Bridges and tunnels are excellent examples because of their great capital cost and because there is usually no alternative route. Some street facilities also provide the same type of benefit. Tolls are often graduated based on the size or weight of the vehicles and may also be structured to encourage high occupancy vehicles. The Federal Highway Administration has recently approved the use of Federal-Aid funds in the construction of some toll facilities.

4. Tax Increment Financing--This financing method is unique in that public tax revenue increases that are anticipated as a result of new development in a specified area are dedicated for financing the public improvements and services in that particular area. Improvements within the area are initially financed from public funds or bonds, then repaid from the increase in tax revenue generated by the new development served by the expanded infrastructure (12). This method does have the drawback of siphoning off increases in revenues which are indirectly needed to provide services that are not

constructed or provided in the improvement plan (4). Examples would be police, fire, and community development services.

5. Street Utility Fees and Assessments--A street utility is a relatively new concept that would for the first time directly relate the use of roads to the cost of providing and maintaining them (25). In order to operate a street utility that collects fees for use, there must be some measure of use or value. A street utility fee would need to be based on traffic generation from individual properties. Such a fee could directly distribute maintenance and improvement costs in direct proportion to a property owner's impact on the street network (26). Initiation of a street utility would be a considerable task but once in place could be easily adjusted.
6. Lottery--Some states have legalized lottery operations which return pre-set percentages to local governments for particular uses (25). In some states, the proceeds either are or can be dedicated to transportation infrastructure improvements.
7. Public Property for Leasing or Selling of Development Rights--Some local jurisdictions have been successful at selling excess properties to fund transportation improvements (27). Others have managed to temporarily lease surface

rights for unneeded property right-of-way while others have approved long-term leases for air rights in densely developed urban areas.

8. Utility Franchise Fees--Utilities that are located in local street right-of-way normally pay a pre-set percentage fee of their annual gross receipts to the local jurisdiction. All or part of this fee could be used to finance improvements to the street system, particularly in the areas of removing, relocating, or protecting fixed utility objects at the roadway's edge (24).

#### HISTORY OF PRIVATE SECTOR INVOLVEMENT IN TRANSPORTATION IMPROVEMENTS

During this century the amount of transportation infrastructure that developers have been asked to contribute to local governments has varied widely. Until the late 1940's developers were generally held responsible for a very limited amount of infrastructure. In most regions of the country a developer's responsibility was limited to the streets, sidewalks, streetlights, water lines, and sewers that were either on or directly adjacent to his development (23). Developers were not expected to pay for arterial roads, collector roads and other "off-site" infrastructure that provided major benefits to other segments of the community. That was the case even though the need for such facilities was created by new development and, in many cases, the infrastructure was on-site.

Before the depression in the 1930's cities were finding themselves strapped to provide local infrastructure and often helped developers shift the responsibility for needed improvements directly to the buyers of new development. In many areas in the west, midwest, and south in particular, cities took the lead in financing local streets and water and sewer lines by establishing special assessment districts and making the residents of new development directly responsible for the infrastructure (23). This approach was used primarily with large new developments and usually was a cooperative effort between the developers and the city. The developer built the infrastructure on his own property, and the city was responsible for establishing the special assessment districts, issuing the bonds to pay back the developer, collecting the assessments, and retiring the debt. This arrangement relieved the developer of the financial responsibility for the infrastructure but at the same time guaranteed that the infrastructure would be there when it was needed. The arrangement also helped the city by eliminating the need to directly use general fund revenues to finance local improvements.

After the depression years a series of changes began regarding what was expected from developers. Because of high default rates on bonds backed by special assessment revenues during the depression, cities were no longer able to finance the infrastructure that had been the developer's responsibility (23). Following the depression, developers were typically expected to build and dedicate to the city

the streets and other local improvements that at one time had been financed through special districts.

After World War II cities experiencing rapid growth began to require the private sector to provide infrastructure that had once been considered a public responsibility. At first, developers were required to provide only the facilities that could be directly attributed to their development. However, cities became more aggressive and began to require facilities that could be tied only indirectly to new development. In 1949 the California courts upheld the right of the City of Los Angeles to require street improvements and dedication of rights-of-way that provided benefit to the general public as well as to a new development (23).

During the 1950's and 1960's the courts allowed the cities further latitude on what they could require from developers (23). Since then, many cities have been able to require the dedication of major streets and other infrastructure that was once considered a "general public" responsibility. While cities were restricted on what they could legally require from developers, they often negotiated "voluntary" contributions tied to subdivision or other local approvals. Consequently, there was a rapid increase in what cities required politically in the form of "voluntary" contributions. Most developers agreed to the cities requests because the infrastructure was less costly than the cost of construction delays and litigation.

Most of these exactions occurred during the subdivision approval and annexation stages and were limited to larger developments.

As cities increased their infrastructure demands, they also began requiring money in lieu of in-kind contributions (23). This was because the direct dedications were not always in the most convenient locations nor were they always the facilities that were needed most at the time. For example, cities often found themselves with major streets that were widened in a piecemeal manner rather than continuously. With direct monetary contributions equal in value to the infrastructure costs, the city could use the money at its discretion to provide more efficiently other facilities to serve the new development.

Much of the infrastructure that is needed to serve new development involves off-site construction for which in-kind contributions usually are not practical. The first attempts to make developers responsible for such infrastructure occurred in the 1950's and 1960's when cities in a few states started to impose water and sewer connection charges, or development fees, that covered more than the cost of physically connecting to the system (23). Those charges were usually set so as to recover some portion of the capital cost of central waste water treatment and water supply facilities. In the late 1970's the use of development fees expanded to virtually all types of infrastructure. Many cities found that political pressures and legal constraints limited their ability to raise taxes and utility

rates, but increasing infrastructure needs and higher construction costs were creating opposing pressures to increase taxes and utility charges (28). In such a situation the options are either to reduce expenditures or to find alternative sources of revenue. Since one of the causes of budgetary problems was growth, many cities determined that the use of development fees was a reasonable alternative. A side benefit is that development fees can assist in controlling and regulating growth so that it occurs in more orderly and planned fashion within the community.

Some cities are now using development fees to finance all types of transportation infrastructure. In support of this practice, recent court decisions allowed cities generally to use development fees to finance infrastructure as long as the fees are based on the costs of supplying the infrastructure directly needed by the new development which is being assessed the fee (23). The primary obstacle that a local government faces in implementing development fees is acceptance by the development community and ultimately the city politicians. While increased revenues are always attractive to politicians, opposition from the business community and some residential areas may prove too much to bear in some local jurisdictions.

#### PRIVATE REVENUE SOURCES

Public financing is defined as financing that involves sharing a cost among a broad base of the community and among generations of residents. The best definition of private financing is that

individuals pay only for the particular infrastructure that provides benefits directly to them. With this definition, the amount an individual pays for infrastructure is not affected by other's needs for it or by the cost of building infrastructure for others. In the past, private financing has been used widely to finance on-site infrastructure (28). Until recently, however, it has seldom been used for financing off-site improvements. As discussed in the preceding section of this chapter, many jurisdictions have begun to find alternatives that shifted the burden of financing new infrastructure to developers and residents of new development (23).

A city normally establishes private financing of new capital improvements by identifying needs either geographically or through individual new developments that create specific needs for infrastructure. Special districts are the most common ways of targeting financing to a geographic area (29). Exactions and development fees are methods of obtaining financing by exacting funds in the development process. Funds exacted in this manner are still directly related to geographic areas since the funds exacted must be closely tied to capital improvements made necessary as a result of the requested development.

