URBAN TRANSPORTATION PLANNING

IN THE UNITED STATES:

AN HISTORICAL OVERVIEW

FIFTH EDITION

EDWARD WEINER

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PREFACE

Urban transportation planning is carried out primarily by state and local agencies. Over the years, much experience has been gained in the planning and evaluation of urban transportation systems. This knowledge can be useful to planners and decision makers in the development and implementation of transportation system changes. In this context, it is important to understand the transportation and planning options which have been tried, and how they developed into the approaches we have today. This report describes the evolution of urban transportation planning over the last sixty years.

This is the Fifth Edition of this report which was first published in 1983. The earlier edition discussed urban transportation planning to mid-1992. This edition updates the evolution of urban transportation planning and policy to mid-1997. It also contains some additions and revisions to the earlier edition. This report is an updated version of "Evolution of Urban Transportation Planning" which was first published in 1979 as Chapter 15 in *Public Transportation: Planning, Operations and Management*, edited by George E. Gray and Lester L. Hoel. It was revised and published in 1992 as Chapter 3 in *Public Transportation*, Second Edition, edited by George E. Gray and Lester L. Hoel.

The report focuses on key events in the evolution of urban transportation planning including developments in technical procedures, philosophy, processes and institutions. But, planners must also be aware of changes in legislation, policy, regulations and technology. These events have been included to provide a more complete picture of the forces that have affected and often continue to affect urban transportation planning.

Summarizing so much history in a single report requires difficult choices. The efforts of many individuals and groups made important contributions to the development of urban transportation planning. Clearly, not all of these contributions could be included or cited. This report concentrates on the key events of national significance and thereby tries to capture the overall evolution of urban transportation planning. Focusing on key events also serves as a convenient point to discuss developments in a particular area.

The report is generally arranged chronologically. Each period is titled with the major theme pervading that period as viewed by the author. Not all key events fit precisely under a particular theme, but many do. The discussion of the background for some events or the follow-on activities for others may cover more than one time period and is placed where it seemed most relevant.

The report takes a multimodal perspective and attempts to provide a balanced view among a number of subject areas including:

- Significant Federal legislation
- Major, relevant Federal regulations and policies
- Highway concerns
- Transit concerns
- Environmental issues
- Energy issues
- Safety issues

Relevant conferences
Technological developments
Transportation service alternatives
Manuals and methodological developments
National transportation studies
National data resources
Local events with national significance

Over the years, the author has discussed these events with many persons in the profession. Often they had participated in or had first hand knowledge of the events. The author appreciates their assistance, even though they are too numerous to mention specifically.

In preparing this report, the author was directly aided by several individuals who provided information on specific events. Their assistance is appreciated: Barry Berlin, Susan Binder, Norman Cooper, Frederick W. Ducca, Sheldon H. Edner, Christopher R. Fleet, Charles A. Hedges, Donald Igo, Anthony R. Kane, Thomas Koslowski, Ira Laster, William M. Lyons, James J. McDonnell, Florence Mills, Camille C. Mittelholtz, Norman Paulhus, Elizabeth A. Parker, John Peak, Sam Rea, Carl Rappaport, James A. Scott, Mary Lynn Tischer, Martin Wachs, Jimmy Yu, and Samuel Zimmerman.

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Any errors of fact or interpretation are the responsibility of the author.

Edward Weiner
Washington, DC
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CHAPTER 1 — INTRODUCTION

More than thirty years have passed since the Federal-Aid Highway Act of 1962 created the federal mandate for urban transportation planning in the United States. The act was the capstone of two decades of experimentation and development of urban transportation procedures and institutions. It was passed at a time in which urban areas were beginning to plan National Interstate and Defense Highway System routes through and around their areas. The 1962 Act combined with the incentive of 90 percent federal funding for Interstate highway projects caused urban transportation planning to spread quickly throughout the United States. It also had a significant influence on urban transportation planning in other parts of the world.

In some ways, the urban transportation planning process and planning techniques have changed little over the thirty years. Yet, in other ways, urban transportation planning has evolved over these years in response to changing issues, conditions and values, and a greater understanding of urban transportation phenomena. Current urban transportation planning practice is considerably more sophisticated, complex, and costly than its highway planning predecessor, and involves a wider range of participants in the process.

Modifications in the planning process took many years to evolve. As new concerns and issues arose, changes in planning techniques and processes were introduced. These modifications sought to make the planning process more responsive and sensitive to those areas of concern. Urban areas that had the resources and technical ability were the first to develop and adopt new concepts and techniques. These new ideas were diffused by various means throughout the nation, usually with the assistance of the federal government and professional associations. The rate at which the new concepts were accepted varied from area to area. Consequently, the quality and depth of planning is highly variable at any point in time.

Early highway planning concentrated on developing a network of all weather highways connecting the various portions of the nation. As this work was being accomplished, the problems of serving increasing traffic grew. With the planning for urban areas came additional problems of dispersed land use development patterns, dislocation of homes and businesses, environmental degradation, citizen participation, energy consumption, transportation for the disadvantaged, and infrastructure deterioration. More recently have been the concerns about and traffic congestion, intermodal connectivity, performance measures, sustainable development, and environmental justice.

Urban transportation planning in the United States has always been conducted by state and local agencies. This is entirely appropriate since highway and transit facilities and services are owned and operated largely by the states and local agencies. The role of the federal government has been to set national policy, provide financial aid, supply technical assistance and training, and conduct research. Over the years, the federal government has attached requirements to its financial assistance. From a planning perspective, the most important has been the requirement that transportation projects in urbanized areas of 50,000 or more in population be based on an urban transportation planning process. This requirement was first incorporated into the Federal-Aid Highway Act of 1962.

Other requirements have been incorporated into federal legislation and regulations over the years. Many of these are chronicled in this report. At times these requirements have been very exacting in their detail. At

other times, greater flexibility was allowed in responding to the requirements. Currently, the emphasis is on increasing state and local flexibility in planning implementation, and in making the planning process more inclusive for all groups and individuals.

Over the years, a number of federal agencies have affected urban transportation planning. (Table 1) The U.S. Bureau of Public Roads (BPR) was part of the U.S. Department of Commerce when the 1962 Highway Act was passed. It became part of the U.S. Department of Transportation (DOT) upon its creation in 1966 and its name was changed to the U.S. Federal Highway Administration (FHWA). The federal urban mass transportation program began in 1961 under the U.S. Housing and Home Finance Administration, which became the U.S. Department of Housing and Urban Development in 1965. The federal urban transit program was transferred to DOT in 1968 as the U.S.

Table 1
Dates Selected Federal Agencies Were Established

1849	Department of Interior
1913	Department of Commerce
1916	Bureau of Public Roads
1921	Bureau of the Budget
1947	Housing and Home Finance Agency
1953	Department of Health, Education and Welfare
1965	Department of Housing and Urban Development
1966	Department of Transportation
1966	Federal Highway Administration
1966	Federal Railroad Administration
1966	Advisory Council on Historic Preservation
1967	National Highway Safety Bureau
1968	Urban Mass Transportation Administration
1969	Council on Environmental Quality
1970	National Highway Traffic Safety Administration
1970	Office of Management and Budget
1970	Environmental Protection Agency
1977	Department of Energy
1979	Department of Health and Human Services
1991	Federal Transit Administration

1991	Bureau of Transportation Statistics

Urban Mass Transportation Administration (UMTA). The name was changed to the U.S. Federal Transit Administration (FTA) by the Federal Transit Act Amendments of 1991. The U.S. Federal Railroad Administration (FRA) was created at the same time as DOT.

The National Traffic and Motor Vehicle Safety Act of 1966 established the National Traffic Safety Agency, and the Highway Safety Act of 1966 established the National Highway Safety Agency both in the Department of Commerce. The two safety agencies were combined by Executive Order 11357 in 1967 into the National Highway Safety Bureau in the newly created DOT. In 1970 it became the National Highway Traffic Safety Administration (NHTSA).

Other federal agencies became involved in urban transportation planning as new issues arose. The Advisory Council on Historic Preservation was established in 1966 to administer national historic preservation programs. The Bureau of the Budget (BOB), later to become the Office of Management and Budget (OMB), issued guidance in 1969 to improve coordination among programs funded by the federal government. To address environmental concerns that were increasing in the latter part of the 1960s, the Council on Environmental Quality (CEQ) was created in 1969 and the U.S. Environmental Protection Agency (EPA) in 1970. The U.S. Department of Health, Education and Welfare (HEW), now the U.S. Department of Health and Human Services (HHS), became involved in urban transportation in 1973 as part of its function to eliminate discrimination against handicapped persons in federal programs. With the passage if the Endangered Species Act of 1973, the Department of Interior and the Department of Commerce became involved in some aspects of urban transportation planning. In 1977, the U.S. Department of Energy (DOE) was created to bring together federal energy functions. The Bureau of Transportation Statistics (BTS) was created by the Intermodal Surface Transportation Efficiency Act of 1991.

The involvement of these and other agencies at the federal, state and local level created an increasing challenge to agencies conducting urban transportation planning to meet all the requirements that resulted. Local planners devoted substantial resources to meeting requirements of higher level governments, which often detracted from their ability to address local needs and objectives. These requirements, however, were also used by local agencies as the justification to carry out activities that they desired but for which they could not obtain support at the local level.

This report reviews the historical development of the urban transportation planning process in the United States from its beginnings in early highway and transit planning to its current focus on intermodal connectivity, sustainable development, and broad participation in the planning process.

Chapter 2 discusses the early beginnings of highway planning.

Chapter 3 covers the formative years of urban transportation planning during which many of the basic concepts were developed.

Chapter 4 focuses on the 1962 Federal-Aid Highway Act and the sweeping changes it brought in urban transportation planning in the United States. It also describes early federal involvement in urban public transportation.

Chapter 5 discusses efforts at intergovernmental coordination, the beginning of the federal highway and vehicle safety programs, a deeper federal role in urban public transportation and the evolution to "continuing" transportation planning.

Chapter 6 describes the environmental revolution of the late 1960s and the increased involvement of citizens in the urban transportation planning process.

Chapter 7 addresses the events that led to integrated planning for urban public transportation and highways. These included major increases in federal transit programs as well as increased flexibility in the use of highway funds.

Chapter 8 focuses on the Arab oil embargo of 1973 which accelerated the transition from long-term system planning to short-term, smaller scale planning. It also discusses the concern for cost-effectiveness in transportation decisions and the emphasis on transportation system management techniques.

Chapter 9 highlights the concern for the revitalization of older urban centers and the growing need for energy conservation. It describes the expanding federal requirements on environmental quality and transportation for special groups.

Chapter 10 describes the efforts to reverse federal intrusion into local decisions and to scale back federal requirements.

Chapter 11 discusses the expanded interest in involving the private sector in the provision of transportation services and the decline in public resources to address transportation planning.

Chapter 12 focuses on strategic planning to the year 2000 and into the next century, and the renewed interest in new technological options. It also discusses the growing concern for traffic congestion and air pollution and the efforts at transportation demand management.

Chapter 13 describes the broadening of the urban transportation planning process to address the relationship of transportation to sustainable development, the inclusion of a wide range of participants in the process including individuals and citizen groups, and the extension of multimodal n planning to the statewide level.

Chapter 14 provides a summary and concluding remarks.

CHAPTER 2 — EARLY HIGHWAY PLANNING

Early highway planning grew out the need for information on the rising tide of automobile and truck usage during the first quarter of the twentieth century. From 1904, when the first automobiles ventured out of the cities, traffic grew at a steady and rapid rate. After the initial period of highway construction which connected many of the nation's cities, emphasis shifted to improving the highway system to carry these increased traffic loads. Early highway planning focused on the collection and analysis of factual information and, on applying that information to the growing highway problems in the period prior to World War II.

Need for Highway Planning

In the early years of highway construction, the automobile had been regarded as a pleasure vehicle rather than an important means of transportation. Consequently, highways consisted of comparatively short sections that were built from the cities into the countryside. There were significant gaps in many important intercity routes. During this period, urban roads were considered to be adequate, particularly in comparison to rural roads which were generally not paved.

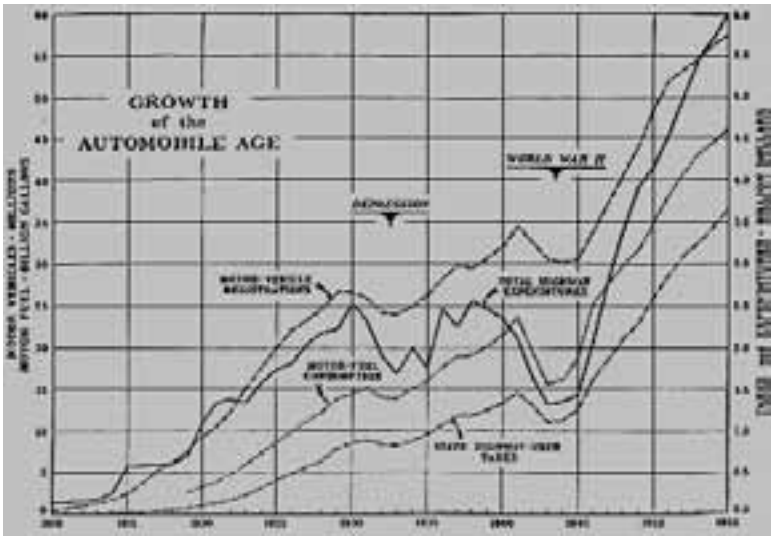
As the automobile was improved and ownership became more widespread, the idea of a highway network gained in strength. The concept of a continuous national system of highways was recognized in the Federal-Aid Highway Act of 1925 with the adoption of a United States numbered highway system composed of important through routes extending entirely across the nation. This was not a formal highway system but simply a basis for route marking as a guide for motorists (Holmes and Lynch, 1957).

With the adoption of a Federal-aid system, in the Federal-Aid Act of 1921, and the marking of through routes, the focus of highway construction was on “closing the gaps.” By the early 1930s, the objective of constructing a system of two-lane roads connecting the centers of population had largely been completed. It was then possible to travel around the country on a smooth, all-weather highway system (U.S. Federal Works Agency, 1949).

With the completion of this “pioneering period" of highway construction, attention shifted to the more complex issues resulting from the rapid growth in traffic and increasing vehicle weights. Figure 1 shows the growth in vehicle registrations, motor fuel consumption, highway expenditures and tax receipts during the period (U.S. Dept. of Commerce, 1954). Early highways were inadequate in width, grade and alignment to serve major traffic loads, and highway pavements had not been designed to carry the numbers and weights of the newer trucks.

It became clear that these growing problems necessitated the collection and analysis of information on highways and their use on a more comprehensive scale than had ever before been attempted (Holmes and Lynch, 1957). A systematic approach to the planning of highways was needed to respond to these problems.

Figure 1
Motor Vehicle Registrations, Fuel Consumption, User Taxes and Highway Expenditures, 1910-1955



Federal-Aid Highway Act of 1934

Beginning with the Federal-Aid Highway Act of 1934, the Congress authorized that 1½ percent of the amount apportioned to any state annually for construction could be used for surveys, plans, engineering, and economic analyses for future highway construction projects. The act created the cooperative arrangement between the U.S. Bureau of Public Roads (now the U.S. Federal Highway Administration) and the state highway departments, known as the statewide highway planning surveys. By 1940, all states were participating in this program (Holmes and Lynch, 1957).

As an initial activity, these highway planning surveys included a complete inventory and mapping of the highway system and its physical characteristics. Traffic surveys were undertaken to determine the volume of traffic by vehicle type, weight, and dimensions. Financial studies were made to determine the relationship of highway finances to other financial operations within each state, to assess the ability of the states to finance the construction and operation of the highway system, and to indicate how to allocate highway taxes among the users. Many of the same types of activities are still being performed on a continuing basis by highway agencies (Holmes, 1962).

Electric Railway Presidents' Conference Committee

Electric railway systems were the backbone of urban mass transportation by World War I with over 1,000 street railway companies carrying some 11 billion passengers by 1917 (Mills, 1975). After 1923, ridership on the nation's electric railways began to decline as the motor bus, with its flexibility to change routes and lower capital costs, quickly began replacing the electric the electric streetcar (N.D. Lea Transportation

Research Corporation, 1975). With rising costs and the inability to raise fares to cover costs, the financial condition of street railway companies worsened.

In 1930, the heads of 25 electric railway companies formed the Electric Railway Presidents' Conference Committee (PCC). The goal of the PCC was to develop a modern streetcar to match the comfort, performance, and modern image of its competitors, and stem the decline of the street railway industry. The effort took five years and $750,000. It was one of the most thorough and efficiently organized ventures in urban mass transit. The product, known as the "PCC car," far surpassed its predecessors in acceleration, braking, passenger comfort, and noise (Mills, 1975).

The first commercial application of the PCC car was in 1935 in Brooklyn, New York. By 1940 more than 1100 vehicles had been purchased. By 1952, when production was first halted, about 6,000 PCC cars had been produced. The PCC cars did improve the competitive position of streetcars and slow the conversion to buses. But without other improvements, such as exclusive rights of way, it could not stop the long term decline in street railways. By 1960, streetcars remained in only about a dozen cities in the U.S. (Vuchic, 1981).

Manual on Uniform Traffic Control Devices

As the highway system was expanded and upgraded to meet the growth in automobile traffic, the need for high uniform standards for traffic control devices became obvious. These traffic control devices included signs, traffic signals, markings and other devices placed on, over, or adjacent to a street or highway by a public body to guide, warn, or regulate traffic. In 1927, the American Association of State Highway Officials published the *Manual and Specifications for the Manufacture, Display and Erection of U.S. Standard Road Markers and Signs*. The manual was developed for application of rural highways. Then, in 1929, the National Conference of Street and Highway Safety published a manual for use on urban streets.

But the necessity for unification of the standards applicable to different classes of road and street systems was obvious. To meet that need, a joint committee of the AASHO and the National Conference of Street and Highway Safety combined their efforts and developed the first *Manual on Uniform Traffic Control Devices* which was published by the BPR in 1935.

Over the years since that first manual, the problems and needs of traffic control changed. New solutions and devices were developed, as well as the standards to guide their application. The original joint committee continued its existence with occasional changes in organization and personnel. In 1972, the Committee formally became the National Advisory Committee on Uniform Traffic Control Devices to the FHWA. The Committee has been responsible for periodic revisions to update and expand the manual in 1942, 1948, 1961, 1971, 1978 and 1988 (U.S. Dept. of Transportation, 1978b; Upchurch, 1989).

AASHO Policy on Geometric Design of Rural Highways

As new knowledge became available on the performance of vehicles and highway design features, there was a need to incorporate it into practice. The Committee on Planning and Design Policies of the American Association of State Highway Officials (AASHO) was formed in 1937 for this purpose. The committee's mode of operation was to outline a program of work which was performed by the BPR under the supervision of the Committee Secretary. The BPR gathered known information and developed draft guidance, known a policies, which were revised by the committee. The policies were finally approved by a two-thirds favorable vote of the States.

In the period 1938 to 1944 the Committee under Secretary Joseph Barnett produced seven policies related to highway classification, highway types, sight distance, signing, and intersection design for at-grade, rotaries and grade separations. These policies were reprinted without change and bound as a single volume in 1950 (American Association of State Highway Officials, 1950).

The policies were updated, expanded and rewritten as a single cohesive document and issued as *A Policy on Geometric Design of Rural Highways* in 1954 (American Association of State Highway Officials, 1954). The policy contained design guidance on the criteria determining highway design, vertical and horizontal alignment, cross section elements, at-grade and grade intersections, and interchanges. The volume, which became known as the "Blue Book," went through seven printings by 1965. It received wide acceptance as the standard guide for highway design. The policy was again reissued in 1966 in revised and updated form to reflect more current information (American Association of State Highway Officials, 1966).

Much of the material in the 1954 Rural Policy applied both to urban and rural highways. As new data and research results became available on urban highways, the AASHO Committee decided to issued a separate policy for the geometric design of urban highways (American Association of State Highway Officials, 1957).

The development of these policies typified the approach to highways standards. Research engineers collected data on the performance of vehicles and highways. These data were brought together in the form of design standards, generally by staff of the BPR under the guidance of the AASHO. Eventually, they became part of highway design practice through agreement of the States. As a result of their factual basis and adoption through common agreement, the policies had immense influence on the design of highways in the United States and abroad.

Toll Road Study

By the mid 1930s, there was considerable sentiment for a few long-distance, controlled-access highways connecting major cities. Advocates of such a highway system assumed that the public would be willing to finance much of its cost by tolls. The U.S. Bureau of Public Roads was requested by President Roosevelt in 1937 to study the idea, and two years later it published the report, *Toll Roads and Free Roads* (U.S. Congress, 1939).

The study recommended the construction of a highway system to be comprised of direct, interregional highways with all necessary connections through and around cities. It concluded that this nationwide highway system could not be financed solely through tolls, even though certain sections could. It also

recommended the creation of a Federal Land Authority empowered to acquire, hold, sell, and lease land. The report emphasized the problem of transportation within major cities and used the city of Baltimore as an example (Holmes, 1973).

Highway Capacity Manual

During the 1920's and early 1930's, a number of studies were conducted to determine the capacity of highways to carry traffic. Early efforts were theoretical but, gradually, fields studies using observers, cameras and aerial surveys created a body of empirical data on which to base capacity estimates. By 1934, it was clear that a coordinated effort was needed to integrate the results of the various studies and to collect and analyze additional data. The BPR launched such an effort from 1934 to 1937 to collect a large quantity of data on a wide variety of roads under different conditions (Cron, 1975a).

In 1944, the Highway Research Board organized a Committee on Highway Capacity to coordinate the work in this field. Its chairman, O.K. Normann, was the foremost researcher on highway capacity at that time. By 1949, the Committee had succeeded in reducing the enormous volume of factual information on highway capacity to a form that would be usable to highway designers and traffic engineers. The results were first published in *Public Roads* magazine, and then as a separate volume entitled, the *Highway Capacity Manual* (U.S. Dept. of Commerce, 1950). The manual defined capacity, and presented methods for calculating it for various types of highways and elements under different conditions. This manual quickly became the standard for highway design and planning. More than 26,000 copies of the manual were sold, and it was translated into nine other languages.

The Committee on Highway Capacity was reactivated in 1953, again with O.K. Normann as chairman, to continue the study of highway capacity and prepare a new edition of the manual. Much of the work was done by the staff of the BPR. The new manual, which was issued in 1965, placed new emphasis on freeways, ramps, and weaving sections because they had come into widespread use. A chapter on bus transit was also added. Other types of highways and streets continued to receive complete coverage. This manual, like its predecessor, was primarily a practical guide. It described methods to estimate capacity, service volume, or level of service for a specific highway design under specific conditions. Alternately, the design to carry a given traffic demand could be determined (Highway Research Board, 1965).

The third edition the Highway Capacity Manual was published by the Transportation Research Board in 1985. It reflected over two decades of empirical research by a number of research agencies primarily under the sponsorship of the National Cooperative Highway Research Program and the FHWA. The procedures and methodologies were divided into three sections on freeways, rural highways, and urban streets with detailed procedures and work sheets. The material in the third edition offered significantly revised procedures in many of the areas, and included entirely new sections on pedestrians and bicycles (Transportation Research Board, 1985c and 1994).

Interregional Highway Report

In April 1941, President Roosevelt appointed the National Interregional Highway Committee to investigate the need for a limited system of national highways to improve the facilities available for interregional transportation. The staff work was done by the U.S. Public Roads Administration, which was the name of the Bureau of Public Roads at that time, and in 1944 the findings were published in the report, *Interregional Highways* (U.S. Congress, 1944). A system of highways, designated as the "National System of Interstate and Defense Highways," was recommended and authorized in the Federal-Aid Highway Act of 1944. However, it was not until the Federal-Aid Highway Act of 1956 that any significant work on the system began.

This study was unique in the annals of transportation planning and the implementation of its findings has had profound effects on American lifestyles and industry. The study brought planners, engineers, and economists together with the highway officials responsible for implementing highway programs. The final route choices were influenced as much by strategic necessity and such factors as population density, concentrations of manufacturing activity, and agricultural production as by existing and future traffic (Holmes, 1973).

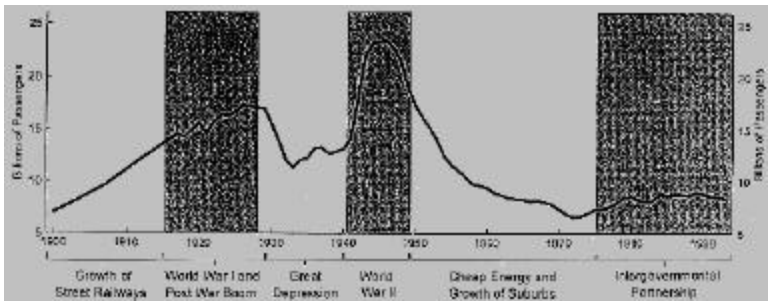
The importance of the system within cities was recognized, but it was not intended that these highways serve urban commuter travel demands in the major cities. As stated in the report, "...it is important, both locally and nationally, to recognize the recommended system...as that system and those routes which best and most directly join region to region and major city to major city" (U.S. Congress, 1944).

The report recognized the need to coordinate with other modes of transportation and for cooperation at all levels of government. It reiterated the need for a Federal Land Authority with the power of excess condemnation and similar authorities at the state level.

CHAPTER 3 — BEGINNINGS OF URBAN TRANSPORTATION PLANNING

During World War II, regular highway programs stopped. Highway materials and personnel were used to build access roads for war production and military needs. With rationing of gasoline and tires, and no new automobiles being manufactured, the use of transit mushroomed. Between 1941 and 1946, transit ridership grew by 65 percent to an all-time high of 23.4 billion trips annually (American Public Transit Association, 1995). (Figure 2)

Figure 2



Major Trends of Transit Ridership
Transit Ridership, 1900-1990

When the war came to an end, the pent-up demand for homes and automobiles ushered in the suburban boom era. Automobile production jumped from a mere 70,000 in 1945 to 2.1 million in 1946, 3.5 million, and 3.5 million in 1947. Highway travel reached its prewar peak by 1946 and began to climb at 6 percent per year that was to continue for decades (Dept. of Transportation, 1979a). Transit use, on the other hand, declined at about the same rate it had increased during the war. By 1953, there were fewer than 14 billion transit trips annually (Transportation Research Board, 1987).