On-site benefit assessments were used widely earlier in this century as a means of financing public improvements such as streets, sidewalks, and sewers (23). A traditional dependence on special assessments and residential developments has lessened since developers

now provide the basic infrastructure in new subdivisions. However, assessment districts are now being formed to address needs both off-site and on-site of development to ensure that particular development pays the entire cost of impacts they create on the entire street system (29).

Listed below are the most common methods now being used to generate private revenue for local government transportation infrastructure improvements.

1. Special Assessment/Benefit Districts

This type of district is the traditional means of geographically isolating the financing of infrastructure that serves a particular area or part of a city. With special assessment districts, a financing district is established which coincides with the area benefitted from a project, and the properties in the district are assessed the cost of the project based on measures such as front footage, acreage, or traffic generation (4). In this way, cities can isolate the financing of infrastructure that serves areas of new development as well as areas that demand extensive levels of infrastructure, from imposing a burden on the residents of the city as a whole.

2. Transportation Corporations and Road Districts

Some states have passed legislation which enables independent political and institutional districts to be

created to provide a particular service to an area (30). This type of district is essentially another level of government which finances facilities for both new and existing residents. These independent special districts have the same characteristics as cities or other general purpose governments when it comes to financing new infrastructure.

### 3. Exactions

During the development approval process, many cities identify the need for new or expanded infrastructure created as a result of a particular development (12). Developers are then required to dedicate property and/or construct improvements related to those needs. These direct in-kind contributions are referred to as exactions. When a developer is requested to provide money, these are considered fees or charges.

Developers can normally be required to make contributions at any time during the development process. Commonly, exactions are required at times of rezoning, subdivision approval, request for special use permits, granting of variances, annexation, issuance of building and occupancy permits, and even connection to or initial use of the infrastructure.

#### 4. Development Fees and Charges

Development Fees are exactions of monetary contributions at some point in the development review and approval process. These fees are directly used to finance infrastructure that is needed as a result of the development. Development fees go by various names such as impact fees, infrastructure fees, capital recovery fees, capital facility fees, system development charges, building occupancy taxes, and connection fees. These fees can be collected at virtually all points in the development approval process depending upon local government regulations.

Many city officials believe that development fees are the wave of the future and are therefore starting to use them more extensively. Some officials, however, have reservations about the continued use of development fees and some state legislatures, such as California and Texas, have passed legislation limiting development fees and exactions (23). Some cities are re-evaluating the use of development fees because of discontent among developers and business leaders who think that the fees are hampering the cities growth. In any event, local reliance on development fees to support on- and off-site infrastructure is limited by practical and legal considerations regarding the kinds of facilities that can be financed.

## 5. Public/Private Negotiations

In many jurisdictions off-site contributions for infrastructure improvements are negotiated on a case-by-case basis between the city and developer, while on-site contributions are determined in accordance with well established city standards (3). In these negotiations there are few, if any, guidelines as to what should be required from the developer. In some instances traffic impact analyses are performed to identify impacts created by the proposed development and what improvements are necessary to mitigate those impacts. In many other instances there are no specific studies in place to specifically define appropriate participation amounts. Many cities are reluctant to formalize off-site infrastructure requirements because many of the requirements would be declared illegal by the courts if the developer were not willing to agree to them voluntarily. In addition, most cities want to retain some flexibility in determining what is required from large developers who are willing to make concessions to the city on other issues during the development approval process. In general, developers prefer fixed fees to negotiated exactions because they do not like the uncertainty of not knowing what their off-site infrastructure requirements would be. Secondly, with fixed fees all developers, regardless of size, would be treated the same.

## 6. Privatization

Under this arrangement the private sector of the local community retains its roll as the regulator of the capital facilities being privatized while a private firm assumes the roll of owner and operator (31). The private operator is responsible for design, construction, and financing of the facility and is entitled to earn certain "tax benefits" such as accelerated appreciation and a fiscal tax credit. As the regulator, the local community serves as the utility commission in assuring the performance of the private sector fund. Typically, the community places itself between the citizens or users of the service and the private sector firm assumes responsibility for authorizing user fee schedules, collecting user fee payments and promptly remitting the agreed upon payment amount to the private sector firm. With the exception of toll facilities, privatization is not a relatively viable option for transportation infrastructure needs.

## CONSIDERATIONS IN SELECTING FINANCING ALTERNATIVES

In the selection of appropriate public and private revenue sources for providing transportation infrastructure at the local level, a community should address several considerations and aspects of each particular revenue source. While many of the traditional revenue sources will in fact remain a stable and continuing source of

funds, the opportunity exists to expand or revise existing revenue approaches or enact new revenue techniques. In evaluating these alternatives a number of issues should be considered, some of which are:

- . What percentage of the new revenue source can be considered a user fee and what percentage is non-user oriented?
- . What is the anticipated public acceptance of the proposed new revenue technique, and how is that expected to influence the political endorsement of the technique?
- . Is the new funding source properly indexed to inflation so that as needs and costs increase in the future, the revenue source will proportionally increase?
- . What are the fairness and equity relationships of the proposed revenue producing methods? A new funding source may be equitable for a certain segment of the community but that does not ensure that it will be fair in terms of the benefits returned to those who pay. Any proposed revenue source should be able to respond to the arguments of fairness in order to stand the test in court, and be equitable in order to defend the funds exacted from those paying.
- . Have the complete legal considerations of the new revenue source been investigated? The approach must meet constitutional law requirements at the Federal and state

level and statutory limitations at both the state and local levels.

- . How easy is the new revenue source to implement and what administrative burdens will be created by enactment? Some new financing methods create a significant amount of detailed analysis in order to justify the amount of revenue being collected. There are also often stringent financial tracking regulations associated with new revenues. The governments should be fully aware of these burdens and ensure that they can be practically met while guaranteeing a net income to the community.
- . What will be the potential impact on new economic growth and development in the community? In the areas of private revenue sources, new taxes, fees, and charges may have a considerable impact on costs of new development and the resultant success of new growth. If the size of these charges is unrealistic, development may locate elsewhere. However, this risk will need to be balanced with the possibility of not being able to fund the transportation infrastructure required for new growth.

These and other relationships should be carefully investigated by the local jurisdiction before proceeding with the implementation of new revenue techniques. If the questions and considerations outlined above are successfully and positively answered, then it will probably

be in the best interest of the community to forge ahead in order to maximize the amount of revenues available for providing new transportation improvements needed for the future.

#### SUMMARY

Chapter II discussed in detail the transportation infrastructure crisis at all government levels. The essential ingredient in solving this crisis is money. Governments, and especially local governments, need more funds to adequately maintain and expand their transportation systems. This chapter explored various methods, traditional and non-traditional, of generating increases in that funding pool or shifting costs for infrastructure needs directly to the persons who benefit from them. What this research did not identify, however, was the types of infrastructure elements that local governments are requiring the private sector to fund or provide. In addition, there was little information on how local governments determined the appropriate level of private sector participation and what types of ordinances, regulations, or policies guided those decisions. Finally, the author was interested to learn how many jurisdictions were currently using, or considering, new and innovative methods of private sector funding. Chapter Four describes the National survey that was conducted to answer these and other questions.