The nation's highways were in poor shape to handle this increasing load of traffic. Little had been done during the war to improve the highways and wartime traffic had exacerbated their condition. Moreover, the growth of development in the suburbs occurred where highways did not have the capacity to carry the resulting traffic. Suburban traffic quickly overwhelmed the existing two-lane formerly rural roads (Dept. of Transportation, 1979a). Transit facilities, too, experienced significant wear and tear during the war from extended use and deferred maintenance. This resulted in deterioration in transit's physical plant by war's end. Pent-up wage demands of transit employees were met causing nearly a 50 percent in average fares by 1950. This further contributed to a decline in ridership. These factors combined to cause serious financial problems for many transit companies (Transportation Research Board, 1987).

The postwar era concentrated on dealing with the problems resulting from suburban growth and resulting from the return to a peacetime economy. Many of the planning activities which had to be deferred during the war resumed with renewed vigor.

Federal-Aid Highway Act of 1944

The Federal-Aid Highway Act of 1944 was passed in anticipation of the transition to a postwar economy and to prepare for the expected growth in traffic. The act significantly increased the funds authorized for federal-aid highway programs from $137,500 in 1942 and 1943, no funds in 1944 and 1945, to $500,000 annually for 1946 through 1948. The act also recognized the growing complexity of the highway program.

The original 7 percent federal-aid highway program was renamed the Federal-aid Primary system, and selection by the states of a Federal-aid Secondary system of farm-to-market and feeder roads was authorized. Federal-aid funding was authorized in three parts, known as the "ABC" program with 45 percent for the Primary system, 30 percent for the Secondary system, and 25 percent for Urban extensions of the Primary and Secondary systems.

The act continued the allocation of funds by means of formulas. For the Primary system, funds were allocated using area, total population, and postal route miles as factors. For the Secondary system, the same formula was used except that rural population was substituted for total population. For the urban extensions, Urban population was the only factor. For the first time, federal-aid funds up to one-third the cost could be used to acquire right-of-way.

A National System of Interstate Highways of 40,000 miles was authorized. The routes were selected by the states with BPR approval. However, but no special funds were provided to build the system beyond regular federal-aid authorizations.

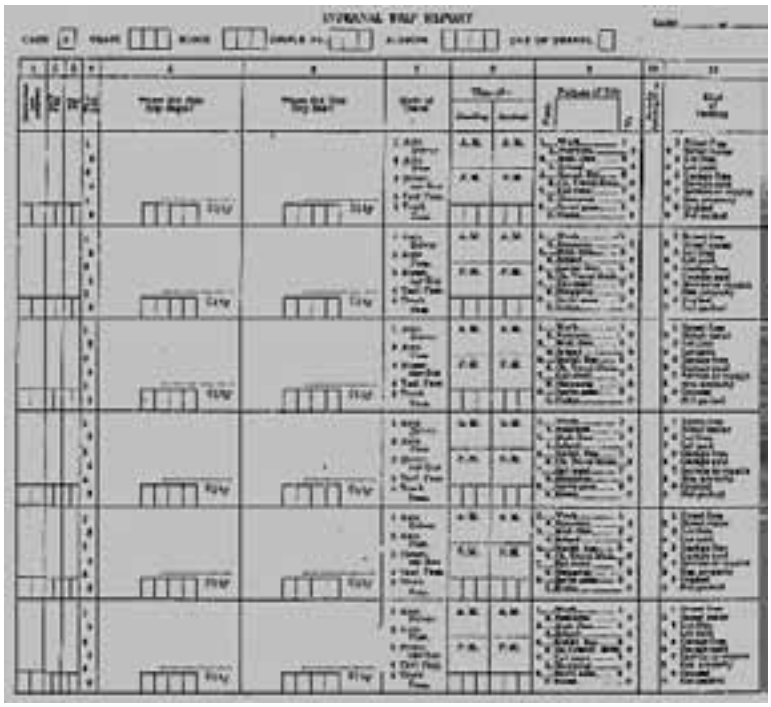
Early Urban Travel Surveys

Most urban areas did not begin urban travel surveys until 1944. It was during that year the Federal-Aid Highway Act authorized the expenditure of funds on urban extensions of the federal-aid primary and secondary highway systems. Until that time there was a lack of information on urban travel which could be used for the planning of highway facilities. In fact, no comprehensive survey methods had been developed that could provide the required information. Because of the complex nature of urban street systems and the shifting of travel from route to route, traffic volumes were not a satisfactory guide to needed improvements. A study of the origins and destinations of trips and the basic factors affecting travel was needed (Holmes and Lynch, 1957).

The method developed to meet this need was the home-interview origin- destination survey. Household members were interviewed to obtain information on the number, purpose, mode, origin, and destination of all trips made on a particular day. These urban travel surveys were used in the planning of highway facilities, particularly expressway systems, and in determining design features. The U.S. Bureau of Public Roads published the first, *Manual of Procedures for Home Interview Traffic Studies*, in 1944 (U.S. Dept. of Commerce, 1944). Figure 3 shows the internal trip report form from a home interview survey. In 1944, the interviewing technique was used in Tulsa, Little Rock, New Orleans, Kansas City, Memphis, Savannah, and Lincoln.

Other elements of the urban transportation planning process were also being developed and applied in pioneering traffic planning studies. New concepts and techniques were being generated and refined in such areas as traffic counting, highway inventories and classification, highway capacity, pavement condition studies, cost estimating and system planning. The first attempt to meld many of these elements into an urban transportation planning process was in the Cleveland Regional Area Traffic Study in 1927, which was sponsored by the U.S. Bureau of Public Roads. But, even in this study, traffic forecasting was a crude art using basically linear projections (Cron, 1975b).

Figure 3



In the Boston Transportation Study, a rudimentary form of the gravity model was applied to forecast traffic in 1926 but the technique was not used in other areas. In fact, the 1930s saw little advancement in the techniques of urban transportation planning. It was during this period that the methodology of highway needs and financial studies was developed and expanded (U.S. Dept. of Transportation, 1979a).

By the 1940s it was apparent that if certain relationships between land use and travel could be measured, these relationships could be used as a means to project future travel. It remained for the development of the computer, with its ability to process large masses of data from these surveys, to permit estimation of these relationships between travel, land use, and other factors. The first major test using this approach to develop future highway plans was during the early 1950s in San Juan, Puerto Rico, and in Detroit (Silver and Stowers, 1964; Detroit Metropolitan Area Traffic Study, 1955/6).

Early Transit Planning

During this period, transit planning was being carried out by operators as part of the regular activities of operating a transit system. Federal assistance was not available for planning or construction, and little federal interest existed in transit. However, financial problems increased as transit ridership declined and there were no funds available to rehabilitate facilities and equipment. In some urban areas, transit authorities were created to take over and operate the transit system. The Chicago Transit Authority and the Metropolitan Transit Authority in Boston were created in 1947, and the New York City Transit Authority in 1955.

It was at this time that the San Francisco Bay area began planning for a regional rapid transit system. In 1956, the Rapid Transit Commission proposed a 123 mile system in a five-county area. As a result of this study, the Bay Area Transit District (BARTD) was formed within the five counties. BARTD completed the planning for the transit system and conducted preliminary engineering and financial studies. In November 1962, the voters approved a bond issue to build a three-county, 75-mile system, totally with local funds (Homburger, 1967).

Dawn of Analytical Methods

Prior to the early 1950s, the results of early origin-destination studies were used primarily for describing existing travel patterns, usually in the form of trip origins and destinations and by "desire lines," indicating schematically the major spatial distribution of trips. Future urban travel volumes were developed by extending the past traffic growth rate into the future, merely an extrapolation technique. Some transportation studies used no projections of any sort and emphasized only the alleviation of existing traffic problems (U.S. Dept. of Transportation, 1967b).

Beginning in the early 1950s, new ideas and techniques were being rapidly generated for application in urban transportation planning. In 1950, the Highway Research Board published *Route Selection and Traffic Assignment* (Campbell, 1950), which was a compendium of correspondence summarizing practices in identifying traffic desire lines and linking origin-destination pairs. By the mid 1950s, Thomas Fratar at the Cleveland Transportation Study developed a computer method for distributing future origin-destination travel data using growth factors. In 1956 the Eno Foundation for Highway Traffic Control published *Highway Traffic Estimation* (Schmidt and Campbell, 1956), which documented the state of the art and highlighted the Fratar technique.

During this period the U.S. Bureau of Public Roads (BPR) sponsored a study on traffic generation at Columbia University, which was conducted by Robert Mitchell and Chester Rapkin. It was directed at improving the understanding of the relationship between travel and land use through empirical methods and included both persons and goods movement. Mitchell and Rapkin state as a major premise of their study:

"Despite the considerable amount of attention given in various countries to movement between place of residence and place of work, the subject has not been given the special emphasis suggested here; that is, to view trips between home and workplace as a "system of movement," changes in which may be related to

land use change and to other changes in related systems of urban action or in the social structure" (Mitchell and Rapkin, 1954, Page 65).
They demonstrated an early understanding of many of the variables that effect travel patterns and behavior; for example:

> "Systems of round trips from places of residence vary with the sex composition and age of the individual members of the household. The travel patterns of single individuals, young married couples, families with young children, and households consisting of aging persons all show marked differences in travel behavior" (Ibid., page 70).

They also anticipated the contribution of social science methods to the understanding of travel behavior:

> "However, inquiry into the motivations of travel and their correspondence with both behavior and the actual events which are consequences of travel would make great contributions to understanding why this behavior occurs, and thus to increase the possibility of predicting behavior" (Ibid., Page 54).

They concluded with a framework for analyzing travel patterns that included developing analytical relationships for land use and travel and then forecasting them as the basis for designing future transportation requirements.

AASHO Manual on User Benefit Analysis

Toward the end of the 1940s, the AASHO Committee on Planning and Design Policies, with the assistance of BPR, undertook the development of generally applicable analytical techniques for performing economic analysis of highway projects. The work grew out of a survey of state highway departments on the use of economic analysis which found a definite lack of similarity in the such procedures and their use (American Association of State Highway Officials, 1960).

Building upon earlier work on highway economic analysis, the committee developed a manual for conducting benefit - cost analyses (American Association of State Highway Officials, 1952b). The basic tenet of the manual was "...that a profit should be returned on an investment applies as well to highway projects as to general business ventures." Unlike previous methods of analysis which only measured construction, right of way, and maintenance costs, the manual included the costs to the user of the highway as a necessary and integral part of the economic analysis. Up to the publication, no data existed to perform such an analysis.

The manual defined the benefit to cost ratio as the difference in road user costs (between alternate routes) divided by the difference in costs. Road user costs included: fuel, other operating costs (i.e. oil, tires, maintenance, depreciation), time value, comfort and convenience, vehicle ownership costs, and safety. The value of time was specified at $1.35 per vehicle hour or $0.75 per person hour. The value of comfort and convenience was included as an increasing cost for greater interference with the trip and varying according to the type of road. It ranged from 0 cents per mile for the best conditions to 1.0 cents per mile for the

worst conditions. The manual included tables and charts containing specific values for these components of costs and benefits, and the procedures to conduct benefit - cost analyses.

The manual was updated in 1960 with the same analytical methodology but new unit cost data (American Association of State Highway Officials, 1960). A major update of the manual was issued in 1977 after a number of research efforts had been completed on analytical techniques and unit cost data (American Association of State Highway Officials, 1978). The manual was also expanded to address bus transit improvements. The manual recognized that benefit-cost analysis was only an element in the evaluation of transportation projects and that it fit within the larger urban transportation planning process.

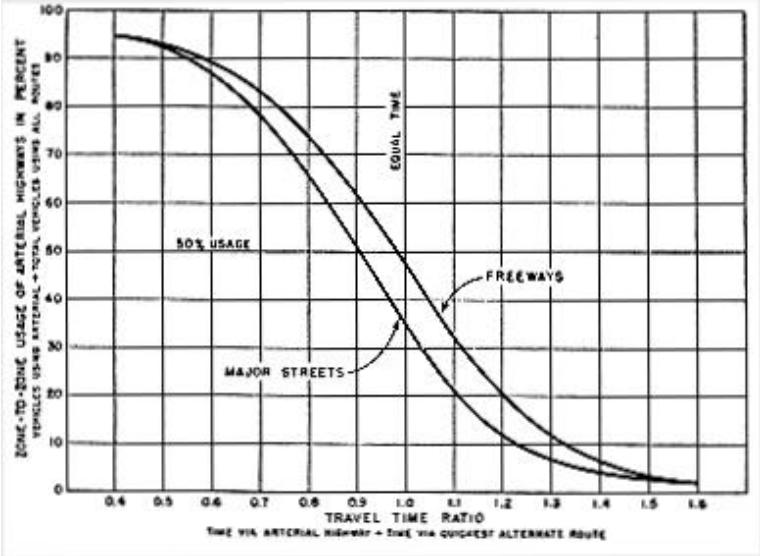
Breakthroughs in Analytical Techniques

The first breakthrough in using an analytical technique for travel forecasting came in 1955 with the publication of a paper entitled, "A General Theory of Traffic Movement," by Alan M. Voorhees (Voorhees, 1956). Voorhees advanced the gravity model as the means to link land use with urban traffic flows. Research had been proceeding for a number of years on a gravity theory for human interaction. Previously, the gravity analogy had been applied by sociologists and geographers to explain population movements. Voorhees used origin-destination survey data with driving time as the measure of spatial separation and estimated the exponents for a three-trip purpose gravity model. Others conducting similar studies soon corroborated these results (U.S. Dept. of Commerce, 1963a).

Another breakthrough soon followed in the area of traffic assignment. The primary difficulty in traffic assignment was evaluating the driver's choice of route between the origin and destination. Earl Campbell of the Highway Research Board proposed an "S" curve, which related the percent usage of a particular facility to a travel-time ratio. A number of empirical studies were undertaken to evaluate the theory using diversion of traffic to new expressways from arterial streets. From these studies, the American Association of State Highway Officials published a standard traffic diversion curve in, "A Basis for Estimating Traffic Diversion to New Highways in Urban Areas," in 1952. (Figure 4) However, traffic assignment was still largely a mechanical process requiring judgment (U.S. Dept. of Commerce, 1964).

Then in 1957 two papers were presented that discussed a minimum impedance algorithm for networks. One was titled, "The Shortest Path Through a Maze," by Edward F. Moore, and the second was, "The Shortest Route Problem," by George B. Danzig. With such an algorithm, travel could then be assigned to minimum time paths using newly developed computers. The staff of the Chicago Area Transportation Study under Dr. J. Douglas Carroll, Jr. finally developed and refined computer programs that allowed the assignment of traffic for the entire Chicago region (U.S. Dept. of Commerce, 1964).

Figure 4



Traffic Diversion Curves for Urban Arterial Highways

National Committee on Urban Transportation

While highway departments were placing major emphasis on arterial routes, city street congestion was steadily worsening. It was in this atmosphere that the Committee on Urban Transportation was created in 1954. Its purpose was, "to help cities do a better job of transportation planning through systematic collection of basic facts ... to afford the public the best possible transportation at the least possible cost and aid in accomplishing desirable goals of urban renewal and sound urban growth" (National Committee, 1958-59).

The committee was composed of experts in a wide range of fields, representing federal, state, and city governments, transit, and other interests. It developed a guidebook, *Better Transportation for Your City* (National Committee, 1958-59), designed to help local officials establish an orderly program of urban transportation planning. It was supplemented by a series of 17 procedure manuals describing techniques for planning highway, transit, and terminal improvements. The guidebook and manuals received national recognition. Even though the guidebook was primarily intended for the attention of local officials, it stressed the need for cooperative action, full communication between professionals and decisionmakers, and the development of transportation systems in keeping with the broad objectives of community development. It provided, for the first time, fully documented procedures for systematic transportation planning.

Housing Act of 1954

An important cornerstone of the federal policy concerning urban planning was Section 701 of the Housing Act of 1954. The act demonstrated congressional concern with urban problems and recognition of the urban planning process as an appropriate approach to dealing with such problems. Section 701 authorized the provision of federal planning assistance to state planning agencies, cities, and other municipalities having

a population of less than 50,000 persons and, after further amendments, to metropolitan and regional planning agencies (Washington Center, 1970).

The intent of the act was to encourage an orderly process of urban planning to address the problems associated with urban growth and the formulation of local plans and policies. The act indicated that planning should occur on a region-wide basis within the framework of comprehensive planning.

Pioneering Urban Transportation Studies

The developments in analytical methodology began to be applied in pioneering urban transportation studies in the late 1940s and during the 1950s. Before these studies, urban transportation planning was based on existing travel demands or on travel forecasts using uniform growth factors applied on an areawide basis.

The San Juan, Puerto Rico, transportation study begun in 1948, was one of the earliest to use a trip generation approach to forecast trips. Trip generation rates were developed for a series of land-use categories stratified by general location, crude intensity measures and type of activity. These rates were applied, with some modifications, to the projected land use plan (Silver and Stowers, 1964).

The Detroit Metropolitan Area Traffic Study (DMATS) put together all the elements of an urban transportation study for the first time. It was conducted from 1953 to 1955 under Executive Director Dr. J. Douglas Carroll, Jr. The DMATS staff developed trip generation rates by land use category for each zone. Future trips were estimated from a land use forecast. The trip distribution model was a variant of the gravity model with airline distance as the factor to measure travel friction. Traffic assignment was carried out with speed and distance ratio curves. Much of the work was done by hand with the aid of tabulating machines for some of the calculations. Benefit/cost ratios were used to evaluate the major elements of the expressway network (Detroit Metropolitan Area Traffic Study, 1955/1956; Silver and Stowers, 1964; Creighton, 1970).

In 1955 the Chicago Area Transportation Study (CATS) began under the direction of Dr. J. Douglas Carroll, Jr. It set the standard for future urban transportation studies. The lessons learned in Detroit were applied in Chicago with greater sophistication. CATS used the basic six-step procedure pioneered in Detroit: data collection, forecasts, goal formulation, preparation of network proposals, testing of proposals, and evaluation of proposals. Transportation networks were developed to serve travel generated by projected land-use patterns. They were tested using systems analysis considering the effect of each facility on other facilities in the network. Networks were evaluated based on economic efficiency - the maximum amount of travel carried at the least cost. CATS used trip generation, trip distribution, modal split, and traffic assignment models for travel forecasting. A simple land-use forecasting procedure was employed to forecast future land-use and activity patterns. The CATS staff made major advances in the use of the computer in travel forecasting (Chicago Area Transportation Study, 1959/1962; Swerdloff and Stowers, 1966; Wells, et. al., 1970).

Other transportation studies followed including the Washington Area Traffic Study in 1955, the Baltimore Transportation Study in 1957, the Pittsburgh Area Transportation Study (PATS) in 1958, the Hartford

Area Traffic Study in 1958, and the Penn-Jersey (Philadelphia) Transportation Study in 1959. All of these studies were transportation planning on a new scale. They were region-wide, multidisciplinary undertakings involving large full-time staffs. Urban transportation studies were carried out by ad hoc organizations with separate policy committees. They were not directly connected to any unit of government. Generally, these urban transportation studies were established for a limited time period with the objective of producing a plan and reporting on it. Such undertakings would have been impossible before the availability of computers (Creighton, 1970).

The resulting plans were heavily oriented to regional highway networks based primarily on the criteria of economic costs and benefits. Transit was given secondary consideration. New facilities were evaluated against traffic engineering improvements. Little consideration was given to regulatory or pricing approaches, or new technologies (Wells, et.al., 1970).

These pioneering urban transportation studies set the content and tone for future studies. They provided the basis for the federal guidelines that were issued in the following decade.

Federal-Aid Highway Act of 1956

During this early period in the development of urban transportation planning came the Federal-Aid Highway Act of 1956. The act launched the largest public works program yet undertaken: construction of the National System of Interstate and Defense Highways. The act was the culmination of two decades of studies and negotiation. As a result of the *Interregional Highways* report, Congress had adopted a National System of Interstate Highways not to exceed 40,000 miles in the Federal-Aid Highway Act of 1944. However, money was not authorized for construction of the system. Based on the recommendations of the U.S. Bureau of Public Roads and the Department of Defense, a 37,700-mile system was adopted in 1947. (Figure 5) This network consisted primarily of the most heavily traveled routes of the Federal-Aid Primary System. The remaining 2,300 miles were reserved for additional radials, bypass-loops, and circumferential routes in and adjacent to urban areas. Studies of urban area needs were made by the states with the cooperation and aid of city officials. The urban connections were formally designated in 1955 (U.S. Dept. of Commerce, 1957).

Funds were appropriated by then, but at very low levels: $25 million annually for 1952 and 1953 with a 50 percent federal share, and $175 million annually for 1954 and beyond with a 60 percent federal share. To secure a significant increase in funding, a major national lobbying effort was launched in 1952 by the Highway Users Conference under the title, "Project Adequate Roads." President Eisenhower appointed a national advisory committee under General Lucius D. Clay, which produced a report, *A Ten-Year National Highway Program*, in 1955. It recommended building a 37,000-mile Interstate System using bonds to fund the $23 billion cost (Kuehn, 1976).

Finally, with the Federal-Aid Highway Act of 1956, construction of the National System of Interstate and Defense Highways shifted into high gear. The act increased the authorized system extent to 41,000 miles. This system was planned to link 90 percent of the cities with populations of 50,000 or greater and many smaller cities and towns. The act also authorized the expenditure of $24.8 billion in 13 fiscal years from

1957 to 1969 at a 90 percent federal share. The act provided construction standards and maximum sizes and weights of vehicles that could operate on the system. The system was to be completed by 1972 (Kuehn, 1976).

Figure 5

The "National System of Interstate Highways" as designated on August 2, 1947.

The companion Highway Revenue Act of 1956 increased federal taxes on gasoline and other motor fuels and excise taxes on tires and established new taxes on retreaded tires and a weight tax on heavy trucks and buses. It created the Highway Trust Fund to receive the tax revenue which was dedicated solely for highway purposes. This provision broke with a long-standing congressional precedent not to earmark taxes for specific authorized purposes (U.S. Dept. of Commerce, 1957).

These acts have had a profound effect on urban areas. They established an assured funding source for highways, through user charges, at a time when federal funds were not available for mass transportation. They set a 90 percent federal share which was far above the existing 50 percent share for other federal-aid highways. About 20 percent of the system mileage was designated as urban to provide alternative interstate service into, through, and around urban areas. These provisions dominated urban transportation planning for years to come and eventually caused the development of countervailing forces to balance the urban highway program.

Sagamore Conference on Highways and Urban Development

The availability of large amounts of funds from the 1956 Act brought immediate response to develop action programs. To encourage the cooperative development of highway plans and programs, a conference was held in 1958 in the Sagamore Center at Syracuse University (Sagamore, 1958).

The conference focused on the need to conduct the planning of urban transportation, including public transportation, on a region-wide, comprehensive basis in a manner that supported the orderly development of the urban areas. The conference report recognized that urban transportation plans should be evaluated through a grand accounting of benefits and costs that included both user and nonuser impacts.

The conference recommendations were endorsed and their implementation urged, but progress was slow. The larger urban areas were carrying out pioneering urban transportation studies, the most noteworthy being the CATS. But few of the smaller urban areas had begun planning studies due to the lack of capable staff to perform urban transportation planning.

To encourage smaller areas to begin planning efforts, the American Municipal Association, the American Association of State Highway Officials, and the National Association of County Officials jointly launched a program in early 1962 to describe and explain how to carry out urban transportation planning. This program was initially directed at urban areas under 250,000 in population (Holmes, 1973).

Housing Act of 1961

The first piece of federal legislation to deal explicitly with urban mass transportation was the Housing Act of 1961. This act was passed largely as a result of the growing financial difficulties with commuter rail services. The act inaugurated a small, low-interest loan program for acquisitions and capital improvements for mass transit systems and a demonstration program (Washington Center, 1970).

The act also contained a provision for making federal planning assistance available for "preparation of comprehensive urban transportation surveys, studies, and plans to aid in solving problems of traffic congestion, facilitating the circulation of people and goods on metropolitan and other urban areas and reducing transportation needs." The act permitted federal aid to "facilitate comprehensive planning for urban development, including coordinated transportation systems, on a continuing basis." These provisions of the act amended the Section 701 planning program that was created by the Housing Act of 1954.

CHAPTER 4 — URBAN TRANSPORTATION PLANNING COMES OF AGE

Urban transportation planning came of age with the passage of the Federal-Aid Highway Act of 1962, which required that approval of any federal-aid highway project in an urbanized area of 50,000 or more in population be based on a continuing, comprehensive urban transportation planning process carried out cooperatively by states and local governments. This was the first legislative mandate requiring planning as a condition to receiving federal capital assistance funds. The U.S. Bureau of Public Roads (BPR) moved quickly to issue technical guidance interpreting the act's provisions.

Through the mid 1960s urban transportation planning went through what some have called its "golden age." Most urban areas were planning their regional highway system and urban transportation planning methodology had been designed to address this issue. The BPR carried out an extensive program of research, technical assistance and training to foster the adoption of this process and the new methodologies. These efforts completely transformed the manner in which urban transportation planning was performed. By the legislated deadline of July 1, 1965, all 224 then existing urbanized areas that fell under the 1962 Act had a urban transportation planning process underway.

This was also a period in which there was early recognition of the need for a federal role in urban mass transportation. This role, however, was to remain limited for a number of years to come.