## CHAPTER IV

### LOCAL GOVERNMENT SURVEY

In order to address transportation infrastructure needs and revenue shortfalls, many governmental jurisdictions across the Nation have begun to develop new ordinances, regulations, and policies that attempt to closely tie the need for new and expanded infrastructure to the economic growth that creates that need. Most jurisdictions, especially in high-growth areas, have begun to realize that the traditional methods and amounts of developer participation in transportation system improvements are not adequate to provide reasonable levels of service for the communities future transportation needs, let alone maintain the level of service on existing facilities. As a result, these jurisdictions are attempting to more accurately assess the transportation impacts of individual developments on the infrastructure and require greater participation and/or needed improvements based on these impacts. In general, these jurisdictions are attempting to establish the necessary regulations and governmental authority to fairly assess the impacts of both future and existing development in order to exact the improvements needed for the future and existing transportation systems in their communities.

#### SURVEY NEED

Although a considerable amount of literature addressed the various methods of assessing infrastructure costs to the private

sector, there was very little information available on the types and amounts of specific transportation infrastructure elements assessed to new development. The author was also concerned with the perceived jurisdictional "lack of authority" in exacting or negotiating this private sector participation. In many instances it appeared that local government staff was requiring both significant and varying amounts of private sector participation without adequate and necessary legal support. Another topic not thoroughly addressed in current literature is how jurisdictions determine specific participation levels for individual developments. While use of traffic impact analysis (TIA) has been gaining popularity in addressing these questions, it was not known to what extent TIA's were being required and to what extent they were being used to identify specific levels of developer participation. Another question not answered by the literature review was the current levels of use of specific types of transportation financing methods by local governments to fund their transportation system improvements.

To better understand the relationships discussed above, a survey of current local government practice was considered necessary. Therefore, a survey questionnaire was developed and distributed as described in the following section.

#### SURVEY PROCESS

The cover letter and questionnaire contained in Appendix A was developed in order to gain a thorough understanding of the private

sector assessment and exaction procedures for transportation improvements currently in use by governments across North America. The questionnaire was also used as a vehicle to request copies of jurisdiction's ordinances, regulations, procedures, and other documents that addressed this topic.

A total of 4,103 questionnaires were mailed to members of the Institute of Transportation Engineers (ITE) in the United States, U.S. Territories, and Canada. These individuals were selected by zip code from the 1986 ITE Membership Directory mailing list. The ITE Headquarters office maintains the membership mailing list by zip code area. Rather than attempt to identify specific individuals or jurisdictions to survey, it was considered more efficient to identify the zip codes that contained the desired mailing areas, and then mail to all members within each zip code. This decision resulted in jurisdictions with multiple ITE members receiving multiple questionnaires which increased the probability of receiving a response from those organizations. Additionally, many non-jurisdictional ITE members received questionnaires with this particular mailing technique. This proved to be beneficial to the survey since 58 useful responses were received from consultants, regional planning organizations, transit districts, and university affiliates.

Multiple zip code areas were initially selected from each state (some Canadian cities and U.S. Territories were also included) to represent urbanized areas that would offer the most experience and

latest trends in terms of development pressures and established regulations and policies governing private sector participation. Some states such as Texas, Florida, Arizona, California, Washington, and Colorado were surveyed in their entirety (all members in all zip codes) since each was known to have experienced significant urban growth pressures and contained jurisdictions that had developed new and innovative growth management and infrastructure participation policies.

#### QUESTIONNAIRE RESPONSES

A total of 269 responses were received representing a return rate of 6.6%. The low response rate was felt to be caused by the uniqueness and complexity of the subject and lack of "pre-screening" for the extensive ITE members mailing list. Of the 269 responses, 254 included completed questionnaires. While most responses were from city representatives (138), several other categories of agencies and individuals were also represented. Table IV-1 cross-references all responses by the type of respondent and their geographic location. A higher level of return was achieved from individuals in the higher growth zip code areas which were targeted for the most intense mailing coverage. However, overall 43 states were represented in the survey results along with several Canadian cities, U.S. Samoa, and the District of Columbia. In addition to the 254 questionnaires, 15 letters were received expressing comments and other observations on

TABLE IV-1  
RESPONSE BY LOCATION AND TYPE OF RESPONDENT

| Geographic Location | City Govt. | Cnty. Govt. | Prvt. Consult. | State Govt. | Reg. Plan. Organ. | Transit Organ. | Fed. Govt. | Univ. Affil. | TOTAL |
|---------------------|------------|-------------|----------------|-------------|-------------------|----------------|------------|--------------|-------|
| California          | 38         | 11          | 8              | 1           | 1                 | 1              |            | 2            | 62    |
| Florida             | 13         | 9           | 6              | 1           | 2                 |                |            |              | 31    |
| Texas               | 15         |             | 4              |             |                   |                |            | 2            | 21    |
| Colorado            | 12         | 2           | 2              | 2           | 1                 |                |            |              | 19    |
| Washington          | 6          | 2           | 1              | 1           |                   |                |            |              | 10    |
| Canada              | 4          |             | 1              |             | 1                 | 1              | 1          | 1            | 9     |
| Tennessee           | 4          | 2           | 1              |             |                   |                |            | 1            | 8     |
| Arizona             | 4          | 1           |                | 2           |                   |                |            |              | 7     |
| Maryland            | 4          | 1           | 1              | 1           |                   |                |            |              | 7     |
| Massachusetts       | 1          |             |                | 1           | 4                 |                |            |              | 6     |
| Illinois            | 4          |             |                |             | 1                 |                |            |              | 5     |
| Ohio                | 3          |             |                | 1           | 1                 |                |            |              | 5     |
| Wisconsin           | 3          | 1           |                | 1           |                   |                |            |              | 5     |
| Nebraska            | 1          |             | 2              | 1           |                   |                |            |              | 4     |
| Kentucky            |            |             | 2              | 1           | 1                 |                |            |              | 4     |
| Connecticut         | 2          |             | 1              | 1           |                   |                |            |              | 4     |
| Oregon              | 3          |             |                | 1           |                   |                |            |              | 4     |
| Minnesota           | 3          |             |                |             |                   |                |            |              | 3     |
| Georgia             |            |             | 2              | 1           |                   |                |            |              | 3     |
| Virginia            | 2          |             | 1              |             |                   |                |            |              | 3     |
| Idaho               |            | 1           | 1              | 1           |                   |                |            |              | 3     |
| Michigan            |            | 2           |                |             |                   |                |            |              | 2     |
| Louisiana           | 1          | 1           |                |             |                   |                |            |              | 2     |
| Indiana             | 1          |             |                | 1           |                   |                |            |              | 2     |
| Nevada              | 1          | 1           |                |             |                   |                |            |              | 2     |
| Montana             |            |             | 2              |             |                   |                |            |              | 2     |
| Arkansas            | 2          |             |                |             |                   |                |            |              | 2     |
| Missouri            | 1          |             |                |             | 1                 |                |            |              | 2     |
| Utah                | 1          |             |                |             |                   |                |            |              | 1     |
| Mississippi         | 1          |             |                |             |                   |                |            |              | 1     |
| D.C.                | 1          |             |                |             |                   |                |            |              | 1     |
| New Jersey          |            |             |                |             | 1                 |                |            |              | 1     |
| Amer. Samoa         |            |             |                |             |                   |                | 1          |              | 1     |
| Pennsylvania        |            |             |                | 1           |                   |                |            |              | 1     |
| Oklahoma            | 1          |             |                |             |                   |                |            |              | 1     |
| Iowa                | 1          |             |                |             |                   |                |            |              | 1     |
| New Hampshire       |            |             |                | 1           |                   |                |            |              | 1     |
| Kansas              | 1          |             |                |             |                   |                |            |              | 1     |
| New Mexico          | 1          |             |                |             |                   |                |            |              | 1     |
| Alabama             |            |             |                | 1           |                   |                |            |              | 1     |
| Hawaii              | 1          |             |                |             |                   |                |            |              | 1     |
| North Dakota        |            |             |                | 1           |                   |                |            |              | 1     |
| Alaska              | 1          |             |                |             |                   |                |            |              | 1     |
| South Dakota        | 1          |             |                |             |                   |                |            |              | 1     |
| Vermont             |            |             |                |             | 1                 |                |            |              | 1     |
| TOTAL               | 138        | 34          | 35             | 22          | 15                | 2              | 2          | 6            | 254   |

the subject. Of the 269 responses, 119 had attached ordinances, regulations, procedures, or other policy information to support their responses.