Joint Report on Urban Mass Transportation

In March 1962 a joint report on urban mass transportation was submitted to President Kennedy, at his request, by the Secretary of Commerce and the Housing and Home Finance Administrator (U.S. Congress, Senate, l962). This report integrated the objectives for highways and mass transit, which were comparatively independent up to that point but growing closer through cooperative activities. The report was in large part based on a study completed in 1961 by the Institute of Public Administration (IPA) entitled *Urban Transportation and Public Policy* (Fitch, 1964). The IPA report strongly recommended that urban transportation was a federal concern and supported the need for transportation planning.

The general thrust of the report to Congress, as it related to planning, can be summarized by the following excerpt from the transmittal letter:

> "Transportation is one of the key factors in shaping our cities. As our communities increasingly undertake deliberate measures to guide their development and renewal, we must be sure that transportation planning and construction are integral parts of general development planning and programming. One of our main recommendations is that federal aid for urban transportation should be made available only when urban communities have prepared or are actively preparing up-to-date general plans for the entire urban area which relate transportation plans to land-use and development plans.

"The major objectives of urban transportation policy are the achievement of sound land-use patterns, the assurance of transportation facilities for all segments of the population, the improvement of overall traffic

flow, and the meeting of total transportation needs at minimum cost. Only a balanced transportation system can attain these goals - and in many urban areas this means an extensive mass transportation network fully integrated with the highway and street system. But mass transportation in recent years experienced capital consumption rather than expansion. A cycle of fare increases and service cuts to offset loss of ridership followed by further declines in use points clearly to the need for a substantial contribution of public funds to support needed mass transportation improvements. We therefore recommend a new program of grants and loans for urban mass transportation" (U.S. Congress, Senate, l962).

President Kennedy's Transportation Message

In April 1962 President Kennedy delivered his first message to Congress on the subject of transportation. Many of the ideas related to urban transportation in the message drew upon the previously mentioned joint report. The President's message recognized the close relationship between the community development and the need to properly balance the use of private automobiles and mass transportation to help shape and serve urban areas. It also recognized the need to promote economic efficiency and livability of urban areas. It also recommended continued close cooperation between the Department of Commerce and the Housing and Home Finance Administration (HHFA) (Washington Center, l970).

This transportation message opened a new era in urban transportation and led to passage of two landmark pieces of legislation: the Federal-Aid Highway Act of 1962 and the Urban Mass Transportation Act of 1964.

Federal-Aid Highway Act of 1962

The Federal-Aid Highway Act of 1962 was the first piece of federal legislation to mandate urban transportation planning as a condition for receiving federal funds in urbanized areas. It asserted that federal concern in urban transportation was to be integrated with land development and provided a major stimulus to urban transportation planning. Section 9 of the act, which is now Section 134 of Title 23 states:

> "It is declared to be in the national interest to encourage and promote the development of transportation systems embracing various modes of transport in a manner that will serve the states and local communities efficiently and effectively" (U.S. Dept. of Transportation, 1980a).

This statement of policy directly followed from the recommendations of the Sagamore conference and President Kennedy's Transportation Message. Moreover, the section directed the Secretary of Commerce to cooperate with the states:

> "...in the development of long-range highway plans and programs which are properly coordinated with plans for improvements in other affected forms of transportation and which are formulated with due consideration to their probable effect on the future development of the urban area..." (U.S. Dept. of Transportation, 1980a).

The last sentence of the section which required that urban highway construction projects be based upon a planning process, legislated the planning requirement:

> "After July 1, 1965, the Secretary shall not approve under section 105 of this title any programs for projects in any urban area of more than fifty thousand population unless he finds that such projects are based on a continuing, comprehensive transportation planning process carried out cooperatively by states and local communities in conformance with the objectives stated in this section" (U.S. Dept. of Transportation, 1980a).

Two features of the act are particularly significant with respect to the organizational arrangements for carrying out the planning process. First, it called for a planning process in urban areas rather than cities, which set the scale at the metropolitan or regional level. Second, it called for the process to be carried on cooperatively by the states and local communities. Because qualified planning agencies to mount such a transportation planning process were lacking in many urban areas, the BPR required the creation of planning agencies or organizational arrangements that would be capable of carrying out the required planning process. These planning organizations quickly came into being because of the growing momentum of the highway program and the cooperative financing of the planning process by the HHFA and the BPR (Marple, 1969).

In addition, the act restricted the use of the 1-1/2 percent planning and research funds to only those purposes. If not used for planning and research, the state would lose the funds. Previously, a state could request that these funds be used instead for construction. This provision created a permanent, assured funding source for planning and research activities. In addition, the act provided that a state could spend another ½ percent at their option for planning and research activities.

Hershey Conference on Urban Freeways

In response to the growing concern about freeway construction in urban areas, the Hershey Conference on Freeways in the Urban Setting was convened in June 1962 (Freeways, l962). It concluded, "Freeways cannot be planned independently of the areas through which they pass. The planning concept should extend to the entire sector of the city within the environs of the freeway." The conference recommendations reinforced the need to integrate highway planning and urban development.

The findings recognized that this planning should be done as a team effort that draws upon the skills of engineers, architects, city planners, and other specialists. Freeway planning must integrate the freeway with its surroundings. When properly planned, freeways provide an opportunity to shape and structure the urban community in a manner that meets the needs of the people who live, work, and travel in these areas. Further, the planning effort should be carried out in a manner that involves participation by the community (Freeways, l962).

Implementation of the 1962 Federal-Aid Highway Act

The BPR moved quickly to implement the planning requirements of the 1962 Federal-Aid Highway Act. Instructional Memorandum 50-2-63, published in March 1963 (U.S. Dept. of Commerce, 1963c) and later superseded by Policy and Procedure Memorandum 50-9 (U.S. Dept. of Transportation, 1967a), interpreted the act's provisions related to a "continuing, comprehensive, and cooperative" (3C) planning process. "Cooperative" was defined to include not only cooperation between the federal, state, and local levels of government but also among the various agencies within the same level of government. "Continuing" referred to the need to periodically reevaluate and update a transportation plan. "Comprehensive" was defined to include the basic ten elements of a 3C planning process for which inventories and analyses were required. (Table 2)

These memoranda and further refinements and expansions upon them covered all aspects for organizing and carrying out the 3C planning process.

Through its Urban Planning Division, under Garland E. Marple, the BPR carried out a broad program to develop planning procedures and computer programs, write procedural manuals and guides, teach training courses, and provide technical assistance. The effort was aimed at developing urbanized area planning organizations, standardizing, computerizing and applying procedures largely created in the late 1950s, and disseminating knowledge of such procedures.

The BPR defined the various steps in a 3C planning process. These steps had been pioneered by the urban transportation planning studies that were carried out during the 1950s. It was an empirical approach which required a substantial amount of data and several years to complete. The process consisted of: establishing an organization to carry out the planning process; development of local goals and objectives; surveys and inventories of existing conditions and facilities; analyses of current conditions and calibration of forecasting techniques; forecasting of future activity and travel; evaluation of alternative transportation networks resulting in a recommended transportation plan; staging of the transportation plan; and identification of resources to implement it. The product of these 3C planning studies was generally an elaborate report(s) describing the procedures, analyses, alternatives and recommended plans.

Table 2
Ten Basic Elements of a 3C Planning Process

1. Economic factors affecting development
2. Population
3. Land use
4. Transportation facilities including those for mass transportation
5. Travel patterns
6. Terminal and transfer facilities
7. Traffic control features
8. Zoning ordinances, subdivision regulations, building codes, etc.

9.	Financial resources
10.	Social and community-value factors, such as preservation of open space, parks and recreational facilities; preservation of historical sites and buildings; environmental amenities; and aesthetics.

To foster the adoption of these technical procedures, the BPR released a stream of procedural manuals that became the technical standards for many years to come: *Calibrating and Testing a Gravity Model for Any Size Urban Area*, (July 1963); *Calibrating and Testing a Gravity Model with a Small Computer*, (October 1963); *Traffic Assignment Manual*, (June 1964); *Population Forecasting Methods*, (June 1964); *Population, Economic, and Land Use Studies in Urban Transportation Planning*, (July 1964); *The Standard Land Use Coding Manual*, (January 1965); *The Role of Economic Studies in Urban Transportation Planning*, (August 1965); *Traffic Assignment and Distribution for Small Urban Areas*, (September 1965), *Modal Split- Documentation of Nine Methods for Estimating Transit Usage*, (December 1966); and *Guidelines for Trip Generation Analysis*, (June 1967).

The BPR developed a two-week "Urban Transportation Planning Course" that was directed at practicing planners and engineers. It covered organizational issues and technical procedures for carrying out a 3C planning process as it had been conceptualized by the BPR. The course used the BPR manuals as textbooks and supplemented them with lecture notes to keep the information current and to cover material not in manual form. In addition, personnel from the BPR provided hands-on technical assistance to state and local agencies in the applying these new procedures to their own areas.

This effort to define the "3C planning process," to develop techniques for performing the technical activities, and to provide technical assistance completely transformed the manner in which urban transportation planning was performed. By the legislated deadline of July 1, 1965, all the 224 existing urbanized areas which fell under the 1962 Act had an urban transportation planning process underway (Holmes, 1973).

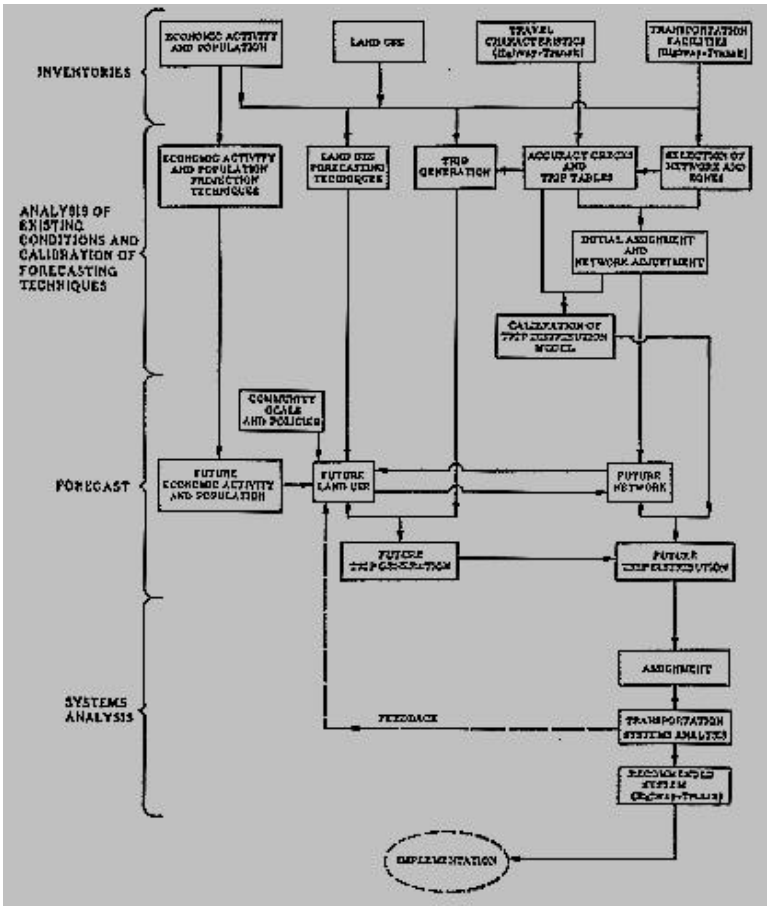
Conventional Urban Travel Forecasting Process

The 3C planning process included four technical phases: collection of data, analysis of data, forecasts of activity and travel, and evaluation of alternatives. Central to this approach was the urban travel forecasting process. (Figure 6) The process used mathematical models that allowed the simulation and forecasting of current and future travel. This permitted the testing and evaluation of alternative transportation networks.

The four-step urban travel forecasting process consisted of trip generation, trip distribution, modal split, and traffic assignment. These models were first calibrated to replicate existing travel using actual survey data. These models were then used to forecast future travel. The forecasting process began with an estimate of the variables that determine travel patterns including the location and intensity of land use, social and economic characteristics of the population, and the type and extent of transportation facilities in the area. Next, these variables were used to estimate the number of trip origins and destinations in each subarea of a region (i.e. the traffic analysis zone), using a trip generation procedure. A trip distribution model was used

to connect the trip ends into an origin-destination trip pattern. This matrix of total vehicle trips was divided into highway and transit trips using a modal split model. The matrices of highway and transit trips were assigned to routes on the highway and transit networks, respectively, by means of a traffic assignment model (U.S. Dept. of Transportation, 1977).

Figure 6
Urban Travel Forecasting Process



In using these models to analyze future transportation networks, forecasts of input variables were used for the year for which the networks were being tested. Travel forecasts were then prepared for each transportation alternative to determine traffic volumes and levels of service. Usually only the modal split and traffic assignment models were rerun for additional networks after a future year forecast had been made for the first network. But occasionally the trip distribution model was also rerun.

Travel forecasting on a regionwide scale required a large computing capability. The first generation of computers had become available in the mid 1950s. The BPR had taken advantage of them and adapted a telephone routing algorithm for traffic assignments purposes that would operate on the IBM 704 computer. Additional programs were developed to perform other functions. The second generation of computers, circa 1962, provided increased capabilities. The library of computer programs was rewritten for the IBM 709 computer and then for the IBM 7090/94 system. The BPR worked with the Bureau of Standards in

developing, modifying, and testing these programs. Some programs were also developed for the IBM 1401 and 1620 computers. This effort was carried out over a number of years, and by 1967 the computer package contained about 60 programs (U.S. Dept. of Transportation, 1977).

This approach to travel forecasting, which later became known as the "conventional urban travel forecasting process," came quickly into widespread use. The procedures had been specifically tailored to the tasks of regionwide urban transportation planning and BPR provided substantial assistance and oversight in applying them. Moreover, there were no other procedures generally available and urban transportation study groups that chose not to use them had to develop their own procedures and computer programs.

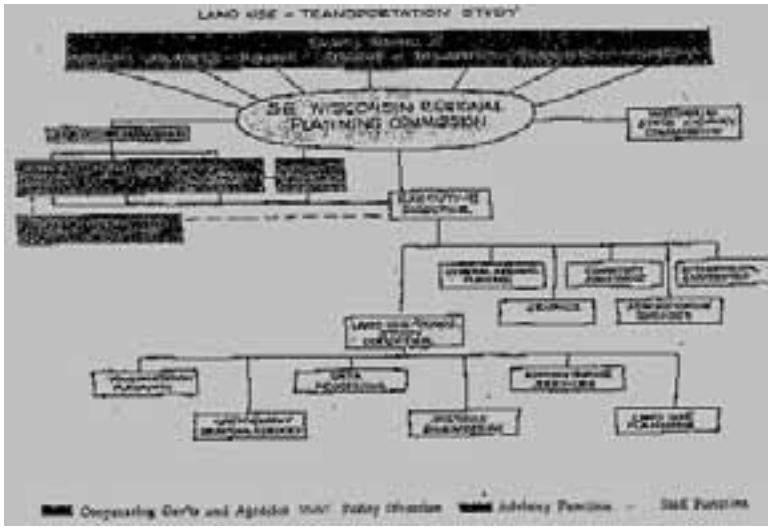
Southeastern Wisconsin Regional Planning Commission

In most urbanized areas, ad hoc organizational arrangements were created to conduct the urban transportation planning process required by the Federal-aid Highway Act of 1962 and the Bureau of Public's guidelines. In some urbanized areas, however, the urban transportation planning process was carried out by existing regional planning agencies. This was the case for the urbanized areas of Milwaukee, Racine and Kenosha in Southeastern Wisconsin.

The Southeastern Wisconsin Regional Planning Commission (SEWRPC) was created under State enabling legislation by Executive Order of the Governor of Wisconsin in 1960 upon petition of the County Boards of the seven constituent counties. It was directed to prepare and adopt master plans for the physical development of the Southeastern Wisconsin region on the basis of studies and analyses. The Commission itself was formed with 21 citizen members, serving for six years without pay, three from each county, with one member from each county appointed by the County Board and the other two members appointed by the Governor (Bauer, 1963).

The Regional Land Use-Transportation Study, which began in 1963, was the Commission's first long-range planning effort. The staff proceeded under the guidance of the Intergovernmental Coordinating and the Technical Coordinating Committees. (Figure 7) The 3 ½ year, $2 million study covered the development of goals and objectives, inventory of existing conditions, preparation and analysis of alternative plans, and selection and adoption of the preferred plan (Southeastern Wisconsin Regional Planning Commission, 1965-66). SEWRPC prepared three alternative land use plans for the year 1990. The "controlled existing trend plan" continued the low-density residential development trend with the imposition of land use controls to minimize leap-frog development and reduce encroachment on environmentally sensitive areas. The "corridor plan" concentrated medium and high density residential development along transportation corridors interlocked with recreation and agriculture wedges. The "satellite city plan" focused new residential development into existing outlying communities in the region. A transportation plan was developed for each of the land use plans which primarily consisted of the existing plus committed highway and transit systems with additions, including an extensive bus rapid transit system with an exclusive busway.

Figure 7
Southeastern Wisconsin Regional Planning Commission



The recommended “controlled existing trend plan" was adopted by the full commission and eventually by most of the county boards and local units of government. In 1966, SEWRPC began the continuing phase of the land use-transportation study which provided support to implement the plan, monitored changes in the region and progress in implementing the adopted plan, and conducted periodic reappraisals of the plan in light of the changes in the region.

In the ensuing years, SEWRPC conducted a wide range of planning studies including those related to: watershed development and water quality, air quality, highway functional classification, public transportation, parks and open space, port development, libraries, airport use, and prepared many local plans in cooperation with the local jurisdictions. Moreover, it provided extensive technical assistance to local governments on a variety of planning issues.

Highway Planning Program Manual

As part of its extensive efforts to provide technical guidance for carrying out highway planning, the BPR developed the *Highway Planning Program Manual*. The manual was designed to consolidate technical information on highway planning practice and make it readily available. Much of that information on highway planning practice and many of the manuals had been developed by the BPR.

The *Highway Planning Program Manual* was first issued in August 1963 (U.S. Dept. of Commerce, 1963d). It was directed primarily at the highway engineers in BPR's field offices who needed information to administer highway planning activities that were being carried out by State highway departments and by urban transportation planning groups with Federal-aid highway planning funds. It also provided valuable information to those performing the actual planning activities in state and local agencies.

The manual covered the basic elements of a highway planning program which included: administration and control, highway inventory, mapping, traffic counting, classifying and weighing, travel studies, motor vehicle registration and taxes, highway fiscal data, road life expectancy and costs, and urban transportation planning. The goal for the overall highway planning process was to develop a master plan for highway development. This was to consist of a functionally classified highway system, an estimate of highway needs, a long range development program to meet the needs with priorities and, a financial plan to pay for the development program.

The section of the manual devoted urban transportation planning to was equally detailed. It covered the various aspects of the urban transportation planning process including: organization, use of computers, origin destination studies, population studies, economic studies, land use, street inventory and classification, evaluation of traffic services, traffic engineering studies, public transportation, terminal facilities, travel forecasting, traffic assignment, developing the transportation plan, plan implementation, and the continuing planning process.

The Federal Highway Administration continued to update the *Highway Planning Program Manual* and add appendices, which included recent version of relevant procedure manuals, until the early 1980's. The manual was eventually rescinded by FHWA in 1985.

Urban Mass Transportation Act of 1964

The first real effort to provide federal assistance for urban mass transportation development was the passage of the Urban Mass Transportation Act of 1964. The objective of the act, still in the spirit of President Kennedy's Transportation Message, was "...to encourage the planning and establishment of areawide urban mass transportation systems needed for economical and desirable urban development" (U.S. Dept. of Transportation, 1979b).

The act authorized federal capital grants for up to two-thirds of the net project cost of construction, reconstruction, or acquisition of mass transportation facilities and equipment. Net project cost was defined as that portion of the total project cost that could not be financed readily from transit revenues. However, the federal share was to be held to 50 percent in those areas that had not completed their comprehensive planning process, that is, had not produced a plan. All federal funds had to be channeled through public agencies. Transit projects were to be initiated locally.

A program of research, development, and demonstrations was also authorized by the 1964 act. The objective of this program was to "...assist in the reduction of transportation needs, the improvement of mass transportation service, or the contribution of such service toward meeting total urban transportation needs at minimum cost" (U.S. Dept. of Transportation, 1979b).

Congress, however, did not authorize much money to carry out this legislation. Not more than $150 million per year was authorized under the 1964 act and the actual appropriations fell short of even that amount (Smerk, 1968).

Urban Development Simulation Models

With the growth of urban transportation planning came an increasing interest in understanding urban phenomena and in constructing urban development simulation models. Such models would enable planners to evaluate alternative urban development patterns, and to produce information on population, employment, and land use for use in estimating travel and transportation requirements. Land use simulation models developed in early urban transportation studies were rudimentary and focused on the effect of transportation access on the location of activities (Swerdloff and Stowers, 1966).

During this period many cities were actively engaged in developing work plans to eliminate slums and urban blight through Community Renewal Programs (CRPs) that were partially funded by the Housing and Home Finance Agency (HHFA). These CRPs provided an additional impetus for the development of urban simulation models. It was as part of one of these CRPs that a significant breakthrough occurred. Between 1962-63, Ira S. Lowry developed a land use allocation model for the Pittsburgh Regional Planning Association as part of a modeling system to generate alternatives and aid decisionmaking (Lowry, 1964).

The "Lowry model," as it came to be known, was the first large scale and complete urban simulation model to become operational. The model was attractive because of the simplicity of its causal structure, the opportunity to expand it, and its operationality (Goldner, 1971). The underlying concept of the model used economic base theory in which employment was divided into "basic" employment that was devoted to goods and services exported outside the region, and "retail" or "non-basic" employment that served local markets. Basic employment was located outside the model, while non-basic employment by the model on the basis of its accessibility to households. Households were located on the basis of accessibility to jobs and availability of vacant land. The model proceeded in an iterative fashion until equilibrium was reached (Putman, 1979).

The conceptual framework developed by Lowry stimulated an era of model development during the mid-1960s, much of which concentrated on elaborations and enhancements of the original Lowry model concepts (Goldner, 1971; Harris, 1965; Putman, 1979). The Lowry model evolved through further development in Pittsburgh and the San Francisco Bay Area Simulation Study, and other efforts by a number of researchers. Most of this work, however, did not result in models that did not become operational (Goldner, 1971). After a period of dormancy, work began anew and resulted in the development of the integrated transportation and land-use package (ITLUP). This set of models performed lad use activity allocation incorporated the effects of transportation and land use and the feedback effects of land use on transportation (Putman, 1983).

Williamsburg Conference on Highways and Urban Development

By 1965 there was concern that planning processes were not adequately evaluating social and community values. Few planning studies had developed goal-based evaluation methodologies. A second conference on Highways and Urban Development was held in Williamsburg, Virginia, to discuss this problem (Highways and Urban Development, 1965). The conference concluded that transportation must be directed toward raising urban standards and enhancing aggregate community values. Transportation values

such as safety, economy, and comfort are part of the total set of community values and should be weighted appropriately.

The conference resolutions highlighted the need to identify urban goals and objectives that should be used to evaluate urban transportation plans. It emphasized that many values may not be quantifiable but, nonetheless, should not be ignored. The conference also endorsed the concept of making maximum use of existing transportation facilities through traffic management and land use controls.

CHAPTER 5 — IMPROVED INTERGOVERNMENTAL COORDINATION

As the number and scope of federal programs for urban development and transportation projects expanded, there was increasing concern over the uncoordinated manner in which these project were being carried out. Each of these federal programs had separate grant requirements which were often development with little regard to the requirements of other programs. Projects proceeded through the approval and implementation process uncoordinated with other projects that were occurring in the same area.

During this period, several actions were taken to alleviate this problem. First, was an attempt to better integrate urban development and transportation programs at the federal level by bringing them together in two new Cabinet level departments, HUD and DOT. Second, was the creation of a project review process to improve intergovernmental coordination at both the federal and local levels. States and local governments also moved to address this problem by consolidating functions and responsibilities. Many states created their own departments of transportation. In addition, states and local communities created broader, multifunctional planning agencies to better coordinate and plan areawide development.

The urban transportation planning process transitioned into the "continuing" phase as most urban areas completed their first plans. There was a new interest in low capital approaches to reducing traffic congestion using techniques such as reserved bus lanes, traffic engineering improvements, and fringe parking lots. It was also during this time that national concern was focused upon the problem of highway safety and the enormous cost of traffic accidents. Environmental issues became more important with legislation addressing the preservation of natural areas and historic sites, and providing relocation assistance for households and businesses.

Housing and Urban Development Act of 1965

The Housing and Urban Development Act of 1965 created the Department of Housing and Urban Development (HUD) to better coordinate urban programs at the federal level. In addition, the act amended the Section 701 urban planning assistance program established under the Housing Act of 1954 by authorizing grants to be made to "...organizations composed of public officials whom he (the Secretary of HUD) finds to be representative of the political jurisdictions within a metropolitan area or urban region..." for the purposes of comprehensive planning (Washington Center, 1970).

This provision encouraged the formation of regional planning organizations controlled by elected rather than appointed officials. It gave impetus to the formation of such organizations as councils of governments (COGs). It also encouraged local governments to cooperate in addressing their problems in a regional context.

1966 Amendments to the Urban Mass Transportation Act

To fill several gaps in the 1964 Urban Mass Transportation Act, a number of amendments were passed in 1966. One created the technical studies program, which provided federal assistance up to a two-thirds

federal matching share for planning, engineering, and designing of urban mass transportation projects or other similar technical activities leading to application for a capital grant.

Another section authorized grants to be made for management training. A third authorized a project to study and prepare a program of research for developing new systems of urban transportation. This section resulted in a report to Congress in 1968, *Tomorrow's Transportation: New Systems for the Urban Future* (Cole, 1968), which recommended a long-range balanced program for research on hardware, planning, and operational improvements. It was this study that first brought to public attention many new systems such as dial-a-bus, personal rapid transit, dual mode, pallet systems, and tracked air-cushioned vehicle systems. This study was the basis for numerous research efforts to develop and refine new urban transportation technologies that would improve on existing ones.

Highway and Motor Vehicle Safety Acts of 1966

In 1964, highway deaths amounted to 48,000 persons, 10 percent above 1963, and the death rate was increasing. In March of 1965, newly Senator Abraham Ribicoff, chairman of the Subcommittee on Executive Reorganization of the Government Operations Committee, held hearings on the issue of highway safety to focus national concern on this national tragedy. Ralph Nader who was already working on highway safety volunteered to assist Senator Ribicoff's committee. He provided much material to the committee based on his research and a book that he was writing on traffic safety (Insurance Institute for Highway Safety, 1986).

In the July hearings, General Motors" president admitted that his company had only spent $1.25 million on safety in the previous year. Following that disclosure, President Johnson ordered Special Assistant Joseph Califano to develop a transportation package. In November 1965, Mr. Nader's book, *Unsafe at Any Speed*, was published with criticism of both the automobile industry and the traffic safety establishment.

In February 1966, President Johnson told the American Trial Lawyers Association that highway deaths were second only to the Vietnam War as the “gravest problem before the nation.” A month later, the President's message requested the Congress to establish a department of transportation. His message also outlined a national traffic safety act to require the establishment of motor vehicle standards, provide for state grants in aid for safety programs, and fund traffic safety research. By August, both housed unanimously passed a motor vehicle standards bill and, with only 3 dissenting votes in the Senate, passed state program legislation. The final bills were signed by President Johnson on September 9, 1966.

The National Traffic and Motor Vehicle Safety Act of 1966 established the National Traffic Safety Agency in the Department of Commerce. It required the establishment of minimum safety standards for motor vehicles and equipment, authorized research and development, and expanded the National Driver Register of individuals whose licenses had been denied, terminated, or withdrawn. According to the act, each standard was required to be practical, meet the need for motor vehicle safety, and stated in objective terms. In prescribing standards, the Secretary was required to consider: (1) relevant available motor vehicle safety data, (2) whether the proposed standard in appropriate for the particular motor vehicle or equipment for

which it is prescribed, and (3) the extent to which the standard contributed to carrying out the purposes of the act (Comptroller General, 1976).
The Highway Safety Act of 1966 established the National Highway Safety Agency in the Department of Commerce. It was designed to provide a coordinated national highway safety program through financial assistance to the states. Under this act, states were required to establish highway safety programs in accordance with federal standards. Federal funds were made available under Section 402, to be allocated by population and highway mileage, to assist in financing these programs with a 75 percent federal and 25 percent matching ratio (Insurance Institute for Highway Safety, 1986).

The two safety agencies were combined by Executive Order 11357 into the National Highway Safety Bureau in the newly created DOT. By 1969, the Bureau, under Dr. William Haddon Jr., had established 29 motor vehicle standards and 13 highway safety standards and all states had established highway safety programs. By the end of 1972, the agency had issued a total of 43 motor vehicle standards, covering vehicle accident prevention and passenger protection, and 18 highway safety standards, covering vehicle inspection, registration, motorcycle safety, driver education, traffic laws and records, accident investigation and reporting, pupil transportation and police traffic services (Insurance Institute for Highway Safety, 1986).

These two safety acts provided the basis for a practical, comprehensive national highway safety program to reduce deaths and injuries caused by motor vehicles.

Department of Transportation Act of 1966

In 1966 the Department of Transportation (DOT) was created to coordinate transportation programs and to facilitate development and improvement of coordinated transportation service utilizing private enterprise to the maximum extent feasible. The Department of Transportation Act declared that the nation required fast, safe, efficient, and convenient transportation at the lowest cost consistent with other national objectives including the conservation of natural resources. DOT was directed to provide leadership in the identification of transportation problems and solutions, stimulate new technological advances, encourage cooperation among all interested parties, and recommend national policies and programs to accomplish these objectives.

Section 4(f) of the act required the preservation of natural areas. It prohibited the use of land for a transportation project from a park, recreation area, wildlife and waterfowl refuge, or historic site unless there was no feasible and prudent alternative and the project was planned in such a manner as to minimize harm to the area. This was the earliest statutory language directed at minimizing the negative effects of transportation construction projects on the natural environment.

The DOT Act left unclear, however, the division of responsibility for urban mass transportation between DOT and HUD. It took more than a year for DOT and HUD to come to an agreement on their respective responsibilities. This agreement, known as Reorganization Plan No. 2, took effect in July 1968. Under it, DOT assumed responsibility for mass transportation capital grants, technical studies, and managerial training grant programs subject to HUD certification of the planning requirements for capital grant applications. Research and development (R&D) was divided up. DOT assumed R&D responsibility for improving the operation of conventional transit systems and HUD assumed R&D responsibility for urban transportation as

it related to comprehensive planning. Joint responsibility was assigned for R&D on advanced technology systems. The Reorganization Plan also created the Urban Mass Transportation Administration (UMTA) (Miller, 1972).

National Historic Preservation Act of 1966

Through the 1950's and 1960's, while the federal government funded numerous public works and urban renewal projects, federal preservation law applied only to a handful of nationally significant properties. As a result, federal projects destroyed or damaged thousands of historic properties. Congress recognized that new legislation was needed to protect the many other properties that were being harmed by federal activities (Advisory Council on Historic Preservation, 1986).

The National Historic Preservation Act of 1966 was passed to address these concerns. The act established the Advisory Council on Historic Preservation to provide advice on national preservation policy. Section 106 of the act required federal agencies to take into account the effects of their undertakings on historic preservation, and to afford the Council the opportunity to comment on such undertakings. Section 110 required federal agencies to identify and protect historic properties under their control.

The Section 106 review process established by the Council required a federal agency funding or otherwise involved in a proposed project to identify historic properties that might be affected by the project and find acceptable means to avoid or mitigate any adverse impact. Federal agencies were to consult with the Council and State Historic Preservation Officers, appointed by the Governors, in carrying out this process.

Demonstration Cities and Metropolitan Development Act of 1966

With the growth in federal grant programs for urban renewal, highways, transit, and other construction projects, there was a need for a mechanism to coordinate these projects. The Demonstration Cities and Metropolitan Development Act of 1966 was enacted to ensure that federal grants were not working at cross purposes. Section 204 of that act was significant in asserting federal interest in improving the coordination of public facility construction projects to obtain maximum effectiveness of federal spending and to relate such projects to areawide development plans.

Section 204 required that all applications for the planning and construction of facilities be submitted to an areawide planning agency for review and comment. The areawide agency was required to be composed of local elected officials. The objective was to encourage the coordination of planning and construction of physical facilities in urban areas. Section 204 was also designed to stimulate operating agencies with narrow functional responsibilities to examine the relationship of their projects to areawide plans for urban growth. Procedures to implement this act were issued by the Bureau of the Budget in Circular No. 82, "Coordination of Federal Aids in Metropolitan Areas Under Section 204 of the Demonstration Cities and Metropolitan Development Act of 1966" (Bureau of the Budget, 1967).

In response to these review requirements, many urban areas established new planning agencies or reorganized existing agencies to include elected officials on their policy boards. By the end of 1969, only six metropolitan lacked an areawide review agency (Washington Center, 1970).

Dartmouth Conference on Urban Development Models

Land-use planning models were developed as an adjunct to transportation planning to provide forecasts of population, employment, and land-use for transportation forecasting models. From the mid 1950s there was rapid development in the field stimulated by newly available computers and advances in operations research and systems analysis (Putman, 1979). Developments were discussed at a seminar at the University of Pennsylvania in October 1964 that was documented in a special issue of the Journal of the American Institute of Planners (Harris, 1965).

By 1967 the Land-Use Evaluation Committee of the Highway Research Board determined that there was need for another assessment of work in the field, which was progressing in an uncoordinated fashion. A conference was held in Dartmouth, New Hampshire, in June 1967 to identify the areas of research that were most needed (Hemmens, 1968).

The conferees recommended that agencies sponsoring research on land use models, generally the federal government, expand the capabilities of their in-house staff to handle these models. They recommended steps to improve data acquisition and handling. Further research on broader models that included social goals was recommended. Conferees recommended that research on the behavioral aspects of the individual decision units be conducted. Concern was expressed about bridging the gap between modelers and decisionmakers. Professional standards for design, calibration and use of models was also encouraged (Hemmens, 1968).

The early optimism in the field faded as the land development models did not perform up to the expectations of researchers and decisionmakers, particularly at the small area level. Modelers had underestimated the task of simulating complex urban phenomena. Many of these modeling efforts were performed by planning agencies that had to meet unreasonable time deadlines. (Putman, 1979) Models had become more complex with larger data requirements as submodels were added to encompass more aspects of the urban development process. They were too costly to construct and operate, and many still did not produce usable results. By the late 1960s land-use modeling activity in the United States entered a period of dormancy that continued until the mid 1970s.

Reserved Bus Lanes

As construction of the Interstate highway progressed, highway engineers came under increasing criticism for providing underpriced facilities that competed unfairly with transit service. Critics were also concerned that the 3C planning process was not giving sufficient attention to transit options in the development of long-range urban transportation plans.

The first official response to this criticism came in April 1964 in a speech by E. H. Holmes, Director of Planning for the Bureau of Public Roads. Mr. Holmes stated, “Since over three-quarters of transit patrons ride on rubber tires, not on steel rails, transit has to be for highways, not against them. And vice versa, highways have to be for transit, not against it, for the more that travelers patronize transit the easier will be

the highway engineer's job." He went on to advocate the use of freeways by buses in express service. This would increase bus operating speeds, reduce their travel times, and thereby make bus service more competitive with car travel. The BPR position was that the reservation of a lane for buses was reasonable if its usage by bus passengers exceeded the number of persons that would be moved in the same period in cars, for example, 3,000 persons per hour for a lane of freeway (Holmes, 1964).

This position was formalized in Instructional Memorandum (IM) 21-13-67, "Reserved Bus Lanes," issued by the Federal Highway Administration (FHWA) in August 1967. In addition to reiterating the warrant for reserving of lanes for buses, the IM stated the warrant for preferential use of lanes by buses. Under preferential use, other vehicles would be allowed to use the lane but only in such numbers that they do not degrade the travel speeds of the buses. The number of other vehicles would be controlled by metering their flow onto the lane. The total number of persons using the preferential lanes was to be greater than would be accommodated by opening the lanes to general traffic.

The FHWA actively promoted the use of exclusive and preferential bus treatments. Expenditures for bus priority projects on arterial highways, including loading platforms and shelters, became eligible for federal-aid highway funds under the Traffic Operations Program to Improve Capacity and Safety (TOPICS), which was initiated as an experimental program in 1967. Reserved lanes for buses on freeways were eligible under the regular federal-aid highway programs.

Many urban areas adopted bus priority techniques to increase the carrying capacity of highway facilities and make transit service more attractive at a limited cost. By 1973 one study reported on more than 200 bus priority projects in the United States and elsewhere. These included busways on exclusive rights-of-way and on freeways, reserved freeway lanes and ramps, bus malls, reserved lanes on arterial streets, traffic signal preemption, and supporting park-and-ride lots and central city terminals (Levinson, 1973).

National Highway Needs Studies

The expected completion of the Interstate highway system in the mid 1970s lead to consideration of new directions for the federal-aid highway program. Recognizing the need for information on which to formulate future highway programs, the U.S. Senate, in section 3 of the Senate Joint Resolution 81 (approved August 28, 1965) called for a biennial reporting of highway needs beginning in 1968.

In April 1965, the U.S. Bureau of Public Roads had requested the states to prepare estimates of future highway needs for the period 1965-85. The states were given only a few months to prepare the estimates and they relied upon available data and rapid estimating techniques. The results were documented in the *1968 National Highway Needs Report*. The estimated cost of $294 billion to meet the anticipated highway needs was a staggering sum. It included another 40,000 of freeways in addition to the 41,000 miles in the Interstate system (U.S. Congress, 1968a). The supplement to the report recommended the undertaking of a nationwide functional highway classification study as the basis for realigning the federal-aid highway systems (U.S. Congress, 1968b).

The 1968 report focused greater attention on urban areas than in the past. The supplement recommended that a larger share of federal-aid highway funds should be made available to urban areas. As a means to accomplish this, the supplement discussed expanding the urban extensions of the primary and secondary highway systems to include all principal arterial routes into a federal-aid urban system. To overcome the difficulties of urban area decisionmaking among fragmented local governments, it suggested requiring the establishment of areawide agencies to develop five-year capital improvement programs. The agencies would be governed by locally elected officials (U.S. Congress, 1968b).

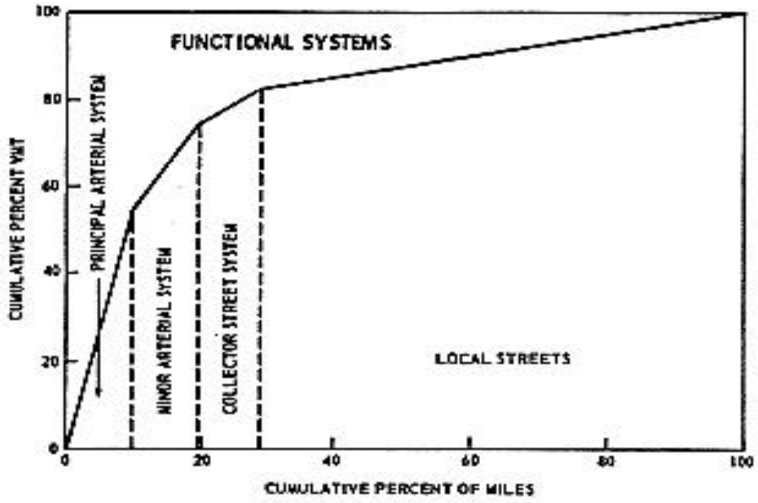
The supplement also recommended the use of federal-aid highway funds for a parking research and development projects, and for construction of fringe parking facilities. The establishment of a revolving fund for advance acquisition of right-of-way was recommended as well. The supplement advocated joint development adjacent to or using airspace above or below highways. Such projects should be coordinated jointly by DOT and HUD (U.S. Congress, 1968b).

Many of the recommendations in the *Supplement to the 1968 National Highway Needs Report* were incorporated into the Federal-Aid Highway Acts of 1968 and 1970. Section 17 of the 1968 act called for a systematic nationwide functional highway classification study in cooperation with state highway departments and local governments. The manual for this functional classification study stated that, "All existing public roads and streets within a State are to be classified on the basis of the most logical usage of existing facilities to serve present travel and land use" (U.S. Dept. of Transportation, 1969b). This was the first major study to collect detailed functional system information on a nationwide basis.

The supplement to the *1970 National Highway Needs Report* detailed the results of the 1968 functional classification study which covered existing facilities under current conditions of travel and land use. The results showed that there was wide variation among states in the coincidence of highways classified functionally and which federal-aid system they were on. This disparity was greater in urban areas than in rural areas. The report demonstrated that arterial highways carried the bulk of highway travel. For example, in urban areas in 1968, arterial highways constituted 19 percent of the miles of facilities and carried 75 percent of the vehicle miles of travel (U.S. Congress, 1970). (Figure 8)

The 1972 National Highway Needs Report documented the results of the 1970-1990 functional classification study. It combined a projected functional classification for 1990 with a detailed inventory and needs estimate for all functional classes including local roads and streets. It recommended the realignment of federal-aid highway systems based upon functional usage in a subsequent year such as 1980. This recommendation for realignment was incorporated into the Federal-Aid Highway Act of 1973. Highway needs were estimated for the twenty-year period to 1990 under nationally uniform "minimum tolerable conditions". Of the estimated $592 billion in needs, 43 percent were on federal-aid systems as they existed in 1970. Over 50 percent of these needs were considered to be "backlog," that is, requiring immediate attention (U.S. Congress, 1972b and 1972c).

Figure 8
National Distribution of Miles versus Vehicle-Miles of Travel Served on the Functional Systems in Urban Areas - 1968



The 1974 National Highway Needs Report updated the needs estimates that were reported in the 1972 report. The 1974 Highway Needs Study was conducted as part of the 1974 National Transportation Study. The 1974 highway report analyzed the sensitivity of the needs estimates to the changes of reduced forecasted travel and a lower level of service than a minimum tolerable conditions. The report clarified that the highway needs estimates are dependent upon the specific set of standards of highway service and highway design on which they are based.

The highway needs studies represented a ongoing process to assess the nation's highway system and quantify the nature and scope of future highway requirements. The studies were carried out as cooperative efforts of the federal, state and local governments. The extensive involvement of state and local governments lent considerable credibility to the studies. Consequently, the highway needs reports had a major influence on highway legislation, and the structure and funding of highway programs (U.S. Congress, 1975).

Federal-Aid Highway Act of 1968

The Federal-Aid Highway Act of 1968 established the Traffic Operations Program to Improve Capacity and Safety (TOPICS). It authorized $200 million each for fiscal years 1970 and 1971. The federal matching share was set at 50 percent. The program was designed to reduce traffic congestion and facilitate the flow of traffic in urban areas. Prior to the act, the Bureau of Public Roads had initiated TOPICS as an experimental program. IM 21-7-67, which established guidelines for TOPICS, divided urban streets into two categories. Those on the federal-aid Primary and Secondary systems were considered Type 1. Other major streets were under Type 2. Only traffic operations improvements were allowed on Type 2 systems (Gakenheimer and Meyer, 1977).

The TOPICS program grew out of a long history of the BPR's efforts to expand the use of traffic engineering techniques. In 1959, the BPR sponsored the Wisconsin Avenue Study to demonstrate the effectiveness of various traffic management methods when applied in a coordinated fashion (U.S. Dept. of Commerce, 1962).

TOPICS projects were to result from the 3C urban transportation planning process. By October 1969 there were 160 cities actively involved in TOPICS and another 96 cities in preliminary negotiations expected to result in active projects. Even so, the level of planning detail for TOPICS projects was not totally compatible with the regional scale of the planning process (Gakenheimer and Meyer, 1977).

The TOPICS program was reauthorized for fiscal years 1972 and 1973 at $100 million per year. But the Federal-Aid Highway Act of 1973 ended further authorizations and merged the TOPICS systems into the new federal-aid Urban system. TOPICS had accomplished its objective of increasing the acceptance of traffic engineering techniques as a means of improving the efficiency of the urban transportation system. It also played an important role in encouraging the concept of traffic management (Gakenheimer and Meyer, 1977).

In addition to launching the TOPICS program, the Federal-Aid Highway Act of 1968 incorporated several provisions designed to protect the environment and reduce the negative effects of highway construction. The Act repeated the requirement in Section 4(f) of the Department of Transportation Act of 1966 on the preservation of public park and recreation lands, wildlife and waterfowl refuges, and historic sites to clarify that the provision applied to highways. Moreover the Act required public hearings on the economic, social, and environmental effects of proposed highway projects and their consistency with local urban goals and objectives. The act also established the highway beautification program. In addition a highway relocation assistance program was authorized to provide payments to households and businesses displaced by construction projects. Additionally, a revolving fund for the advanced acquisition of right-of-way was established to minimize future dislocations due to highway construction and reduce the cost of land and clearing it. Also, the Act authorized funds for a fringe parking demonstration program.

Many of the provisions of the Act were early responses to the concern for environmental quality and for ameliorating the negative effects of highway construction.

“Continuing" Urban Transportation Planning

By 1968 most urbanized areas had completed or were well along in their 3C planning process. The Federal Highway Administration turned its attention to the “continuing" aspect of the planning process. In May 1968, IM 50-4-68, “Operations Plans for ‘Continuing' Urban Transportation Planning" was issued. The IM required the preparation of an operations plan for continuing transportation planning in these areas. The objective was to maintain the responsiveness of planning to the needs of local areas and to potential changes (U.S. Dept. of Transportation, 1968).

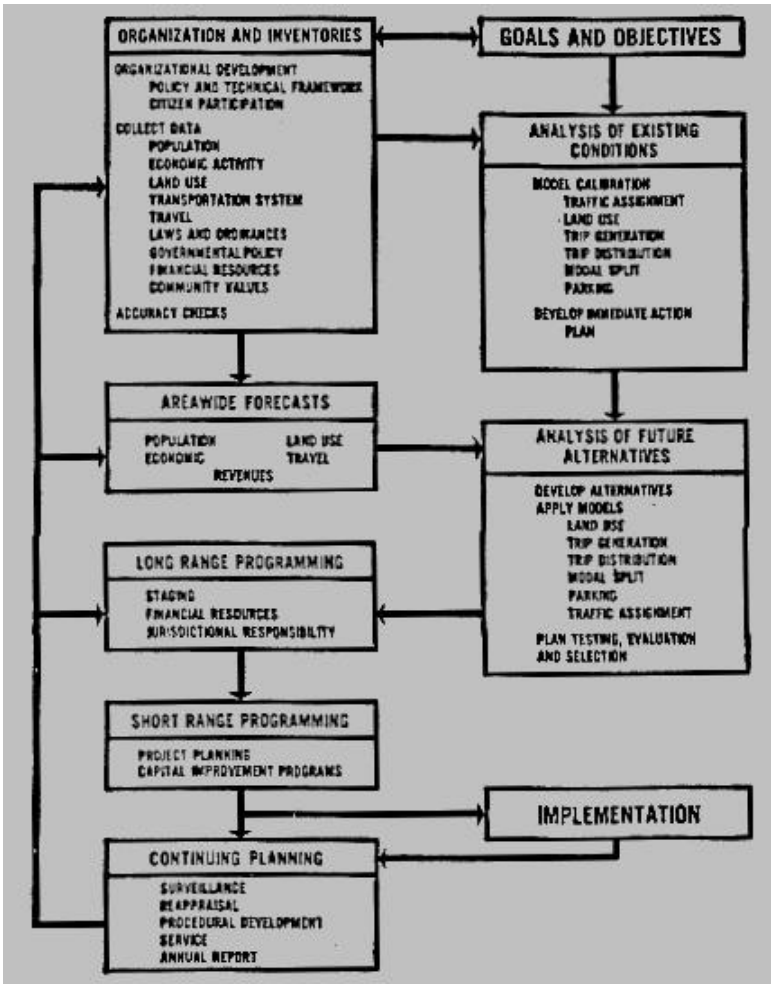
The operations plans were to address the various items needed to perform continuing planning, including: the organizational structure; scope of activities and the agencies that were responsible; a description of the

surveillance methodology to identify changes in land development and travel demand; a description of land use and travel forecasting procedures; and work remaining on the ten basic elements of the 3C planning process (U.S. Dept. of Transportation, 1968).

Guidelines were provided identifying the five elements considered essential for a continuing planning process. (Figure 9) The “surveillance" element focused on monitoring changes in the area in development, sociodemographic characteristics, and travel. “Reappraisal" dealt with three levels of review of the transportation forecasts and plan to determine if they were still valid. Every five years the plan and forecast were to be updated to retain a 20-year time horizon. The third element, “service,” was to assist agencies in the implementation of the plan. The “procedural development" element emphasized the need to upgrade analysis techniques. Last was the publication of an “annual report" on these activities as a means of communicating with local officials and citizens (U.S. Dept. of Transportation, 1968).

Extensive training and technical assistance was provided by the FHWA to shift urban transportation planning into a continuing mode of operation.

Figure 9
The Continuing Urban Transportation Planning Process



Intergovernmental Cooperation Act of 1968

Section 204 of the Demonstration Cities and Metropolitan Act was the forerunner of much more extensive legislation, adopted in 1968, designed to coordinate federal grant-in-aid programs at federal and state levels. The Intergovernmental Cooperation Act of 1968 required that federal agencies notify the governors or legislatures of the purpose and amounts of any grants-in-aid to their states. The purpose of this requirement was to make it possible for states to plan more effectively for their overall development (Washington Center, 1970).

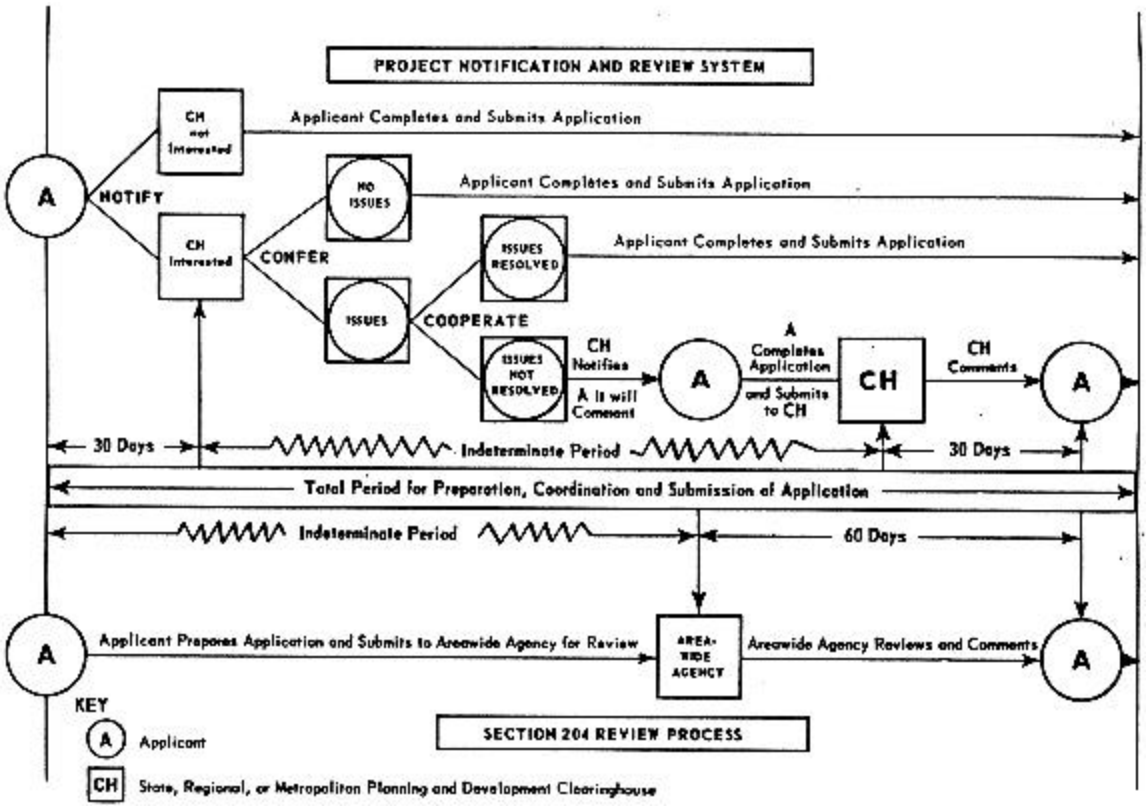
The act required that the areawide planning agency be established under state enabling legislation. It provided that in the absence of substantial reasons to the contrary, federal grants shall be made to general purpose units of government rather than special purpose agencies. The act also transferred administration of these intergovernmental coordination requirements from HUD to the Bureau of the Budget.