Appendix B is a summary of the responses to all eight questions included in the questionnaire. Table IV-2 stratifies those responses for the eight states, and Canada, that were represented by seven or more completed questionnaires. Not all questions were answered on all forms received. Of the 254 questionnaires returned, between 210 and 235 responses were received for most questions. Listed below is each question, and a brief summary of the responses received, and an analysis of any trends or conclusions drawn from these responses.

Question No. 1.

Does your jurisdiction currently require private sector participation in the funding or construction of transportation improvements?

Of the 228 responses, 91% (208) answered yes. In areas represented by seven or more responses, 96% responded with a yes answer. For areas represented by less than seven responses, the percentage of yes answers was 81%. This relationship indicates that by a large number of jurisdictions have adopted this funding strategy and require private sector participation in transportation improvements, although the percentage appears to be significantly higher in the higher growth areas represented by the greater number of responses.

TABLE IV-2  
QUESTIONNAIRE RESULTS BY AREA

|             | Area   |      |       |      |       |        |       |       |       |       |       |
|-------------|--------|------|-------|------|-------|--------|-------|-------|-------|-------|-------|
| Question    | Calif. | Fla. | Texas | Col. | Wash. | Canada | Tenn. | Ariz. | Mary. | Other | TOTAL |
| Number 1:   |        |      |       |      |       |        |       |       |       |       |       |
| /Yes        | 51     | 29   | 14    | 15   | 12    | 6      | 7     | 6     | 8     | 60    | 208   |
| /No         | 1      | 1    | 1     | 1    | 0     | 1      | 1     | 0     | 0     | 14    | 20    |
| Number 2:   |        |      |       |      |       |        |       |       |       |       |       |
| /Yes        | 39     | 26   | 14    | 12   | 7     | 4      | 3     | 4     | 5     | 33    | 147   |
| /No         | 13     | 4    | 2     | 3    | 4     | 3      | 5     | 2     | 3     | 46    | 85    |
| Number 3:   |        |      |       |      |       |        |       |       |       |       |       |
| Zon./Yes    | 35     | 19   | 6     | 11   | 7     | 2      | 3     | 4     | 5     | 32    | 124   |
| /No         | 16     | 10   | 10    | 6    | 4     | 5      | 5     | 2     | 4     | 45    | 107   |
| Flat/Yes    | 33     | 13   | 3     | 12   | 8     | 2      | 2     | 1     | 4     | 17    | 95    |
| /No         | 18     | 15   | 13    | 5    | 3     | 5      | 6     | 5     | 5     | 60    | 135   |
| B.Pmt./Yes  | 18     | 10   | 0     | 7    | 7     | 2      | 2     | 3     | 1     | 19    | 69    |
| /No         | 32     | 18   | 16    | 10   | 4     | 5      | 6     | 3     | 8     | 58    | 160   |
| Number 4:   |        |      |       |      |       |        |       |       |       |       |       |
| /Yes        | 41     | 30   | 11    | 16   | 10    | 5      | 6     | 5     | 7     | 46    | 177   |
| /No         | 6      | 0    | 1     | 0    | 1     | 2      | 1     | 1     | 1     | 18    | 31    |
| Number 5:   |        |      |       |      |       |        |       |       |       |       |       |
| /Yes        | 32     | 20   | 9     | 11   | 5     | 2      | 3     | 4     | 6     | 31    | 123   |
| /No         | 20     | 8    | 5     | 5    | 5     | 5      | 3     | 2     | 1     | 39    | 93    |
| Number 6:   |        |      |       |      |       |        |       |       |       |       |       |
| A /Yes      | 36     | 8    | 1     | 6    | 7     | 2      | 0     | 2     | 0     | 22    | 84    |
| /No         | 17     | 22   | 15    | 11   | 4     | 5      | 8     | 4     | 9     | 44    | 139   |
| B /Yes      | 11     | 9    | 1     | 5    | 3     | 0      | 0     | 2     | 1     | 15    | 47    |
| /No         | 43     | 21   | 15    | 12   | 8     | 7      | 8     | 4     | 8     | 50    | 176   |
| C /Yes      | 39     | 23   | 4     | 7    | 5     | 2      | 0     | 2     | 5     | 13    | 100   |
| /No         | 15     | 7    | 12    | 10   | 6     | 5      | 8     | 4     | 4     | 63    | 134   |
| D /Yes      | 40     | 24   | 7     | 14   | 8     | 5      | 4     | 4     | 6     | 51    | 163   |
| /No         | 14     | 6    | 9     | 3    | 3     | 2      | 4     | 2     | 3     | 25    | 71    |
| E /Yes      | 20     | 9    | 3     | 6    | 3     | 1      | 1     | 2     | 4     | 18    | 67    |
| /No         | 34     | 21   | 13    | 11   | 8     | 6      | 7     | 4     | 5     | 58    | 167   |
| F /Yes      | 1      | 13   | 0     | 0    | 0     | 0      | 0     | 0     | 0     | 3     | 17    |
| /No         | 53     | 17   | 16    | 17   | 11    | 7      | 8     | 6     | 9     | 73    | 217   |
| G /Yes      | 8      | 2    | 0     | 0    | 0     | 0      | 0     | 0     | 2     | 3     | 15    |
| /No         | 46     | 28   | 16    | 17   | 11    | 7      | 8     | 6     | 7     | 73    | 219   |
| Number 7:   |        |      |       |      |       |        |       |       |       |       |       |
| /Yes        | 30     | 22   | 8     | 10   | 6     | 5      | 4     | 1     | 5     | 33    | 124   |
| /No         | 23     | 6    | 6     | 6    | 5     | 2      | 3     | 5     | 3     | 40    | 99    |
| Number 8:   |        |      |       |      |       |        |       |       |       |       |       |
| /Yes        | 9      | 5    | 2     | 4    | 4     | 2      | 0     | 1     | 2     | 9     | 35    |
| /No         | 27     | 10   | 1     | 3    | 2     | 0      | 3     | 0     | 0     | 31    | 74    |
| No Response | 38     | 15   | 13    | 9    | 5     | 5      | 5     | 5     | 7     | 38    | 126   |

Of the 18 items listed as possible transportation improvements subject to participation, responses varied widely by facility type. On local streets, the items most often noted for participation and assessment were right-of-way/easements, thru-lanes, drainage, curb/gutter, sidewalks, and streetlights. On collector and arterial roadways, the primary items selected were right-of-way/easements, thru-lanes, left and right turn lanes, drainage, curb/gutter, sidewalks, streetlights, traffic signs/markings/signals, and landscaping. Between 10% to 15% of the respondents noted that developers were asked to participate to some extent in funding or constructing freeway facilities. Of the freeway items selected, access ramps, frontage roads and right-of-way were most often noted for participation.