Bureau of the Budget's Circular No. A-95

To implement the 1968 Intergovernmental Cooperation Act, the Bureau of the Budget issued Circular No. A-95, "Evaluation, Review, and Coordination of Federal Assistance Programs and Projects," in July 1969 (Bureau of the Budget, 1969), which superseded Circular No. A-82 (Bureau of the Budget, 1967). This circular required that the governor of each state designate a "clearinghouse" at the state level and for each metropolitan area. The function of these clearinghouses was to review and comment on projects proposed for federal-aid in terms of their compatibility with comprehensive plans and to coordinate among agencies having plans and programs that might be affected by the projects. These clearinghouses had to be empowered under state or local laws to perform comprehensive planning in an area (Washington Center, 1970).

The circular established a project notification and review system (PNRS) which specified how the review and coordination process would be carried out and the amount of time for each step in the process. (Figure 10) The PNRS contained an "early warning" feature that required that a local applicant for a federal grant or loan notify the state and local clearinghouses at the time it decided to seek assistance. The clearinghouse had 30 days to indicate further interest in the project or to arrange to provide project coordination. This regulation was designed to alleviate the problem many review agencies had of learning of an application only after it had been prepared, and thereby having little opportunity to help shape it (Washington Center, 1970).

Figure 10
Comparison of 204 Review Process and Project Notification and Review System



Circular No. A-95 provided the most definitive federal statement of the process through which planning for urban areas should be accomplished. Its emphasis was not on substance but on process and on the intergovernmental linkages required to carry out the process.

The various acts and regulations to improve intergovernmental program coordination accelerated the creation of broader multifunctional agencies. At the state level, 39 Departments of Transportation had been created by 1977. Most of the departments had multimodal planning, programming, and coordinating functions. At the local level, there was a growing trend for transportation planning to be performed by comprehensive planning agencies, generally those designated as the A-95 clearinghouse (Advisory Commission, 1974).

CHAPTER 6 — THE ENVIRONMENT AND CITIZEN INVOLVEMENT

During the decade of the 1960s, the growing concern for environmental quality put considerable pressure on the planning process and its ability to adapt to change. Public attention became focused on the issues of air and water pollution; dislocation of homes and businesses; preservation of parkland, wildlife refuges, and historic sites; and the overall ecological balance in communities and their capacity to absorb disruption. Moreover, citizens were concerned that changes were being made to their communities without their views being considered. The federal role in these matters, which had begun modestly in previous years, broadened and deepened during this period.

Citizen Participation and the Two-Hearing Process for Highways

Citizen reaction to highway projects usually was most vocal at public hearings. It became clear that citizens could not effectively contribute to a highway decision by the time the project had already been designed. Many of the concerns related to the basic issue of whether to build the highway project at all and the consideration of alternative modes of transportation. Consequently, in early 1969, the Federal Highway Administration (FHWA) revised Policy and Procedure Memorandum (PPM) 20-8, "Public Hearings and Location Approval" (U.S. Department of Transportation, 1969a).

It established a two-hearing process for highway projects, replacing the previous single hearing, which occurred late in the project development process. The first "corridor public hearing" was to be held before the route location decision was made and was designed to afford citizens the opportunity to comment on the need for and location of the highway project. The second "highway design public hearing" was to focus on the specific location and design features. This PPM also required the consideration of social, economic, and environmental effects prior to submission of a project for federal-aid.

It was recognized that even a two-hearing process did not provide adequate opportunity for citizen involvement and, worse, provided a difficult atmosphere for dialogue. In late 1969 the basic guidelines for the 3C planning process were amended to require citizen participation in all phases of the planning process from the setting of goals through the analysis of alternatives. Consequently, it became the responsibility of the planning agency to seek out public views.

National Environmental Policy Act of 1969

The federal government's concern for environmental issues dated back to the passage of the Air Quality Control Act of 1955, which directed the Surgeon General to conduct research to abate air pollution. Through a series of acts since that time, the federal government's involvement in environmental matters broadened and deepened.

In 1969 a singularly important piece of environmental legislation was passed, the National Environmental Policy Act of 1969 (NEPA). This act presented a significant departure from prior legislation in that it enunciated for the first time a broad national policy to prevent or eliminate damage to the environment. The

act stated that it was national policy to "encourage productive and enjoyable harmony between man and his environment."
Federal agencies were required under the act to use a systematic interdisciplinary approach to the planning and decisionmaking that affected the environment. It also required that an environmental impact statement (EIS) be prepared for all legislation and major federal actions that would affect the environment significantly. The EIS was to contain information on the environmental impacts of the proposed action, unavoidable impacts, alternatives to the action, the relationship between short-term and long-term impacts, and irretrievable commitments of resources. The federal agency was to seek comments on the action and its impacts from affected jurisdictions and make all information public.

The act also created the Council on Environmental Quality to implement the policy and advise the President on environmental matters.

Environmental Quality Improvement Act of 1970

The Environmental Quality Improvement Act of 1970 was passed as a companion to the NEPA. It established the Office of Environmental Quality under the Council of Environmental Quality. The office was charged with assisting federal agencies in evaluating present and proposed programs, and with promoting research on the environment.

These two acts dealing with the environment marked the first reversal in over a decade of the trend to decentralize decisionmaking to the state and local levels of government. It required the federal government to make the final determination on the trade-off between facility improvements and environmental quality. Further, it created a complicated and expensive process by requiring the preparation of an EIS and the seeking of comments from all concerned agencies. In this manner, the acts actually created a new planning process in parallel with the existing urban transportation planning process.

Nationwide Personal Transportation Study

Earlier national surveys of travel were limited to automobile and truck use. Between 1935 and 1940, and again during the 1950s, a number of states conducted motor vehicle use studies on the characteristics of motor vehicle ownership, users and travel (Bostick, Messer and Steele, 1954; and Bostick 1963). During 1961, the U.S. Bureau of the Census conducted the National Automobile Use Study of 5,000 households for BPR. The survey covered characteristics of motor vehicle ownership and use, and the journey to work. Income and other household data were available to relate to the travel and automobile information (Bostick, 1966).

The Nationwide Personal Transportation Study (NPTS) grew out these efforts and was designed to obtain current information on national patterns of passenger travel. The NPTS surveyed households covering all person trips by all modes and for all trip purposes. The NPTS was first conducted in 1969 (Dept. of Transportation, 1972-1974) and was repeated at approximately seven year intervals in 1977 (U.S. Dept. of Transportation, 1980-83), in 1983 (Klinger and Kuzymak, 1985-86), and in 1990 (Hu and Young, 1992). The first three surveys were conducted by the U.S. Bureau of the Census for DOT using home interviews.

The 1990 NPTS was conducted by a private contractor using computer-assisted telephone interviewing (CATI) and random digit dialing to allow for unlisted telephone numbers. Since CATI was less expensive than home interviews, the sample size for the NPTS could be increased to 18,000 households after it had declined from that number in 1977 to 6500 in 1983. MPO's were also allowed to purchase additional NPTS samples for their areas, and this added 3,800 households.

Respondents were asked to report in considerable detail on all trips made by household members on the day prior to the interview, and to provide less detail on longer trips made for the previous two-week period. Information was also collected on the socioeconomic characteristics if the household, vehicles owned, journey-to-work characteristics, and driving done as a part of the job. The NPTS provided national statistics on person travel with some disaggregation by Standard Metropolitan Statistical Areas (SMSA) size groupings. It provided information on average daily travel by household members including trip purpose, mode, trip length, vehicle occupancy, time of day, and day of the week.

By comparing successive surveys, the NPTS quantified a number of important national trends including the significant increase in automobile ownership, declining household size, growth in VMT per household, continuing decline of the work trip fraction of travel, increasing use of light trucks for household travel, and the relative constancy of annual VMT per vehicle even with major increases in VMT per person. (Table 3) In terms of modal distribution of travel, the private vehicle share grew steadily while vehicle occupancy declined (Liss, 1991).

The NPTS has become a unique and valuable data resource for analyzing the nation's travel patterns. It allowed the tracking of changes in key household travel characteristics and has been used at the Federal as well as local levels.

Clean Air Act Amendments of 1970

The Clean Air Act Amendments of 1970 reinforced the central position of the federal government to make final decisions affecting the environment. This act created the Environmental Protection Agency (EPA) and empowered it to set ambient air quality standards. Required reductions in new automobile emissions were also specified in the act. The act authorized the EPA to require states to formulate implementation plans describing how they would achieve and maintain the ambient air quality standards. In 1971 the EPA promulgated national ambient air quality standards and proposed regulations on state implementation plans (SIPs) to meet these standards (U.S. Dept. of Transportation, 1975b).

Table 3
Nationwide Personal Transportation Study
Household and Travel Indicators
1969-90

	Percent		
Summary Statistic	**1969**	**1990**	**Change**

Total Population	197.2 million	239.4 million	21
Total Households	62.5 million	93.3 million	49
Total Workers	75.8 million	118.3 million	56
Total Vehicles	72.5 million	165.2 million	128
Total Annual VMT	775.9 million	1,409.6 million	82
Indicator			
Persons per Household	3.2	2.6	
Vehicles per Household	1.2	1.8	
Percent of Households:			
0 Vehicles	20.6	9.2	
1 Vehicle	48.4	32.8	
2 Vehicles	26.4	38.4	
3+ Vehicles	4.6	19.6	
VMT per Household	12,423	15,100	
% Work Vehicle Trips	31.9	26.3	
% Nonwork Vehicle Trips	68.1	73.9	
% Transit Trips	3.4	2.2	
Automobile Occupancy	1.9	1.6	

The preparation, submission, and review of the SIPs occurred outside the traditional urban transportation planning process and, in many instances, did not involve the planning agencies developing transportation plans. This problem became particularly difficult for urban areas that could not meet the air quality standards even with new automobiles that met the air pollution emission standards. In these instances, transportation control plans (TCPs) were required that contained changes in urban transportation systems and their operation to effect the reduction in emissions. Rarely were these TCPs developed jointly with those agencies developing urban transportation plans. It took several years of dialogue between these air pollution and transportation planning agencies to mediate joint plans and policies for urban transportation and air quality.

Another impact of the environmental legislation, particularly the Clean Air Act, was the increased emphasis on short-term changes in transportation systems. In that the deadline for meeting the ambient air quality standards was fairly short, EPA was primarily concerned with actions that could affect air quality in that time

frame. The actions precluded major construction and generally focused on low capital and traffic management measures. Up to that time, urban transportation planning had been focused on long-range (20 years or more) planning (U.S. Dept. of Transportation, 1975b).

Boston Transportation Planning Review

The results of many urban transportation planning studies called for major expansions of the area's freeway system along with other highway improvements. Public transportation was often projected to have a minimal role in the area's future. In these urban transportation plans, many of the highway improvements were to be located in built up areas where they would cause major disruptions and dislocations. As public awareness to social and environmental concerns grew in many urban areas, so too did the opposition to transportation plans that contained recommendations for major expansions of the highway system. When faced with these circumstances, urban areas were forced to reevaluate their plans. The prototype for these reevaluations was the Boston Transportation Planning Review (BTPR).

The long-range plan for the Boston region published in 1969 contained recommendations for a comprehensive network of radial and circumferential highways and substantial improvements to the existing mass transportation system. Much of the freeway portion of the plan was included as part of the Interstate highway system. Many of the recommended highways were contained in the earlier 1948 plan, which was typical of urban transportation plans of this period. Opposition to the 1969 plan developed even before it was published, especially from the affected communities (Humphrey, 1974).

Governor Francis Sargent ordered a moratorium on major highway construction in February 1970 shortly after the Boston City Council had already done so. He announced a major reevaluation of transportation policy for the Boston area and created the BTPR as an independent entity reporting directly to the governor to address the area's transportation issues.

The BTPR lasted about 18 months, during which time numerous transportation alternatives were identified and evaluated by an interdisciplinary team of professionals. The work was accomplished in an atmosphere of open and participatory interaction among planners, citizens, and elected officials. The BTPR led to the decision made by the governor not to build additional freeways within the Boston core. Instead, the major emphasis was on a mix of arterials, special purpose highways, and major improvements in the mass transportation system (Humphrey, 1974).

There were several hallmarks of this new form of the urban transportation planning process, termed by Alan Altshuler, who chaired the BTPR, the “open study.” First and foremost was the extensive involvement of professionals, citizens, interest groups and decisionmakers in all aspects of the restudy. Second, transit options were evaluated on an equal footing with highway options. Third, the restudy focused on both the broader regionwide scale and the finer community level scale. Fourth, there was less reliance on computer models for analysis and a more open attitude toward explaining the analytical methodology to the nontechnical participants. Fifth, the study used a wider range of evaluation criteria that accounted for more social and environmental factors. Sixth, decisionmakers were willing to step in and make decisions at points where the process had reached a stalemate (Gakenheimer, 1976 and Allen 1985).

The BTPR occurred at the height of the citizen participation movement in a highly charged atmosphere outside the mainstream of decisionmaking in Boston. Although it is unlikely that such a study will be repeated elsewhere in the same manner, the BTPR has left a permanent impact on urban transportation. The legacy of the BTPR has been to demonstrate a more open form of planning and decisionmaking that has greater concern for social and environmental impacts and the opinions of those affected by transportation improvements.

Urban Corridor Demonstration Program

In January 1970, the DOT initiated the Urban Corridor Demonstration Program to test and demonstrate the concerted use of available highway traffic engineering and transit operations techniques for relieving traffic congestion in radial corridors serving major urban corridors. The program emphasized low-capital intensive improvements rather than new major construction to demonstrate whether relatively inexpensive projects which could be implemented rapidly could play an effective role in relieving urban traffic congestion (Alan M. Voorhees and Assoc., 1974).

The program was focused on urbanized areas over 200,000 in population. It utilized existing federal programs for transit facilities and equipment, demonstrations, research and technical studies, and for highway construction, TOPICS, and fringe parking. The demonstration projects use various improvement techniques that were funded under these programs in a coordinated fashion to reduce peak-hour congestion.

In July 1970 eleven areas were selected to conduct planning for demonstration projects. An evaluation manual was developed to assist the participating urban areas in developing the experimental design, hypotheses to be tested, and overall evaluation strategy (Texas Transportation Institute, 1972). Based on the evaluation plans from these areas, eight were selected to carry out demonstrations, and seven actually conducted them. The projects tested line-haul improvements such as transit priority schemes, traffic engineering techniques and bus service improvements; low-density collection-distribution improvements such as park and ride facilities, demand responsive buses, and shelters; and CBD collection-distribution system improvements such as bus shuttle service and improved transportation terminals.

This early attempt to integrate low-capital intensive transit and highway improvement techniques in a concerted manner to improve urban transportation pointed the way to the extensive use of transportation system management approaches in later years. Further experimentation on low-capital techniques continued with the establishment of the Service and Methods Demonstration Program in 1974.

Census Journey-to-Work Surveys

The decennial census, which is required by the Constitution, is the longest time series of U.S. demographic data. The census was first taken in 1790 and broadened in 1810 to include other subjects. Interest in the census by transportation planners began in the late 1950s with the advent of comprehensive urban transportation studies and the need for data on socio-demographic characteristics. At that time, the HRB launched the Committee on Transportation Information Systems and Data Requirements to persuade the Bureau of the Census to include questions on place of work and automobile ownership in the 1960 census. In 1960, the format of the census was changed so that the majority of the population had to only answer a limited set of questions ("short form"), and a sample of the population had to answer a more detailed set of questions (long form). Journey-to-work and other transportation-related questions were included on the long form.

In the 1960s, the Bureau of the Census established a Small Area Data Advisory Committee, which included a number of transportation planners, to assist them in the planning for the 1970 census. Transportation planners recognized that the data from the decennial census could be used more broadly for transportation studies because it included most of the traditional variables used in the studies and the journey-to-work question was similar to traditional origin-destination questions. In late 1966, the Bureau of the Census conducted a Census Use Study in New Haven, Connecticut. The purpose of the study was to examine the methods and procedures they has developed to facilitate the use of census data by local agencies. FHWA became involved because of their interest in an efficient method of maintaining current urban transportation planning data. A critical problem of the incompatibility of census tracts and traffic analysis zones was solved with the development of geographic coding systems. This permitted residence and work place addresses to be geographically coded to individual city blocks which allowed the census data to be summarized by traffic analysis zone (Sword and Fleet, 1973).

As a result of the pretest, the FHWA funded the Bureau of the Census to develop the capability to provide special summary tabulations, as the proposed 1970 tabulations would not have satisfied urban transportation study needs. The result was the Urban Transportation Planning Package which integrated journey-to-work and work place data along with socio-demographic data into an urban areas specific data base that could be used by local planning agencies (Sword and Fleet, 1973).

During the 1970s, the use of the Urban Transportation Planning Package in transportation planning was evaluated in preparation for the 1980 census (Highway Research Board, 1971c; Transportation Research Board, 1974c). Many of the recommendations were incorporated by the Census Bureau. These included finer levels of stratification for vehicle ownership, modes and geographic detail, and the addition of travel times to work.

By the 1980s, the census journey-to-work survey had become a significant source of data for urban transportation planning. First, since the 1960s rising costs and diminished financial resources forced most urban transportation agencies to forgo large-scale data collection. Second, planning agencies were being faced with pressures from decision makers for up-to-date information on which to base their analyses and recommendations. Third, improvements in data-based modeling reduced the need for locally conducted

surveys, such as home-interview origin-destination studies. Fourth, improvements in both the transportation-related questions, and detail and accuracy of geographic coding of data from the 1980 census afforded planners a data base that at least partially filled the void left by the lack of locally-collected data (Transportation Research Board, 1985b).

The DOT provided technical assistance and training in the use of the 1980 census as they had with the 1970 census (Sosslau, 1983) . By the early-1980s over 200 MPOs had purchased Urban Transportation Planning Package tabulations.

Evaluation of the experience with the package continued (Transportation Research Board, 1984c). A conference on December 9-12, 1984 in Orlando, Florida, was organized by the TRB and sponsored by the DOT to review the progress to date and make recommendations for the 1990 census (Transportation Research Board, 1985b). The conference demonstrated the central role that census data has achieved in urban transportation planning.

FHWA analyzed the nationwide changes in population, journey-to-work patterns, mode of travel to work and vehicle availability occurring between the 1960, 1970 and 1980 censuses (Briggs, et. al., 1986). Further analyses were conducted under the National Commuting Study which was sponsored by a number of organizations lead by AASHTO (Pisarski, 1987a and 1996).

The census journey-to-work became a significant source of travel data both at the national level, and for State and local planning. At the national level, this data set increased in value with each addition to the series. At the local level, census data became more important as changes were made to improve its usefulness for urban transportation planning, and as cost constraints precluded collection of new data.

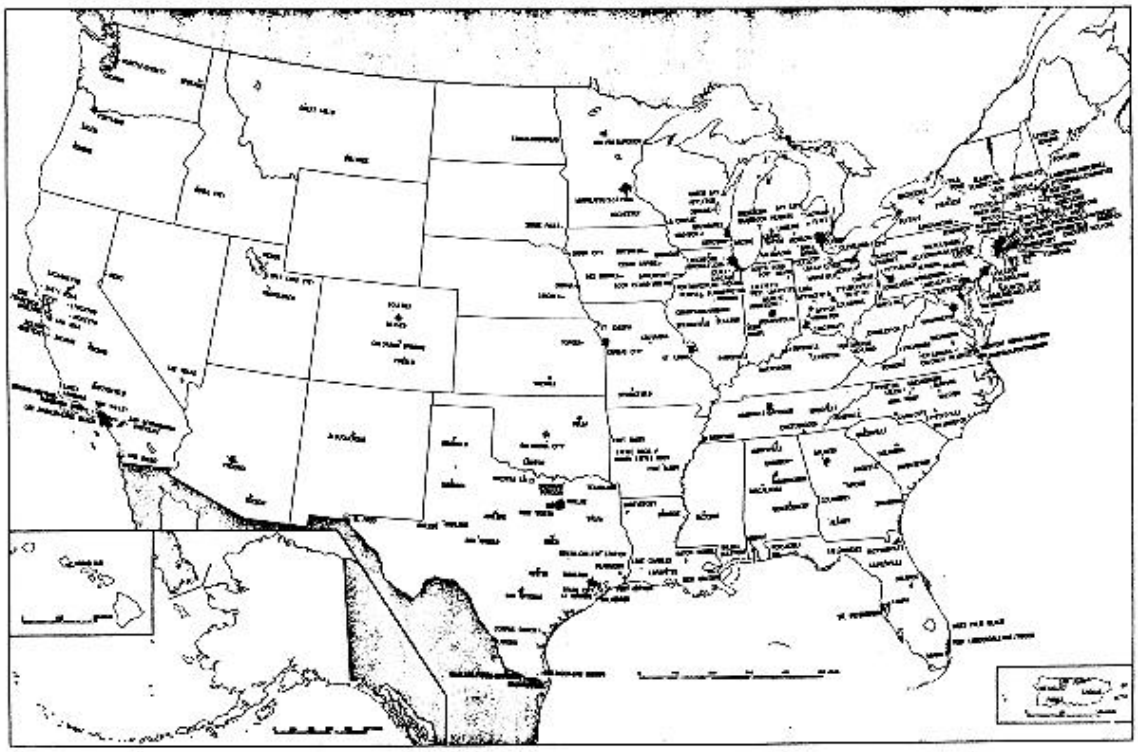
CHAPTER 7 — BEGINNINGS OF MULTIMODAL URBAN TRANSPORTATION PLANNING

By 1970, there were 273 urbanized areas actively engaged in continuing urban transportation planning. (Figure 11) By then, however, the urban transportation planning process was receiving criticism on a number of issues. It was criticized for inadequate treatment of the social and environmental impacts of transportation facilities and services. The planning process had still not become multimodal and was not adequately evaluating a wide range of alternatives. Planning was focused almost exclusively on long-range time horizons, ignoring more immediate problems. And, the technical procedures to carry out planning were criticized for being too cumbersome, time-consuming, and rigid to adapt to new issues quickly. There was also concern expressed about their theoretical validity.

During the early 1970s actions were taken to address these criticisms. Legislation was passed that increased the capital funds available for mass transportation and provided federal assistance for operating costs. Greater flexibility was permitted in the use of some highway funds including their use on transit projects. These provisions placed transit on a more equal footing with highways and considerably strengthened multimodal planning and implementation.

In addition, the federal government took steps to better integrate urban transportation planning at the local level, and to require shorter-range capital improvement programs along with long-range plans. Emphasis was placed on non-capital intensive measures to reduce traffic congestion as alternatives to major construction projects. And, state highway agencies were required to develop procedures for addressing social, economic, and environmental impacts of highways.

Figure 11



Urbanized Areas 1970

Urban Mass Transportation Assistance Act of 1970

The Urban Mass Transportation Assistance Act of 1970 was another landmark in federal financing for mass transportation. It provided the first long-term commitment of federal funds. Until the passage of this act, federal funds for mass transportation had been limited. It was difficult to plan and implement a program of mass transportation projects over several years because of the uncertainty of future funding.

The 1970 act implied a federal commitment for the expenditure of at least $10 billion over a 12-year period to permit confident and continuing local planning and greater flexibility in program administration. The act authorized $3.1 billion to finance urban mass transportation beginning in fiscal year 1971. It permitted the use of "contract authority" whereby the Secretary of Transportation was authorized to incur obligations on behalf of the United States with Congress pledged to appropriate the funds required to liquidate the obligations. This provision allowed long-term commitments of funds to be made.

This act also established a strong federal policy on transportation for elderly and handicapped persons:

> "...elderly and handicapped persons have the same right as other persons to utilize mass transportation facilities and services; that special efforts shall be made in the planning and design of mass transportation facilities and services so that the availability to elderly and handicapped persons

to mass transportation which they can effectively utilize will be assured...." (U.S. Dept. of Transportation, 1979b)

The act authorized that 2 percent of the capital grant and 1.5 percent of the research funds might be set aside and used to finance programs to aid elderly and handicapped persons.

The act also added requirements for public hearings on the economic, social, and environmental impacts of a proposed project and on its consistency with the comprehensive plan for the area. It also required an analysis of the environmental impacts of the proposed project and for the Secretary of Transportation to determine that there was no feasible or prudent alternative to any adverse impact that might result.

Federal-Aid Highway Act of 1970

The Federal-Aid Highway Act of 1970 established the federal-aid Urban highway system. The system in each urban area was to be designed to serve major centers of activity and to serve local goals and objectives. Routes on the system were to be selected by local officials and state departments cooperatively. This provision significantly increased the influence of local jurisdictions in urban highway decisions. The influence of local officials in urban areas was further strengthened by an amendment to Section 134 on urban transportation planning:

"No highway project may be constructed in any urban area of 50,000 population or more unless the responsible local officials of such urban area...have been consulted and their views considered with respect to the corridor, the location and the design of the project" (U.S. Dept. of Transportation, 1980a).