Other items mentioned as participation items beyond the 18 specifically provided were full freeway interchanges, guardrail, utility relocations, bus turnouts, pedestrian bridge/tunnels, and environmental impact studies.

Question No. 2.

Do you have any written regulations/ordinances that define your participation/assessment amounts or procedures?

Of the 232 responses, 63% (147) answered yes. This response is rather alarming since 91% of the respondents stated in Question No. 1 that private sector participation is required. Evidently, many jurisdictions are requiring participation but

lack the necessary or desirable regulations and ordinances to defend and guide those exactions. It is assumed that much of this participation is being negotiated without the benefit of definitive standards or policies. The nine higher-response areas yielded a 75% "yes" response rate while the remaining areas responded at a 42% "yes" rate.

Question No. 3.

Does your jurisdiction currently have regulations/ordinances that require traffic impact analyses (TIA) for new developments at time of zoning, platting, or building permits?

For zoning cases, 54% of the 231 respondents stated that TIA's were required. Forty-one percent (41%) responded that TIA's were required at time of platting (subdivision), and 30% stated that they were required at time of building permit. Several responses indicated that TIA's were also required at time of annexations, site plan reviews, and access permits. As in Question Number 2, the higher-response areas consistently exhibited higher rates of positive responses (TIA's being required) for all three development categories.

Question No. 4.

If traffic impact analyses are performed, are they required to identify needed transportation improvements and/or recommend cost-sharing based upon these impacts?

Of the 208 responses, 85% (177) answered yes. This rate implies that TIA's, when required, are providing useful

information in making decisions for private sector participation in transportation improvements.

Question No. 5.

Are there methods other than traffic impact analysis which define how developments are required to participate in transportation improvements?

Of the 216 responses, 57% (123) responded yes. Most jurisdictions responded by providing detailed ordinances and regulations outlining developer participation based on amount of street frontage, acreage, zoning category, and daily or peak hour traffic generation.

Question No. 6.

Please check any of the following methods used by your jurisdiction to finance transportation system improvements:  
Benefit Assessment Districts, Special Taxing Districts,  
Development fees, Public/Private Negotiations, Private Roads,  
Toll Financing, and Transit Fees.

Of the 234 responses, only "Public/Private Negotiations" was listed by the majority of jurisdictions (73%). Development fees were used by 45% of the respondents while Benefit Assessment Districts were noted in 38% of the responses. Private Roads were shown as being used 30% while Special Taxing Districts were mentioned by 21% of the respondents. Toll Financing and Transit Fees received 8% and 7% usage, respectively.

Question No. 7.

Does your jurisdiction require the "phasing" of development in conjunction with the construction of roadway improvements?

Of the 223 responses, 56% (124) answered yes. While the higher-response areas generally exhibited a higher "yes" rate, the State of Florida yielded the highest response rate of 79%.

Question No. 8.

If your jurisdiction has experienced any major legal or procedural problems in applying private sector participation regulations/ordinances, please describe them.

Of the 235 responses, 54% (126) did not respond while another 31% (74) stated that no problems existed. If combined, these responses indicate that 85% of the respondents have not experienced major legal or procedural problems in their private sector participation processes. Of the 15% who responded that problems had existed, most dealt with the lack of adequate language in their regulations and ordinances to clearly define this participation while others commented that the legal authority simply was not in place to support their current practices. Others implied that political intervention caused participation to be applied unfairly in some cases.

SURVEY RESULTS

The following findings have been drawn from the results of the survey and supporting documentation:

1. While most jurisdictions are requiring developers to participate in transportation system improvements, the amount and scope of these improvements is often less than that needed to fully provide the facilities required by such development.
2. Many jurisdictions are continuing to assess developers for the "basic" transportation needs such as right-of-way, pavement, sidewalks, and traffic signals. Many other transportation needs, such as traffic signs/markings, streetlights, noise attenuation, and other supporting roadway structures are generally being provided by public funds.
3. Many jurisdictions are requiring or negotiating transportation system improvements from developers without the support or benefit of clearly defined exaction ordinances, regulations, or policies.
4. When a traffic impact analysis (TIA) is required in conjunction with a development proposal, and about half the respondents are requiring them, it is being effectively used to identify participation levels in needed improvements.
5. Many jurisdictions are using developer participation policies based on simple numerical or land use relationships that are not clearly tied to the actual transportation facility need created by such development. For example, some policies require participation amounts based solely on the front

footage of a property even though that particular item has no reasonable relationship to traffic generation.

6. While development fees and other innovative financing techniques are gaining popularity in the higher-growth regions, alternative transportation funding methods are not generally being utilized in the remaining sections of the country.
7. Jurisdictions are beginning to regulate new development growth based on the ability to provide the transportation facilities necessary to serve that growth.

#### SUMMARY

The completed questionnaires collectively indicate that there is little consistency across the United States in the application of regulations and policies for private sector participation in transportation improvements. Jurisdictions in areas experiencing extensive growth pressures have generally developed more aggressive and comprehensive exaction policies than those where growth has been slower. It is expected that jurisdictions in the slower-growth regions will adopt more stringent and comprehensive development participation policies as the gap between available public funds and transportation infrastructure maintenance/construction needs grows wider and more visible. The economic concern that "development will go elsewhere" as a result of expanded development participation policies is losing credibility as elected officials become more

concerned with correcting transportation system deficiencies. Although individual local and state laws will always result in diverse approaches to private sector participation policies throughout the United States, it is certain that the trend will be more aggressive and comprehensive regulation of new development to ensure that it "pays a fair share" of future transportation improvements.

As growth in urban areas continues, public and political pressures will mount to at least maintain, if not improve, the current levels of transportation system operation. As discussed in Chapter II, most jurisdictions will not have the available funds to meet those demands. Consequently, it is incumbent on the transportation staff's in those jurisdictions to maximize the revenues for system improvement. Establishing private sector participation policies that maximize private revenues in public facilities is one method of accomplishing this goal. However, if this effort is to be successful a thorough analysis of total system needs is required to (1) establish the fact that funds are inadequate to provide the desired level of transportation service, (2) identify the amount of funds needed to achieve this service level, (3) determine the portion of these funds that is attributable to new growth, and (4) to develop a fair and equitable method of assessing new development for the transportation funding needs that it creates. Chapter V establishes a procedure by which local governments can answer those questions and thereby pursue

the appropriate private sector and other revenue sources to achieve these goals.

## CHAPTER V

### A RECOMMENDED PROCEDURE FOR IDENTIFYING AND FUNDING TRANSPORTATION INFRASTRUCTURE NEEDS

When traditional revenue sources are no longer able to cope with the transportation investments required, it is up to the transportation/public works professionals and elected officials to look for alternative financing methods. One of the first steps that must be taken by local governments if they are to strategically respond to this need is to develop a better understanding of the relationship between their infrastructure needs and revenues. This is a challenging task in most jurisdictions because of either a lack of political interest, absence of clearly defined community goals and objectives, inadequate infrastructure inventories and standards, and lack of growth and growth-related data. The procedural outline provided in the following section will aid local officials interested in analyzing and planning for infrastructure needs within their respective communities.