Funds for the federal-aid Urban system were to be allocated to the states on the basis of total urban population within the state. The act also authorized the expenditure of highway funds on exclusive or preferential bus lanes and related facilities. This could only be done if the bus project reduced the need for additional highway construction or if no other highway project could provide the person-carrying capacity of the bus project. There had to be assurances, as well, that the transit operator would utilize the facility. An additional provision of the act authorized expenditures of highway funds on fringe and corridor parking facilities adjacent to the federal-aid Urban system that were designed in conjunction with public transportation services.

This act also incorporated a number of requirements related to the environment. One required the issuance of guidelines for full consideration of economic, social, and environmental impacts of highway projects. A second related to the promulgation of guidelines for assuring that highway projects were consistent with SIPs developed under the Clean Air Act.

As a result of the 1970 highway and transit acts, projects for both modes would have to meet similar criteria related to impact assessment and public hearings. The highway act also increased the federal matching share to 70 percent for all non-Interstate highways, making it comparable to the 66-2/3 percent federal

share for mass transportation capital projects. In addition, the highway act legally required consistency between SIPs and urban highway plans.

Conference on Urban Commodity Flow

The urban transportation planning processes and methodologies that had been developed through the decade of the 1960s emphasized passenger movement. Little attention was given to the problems of commodity movements in urban areas. The majority of studies of urban goods movement had been limited to those related to trucks. Data on commodity movements was seldom collected because of the difficulty in tracking the movements and the lack of available methods (Chappell and Smith, 1971).

In recognition of the need for more information and better planning concerning the movement of goods in urban areas, a Conference on Urban Commodity Flow was convened at Airlie House in Warrentown, Virginia on December 6-9, 1970. Initially, the conference was to focus on information and techniques to forecast urban commodity movement. But, as planning for the conference progressed, there emerged a need for a more fundamental understanding of commodity movements and the economic, social, political and technological forces that affected them (Highway Research Board, 1971a).

The conference revealed the lack of information on urban goods movement and the need for such information to make informed policy decisions on investment and regulation. The various viewpoints on the problems of urban commodity flow were explored. Planners, shippers, government agencies, freight carrier, and citizens saw the problems and consequences differently. With so many actors, the institutional issues were considered to be too complex to mount effective strategies to address the problems (Highway Research Board, 1971a).
The conferees concluded that goods movement needed more emphasis in the urban transportation planning process and that techniques for forecasting goods movement needed to be developed. The regulations and programs of federal, state and local agencies needed to be coordinated to avoid conflicting effects on the goods movement industry that were not in the best interest of the public. Greater efforts were called for to explore means of reducing the economic, social, and environmental costs of goods movement in urban areas (Highway Research Board, 1971b).

This conference directed attention to the neglect of goods movement in the urban transportation planning process, and the complexity of the goods movement issue. It generated more interest and research in the subject and focused on the opportunity to develop strategies to deal with urban goods movement problems.

Mt. Pocono Conference on Urban Transportation Planning

In recognition of the widespread awareness that urban transportation planning had not kept pace with changing conditions, a conference on Organization for Continuing Urban Transportation Planning was held at Mt. Pocono, Pennsylvania, in 1971. The focus of this conference was on multimodal transportation planning evolving from the earlier conferences that had focused on highway planning and the separation between planning and implementation (Highway Research Board, 1973a).

The conference recommended close coordination of planning efforts as a means of achieving orderly development of urban areas and relating the planning process more closely to decisionmaking processes at all levels of government. It urged that urban planning be strengthened through state enabling legislation and bolstered by equitable local representation. Further, citizen participation should occur continually throughout the planning process but should not be considered as a substitute for decisionmaking by elected officials (Advisory Commission, 1974).

All comprehensive and functional planning, including multimodal transportation planning, should be integrated, including the environmental impact assessment process. The planning process should continually refine the long-range regional transportation plan at the sub-area scale and focus on a 5- to l5-year time frame so that planning would be more relevant to programming and project implementation. Transportation planning should consider service levels consistent with local goals, and a wide range of alternatives should be evaluated. The impact of changes in the transportation system should be monitored to improve future decisionmaking and planning efforts (Advisory Commission, 1974).

The conference report went on to urge that this more inclusive kind of planning be supported by flexible funding from the federal government. This was to be done to avoid a preference for any mode so as not to unbalance specific urban transportation decisions contrary to local goals and priorities. The conference also supported additional resources for planning, research and training.

DOT Initiatives Toward Planning Unification

The U.S. Department of Transportation had been working for several years on integrating the individual modal planning programs. In 1971, the DOT established a trial program of intermodal planning in the field. The overall objective of the program was to integrate the modal planning programs at the urban-area level rather than at the federal level. With the successful completion of the trial program, the DOT implemented the program on a permanent basis by establishing intermodal planning groups (IPGs) in each of the 10 DOT regions. The IPGs were charged with responsibility for obtaining and reviewing an annual unified work program for all transportation planning activities in an urban area; for obtaining agreement on a single recipient agency for areawide transportation planning grants in each urban area; and, for obtaining a short-term (3- to 5-year) transportation capital improvement program, updated annually, from each recipient agency (U.S. Dept. of Transportation and U.S. Dept. of Housing and Urban Development, 1974).

Also in 1971 a DOT transportation planning committee was established to promote a coordinated department-wide process for urban area and statewide transportation planning and for unified funding of such planning. As a result of the efforts of the committee, a DOT order was issued in 1973 that required that all urbanized areas submit annual unified work programs for all transportation planning activities as a condition for receiving any DOT planning funds. These work programs had to include all transportation-related planning activities, identification of the agency responsible for each activity, and the proposed funding sources. The work programs were used to rationalize planning activities and joint funding under the DOT planning assistance programs (U.S. Dept. of Transportation and U.S. Dept. of Housing and Urban Development, 1974).

Process Guidelines for Highway Projects

The Federal-Aid Highway Act of 1970 required that guidelines be issued to assure that possible adverse economic, social, and environmental effects were considered in developing highway projects and that decisions on these projects were made in the best overall public interest. Initially guidelines were developed specifying requirements and procedures for evaluating the effects in each of the impact areas. These guidelines were presented and discussed at a Highway Research Board Workshop during July 1971 in Washington, D.C. The primary conclusion of the workshop was that full consideration of adverse impacts and of decisions in the best overall public interest could not be assured by extensive technical standards. It would depend upon the attitudes, capabilities, organization, and procedures of the highway agencies responsible for developing the projects (U.S. Congress, 1972a).

Based on the workshop recommendations and other comments, the emphasis of the guidelines was shifted to the process used in developing highway projects. In September 1972, FHWA issued PPM 90-4, "Process Guidelines (Economic, Social, and Environmental Effects of Highway Projects)" (U.S. Dept. of Transportation, 1972a). These guidelines required each state to prepare an Action Plan spelling out the organizational arrangement, the assignment of responsibilities, and the procedures to be followed in developing projects in conformance with the law. The Action Plan had to address the process for the identification of social, economic, and environmental impacts, considerations of alternative courses of action, use of a systematic interdisciplinary approach, and the involvement of other agencies and the public. Flexibility was provided to the States to develop procedures which were adjusted to their own needs and conditions.

The use of process guidelines was a further evolution of the manner in which highway projects were developed. The staffs of highway agencies were exposed to the views of other agencies and the public. Professionals with skills in the social and environmental areas were brought into the process. Gradually, the project development process became more open and embraced a broader range of criteria in reaching decisions.

UMTA's External Operating Manual

With the passage of the Urban Mass Transportation Assistance Act of 1970, the federal transit grant program substantially increased from less than $150 million annually before 1970 to over $500 million by 1972 (U.S. Dept. of Transportation, 1977b). It was anticipated that both the level of funding and number of projects to be administered would further increase. In August 1972 UMTA issued its first consolidated guidance for project management in its *External Operating Manual* (U.S. Dept. of Transportation, 1972c).

The *External Operating Manual* contained general information on UMTA's organization and programs. It provided potential applicants with information on preparing an application for federal assistance, and the statutory criteria and program analysis guidelines UMTA would use in evaluating the applications. It also contained policies and procedures for administering projects.

The manual stated that the near-term objectives that UMTA sought to achieve with the federal transit program were: increasing the mobility of non-drivers, relief of traffic congestion, and improving the quality of the urban environment. These objectives were related to urban areas of three size groups: small areas under 250,000 in population, medium areas between 250,000 and 1,000,000 in population, and large areas over 1 million in population. For small areas, the primary objective was for the mobility of the transit dependent. In addition, for medium areas the use of non-capital intensive (i.e. transportation system management) strategies to reduce traffic congestion was emphasized. Additionally, for large areas, analysis of alternative transportation schemes including non-capital intensive strategies and new technologies was emphasized to support land development patterns (U.S. Dept. of Transportation, 1972c).

Included as Appendix 2 of the Manual was the *Urban Mass Transportation Planning Requirements Guide* which set forth the areawide planning requirements for the transit program. These requirements were certified by HUD designed to be consistent with the 3C planning requirements of the FHWA. An urban area needed to have: a legally established planning agency representing local units of government; a comprehensive, continuing areawide planning process; and a land use plan to serve as the basis for determining travel demand.

The transportation planning requirements, which were certified by UMTA, included: a long-range transportation planning process, a 5-10 year transit development program, and a short-range program. The agency conducting the transportation planning was to be, wherever possible, the agency carrying out the comprehensive planning. An area could meet the planning requirements on an interim basis, until July 1, 1972, if it had a planning process underway, but received only a 50 percent federal share for its transit project instead of the two-thirds share if the requirement was fully met.

The *External Operating Manual* was revised through 1974 but was updated and supplemented in later years with UMTA Circulars, Notices, and regulations (Kret and Mundle, 1982). The planning requirements contained in the Manual were superseded by the joint FHWA/UMTA Urban Transportation Planning regulations (U.S. Dept. of Transportation, 1975a).

Williamsburg Conference on Urban Travel Forecasting

By the latter part of the 1960s use of the conventional urban travel forecasting procedures pioneered in the late 1950s and early 1960s was widespread but criticism of them was growing. Critics argued that conventional procedures were time-consuming and expensive to operate and required too much data. The procedures had been designed for long-range planning of major facilities and were not suitable for evaluation of the wider range of options that were of interest, such as low-capital options, demand-responsive systems, pricing alternatives, and vehicle restraint schemes. Policy issues and options had changed, but travel demand forecasting techniques had not.

These issues were addressed at a conference on Urban Travel Demand Forecasting held at Williamsburg, Virginia, in December 1972, sponsored by the Highway Research Board and the U.S. Department of Transportation. The conference concluded that there was a need for travel forecasting procedures that were sensitive to the wide range of policy issues and alternatives to be considered, quicker and less costly

than conventional methods, more informative and useful to decisionmakers, and in a form that nontechnical people could understand. Further, that improvements in methodology were urgently needed, and that significant improvements in capabilities could be achieved within three years based on the results of available research (Brand and Manheim, 1973).

The conference recommended several simultaneous paths to improve travel forecasting capabilities. First was to upgrade existing methodology with the results of recent research. Second was to pilot test emerging procedures in several urban areas. Third, was research to improve the understanding of travel behavior including before/after studies, consumer theory, psychological theory, and location behavior. Fourth, research was needed to transform the results of travel behavior research into practical forecasting techniques. Fifth, a two-way dissemination program was necessary to get new methods into the field and for the results of these applications to flow back to the researchers to improve the methods (Brand and Manheim, 1973).

The conferees were optimistic that the conversion to new, improved behavioral methods was soon to be at hand. They did recognize that a substantial amount of research was going to be necessary. And in fact the Williamsburg conference did launch a decade of extensive research and activity in disaggregate urban travel demand forecasting.

Federal-Aid Highway Act of 1973

The Federal-Aid Highway Act of 1973 contained two provisions that increased the flexibility in the use of highway funds for urban mass transportation in the spirit of the Mt. Pocono conference. First, federal-aid Urban system funds could be used for capital expenditures on urban mass transportation projects. This provision took effect gradually, but was unrestricted starting in Fiscal Year 1976. Second, funds for Interstate highway projects could be relinquished and replaced by an equivalent amount from the general fund and spent on mass transportation projects in a particular state. The relinquished funds reverted back to the Highway Trust Fund.

This opening up of the Highway Trust Fund for urban mass transportation was a significant breakthrough sought for many years by transit supporters. These changes provided completely new avenues of federal assistance for funding urban mass transportation.

The 1973 act had other provisions related to urban mass transportation. First, it raised the federal matching share for urban mass transportation capital projects from 66-2/3 percent to 80 percent, except for Urban system substitutions, which remain at 70 percent. Second, it raised the level of funds under the UMTA capital grant program by $3 billion, to $6.1 billion. Third, it permitted expenditure of highway funds for bus-related public transportation facilities, including fringe parking on all federal-aid highway systems.

The act called for realigning all federal-aid systems based on functional usage. It authorized expenditures on the new federal-aid Urban system and modified several provisions related to it. “Urban" was defined as any area of 5,000 or more in population. Apportioned funds for the system were earmarked for urban areas of 200,000 or more population. Most important, it changed the relationship between the state and local

officials in designating routes for the system. It authorized local officials in urbanized areas to choose routes with the concurrence of state highway departments (Parker, 1977).

Two additional provisions related directly to planning. For the first time urban transportation planning was funded separately: ½ of 1 percent of all federal-aid funds were designated for this purpose and apportioned to the states on the basis of urbanized area population. These funds were to be made available to the metropolitan planning organizations (MPOs) that were designated by the states as being responsible for comprehensive transportation planning in urban areas.

The 1973 Federal-Aid Highway Act took a significant step toward integrating and balancing the highway and mass transportation programs. It also increased the role of local officials in the selection of urban highway projects and broadened the scope of transportation planning by MPOs.

Endangered Species Act of 1973

The Endangered Species Act of 1973 was enacted to prevent any animal or plant from becoming extinct in the United States. The act prevented the taking of endangered and threatened species of fish, wildlife, and plants, and the critical habitats where they live. The act applied to the loss of, or injury to, endangered species either directly or indirectly through activities that would interfere with their life support system (Alan M. Voorhees & Assoc., 1979).

Section 4 of the act required the determination of which species were endangered by the Secretary of Interior with regard to wildlife and plants, and the Secretary of Commerce with regard to fish. Section 7 of the act established a consultative process between any Federal agency seeking to carry out a project or action and the appropriate Department (either Interior or Commerce) to determine if there would be an adverse impact on any endangered species. The determination was to be made in the form of a biological opinion based on the best scientific and commercial data available. If the biological opinion found that an endangered species or its habitat was in jeopardy, the act required that reasonable and prudent alternatives be proposed by the Department of Commerce or Interior respectively. Where the Federal agency could not comply with the proposed alternatives, the project or action could not proceed (Ryan and Emerson, 1986).

The 1978 Amendments to the act established the Endangered Species Committee which was authorized to grant exemptions from requirements of the act. This provision was a response to the decision by the U.S. Supreme Court to uphold blockage of the completion of the Tennessee Valley Authority's Tellico Dam because it endangered a small fish called the snail darter (Salvesen).

In 1982, the act was again amended to allow for incidental takings of wildlife under certain conditions. For example, development could occur in the habitat of an endangered species if the development mitigated any adverse impacts of the species. This mitigation typically took the form of setting aside part of the site for a wildlife preserve, and by a finding that the development would not appreciably reduce the likelihood of the survival and recovery of the species in the wild (Salvesen).

The Endangered Species Act has been called the most powerful land use law in the nation. By 1990, there were about 500 plant and animal species listed as endangered or threatened in the United States, and with more being added to the list each year. In the future, the act will affect many more development activities.

AASHTO Policy on Geometric Design of Urban Highways

By 1966, the 1957 edition of *A Policy on Arterial Highways in Urban Areas* had become partially obsolete as a result of the changing demands placed upon the urban transportation system (American Association of State Highway Officials, 1957). The American Association of State Highway and Transportation Officials (AASHTO) (the name was changed in 1973) began a seven year effort to update and considerably expanded this policy. The new edition was reissued as *A Policy on Design of Urban Highways and Arterial Streets-1973* (American Association of State Highway and Transportation Officials, 1973).

In addition to updated material on highway design, the policy contained two new sections on transportation planning and highway location not previously included in AASHTO policies. The material on transportation planning included a brief review of alternative organizational approaches, elements of an planning process, and steps in the process including data collection, forecasting, evaluation, surveillance and reappraisal. The information closely paralleled the guidance provided by FHWA in PPM 50-9 and IM 50-4-68, and the technical guidance documented in their various manuals on the 3C planning process.

The section on highway location covered social and environmental effects of urban highway developments, community participation, and economic and environmental evaluation. The new material on highway design included design guidance for mass transit especially for buses on arterial streets and freeways. The *A Policy on Design of Urban Highways and Arterial Streets-1973* attempted to show that the planning, location and design of a highway were not three distinct independent processes but rather a coordinated effort by planners, locators, and designers.

In 1984, AASHTO issued *A Policy on Geometric Design of Highways and Streets-1984* which combined updated, and replaced the 1973 urban policy and 1965 rural policy in addition to several others (American Association of State Highway and Transportation Officials, 1984). This 1984 edition did not include the material from the 1973 urban policy on transportation planning and highway location but instead referenced it.

1972 and 1974 National Transportation Studies

Although urban transportation planning had been legislatively required for over a decade, the results had not been used in the development of national transportation policy. Beyond that, a composite national picture of these urban transportation plans did not exist even though they were the basis for capital expenditure decisions by the federal government. In the early 1970s, the Department of Transportation conducted two national transportation studies to inventory and assess the current and planned transportation system as viewed by the states and urban areas.

The two studies differed in their emphasis. The 1972 National Transportation Study obtained information on the existing transportation system as of 1970, the transportation needs for the 1970-1990 period, and short-range (1974-1978) and long-range (1979-1990) capital improvement programs under three federal funding assumption (U.S. Dept. of Transportation, 1972b). The study showed that the total transportation needs of the states and urban areas exceeded the financial resources of the nation to implement them and discussed the use of low-capital alternatives to improve the productivity of the existing transportation system, particularly in urban areas.

The 1974 National Transportation Study related more closely to the ongoing urban transportation planning processes (U.S. Dept. of Transportation, 1975). It obtained information on the 1972 inventories, long-range plans (1972-1990), and short-range programs (1972-1980) for the transportation system in a more comprehensive manner than did the 1972 study. The transportation system for all three periods was described in terms of the supply of facilities, equipment, and services, travel demand, system performance, social and environmental impacts, and capital and operating costs. Information on low-capital alternatives and new technological systems was also included. The 1972-1980 program was based on a forecast of federal funds that could reasonably be expected to be available and an estimate of state and local funds for the period (Weiner, 1974). This study again demonstrated that the long-range plans were overly ambitious in terms of the financial resources that might be available for transportation. Further, it showed that even after the expenditure of vast amounts of money for urban transportation, urban transportation systems would differ little in character in the foreseeable future (Weiner, 1975b).

The National Transportation Study process introduced the concept of tying state and urban transportation planning into national transportation planning and policy formulation. It stressed multimodal analysis, assessment of a wide range of measures of the transportation system, realistic budget limitations on plans and programs, and increasing the productivity of the existing transportation system. Although these concepts were not new, the National Transportation studies marked the first time that they had been incorporated into such a vast national planning effort (Weiner, 1976a).

National Mass Transportation Assistance Act of 1974

The National Mass Transportation Assistance Act of 1974 authorized for the first time the use of federal funds for transit operating assistance. It thereby continued the trend to broaden the use of federal urban transportation funds and provide state and local officials more flexibility. This act was the culmination of a major lobbying effort by the transit industry and urban interests to secure federal operating assistance for transit.

The act authorized $11.8 billion over a 6-year period. Under the Section 5 Formula Grant program, almost $4 billion was to be allocated to urban areas by a formula based on population and population density. The funds could be used for either capital projects or operating assistance. The funds for areas over 200,000 in population were attributable to those areas. The funds were to be distributed to “designated recipients" jointly agreed to by the governor, local elected officials and operators of publicly-owned mass transportation services. For areas under 200,000 in population, the governor was designated to allocate the funds.

Of the remaining $7.8 billion, $7.3 billion was made available for capital assistance at the discretion of the Secretary of Transportation, under the Section 3 Discretionary Grant program, and the remainder was for rural mass transportation. Funds used for capital projects were to have an 80 percent federal matching share. Operating assistance was to be matched 50 percent by the federal government (U.S. Dept. of Transportation 1976).

Section 105(g) of the act required applicants for transit projects to meet the same planning statute as Section 134 of the highway act. Finally, highway and transit projects were subject to the same long-range planning requirement. Although many urbanized areas already had a joint highway/transit planning process, this section formalized the requirement for multimodal transportation planning.

The act also required transit systems to charge elderly and handicapped persons fares that were half regular fares when they traveled in off-peak hours. This was a further condition to receiving federal funds.

The act created a new Section 15 that required the Department of Transportation to establish a data reporting system for financial and operating information and a uniform system of accounts and records. After July 1978 no grant could be made to any applicant unless they were reporting data under both systems.

PLANPAC and UTPS Batteries of Computer Programs

The computer programs developed and maintained by BPR during the 1960s were essential to most urban transportation planning studies which generally did not have the time and resources to develop their own programs. The battery had been written for most part by the U.S. Bureau of Standards and consisted of 60 single purpose computer programs. Toward the end of the decade of the 1960s, new batteries of computer programs were being developed for transportation planning for the recently introduced third generation of computers, the IBM 360 (U.S. Dept. of Transportation, 1977a).

The highway planning package, known as PLANPAC, was rewritten to take advantage of the new capabilities of these computers. Most highway agencies were acquiring IBM 360s for their own computer installations and would soon be able to use the new computers. PLANPAC included computer programs to analyze survey data, develop and apply trip generation relationships, calibrate and apply trip distribution models, perform traffic assignment, evaluate networks, and for plotting and utility programs to handle data sets (U.S. Dept. of Transportation, 1977a).

New programs continued to be written and added to PLANPAC. In 1974 the FHWA completed a reorientation of the package. Many of the programs in PLANPAC that were not associated with the traditional four-step urban travel forecasting process were shifted to BACKPAC. These included computer programs for traffic signal optimization, parking studies, highway capacity analysis, carpool matching, micro traffic analysis, land-use forecasting and freeway management. This resulted in 59 programs being retained in PLANPAC and 244 programs being included in BACKPAC.

A battery of computer programs for transit system planning was also developed during the mid 1960s by the U.S. Department of Housing, and Urban Development which administered the federal transit program at that time. The battery was first written for the IBM 7090/94 computers and consisted of 11 multi-purpose programs. About 1973 UMTA assumed responsibility for the HUD transit planning package and released an enhanced version for the IBM 360 as the UMTA Transportation Planning System (UTPS). The programs were designed for network analysis, travel demand estimation, sketch planning and data manipulation. The programs were compatible and communicated through a common data base.

In 1976 the FHWA decided not to perform any further developments for PLANPAC but instead join with UMTA to support the UTPS package whose name was changed to Urban Transportation Planning System. FHWA did make a commitment to maintain and support PLANPAC as long as users needed it. The first release of the UMTA/FHWA multimodal UTPS was in 1976. A 1979/80 release provided additional capabilities and contained 20 programs.

The development and support of computer programs by FHWA and UMTA substantially assisted urban transportation planning studies in performing their various analytical and planning functions. These computer batteries facilitated the use of conventional planning techniques and furthered this style of urban transportation planning.

CHAPTER 8 — TRANSITION TO SHORT-TERM PLANNING

As planning for the Interstate Highway System was being completed, attention turned to increasing the productivity and efficiency of existing facilities. In planning for major new regional transportation facilities, many urban areas had neglected maintaining and upgrading other facilities. However, environmental concerns, the difficulty of building inner city freeways, renewed interest in urban mass transit and the energy crisis gave added impetus to the focus on more immediate problems. Signs were becoming evident of the changing emphasis to shorter-term time horizons and the corridor level in transportation planning. Gradually, planning shifted towards maximizing the use of the existing system with a minimum of new construction. Further, the connection was strengthened between long-term planning and the programming of projects (Weiner, 1982).

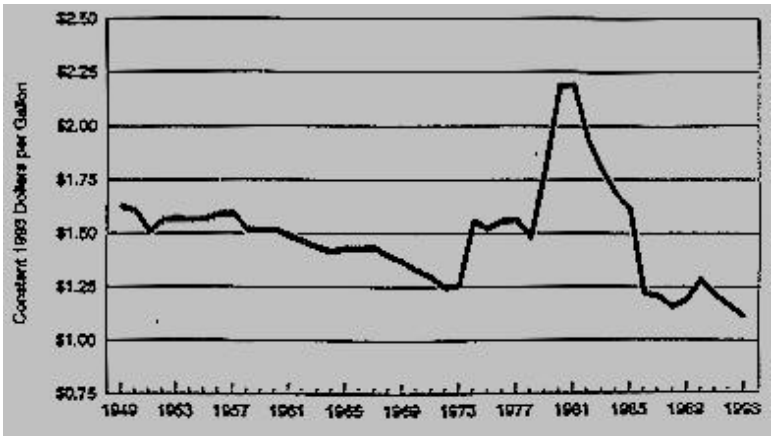
Emergency Energy Legislation

In October 1973, the Organization of Petroleum Exporting Countries (OPEC) embargoed oil shipments to the United States and, in doing so, began a new era in transportation planning. The importance of oil was so paramount to the economy and, in particular, the transportation sector that oil shortages and price increases gradually became one of the major issues in transportation planning. (Figure 12)

The immediate reaction to the oil embargo was to address the specific emergency. President Nixon signed the Emergency Petroleum Allocation Act of 1973 in November of that year which established an official government allocation plan for gasoline and home heating fuel. It regulated the distribution of refined petroleum products by freezing the supplier-purchaser relationships and specifying a set of priority users. The act also established price controls on petroleum. It gave the President authority to set petroleum prices, not to exceed $7.66 a barrel. This authority was to terminate on September 30, 1981.