#### A STRATEGIC INFRASTRUCTURE PLANNING PROCESS

The following steps are fundamental to the goal of establishing needs and revenues for local government transportation systems. Each task is necessary to develop an accurate and defensible transportation facilities plan and revenue strategy to fund that plan.

### 1. Establish Community Goals and Objectives

Elected officials, community leaders, and government staff should work together to establish desired quality of life issues and goals for the transportation system. In most communities, those goals will take the form of broad statements such as "Move people and goods as safely and efficiently as possible along city streets, sidewalks, and bikeways." Other goals typically address maximizing transportation safety, providing convenience to the public, facilitating economic growth, minimizing environmental impacts, protecting residential neighborhood integrity, facilitating transit, and other important quality of life issues. Some goals can become very objective such as establishing specific maximum congestion levels or accident rates for various street segments or classifications.

### 2. Inventory Existing Infrastructure and Needs

This process would include the inventory of all existing transportation infrastructure facilities and some evaluation of their current condition and need with regard to the previously established goals and objectives. This information is necessary to accurately forecast maintenance, operating and capital investment needs.

### 3. Project Future Street System Demand (Capacity Needs)

This is an important and basic task of the urban transportation planning process whereby growth in population and employment is projected for incremental years to some long-term or build-out horizon, travel demand is estimated and assigned to various transportation modes, traffic volumes and other system demands are estimated, and then this demand is assigned to the appropriate mode choice and travel corridors. The travel demand is then compared to the existing and planned facilities based on some level of travel performance or adequacy in order to determine future improvement needs to meet these desired service levels and objectives.

### 4. Determine Other Transportation Infrastructure Needs

In this step the various community standards and adequacy levels established in Step 1 are applied to the existing transportation infrastructure to determine what capital needs beyond capacity improvements should be programmed for the future. Specifically, these projects can address needs and issues such as safety problems, geometric design deficiencies, residential traffic management actions, economic growth enhancement, environmental concerns, improved levels of pedestrian and bicycle facilities, and construction to facilitate transit service. All of these capital needs

are in addition to those identified in the pure capacity analysis of Step 3 but are essential to meeting community goals since they may also represent a significant capital expenditure need for the future.

5. Identify and Assess Political and Feasibility Constraints to Identified Capital Needs

To this point, the improvements identified for capacity and other capital needs have not been analyzed in cost/benefit terms or the practical and political ability to provide them. Therefore, this step in the process suggests that the government staff and/or elected representatives identify those projects that either will not, or can not, be expected to occur under any set of circumstances. This may result in some very needy and worthwhile projects being eliminated from consideration simply due to political concerns. Therefore, it is strongly suggested that the impacts of eliminating any project be fully considered prior to removing it from further consideration.

6. Identify Other Long-Term Transportation Infrastructure Needs

This portion of the process will identify the routine and continuing elements of operating and maintaining the various transportation infrastructure systems. This step is very important in that it ensures that existing capital improvements and future capital improvements are adequately

operated and maintained for full effectiveness and cost-efficiency. This will include, for example, very costly projects such as the repaving or reconstruction of existing streets and, at the other extreme, relatively inexpensive projects such as signing and marking maintenance.

7. Assign Initial and Continuing Costs

In this step appropriate costs will be estimated for all projects and programs necessary to operate, maintain, and construct/reconstruct new or existing capital improvements. These cost projections should ultimately be indexed to inflation and identify all anticipated needs up to the planning horizon year.

8. Prioritize Programs

At this time a prioritization ranking technique should be developed to establish the overall importance of the particular project or program to the community. This ranking process can include both objective and subjective data and should be based on the goals and objectives established in Step 1. For example, it is relatively straight forward to estimate and rank newer construction projects based on relative improvements in capacity, but it is very difficult to quantify improvements in safety or reductions in accident rates.

#### 9. Structure Long-Range Improvements Plan

This step in the process requires that all programs and projects be set into a optimum schedule necessary to meet the needs and goals of the community throughout the planning period. The scheduling of these projects is not constrained by funding at this point but does attempt to recognize the time periods during which improvements are actually needed to serve projected needs and growth. At the end of this process, a total estimated annual cost for transportation infrastructure capital, operation, and maintenance needs will be obtained.

#### 10. Forecast Normal Recurring Revenue Sources

At this point the normal and expected revenues available to fund local transportation infrastructure improvements and operation are forecasted throughout the planning horizon. This will identify the maximum amount of funds that can reasonably be expected to finance future infrastructure programs.

#### 11. Compare Desired Versus Expected Revenues

At this point the difference between the desired transportation funding needs and expected funding resources can be identified. In most jurisdictions this analysis is expected to indicate a revenue shortfall condition.

12. Establish Fundamental Financing Philosophy

At this point the city's financial experts and elected representatives should decide upon the jurisdiction's desired future financing strategy. The primary decision to be made is whether or not the city will adopt a pay-as-you-go strategy or incur future debt to provide infrastructure earlier than would be normally afforded. If a funding shortfall exists and it is decided that up-front borrowing is desired, a debt carrying capacity study will ultimately need to be performed for the jurisdiction.

13. Identify Alternative Funding Sources

At this time all new revenue-producing techniques and innovative financing methods should be identified and explored. Preliminary projections should be made for each alternative to determine the expected reasonable amounts of new revenue to be generated by both the public and private sector methods.

14. Select New Revenue Sources

Based on the information obtained in Step 13, a future revenue plan should be developed which generates the desired funding levels to address the expected shortfall identified in Step 11. It may require that some new revenue-generating techniques are adopted immediately while others are enacted over time.

15. Respond to Funding Shortfall

If projected traditional revenue sources and planned new revenue sources still do not match the desired funding needs of Step 9, the following alternatives should be studied: (a) develop a strategy to reduce future transportation needs, (b) manage the pace of future transportation growth so that it corresponds to the level of transportation improvements provided by available funds, or (c) make the decision to accept less than desirable transportation improvements which will result in either lower levels of service, sub-standard facilities, or reduced quality of life for the community.

16. Analyze Impacts of Funding Shortfall Alternatives

The purpose of this step is simply to analyze the impacts of the funding shortfall alternatives on the community's goals and objectives, so that the elected representatives will understand the full implications of any decision.

17. Develop Action Plan

This step suggests that if the community cannot identify adequate revenue sources, one of the alternatives in Step 15 (or a combination of alternatives) should be adopted. Based on that decision an action plan should be endorsed by the elected officials which implements this decision including any new revenue sources selected in Step 14.

#### 18. Develop Public Information Campaign

Pursuing a comprehensive information campaign is important to build support for the action plan, or at least to minimize the amount of negative public reaction that may be generated by either an increase in revenue sources or a reduction in the community's goals and objectives.

#### SUMMARY

The above procedure, while somewhat idealistic, is ultimately necessary to accurately identify and plan for a community's transportation infrastructure. Developing a comprehensive infrastructure needs analysis has limited benefit without the funding to implement it. Likewise, selecting and funding projects without the benefit of an accurate forecasting and prioritization process often results in poorly timed and designed improvements which are a waste of precious resources. This procedure, if at least followed in concept, will result in an orderly and efficient capital improvements planning and financing plan.