The Emergency Highway Energy Conservation Act, signed on January 2, 1974, established a national 55 miles per hour speed limit to reduce gasoline consumption. It was extended indefinitely on January 4, 1975 (U.S. Dept. of Transportation, 1979c). It also provided that Federal-aid highway funds could be used for ridesharing demonstration programs.

Figure 12
Real Gasoline Prices, 1949-1993
(Constant 1993 Dollars per Gallon)



As the immediate crisis abated, the focus shifted to longer-term actions and policies to reduce the nation's dependence on oil, especially imported oil. The Energy Policy and Conservation Act of 1975 was passed by Congress to ensure that automobile gasoline consumption would be reduced to the lowest level possible and to promote energy conservation plans. As directed, the U.S. Department of Transportation through the National Highway Traffic Safety Administration (NHTSA) promulgated regulations that required the corporate average fuel economy (CAFE) be raised from 18.0 miles per gallon in 1978 to 27.5 in 1985 and beyond (U.S. Dept. of Transportation, 1979c).

Reaction to the energy crisis of 1973/1974 evolved slowly at the local level as information and analysis tools gradually appeared. Most local planning agencies knew little about energy consumption and conservation and needed to learn about this new issue that had been thrust upon them. It was not until the second crisis in 1979 with fuel shortages and sharply increasing prices that energy issues were thoroughly integrated into urban transportation planning.

Service and Methods Demonstrations Program

The focus in transportation planning and development was shifting to shorter-term, low-capital improvements in the early 1970s. Many of these improvements, which were grouped under the term “transportation system management" (TSM) techniques, were only in the conceptual stage or in limited applications in the United States and other countries. There was a need to perform the final steps of evaluation and development, where necessary, to bring these new improvement strategies into operational practice.

The Service and Methods Demonstrations (SMD) Program was established in 1974 to promote the development, demonstration, evaluation, and widespread adoption of innovative transit services and transportation management techniques throughout the United States. The program focused on concepts that used existing technology to create improvements that require relatively low levels of capital investment and that can be implemented within a short time frame. The concepts were demonstrated in real-world operational environments and evaluated to determine their costs, impacts, and implementation

characteristics. Evaluation findings were widely disseminated to transportation planners, policy makers, and transit operators (Spear, 1979).

The SMD Program began with six demonstrations involving specialized transportation for the elderly and handicapped, double-deck buses, and priority lanes for highway occupancy vehicles. By 1978 the program was sponsoring 59 ongoing demonstrations, evaluating 31 special case study projects, and had begun a cooperative program with the FHWA to evaluate another 17 projects in the National Ridesharing Demonstration Program.

Projects were divided into four program areas. First, under conventional service improvements, projects concentrated on improving productivity, reliability, and effectiveness with such techniques as priority treatment for buses and other high occupancy vehicles, route restructuring, auto restricted zones, and articulated buses. In the second category of pricing and service innovation were projects on fare payment strategies, fare integration, fare change strategies, service changes, and parking pricing. The third category of paratransit services contained projects on ridesharing, brokerage, and taxicabs. Fourth, transportation services for special user groups focused on accessible bus services, user-side subsidies, coordination of social service agency transportation, and rural public transportation (Spear, 1981).

The Service and Methods Demonstration Program made a major contribution to the identification, evaluation, and dissemination of transportation system management techniques. This effort accelerated the introduction and adoption of innovative approaches to the provision of public transportation service. It also spurred experimentation with new public transportation service concepts by other agencies at the state and local levels.

OTA's Report on Automated Guideway Transit

By the time the report *Tomorrow's Transportation: New Systems for the Urban Future* (Cole, 1968) was published in 1968, UMTA barely had a research program in the area of new urban transit technologies. A small grant had been made for development of Westinghouse's Transit Expressway and several new system feasibility studies were begun in 1967. By 1970 decisions had been reached to proceed with funding of three major automated guideway transit (AGT) demonstration projects - the Transpo 72 exhibition and two other demonstrations (U.S. Congress, Office of Technology Assessment, 1975).

Transpo 72 was held at the Dulles International Airport near Washington, D.C. in the spring of 1972. Four companies built and operated prototype AGT systems for public demonstration. In 1971, UMTA awarded a grant to the Vought Corporation to build a group rapid transit (GRT) system, Airtrans, as the internal circulation system for the Dallas-Ft. Worth Airport. Service began in 1974. The third GRT demonstration connected three separate campuses of West Virginia University at Morgantown. Boeing Aerospace Company became the manager of the project which was largely based on a proposal by Alden Self-Transit Systems Corporation. Public service began in October 1975. The system was expanded with an UMTA grant and operations began in July 1979 (U.S. Dept. of Transportation, 1983b).

By the end of 1975, another 18 systems were in operation or under construction. They were all simple shuttle loop transit (SLT) systems at airports, amusement parks, and shopping centers. All were funded with private funds (U.S. Dept. of Transportation, 1983b).

In September 1974, the U.S. Senate Transportation Appropriations Committee directed the Congressional Office of Technology Assessment (OTA) to assess the potential for AGT systems. The report, produced in June 1975, was a comprehensive assessment of AGT systems and contained five reports from panels of specialists. Overall the report concluded that the $95 million spent on AGT research and development up to that time by UMTA had not produced the direct results expected in the form of fully developed systems in urban settings. The OTA went further in concluding that insufficient funding was directed at new systems research and that the program needed restructuring with a clarification of objectives (U.S. Congress, Office of Technology Assessment, 1975).

The OTA found that SLT systems were promising for specialized urban transportation problems. With regard to the more sophisticated GRT systems, the OTA found that a number of cities had shown interest but that there were serious technical problems. As to the small vehicle personal rapid transit (PRT) systems, only preliminary studies were recommended A major conclusion was that the program emphasized hardware development, but further research was needed on social, economic and environmental impacts. Also UMTA had not developed a mechanism for qualifying new technological systems for capital grants (U.S. Congress, Office of Technology Assessment, 1975).

In response to the study, UMTA launched the AGT Socio-Economic Research Program in 1976. It consisted of assessments of existing AGT installations, studies of capital and operating costs, travel market analyses, and an assessment of AGT technology compared with other alternatives in urban area application (U.S. Dept. of Transportation, 1983b).

A review of local planning studies conducted under this program found that more than 20 cities had considered AGT systems. The conclusion reached was that there was considerable uncertainty with regard to costs, public acceptance, reliability, crime and land use impacts (Lee et.al., 1978). Planning procedures and data were not available to adequately assess new technological systems as an alternative to conventional urban technologies.

Also in 1976, UMTA initiated the Downtown People Mover (DPM) program. It was designed to demonstrate the application of an SLT type system in an urban environment. Impact studies were to be conducted to assess the systems with regard to patronage, community acceptance, reliability, maintainability, safety, and economics. Four cities were selected for these demonstrations: Cleveland, Houston, Los Angeles and St. Paul. Three other cities were approved for participation using their existing commitments of federal funds: Detroit, Miami and Baltimore (Mabee and Zumwalt, 1977). Detroit and Miami have constructed DPMs.

Model 13(c) Labor Protection Agreement for Operating Assistance

Section 13(c) was included in the Urban Mass Transportation Act of 1964 to protect employees in the transit industry from potential adverse effects of federal transit assistance. At the time, federal assistance was in the form of capital grants and loans that could be used for public acquisition of private operations. A major concern was the loss of collective bargaining rights when employees entered the public sector.

Section 13(c) required an applicant for federal assistance to make arrangements to protect the interests of employees. Employee protection arrangements under Section 13(c) included: (1) preservation of rights under existing contracts; (2) continuation of collective bargaining rights; (3) protection of employees against a worsening of their positions; (4) assurances of employment or reemployment for existing employees; and (5) paid training or retraining programs.

The Secretary of Labor was responsible for determining whether these arrangements were fair and equitable. There had been an evolution in the administration of Section 13(c) since it was enacted. Originally the Department of Labor (DOL) only required a statement that the interests of employees would not be adversely affected by the Federal grant. By 1966, however, there had evolved detailed 13(c) agreements that were the result of collective bargaining between grant applicants and the employee representatives. These 13(c) agreements were subject to renegotiation with each new grant.

With the passage of the National Mass Transportation Assistance Act of 1974, federal funds became available for operating assistance under the Section 5 Formula Grant program. Grants for operating assistance were also required to comply with the Section 13(c) provisions. To facilitate processing of these operating assistance applications, organized labor, the American Public Transit Association (APTA), and the DOL developed a national model 13(c) agreement pertaining to such agreements. The model agreement was signed in July 1975 by APTA, the Amalgamated Transit Union, and the Transport Workers Union of America. APTA established a procedure under which individual transit properties could affiliate themselves with the agreement and, thereby, become eligible for coverage by it for operating assistance applications (Lieb, 1976).

The model section 13(c) agreement for transit operating assistance reduced the time and effort of individual transit properties and labor representatives to negotiate agreement and accelerated the use of federal funds for operating assistance.

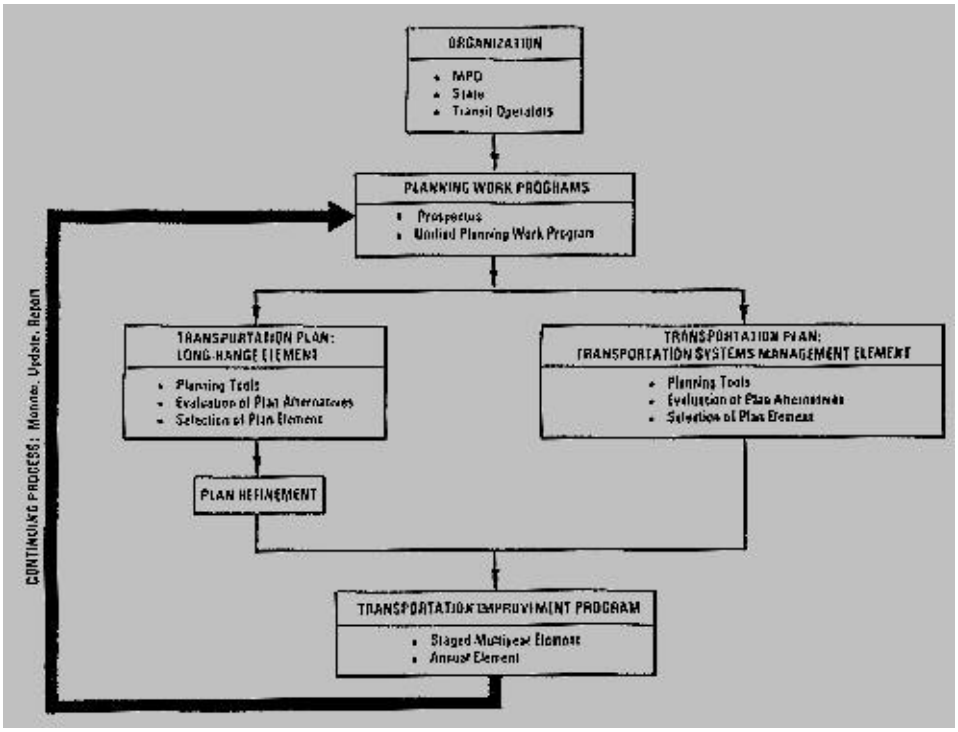
Joint Highway/Transit Planning Regulations

The UMTA and FHWA had worked for several years on joint regulations to guide urban transportation planning. Final regulations were issued to take effect in October 1975 (U.S. Dept. of Transportation, 1975a). They superseded all previous guidelines, policies, and regulations issued on urban transportation planning by the UMTA and FHWA.

The regulations provided for the designation of MPOs by the Governors and, to the maximum extent feasible, that the MPOs be established under state legislation. The MPO was to be the forum of cooperative decisionmaking by principal elected officials. Principal elected officials of the local jurisdictions were to have adequate representation on the MPO. The MPO together with the state was responsible for

carrying out the urban transportation planning process. The regulations also required agreements on the division of responsibility where the MPOs and A-95 agencies were different. A multiyear prospectus and annual unified work program had to be submitted specifying all transportation-related planning activities for an urban area as a condition for receiving federal planning funds. (Figure 13)

Figure 13



Joint FHWA/UMTA Urban Transportation Planning Process

The urban transportation planning process was required to produce a long-range transportation plan, which had to be reviewed annually to confirm its validity. The transportation plan had to contain a long-range element and a shorter-range “transportation systems management element" (TSME) for improving the operation of existing transportation systems without new facilities. An Appendix to the regulations contained a list of major categories of actions to be considered for inclusion in the TSME. (Table 4) The Appendix stated that the feasibility and need for the individual actions differed with the size of the urbanized area, but that some actions in each of the categories would be appropriate in for any urbanized area.

A multiyear “transportation improvement program" (TIP) also had to be developed consistent with the transportation plan. The TIP had to include all highway and transit projects to be implemented within the coming five years. It thereby became the linkage between the planning and programming of urban transportation projects. It also brought together all highway and transit projects into a single document that could be reviewed and approved by decision makers. The TIP had to contain an “annual element" that would be the basis for the federal funding decisions on projects for the coming year.

The regulations provided for a joint FHWA/UMTA annual certification of the planning process. This certification was required as a condition for receiving federal funds for projects. The regulations incorporated previously legislated requirements related to social, economic, and environmental impact analysis, air quality planning, and the elderly and handicapped.

These joint regulations applied to all urban highway and transit programs including those for transit operating assistance. They represented the most important action up to that time to bring about multimodal urban transportation planning and programming of projects. They changed the emphasis from long-term planning to shorter range transportation system management, and provided a stronger linkage between planning and programming. These regulations were another turning point in the evolution of urban transportation planning that set the tone for the next several years.

Policy on Major Urban Mass Transportation Investments

The level of federal funds for urban mass transportation had increased dramatically since 1970. However, the requests for federal funds from urban areas outpaced that increase. In particular, there was a resurgence of the conviction that rail transit systems could largely solve the problems of congestion and petroleum dependence while promoting efficient development patterns. Consequently, the need to assure that these funds were used effectively and productively became apparent.

The UMTA set forth its views on this issue in the document, *Preliminary Guidelines and Background Analysis* (Transportation Research Board, 1975a). It was prepared for review at a conference on the Evaluation of Urban Transportation Alternatives held at Airlie House, Virginia, in February 1975. The conference was attended by a broad spectrum of persons from all levels of government, the transit industry, consultants, universities, and private citizens. The conference report indicated a number of concerns with the guidelines, which were transmitted to the UMTA (Transportation Research Board, 1977).

With the assistance of the conference findings, the UMTA developed a draft policy statement to guide future decisions regarding federal assistance in the funding of major mass transportation projects. This Proposed Policy on Major Urban Mass Transportation Investments was published in August 1975 (U.S. Dept. of Transportation, 1975c). It embodied a number of principles.

Table 4
Actions to Be Considered for Inclusion in
The Transportation System Management Element

Actions to Ensure the Efficient Use of Existing Road Space

- Traffic Operations Improvements
- Preferential Treatment of Transit and High Occupancy Vehicles
- Provision for Pedestrians and Bicycles
- Management and Control of Parking
- Changes in Work Schedules, Fare Structures and Automobile Tolls

Actions to Reduce Vehicle Use in Congested Areas

- Encouragement of Carpooling and Other Forms of Ridesharing
- Diversion, Exclusion and Metering of Automobile Access to Specific Areas
- Area Licenses, Parking Surcharges and Other Forms of Congestion Pricing
- Establishment of Car Free Zones and Closure of Selected Streets
- Restrictions of Downtown Truck Deliveries During Peak Hours

Actions to Improve Transit Service

- Provision of Better Collection, Distribution, and Internal Collection Service Within Low Density Areas
- Greater Responsiveness and Flexibility in Routing, Scheduling and Dispatching of Transit Vehicles
- Provision of Express Services
- Provision of Extensive Park and Ride Services From Fringe Parking Areas
- Provision of Shuttle Transit Services From CBD Fringe Parking Areas
- Encouragement of Jitneys and Other Flexible Paratransit Services and Their Integration in the Transit System
- Simplified Fare Collection Systems and Policies
- Better Passenger Information Systems and Services

Actions to Increase Transit Management Efficiency

- Improve Marketing
- Develop Cost Accounting and Other Management Tools to Improve Decisionmaking
- Establish Maintenance Policies that Ensure Greater Equipment Reliability
- Using Surveillance and Communications Technology to Develop Real Time Monitoring and Control Capability

First, areawide transportation improvement plans should be multimodal and include regionwide and community-level transit services. Second, major mass transportation investment projects should be planned and implemented in stages to avoid premature investment in costly fixed facilities and to preserve maximum flexibility to respond to future unknowns. Third, full consideration should be given to improving the management and operation of existing transportation systems. Fourth, the analysis of alternatives should include a determination of which alternative meets the local area's social, environmental, and transportation goals in a cost effective manner. And fifth, full opportunity should be provided for involvement of the public and local officials in all phases of the planning and evaluation process (Transportation Research Board, 1977).

The UMTA stated that the level of federal funding would be based on a cost-effective alternative that would meet urban area needs and goals in a 5- to 15-year time frame and that was consistent with the long-range transportation plan.

A second Conference on Urban Transportation Alternative Analysis was held in March/April 1976 at Hunt Valley, Maryland. This conference, too, was attended by a broad spectrum of the professional community. There was considerable discussion on several issues including the criteria to be used to measure cost-effectiveness, where the cost-effectiveness analysis fit in the overall planning process and the differences in the project development process between transit and highways (Transportation Research Board, 1977).

Using the recommendations from the second conference, the UMTA prepared and published a final policy statement in September 1976 (U.S. Dept. of Transportation, 1976b). Although changes in the proposed policy were made, the principles remained basically unchanged.

In February 1978, the UMTA provided further elaboration in its Policy Toward Rail Transit (U.S. Dept. of Transportation, 1978a). It stated that new rail transit lines or extensions would be funded in areas where population densities, travel volumes, and growth patterns indicated the need. Preference would be given to corridors serving densely populated urban centers. It reaffirmed the principles of analysis of alternatives, including TSM measures, incremental implementation and cost-effectiveness. The policy added the requirement that the local area had to commit itself to a program of supportive actions designed to improve the cost-effectiveness, patronage, and prospect for economic viability of the investment. This included automobile management policies; feeder service; plans, policies and incentives to stimulate high density private development near stations; and other measures to revitalize nearby older neighborhoods and the central business district. With this policy supplement, rail transit was to become a tool for urban redevelopment.

Characteristics of Urban Transportation Systems

Urban transportation planning in the mid 1970's was a more diverse and complex activity compared to the rather uniform process that existed during the mid 1960's. This change was caused by the need to address an expanded list of issues, and was fostered by the issuance of the Joint FHWA/UMTA Planning Regulations and UMTA's Policy on Major Urban Mass Transportation Investments (U.S. Dept. of Transportation, 1975a and 1976b). The range of alternatives that had to be evaluated widened to include a fuller consideration of transit system options, transportation system management measures, and traffic engineering improvements. A more thorough assessment of social, economic, environmental, and energy impacts was required. Consequently, urban areas were conducting transportation systems evaluations with increasing sophistication that consumed more time and resources.

Even though there were many sources of information on the characteristics of urban transportation systems and their impacts to facilitate this evaluation process, they were difficult to locate, conflicting, often out of date, and generally local in nature. There was a need to synthesis and codify this data and information so that it would be more accessible. An earlier effort in the 1960's by the Institute of Traffic Engineers, *Capacities and Limitations of Urban Transportation Modes*, was more narrowly focused and reflected the range of issues at that time (Institute of Traffic Engineers, 1965).

To fill this gap, a handbook was prepared and published in early 1974 under the title, *Characteristics of Urban Transportation Systems* (CUTS) (Sanders and Reynen, 1974). CUTS was designed as a single reference source containing information of the performance characteristics of urban transportation systems for use in the evaluation of transportation alternatives. The first edition contained data on: rail transit, bus transit, the automobile/highway system, and pedestrian assistance systems. The seven supply parameters selected were: speed, capacity, operating cost, energy consumption, air pollution and noise, capital cost, and accident frequency. The CUTS handbook was periodically updated and expanded. Later editions included data on activity center systems as well as the original four modes. Labor inputs were added to the supply parameters in layer editions of the handbook. The Seventh Edition of the handbook was published in 1992. (Cambridge Systematics, et. al., 1992).

CUTS was supplemented with two additional handbooks which provided data on the demand characteristics of urban transportation systems. The first, released in 1977, was *Traveler Response to Transportation System Changes* (Pratt, Pedersen and Mather, 1977). It summarized and synthesized information, primarily from existing literature, on the traveler behavior changes for a wide variety of changes in the transportation system. The initial edition distilled and interpreted data on seven types of transportation changes including: high occupancy vehicle priority facilities, variable working hours, van and buspools, transit scheduling frequency changes, routing changes, transit fare changes and transit marketing. Parking and express transit were added in the second edition (Pratt and Copple, 1981).

The second handbook was *Characteristics of Urban Transportation Demand* (CUTD) along with a later issued Appendix (Levinson, 1978 and 1979). The CUTD handbook contained data on areawide travel characteristics and typical usage information for rail, bus and highways systems. The data was designed as inputs and cross checks for urban travel forecasting. The Appendix contained more detailed city specific and site specific data on travel. The revision to CUTD reorganized, integrated and updated the information included in the earlier edition (Charles River Associates, 1988).

These efforts sought to capitalize on the large body of data and experience on urban transportation systems that had been accumulated in the previous two decades and make it more available and accessible to the transportation planning community. It came at a time when the range of information needed for transportation system evaluation had greatly broadened but the resources for collecting new data were contracting.

Light Rail Transit

In the late 1960s and early 1970s, many urban areas were seeking alternatives to the construction of freeways. San Francisco and Washington, D.C. had decided to construct heavy rail systems, but many areas did not have the density or potential travel demand to justify such systems. Moreover, heavy rail systems had high construction costs and disrupted the areas through which they passed during construction. Busways and preferential treatment for buses were being considered as alternatives to high cost fixed guideway systems, particularly in the United States. In Europe, especially West Germany, light rail transit was the preferred alternative. This European experience renewed interest in light rail systems in the United States (Diamant, 1976).

In 1971 the San Francisco Municipal Railway (Muni) requested bids on 78 new light rail vehicles to replace its deteriorating PCC car fleet. The two bids that were received were rejected as being too costly. About this time, the Massachusetts Bay Transportation Authority (MBTA) and the Southeastern Pennsylvania Transportation Authority (SEPTA) decided to preserve and upgrade their light rail systems. These events provided the opportunity to develop a standard design for common use. The UMTA authorized a grant to the MBTA to develop specifications for a new U.S. Standard Light Rail Vehicle (SLRV). The first SLRVs were built by Boeing Vertol and tested in 1974 at the UMTA's test track in Pueblo, Colorado (Silien and Mora, 1975).

In December 1975 the UMTA expressed its concern that urban areas should give adequate consideration to light rail transit (LRT) in a Policy Statement on Light Rail Transit. The UMTA stated that while it had no modal favorites, the increasing demand for transit capital assistance combined with escalating transit construction costs made it essential that cost effective approaches be fully explored. UMTA considered LRT as a potentially attractive option for many urban areas and would assist in its deployment in areas where proper conditions existed (Transportation Systems Center, 1977).

As interest in LRT grew, a series of conferences was organized to exchange information and explore the technical aspects and applications of LRT. The first conference, held in Philadelphia in 1975, had as its objective the reintroduction of LRT to a wide spectrum of decision makers in government, industry and academia (Transportation Research Board, 1975b). In 1977 a second conference in Boston addressed the need for a more detailed focus on the theme of planning and technology (Transportation Research Board, 1978). Several years later, in 1982, a third conference occurred in San Diego with the theme of planning, design, and implementation of LRT in existing urban environments (Transportation Research Board, 1982a). The fourth conference in Pittsburgh in 1985 focused on cost-effective approaches in the deployment of LRT systems that capitalized on the flexibility of this mode of transit (Transportation Research Board, 1985a).

By the 1990's, LRT had achieved a substantial resurgence in the United States. Boston, Cleveland, Newark, New Orleans, Philadelphia, Pittsburgh, and San Francisco had renovated existing lines or replaced their existing vehicle fleets or both. (Table 5) Baltimore, Buffalo, Dallas, Los Angeles, Portland, Sacramento, St. Louis, San Diego and San Jose, had opened new LRT lines. And new LRT lines were under construction in Bayonne, Northern New Jersey and Salt Lake City.

Federal-Aid Highway Act of 1976

The Federal-Aid Highway Act of 1976 broadened the use of funds from trade-ins of nonessential Interstate routes. The process of increasing flexibility in the use of Interstate funds began with Section 103(e)(2), referred to as the Howard-Cramer Amendment, of the Federal-Aid Highway Act of 1968. It allowed withdrawal of a nonessential Interstate route and the use of the funds on another Interstate route in the state. In the Federal-Aid Highway Act of 1973, Section 103(e)(4) allowed urbanized areas to withdraw a nonessential Interstate segment within an area upon joint request of local elected officials and the governor. An equivalent amount of funds could then be spent from general revenues for mass transportation capital

projects at an 80 percent federal matching share. The 1976 act allowed the funds from the Interstate substitution to be used also for other highways and busways serving those urbanized areas (Bloch, et. al., 1982).