## CHAPTER VI

### CONCLUSIONS AND RECOMMENDATIONS

This research attempted to ascertain the problems and needs of governments responsible for providing transportation infrastructure at the local level. To support this research, a survey was conducted to determine how city, county, state, and other governments are currently identifying and funding their transportation system improvements, and to what extent the private sector is participating in those improvements. The results of the Survey and Literature Review have assisted in understanding the problems currently faced by local governments and the general need for increased revenue sources to address those problems. Because of the importance of revenue in any local government transportation improvement plan, a number of traditional, new and innovative revenue sources were also identified and discussed in the report.

Based on this work, a number of specific conclusions can be drawn.

1. Traffic congestion in urban areas is growing, especially in those major urban areas experiencing rapid and significant growth.
2. No comprehensive Federal, state, or local programs exist to adequately respond to the growing congestion problems in urban areas. Although state and Federal-Aid systems carry

a significant portion of travel in urban areas, funding to improve and maintain those facilities has not kept pace with the growth in travel demand.

3. The expansion and improvement of local government transportation systems has not kept pace with the growth in travel demand. As with the state and Federal governments, local government funding for transportation improvements is inadequate to meet needs today and in the future.
4. The outlook for increasing transportation revenues at the local government level is poor unless new and innovative revenue sources can be identified. These resources will increasingly rely on private sector participation and system user fees and charges.
5. As indicated by the survey results, many jurisdictions are requiring private sector participation in transportation system improvements although they often do not have clearly defined ordinances, regulations, or policies to guide those exactions.
6. According to the survey, many jurisdictions determine private sector participation through detailed traffic impact analysis. Others rely on simple numerical or land use relationships (i.e., acreage or zoning), while many more use a negotiation process on a case-by-case basis.

7. The survey indicates that new and innovative financing techniques are increasingly being utilized in the higher-growth regions of the country, but are being used sparingly in the remaining regions.
8. Many local jurisdictions do not have adequate inventories and plans to assess their current and future transportation system deficiencies and needs. Without this information, it is difficult, if not impossible, to identify future funding needs and pursue them through increased private sector participation or other techniques.

The conclusions listed above indicate that local governments face a significant challenge in providing adequate transportation facilities into the future. To meet that challenge, local governments should develop a procedure whereby they can accurately identify their existing and future infrastructure needs and costs. At a minimum, such a procedure should include:

- . A comprehensive inventory of existing infrastructure facilities.
- . A transportation planning process to establish future needs.
- . A projection of all costs necessary to construct, maintain, and operate the existing and future transportation system.
- . A financial analysis of existing and future revenue sources.
- . A plan to respond to any revenue shortfall or transportation system deficiencies.

### RECOMMENDATIONS FOR FURTHER RESEARCH

While the process outlined above is logical and necessary for developing a comprehensive long-range transportation infrastructure plan, only the larger and more progressive local jurisdictions commonly undertake this level of effort. The transportation engineering profession should attempt to educate and encourage all local jurisdictions to initiate basic infrastructure planning programs. Organizations such as the American Association of State Highway and Transportation Officials, the American Public Works Association, the American Society of Civil Engineers, the Institute of Transportation Engineers, and other professional organizations should be encouraged to develop and promote these programs. In addition, the Federal Highway Administration should be urged to dedicate additional funds to be distributed through local metropolitan planning organizations for local jurisdiction infrastructure planning purposes. An effective campaign by these agencies and organizations would result in a greater understanding of the transportation needs at the local government level and ultimately serve to stimulate interest in addressing those needs in a coordinated and comprehensive manner.

In order to effectively pursue local jurisdiction awareness and technical assistance in these areas, further research is needed in the following areas:

1. While extensive inventories and needs analyses have been conducted for the state and Federal-Aid highway systems, little information is available to define in aggregate form the magnitude and conditions of local jurisdiction street systems and their projected needs. A research effort should be undertaken to develop a National database program for the non-state and non-Federal-Aid street and highway systems.
2. An effort should be undertaken to establish a "handbook" or "guidelines" document to assist local government officials in developing programs to adequately inventory, plan, and fund their current and future transportation infrastructure needs. This document can be used by Federal, state and professional organizations to educate and promote strategic infrastructure planning.
3. Further research should be done to define new and innovative infrastructure financing techniques, quantify their potential for generating revenue at the local government level, and establish recommendations for the selection and implementation of each technique. Such an effort could include development of a "model" local government enabling ordinance for the various techniques.

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## APPENDIXES

SURVEY LETTER AND QUESTIONNAIRE

APPENDIX A



Box 231  
Zip Code 76004-0231  
Arlington Phone  
(817) 275-3271  
Dallas Phone  
(Metro) 265-3311

September 22, 1986

Dear ITE Member:

The City of Arlington, Texas, is investigating alternatives for securing right-of-way and funding for the construction of needed improvements to the City's transportation system. We are specifically interested in establishing the governmental authority and regulations necessary to fairly assess both future and existing development in order to exact those public improvements necessary to address both future and existing transportation system needs. Towards that end, we are requesting your assistance by informing us of experiences you may have had with this subject.

I would like to ask that you take a few minutes to complete the short questionnaire concerning the specific topics of traffic impact assessment, right-of-way exaction, and the associated funding/construction of transportation improvements. We are also asking that you provide, if possible, copies of any ordinances, regulations, procedures, or other documents which further address these issues. If there is a charge for these documents, please let us know.

If there is someone else within your organization that would be better able to respond to this request, we would appreciate your forwarding this information to them. Also, if you are aware of information or experiences outside your organization that may be beneficial to us in researching this topic, we would appreciate your assistance by identifying those sources. Once our research has been completed and a report is finalized, we will be happy to send you a copy if requested.

Your response is appreciated by October 20. If you would like to personally discuss this matter, or if we can clarify our questionnaire in any way, please call me at (817) 459-6352.

Sincerely,

R. Marshall Elizer, Jr.  
Director  
Traffic and Transportation

RME/jkb

Attachment

### Identification, Funding, and Construction of Transportation System Improvements

1. Does your jurisdiction currently require private sector participation in the funding or construction of transportation improvements? \_\_\_\_ Yes \_\_\_\_ No

If so, please check (✓) which of the following items are subject to participation or assessment?

| Item                   | Facility Type            |                          |                          |                          |
|------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
|                        | Freeway                  | Arterial                 | Collector                | Local                    |
| Right-of-Way           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Easement               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Thru-Lanes             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Access Ramps           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Frontage Roads         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Left Turn Lanes        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Right Turn Lanes       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Bridge Structures      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Drainage               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Curb and Gutter        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Sidewalks              | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Bikepaths              | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Traffic Signals        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Traffic Signs/Markings | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Street Lights          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Landscaping            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Noise Attenuation      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Fencing                | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Other: _____           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| _____                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

2. Do you have any written regulations/ordinances that define your participation/assessment amounts or procedures? \_\_\_\_ Yes \_\_\_\_ No

If so, please provide a copy or indicate from whom this information may be obtained: \_\_\_\_\_

3. Does your jurisdiction currently have regulations/ordinances that require traffic impact analyses (TIA) for new developments at time of:

|                  |          |         |
|------------------|----------|---------|
| Zoning           | ____ Yes | ____ No |
| Platting         | ____ Yes | ____ No |
| Building Permits | ____ Yes | ____ No |

Other: \_\_\_\_\_

If you answered YES to any of the above, please provide a copy of any TIA standards/regulations or indicate from whom this information may be obtained: \_\_\_\_\_

4. If traffic impact analyses are performed, are they required to identify needed transportation improvements and/or recommend cost-sharing based upon these impacts? \_\_\_\_ Yes \_\_\_\_ No

If the answer is YES, please describe how this participation is exacted from the developer. (If an "improvements agreement" is required, please attach a sample.)

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5. Are there methods other than traffic impact analysis which define how developments are required to participate in transportation improvements? ☐ Yes ☐ No

If so, please describe this process or attach a copy of the appropriate regulation/ordinance.

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6. Please check (✓) any of the following methods used by your jurisdiction to finance transportation system improvements:

|                              |                              |                             |
|------------------------------|------------------------------|-----------------------------|
| Benefit Assessment Districts | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Special Taxing Districts     | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Development Fees             | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Public/Private Negotiations  | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Private Roads                | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Toll Financing               | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Transit Fees                 | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Other:                       |                              |                             |

If you answered YES to any items, please provide a copy of the enabling regulations/ordinances or indicate from whom this information may be obtained:

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7. Does your jurisdiction require the "phasing" of development in conjunction with the construction of roadway improvements? ☐ Yes ☐ No

If the answer is YES, briefly describe the process: \_\_\_\_\_

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8. If your jurisdiction has experienced any major legal or procedural problems in applying private sector participation regulations/ordinances, please describe them.

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Person filling out form:

Name: \_\_\_\_\_ Phone: \_\_\_\_\_

Organization: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

Check here if you would like a copy of the Summary Report: ☐

Please return by October 19 to:

R. Marshall Eitzer, Jr.  
 Director of Traffic & Transportation  
 City of Arlington  
 P.O. Box 231  
 Arlington, Texas 76010

APPENDIX B  
QUESTIONNAIRE RESULTS

### Questionnaire Results

1. Does your jurisdiction currently require private sector participation in the funding or construction of transportation improvements?

Yes: 208 (91%)      No: 20 (9%)

If so, please check which of the following items are subject to participation or assessment?

| Item                                                                                                                        | Freeway | Arterial | Collector | Local |
|-----------------------------------------------------------------------------------------------------------------------------|---------|----------|-----------|-------|
| A. Right-of-Way                                                                                                             | 31      | 171      | 168       | 157   |
| B. Easement                                                                                                                 | 25      | 132      | 130       | 122   |
| C. Thru-Lanes                                                                                                               | 22      | 123      | 127       | 114   |
| D. Access Ramps                                                                                                             | 40      | 52       | 35        | 29    |
| E. Frontage Roads                                                                                                           | 36      | 73       | 55        | 41    |
| F. Left Turn Lanes                                                                                                          | 20      | 161      | 138       | 76    |
| G. Right Turn Lanes                                                                                                         | 20      | 163      | 137       | 79    |
| H. Bridge Structures                                                                                                        | 29      | 84       | 81        | 71    |
| I. Drainage                                                                                                                 | 27      | 161      | 155       | 145   |
| J. Curb and Gutter                                                                                                          | 24      | 164      | 160       | 152   |
| K. Sidewalks                                                                                                                | 17      | 166      | 162       | 141   |
| L. Bikepaths                                                                                                                | 12      | 82       | 77        | 63    |
| M. Traffic Signals                                                                                                          | 24      | 154      | 132       | 82    |
| N. Traffic Signs/Markings                                                                                                   | 22      | 115      | 109       | 94    |
| O. Street Lights                                                                                                            | 18      | 110      | 108       | 102   |
| P. Landscaping                                                                                                              | 18      | 119      | 103       | 89    |
| Q. Noise Attenuation                                                                                                        | 26      | 57       | 37        | 31    |
| R. Fencing                                                                                                                  | 16      | 74       | 54        | 45    |
| S. Other: Interchange, guardrail, utility re-locating, bus turnout, pedestrian bridge/tunnel, environmental impact studies. |         |          |           |       |

2. Do you have any written regulations/ordinances that define your participation/assessment amounts or procedures?

Yes: 147 (63%)      No: 85 (37%)

3. Does your jurisdiction currently have regulations/ordinances that require traffic impact analyses (TIA) for new developments at time of:

|                  |                |               |
|------------------|----------------|---------------|
| Zoning:          | Yes: 124 (54%) | No: 107 (46%) |
| Platting:        | Yes: 95 (41%)  | No: 135 (59%) |
| Building Permit: | Yes: 69 (30%)  | No: 160 (70%) |

Other: Annexations, Site Plans, Access Permits

Questionnaire Results  
Continued

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4. If traffic impact analyses are performed, are they required to identify needed transportation improvements and/or recommend cost-sharing based upon these impacts?

Yes: 177 (85%)      No: 31 (15%)

5. Are there methods other than traffic impact analysis which define how developments are required to participate in transportation improvements?

Yes: 123 (57%)      No: 93 (43%)

6. Please check any of the following methods used by your jurisdiction to finance transportation system improvements:

|                                 |                |               |
|---------------------------------|----------------|---------------|
| A. Benefit Assessment Districts | Yes: 84 (38%)  | No: 139 (62%) |
| B. Special Taxing Districts     | Yes: 47 (21%)  | No: 176 (79%) |
| C. Development Fees             | Yes: 100 (45%) | No: 134 (55%) |
| D. Public/Private Negotiations  | Yes: 163 (73%) | No: 71 (27%)  |
| E. Private Roads                | Yes: 67 (30%)  | No: 167 (70%) |
| F. Toll Financing               | Yes: 17 (8%)   | No: 217 (92%) |
| G. Transit Fees                 | Yes: 15 (7%)   | No: 219 (93%) |

7. Does your jurisdiction require the "phasing" of development in conjunction with the construction of roadway improvements?

Yes: 124 (56%)      No: 99 (44%)

8. If your jurisdiction has experienced any major legal or procedural problems in applying private sector participation regulations/ordinances, please describe them.

Yes: 35 (15%)      No: 74 (31%)      No Response: 126 (54%)

For those answering Yes, the types of problems noted involved lack of ordinances, inadequate ordinances, and political intervention.

## VITA

Robert Marshall Elizer, Jr., was born in Nashville, Tennessee, on August 31, 1952. He attended public schools in that city and was graduated from Bellevue High School in June 1970. Later in that same month he entered the University of Tennessee, Martin and by June 1972 had completed two years of undergraduate study in Civil Engineering. The following September he entered the University of Tennessee, Knoxville, and received a Bachelor of Science Degree in Civil Engineering in December 1974. In the winter of 1975 he accepted a research assistantship from the Civil Engineering Department at the University of Tennessee, Knoxville and also enrolled in the Masters Program in the Department of Civil Engineering.

Later in 1975 he accepted a traffic engineer position with the City of Knoxville, Tennessee. In 1978 he became Transportation Engineering Planner for the East Tennessee Development District based in Knoxville, Tennessee. In 1979 he became Transportation Planner for the City of Lakewood, Colorado and later was appointed Traffic Engineer. He remained in Lakewood until September of 1985 when he was appointed Director of Transportation for the City of Arlington, Texas.

The author is registered as a Professional Engineer in the States of Texas and Colorado. He is a member of the Institute of Transportation Engineers, Urban Land Institute and the American Public Works Association. He also serves as a technical member of the National Committee on Uniform Traffic Control Devices and has

participated in several Technical Committee efforts on behalf of the Institute of Transportation Engineers.