Table 5
U.S. Light Rail Systems

Metropolitan Area	Year Built	Year Modernized	Directional Route Miles
Baltimore	1992		43.6
Boston	1897	1975-89	55.9
Buffalo	1985		12.4
Cleveland	1919	1980's	26.7
Dallas	1996		51.2
Denver	1994		10.6
Los Angeles	1990		43.2
Newark	1935	1980's	8.3
New Orleans	1893	1980's	16.0
Philadelphia	1892	1981	69.3
Pittsburgh	1891	1985	38.1
Portland	1986		30.2
Sacramento	1987		36.2
St. Louis	1993		34.0
San Diego	1980		41.5
San Francisco	1897	1981	49.7
San Jose	1988		39.0
Under Construction			
Bayonne, Northern, NJ	1999		52.8
Salt Lake City	1999		38.4

The 1976 act also changed the definition of construction to allow federal funds to be expended on resurfacing, restoration, and rehabilitation (3R) of highways. This was done in recognition of the growing problem of highway deterioration. The completion date for the Interstate system was extended to September 30, 1990. Finally, the act expanded the transferability of federal funds among different federal-aid systems, thereby increasing flexibility in the use of these funds.

ITE Trip Generation Report

In 1972, the Technical Council of the Institute of Transportation Engineers (ITE) formed the Trip Generation Committee do develop a report on trip generation rates. The purpose of the Committee was to collect trip generation rate data already measured by others and to compile these data into on common source. The first edition of *Trip Generation, An Informational Report* was published in 1976 and contained data collected between 1965 and 1973 from nearly 80 different sources (Institute of Transportation Engineers, 1976). Revised and updated editions were published in 1979, 1983, 1987 and 1991 (Institute of Transportation Engineers, 1979, 1982, 1987 and 1991).

The fifth edition of *Trip Generation* represented the most comprehensive data base then available on trip generation rates. These data were collected through volunteer efforts and did not represent ITE's recommendations on individual rates or preferred application of the data. The fifth edition contained trip generation rates for a 121 land uses categories from over 3,000 studies. Many categories, however, contained a limited number of studies. Rates were given for several different variables of a project including floor area, employment, and acreage, as well as for several time periods. In earlier editions of the report, trip rates were given in the form of cells of a series of matrices. Starting with the fourth edition, rates were calculated using regression equations.

The ITE *Trip Generation* reports became the most widely used reference for trip generation data by traffic engineers and transportation planners for site level planning and analysis. At times the Trip *Generation* report was used as an expedient when a site specific analysis would have been more appropriate.

Urban System Study

The joint highway/transit planning regulations were controversial during their preparation and after their issuance. The states contended that the federal requirement to create metropolitan planning organizations (MPOs) with the responsibility to program funds preempted the states' right of self-determination. In essence they argued that MPOs were another level of government. Those at the local level of government were more supportive of the regulations, especially the greater authority to select projects and program funds. But, there was widespread concern that the planning and programming process had become too inflexible and cumbersome (U.S. Dept. of Transportation, 1976a).

Consequently the Federal-Aid Highway Act of 1976 required a study of the various factors involved in the planning, programming, and implementation of routes on the Urban system. The study was conducted jointly by the FHWA and UMTA and submitted to Congress in January 1977 (U.S. Dept. of

Transportation, 1976a). It was a major undertaking involving a liaison group of 12 organizations representing state and local interests, site visits to 30 urbanized area and field data on the remaining areas.

The study concluded that the planning requirements were being carried out responsibly by all participants. This was true in spite of the controversy over the responsibilities of the MPO. They also found that the flexibility in the use of Urban system funds for transit was not widely used. Only 6.4 percent of the funds were being used for transit projects. It was concluded that overall the complexity of federal requirements deterred many local governments from using their federal urban system funds (Heanue, 1977). The study recommended that no changes should be made at that time, the process was new and participants had not had sufficient time to adjust, and that even though there was some confusion and controversy, the process was working properly (U.S. Dept. of Transportation, 1976a).

Road Pricing Demonstration Program

Road pricing had long been discussed as means to manage traffic demand as was used in many other industries to manage demand for services. The basic approach was to increase prices for the use of facilities and service when demand was highest so that those users would either pay the higher cost to be served during the peak or divert to lower demand periods or alternative modes (Vickrey, 1959). An extensive research program on the feasibility of road pricing was conducted by the Urban Institute (Kulash, 1974).

In an attempt to stimulate the use of road pricing, the U.S. Department of Transportation began a demonstration program in 1976. Secretary of Transportation William T. Coleman wrote to the mayors of eleven cities about the availability of a road pricing demonstration and offering Federal funding for administration enforcement and evaluation of a vehicle licensing scheme inviting their participation (Arrillaga, 1978). This approach to road pricing was based on the successful application in the city-state of Singapore (Watson and Holland, 1978).

Of the cities that responded, three were most promising: Madison, Wisconsin, Berkeley, California; and Honolulu, Hawaii. These cities seemed most committed to reducing automobile use and to using the resulting revenue to finance transit expansion (Higgins, 1986). Preliminary studies were conducted for each of the cities. Based on these preliminary analyses, all three cities declined to pursue the demonstrations any further. A number of reasons were cited in opposition to the schemes including: harm to business, coercive interference with travel rights, regressive impacts on the poor, and inadequate information dissemination and promotion.

More than a decade would pass before there was renewed interest in trying road pricing schemes. This would come under the stimulus of the Clean Air Act and the difficulty some urbanized areas had in meeting national ambient air quality standards.

National Transportation Trends and Choices

Ten years after it was established, the U.S. Department of Transportation, under Secretary William T. Coleman, completed its first multimodal national transportation planning study. The report, *National Transportation Trends and Choices - To The Year 2000*, described DOT's views regarding the future evolution of transportation, set forth the decisions that needed to be made, and described the changes that would best serve national objectives (U.S. Dept. of Transportation, 1977c).

National Transportation Trends and Choices elaborated upon a key policy theme of Secretary Coleman's statement of national transportation policy:

> "Underlying comprehensive transportation policy is the recognition that diversity and intermodal competition are essential to an effective transportation system. Government policy must move in the direction of increasing equal competitive opportunity among the transportation modes, minimizing the inequitable distortions of government intervention and enabling each mode to realize its inherent advantages" (U.S. Dept. of Transportation, 1977c).

National Transportation Trends and Choices was designed to show the Congress and the public that the DOT was making both substantive and resource allocation decisions effectively and coherently in light of long-range consequences, intermodal trade-offs, and broader national goals and objectives. In addition, the planning effort was designed to facilitate decisionmaking within the federal government, and to encourage consistency by State and local agencies and the private sector. This study was intended to initiate a continuing national planning process based on common time horizons and planning assumptions.

The needs estimates in *National Transportation Trends and Choices* were developed for the 15-year period 1976-1990. For highways and public transportation, the estimates were based on updates of the data from the *1974 National Transportation Report* (U.S. Dept. of Transportation, 1975d) which were submitted by only 15 states. The aviation needs estimate were developed by updating the 1976 National Airport System Plan plus additional analyses. Railroad and pipeline needs were estimated based on assumptions developed by the study staff.

National Transportation Trends and Choices was received by the Congress with little fanfare. However, the thrust of the report towards greater competition and reduced federal regulation was reflected in actions taken in later years. The study did not become the beginning of a longer term national planning effort.

Transit Uniform System of Accounts and Records

Transit operating and financial data had been collected by the American Public Transit Association (APTA) and its predecessor, the American Transit Association, since 1942 (American Public Transit Association, 1989). This data had been the primary source of comparative transit information for operators, researchers, and governmental agencies. It had been recognized for some time, however, that this data had limitations in terms of uniformity of data definitions, consistency of reporting, and accuracy. As the involvement of Federal, State and local governments increased in funding urban public transportation, particularly operating assistance, the need for a uniform system of accounts and records was recognized (U.S. Dept. of Transportation, 1977d).

In 1972, the American Transit Association (ATA) and Institute for Rapid Transit (IRT), predecessors of APTA, began Project FARE, Uniform Financial Accounting and Reporting Elements, to develop a uniform industry data reporting system. Project FARE developed and pilot tested a new system of accounts and records to meet the needs of the industry and government agencies to monitor operating performance (Arthur Andersen & Co., 1973).

Shortly thereafter, the Urban Mass Transportation Act of 1974 created a new Section 15 that required the Department of Transportation to establish a data reporting system for financial and operating information and a uniform system of accounts and records. UMTA continued to work with an Industry Control Board to modify and adapt the FARE system to accommodate the requirements of Section 15. The resulting system was required to be instituted by all recipients of UMTA Section 5 Formula Grant funds (U.S. Dept. of Transportation, 1977e).

The Section 15 Transit Data Reporting System was first applied for fiscal year 1979 (U.S. Dept. of Transportation, 1981d). Over 400 transit systems reported under the system. Data items included those covering revenues, government subsidies, capital and operating costs, organizational structure, vehicles, employees, service provided, ridership, safety, energy consumption, and operating performance. Over a period of years, the system underwent a number of modifications to its content, structure and procedures to adjust to changing data requirements. This included broadening the data base to include commuter rail, vanpools, and purchased (contracted) services.

Clean Air Act Amendments of 1977

The Clean Air Act Amendments of 1977 increased the flexibility and local responsibility in the administration of the Clean Air Act. The amendments required state and local governments to develop revisions to state implementation plans (SIPs) for all areas where the national ambient air quality standards had not been attained. The revised SIPs were to be submitted to the EPA by January 1, 1979, and approved by May 1, 1979.

The revised plans had to provide for attainment of national ambient air quality standards by 1982, or in the case of areas with severe photochemical oxidant or carbon monoxide problems, no later than 1987. In the latter case, a state must demonstrate that the standards cannot be met with all reasonable stationary and transportation control measures. The plans also had to provide for incremental reductions in emissions ("reasonable further progress") between the time the plans were submitted and the attainment deadline. If a state failed to submit a SIP or if EPA disapproved the SIP and the state failed to revise it in a satisfactory manner, EPA was required to promulgate regulations establishing a SIP by July 1, 1979. If, after July 1, 1979, EPA determined that a state was not fulfilling the requirements under the act, it was to impose sanctions. This would include stopping federal-aid for highways (Cooper and Hidinger, 1980).

In many major urbanized areas the revised SIPs required the development of transportation control plans (TCPs) that included strategies to reduce emissions from transportation-related sources by means of structural or operational changes in the transportation system. Since state and local governments implement

changes in the transportation system, the act strongly encouraged the preparation of transportation elements of the SIP by metropolitan planning organizations. These local planning organizations were responsible for developing the transportation control measure element of the SIP (Cooper and Hidinger, 1980).

From 1978 to 1980, the DOT and EPA, after long negotiations, jointly issued several policy documents to implement the Clean Air Act's transportation requirements. One of these, signed in June 1978, was a "Memorandum of Understanding" that established the means by which the DOT and the EPA would assure the integration of transportation and air quality planning. A second one issued also in June 1978, "Transportation Air Quality Planning Guidelines" described the acceptable planning process to satisfy the requirements. Another, in March 1980, was a notice containing guidelines for receiving air quality planning grants under section 175 of the act (Cooper and Hidinger, 1980).

In January 1981 DOT issued regulations on air quality conformance and priority procedures for use in federal highway and transit programs. The regulations required that transportation plans, programs, and projects conform with the approved SIPs in areas that had not met ambient air quality standards, termed "nonattainment areas." In those areas, priority for transportation funds was to be given to "transportation control measures" (TCMs) that contributed to reducing air pollution emissions from transportation sources. Where an area's transportation plan or program was not in conformance with the SIP, "sanctions" were to be applied that prohibited the use of federal funds on major transportation projects (U.S. Dept. of Transportation, 1981b).

The 1977 Clean Air Act Amendments certainly gave impetus to short-range planning and transportation system management strategies. They also added a new dimension to the institutional and analytical complexity of the planning process.

CHAPTER 9 — URBAN ECONOMIC REVITALIZATION

In the mid 1970s the country was feeling the effects of structural changes in the economy, high unemployment, inflation, and rising energy prices. Many of the problems had been developing for a number of years. The economy was in a transition from a predominantly manufacturing base to one that had a larger share concentrated in service, communication, and high technology industries. Jobs in the manufacturing sector were declining and new jobs were growing in the new sectors of the economy. People were moving to those areas of the country where the new jobs were being created, especially the South and the West. The older urban areas in the Northeast and Midwest were being affected most severely by these changes. But older central cities in all sections of the country were in decline as jobs and people migrated first to the suburbs and then to the newer urban areas where the economies were growing.

These older communities and central cities were severely distressed economically and limited in their ability to address these problems themselves. It was recognized that the federal government had contributed to these problems with programs that had unintended consequences. However, many of the decisions that affected changes in urban areas were outside the control of even the federal government and often any level of government. The federal, state, and local levels of government would, therefore, have to cooperate among themselves and with the private sector in order to alleviate these problems.

1978 National Urban Policy Report

In Title VII of the Housing and Urban Development Act of 1970 the Congress required preparation of biennial reports on national growth and development. Congress recognized the need to analyze the many aspects of the nation's growth in a systematic manner with the objective of formulating a national urban growth policy. The first report, transmitted to Congress in 1972, discussed the broad subject of national growth, including both rural and urban areas (Domestic Council, 1972). The 1974 report focused on the dominant role of the private sector in determining growth and the ways in which the public and private sector could influence development patterns. The 1976 report discussed the decline of older Northeastern cities, the constraints of energy, environmental resources, and the need to conserve and rehabilitate existing housing and public facilities (Domestic Council, 1976).

The National Urban Policy and New Community Development Act of 1977 amended the 1970 Act to designate the report the “National Urban Policy Report" rather than the more general “Report on Urban Growth" (Domestic Council, 1976). Less than a year later, on March 27, 1978, President Carter presented his Message to Congress on National Urban Policy. The policy was designed to build a new Partnership to Conserve America's Communities involving all levels of government, the private sector, and neighborhood and voluntary organizations. It contained a number of proposals to improve existing programs and for new initiatives with the purpose of revitalizing distressed central cities and older suburbs (U.S. Dept. of Housing and Urban Development, 1978b).

The President's Message was followed in August by the President's 1978 National Urban Policy Report (U.S. Dept. of Housing and Urban Development, 1978b). Like its predecessors, the report discussed the demographic, social and economic trends in the nation's urban areas. But, it was the first report to

recommend a national urban policy. The recommendations in the Report and the President's Message were developed by an inter-departmental committee called the Urban and Regional Policy Group. The Group worked for a year with extensive public involvement to formulate its analysis of the problems and recommendations (U.S. Department of Housing and Urban Development, 1978a).

The urban policy consisted of nine objectives. The first urban policy objective was, "Encourage and support efforts to improve local planning and management capacity and the effectiveness of existing federal programs by coordinating these programs, simplifying planning requirements, reorienting resources, and reducing paperwork." Other objectives called for greater state, private sector and voluntary involvement to assist urban areas. Several objectives were for fiscal relief for distressed communities and assistance to disadvantaged persons. The last objective was for an improved physical environment and reduced urban sprawl (U.S. Dept. of Housing and Urban Development, 1978b).

A wide range of legislative and administrative actions were taken to implement the national urban policy (U.S. Dept. of Housing and Urban Development, 1980). The Department of Transportation, FHWA and UMTA, issued guidance for evaluating the impact on urban centers of major transportation projects and investments. The guidance required an analysis of the impacts of improvements in highways and transit on central cities' development, tax base, employment, accessibility and environment. In addition, impacts on energy conservation, and on minorities and neighborhoods were to be analyzed. Furthermore, the guidance required that improvements to existing facilities be considered first, including the repair and rehabilitation of transportation facilities and TSM measures to increase the effectiveness of those facilities. In this manner, the guidance sought to assure that the new investments in transportation facilities would be cost-effective (U.S. Dept. of Transportation, 1979e).

The new national urban policy gave added impetus to the shift from constructing new facilities to managing, maintaining and replacing existing facilities. It was rooted in the belief that mobility could be assured despite energy, environmental, and financial constraints. The key was to manage the use of the automobile in the city better. The challenge was for the urban transportation planning process to maintain and enhance mobility while meeting these other objectives (Heanue, 1980).

Surface Transportation Assistance Act of 1978

The Surface Transportation Assistance Act of 1978 was the first act that combined highway, public transportation and highway safety authorizations in one piece of legislation. It provided $51.4 billion for the fiscal years 1979 through 1982, with $30.6 billion for highways, $13.6 billion for public transportation, and $7.2 billion for highway safety. It was the first time that authorizations for the highway program were made for a four-year period. Highway Trust Fund user charges were extended five years to 1984 and the fund itself to 1985.

Title I, the Federal-Aid Highway Act of 1978, accelerated completion of the National System of Interstate and Defense Highways. It concentrated funds on projects that were ready to be constructed by changing the availability of a state's apportionment from four to two years. If the funds were not used, they could be reallocated to states with projects ready to go. The Act withdrew authority to replace one Interstate route

with another. It placed a deadline of September 30, 1983, on substituting public transportation or other highway projects for withdrawn Interstate routes. The federal share for both highway and transit substitute projects was increased to 85 percent. The act required that environmental impact statements for Interstate projects be submitted by September 30, 1983, and that they be under contract or construction by September 30, 1986, if sufficient federal funds were available. If the deadlines were not met, the Interstate route or substitute project was to be eliminated.

The act also raised the federal share for non-Interstate highways from 70 to 75 percent. It further increased the allowable amount of funds that could be transferred among federal-aid systems to 50 percent. The eligibility of federal funds for carpools and vanpools was made permanent. The amount of $20 million annually for fiscal years 1979 through 1982 was authorized for bicycle projects. The act substantially increased the funding for bridge replacement and rehabilitation to $1 billion annually.

Title III, the Federal Public Transportation Act of 1978, expanded the Section 5 Formula Grant program. The basic program of operating and capital assistance was retained with the same population and population density formula at higher authorization levels. A “second tier" program was authorized with the same project eligibility and apportionment formula. However, the funds were to be initially split so that 85 percent went to urbanized areas over 750,000 in population and the remaining 15 percent to smaller areas. A third tier was established for routine purchases of buses and related facilities and equipment. A new fourth tier replaced the Section 17 and 18 commuter rail programs. The funds could be used for commuter rail or rail transit capital or operating expenses. The funds were apportioned two-thirds based on commuter rail vehicle miles and route miles and one-third on rail transit route miles.

The act changed the availability of funds for transit from two to four years. It formalized the “letter of intent" process whereby the federal government committed funds for a transit project in the Section 3 Discretionary Grant program. Public hearings were required for all general increases in fares or substantial changes in service. A small formula grant program for non-urbanized areas (Section 18) was established for capital and operating assistance. Apportioned on non-urbanized area population, it authorized an 80 percent federal share for capital projects and 50 percent for operating assistance. The act also established an intercity bus terminal development program, intercity bus service operating subsidy program, and human resources program for urban transit systems.

The urban transportation planning requirement was changed in an identical fashion in the highway and transit titles. Energy conservation was included as a new goal in the planning process and alternative transportation system management strategies to make more efficient use of existing facilities were required to be evaluated. The designation of metropolitan planning organizations was to be by agreement among general purpose units of local government and in cooperation the governors. Within one year after enactment, local government representing at least 75 percent of all local governmental units and at least 90 percent of the population in the area may redesignate the MPO in cooperation with the governor. For the transit program, it was further required that plans and programs encourage to the maximum extent feasible the participation of private enterprise. Funding for transit planning grants was set at 5.5 percent of Section 3 appropriations.

A “Buy America" provision was included to apply to all contracts over $500,000. The provision could be waived if: its application was inconsistent with the public interest; domestic supplies were not available or of unsatisfactory quality; or if the use of domestic products would increase the cost by over 10 percent.

Quick Response Urban Travel Forecasting Techniques

Most urban travel forecasting techniques were developed to evaluate regional transportation systems and to produce traffic volumes for the design of facilities. These procedures were geared to long range planning studies that often took several years to carry out and had extensive data requirements. Urban transportation planning, however, was transitioning to a shorter term time horizon and issues were refocusing on low capital improvements and environmental impacts. In light of these trends, there was a need for simplified analytical procedures that were easy to understand, relatively inexpensive and less time consuming to apply, and responsive to the policy issues of the day (Sousslau, et.al., 1978a).

To address this issue, the National Cooperative Highway Research Program (NCHRP) launched a research project on quick response urban travel forecasting techniques (Sousslau, et.al., 1978b). The study found that no existing travel estimation technique was adequate to respond to the many new policy issues being faced by decision makers.

To fill the gap, the project developed a set of manual urban travel estimation techniques based upon the four-step conventional urban travel forecasting process. The techniques covered trip generation, trip distribution, mode choice, auto occupancy, time-of-day distribution, traffic assignment, capacity analysis, and development density/highway spacing relationships. The approach minimized the need for data by supplying tables and graphs that could use “default" values to substitute for local information. A User's Guide was produced as part of the project which allowed the estimation of travel demand using charts, tables and nomographs (Sousslau, et.al., 1978c).

The original Quick Response System (QRS) was principally used for planning problems that were too small to warrant use of the full regional scale urban travel forecasting procedures. To increase the usefulness and applicability of QRS, a microcomputer version was developed (COMSIS Corp., 1984). The microcomputer programs contained all of the functions originally developed in manual form and an additional mode choice estimation technique.

The microcomputer version of QRS increased the size of the transportation planning that could be analyzed. But, the analysis became disproportionately more difficult to handle as the size of the analysis area increased. A more sophisticated version of QRS was developed to expand its utility. The new QRS II departed from QRS by requiring that transportation networks be drawn and analyzed as part of the analytical process. Consequently, QRS II could be used for routine calculations of the manual techniques as QRS allowed, as well as perform detailed analyses comparable to those that could be performed with conventional urban travel forecasting procedures (Horowitz, 1989).

QRS II became widely used for sketch planning, small area analysis, and in a number of instances was used as replacement for the conventional urban travel forecasting process using UTPS.

National Energy Act of 1978

In 1979 Iran cut off crude oil shipments to Western nations causing shortages of oil products, especially gasoline, and price increases. Most of the regulations implemented in 1973 and 1974 were still in effect and basically unchanged. (Diesel fuel prices had been deregulated in 1976). During the intervening years, other legislation had been passed to stimulate oil production and foster conservation (Schueftan and Ellis, 1981). The Department of Energy Organization Act of 1977 brought together most federal energy functions under a single cabinet level department.

In October 1978 the Congress passed the National Energy Act which was composed of five bills. The National Energy Conservation Policy Act of 1978 extended two state energy conservation programs that required states to undertake specific conservation actions including the promotion of carpools and vanpools. The Powerplant and Industrial Fuel Use Act of 1978 required Federal agencies to conserve natural gas and petroleum in programs which they administered (U.S. Dept. of Energy, 1978). To implement Section 403(b) of the act, President Carter signed Executive Order 12185 in December 1979 extending existing efforts to promote energy conservation through federal-aid programs.

The DOT issued final regulations in August 1980 in compliance with the Executive Order. These regulations required that all phases of transportation projects from planning to construction and operations be conducted in a manner that conserves fuel. It incorporated energy conservation as a goal into the urban transportation planning process and required an analysis of alternative TSM improvements to reduce energy consumption (U.S. Dept. of Transportation, 1980c).

Other actions affected urban transportation and planning. President Carter signed an Executive Order in April 1979 that began the phased decontrol of petroleum prices. By September 30, 1981, petroleum prices were to be determined by the free market. This process was accelerated by President Reagan through an Executive Order in January 1981 which immediately terminated all price and allocation controls (Cabot Consulting Group, 1982).

The Emergency Energy Conservation Act of 1979, which was signed in November 1979, required the President to establish national and state conservation targets. States were to submit state emergency conservation plans that would meet the targets. The act expired in July 1983 without targets being set nor plans prepared. However, many states became active in contingency planning for a potential future energy emergency (Cabot Consulting Group, 1982).

Energy conservation had become integrated into the urban transportation planning process as a result of federal and state legislation and regulation. It gave further impetus to reducing the use of automobiles and for emphasis on transportation system management. Energy contingency planning became more widespread by planning organizations, transit authorities and highway departments.

Council on Environmental Quality's Regulations

The Council on Environmental Quality (CEQ) issued final regulations on November 29, 1978, establishing uniform procedures for implementing the procedural provisions of the National Environmental Policy Act of 1969. They applied to all federal agencies and took effect on July 30, 1979. They were issued because the 1973 CEQ Guidelines for preparing environmental impact statements (EISs) were not viewed consistently by all agencies leading to differences in interpretations (Council on Environmental Quality, 1978).

The regulations embodied several new concepts designed to make the EIS more useful to decisionmakers and the public, and to reduce paperwork and delays. First, the regulations created a “scoping" process to provide for the early identification of significant impacts and issues. It also provided for allocating responsibility for the EIS among the lead agency and cooperating agencies. The scoping process was to be integrated with other planning activities (Council on Environmental Quality, 1978).

Second, the regulations permitted “tiering" of the EIS process. This provided that environmental analyses completed at a broad scale (for example, region) need not be duplicated for site-specific projects; the broader analyses could be summarized and incorporated by reference. The purpose of “tiering" was to eliminate repetition and allow discussion of issues at the appropriate level of detail (Council on Environmental Quality, 1978).

Third, in addition to the previously required EIS, which discussed the alternatives being considered, a “record of decision" document was required. It had to identify the “environmentally preferable" alternative, the other alternatives considered, and the factors used in reaching the decision. Until this document was issued, no action could be taken on an alternative that would adversely effect the environment or limit the choice of alternatives (Council on Environmental Quality, 1978).

The regulations generally sought to reduce the paperwork in the EIS process by such techniques as limiting the length of the document to 150 pages (300 in complex situations), specifying a standard format, emphasizing that the process focus on real alternatives, allowing incorporation of material by reference, and by using summaries for circulation instead of the entire EIS. Agencies were encouraged to set time limits on the process and to integrate other statutory and analysis requirements into a single process.

In October 1980 the FHWA and UMTA published supplemental implementing procedures. They established a single set of environmental procedures for highway and urban transit projects. They also integrated the UMTA's procedures for alternatives analysis under its major investment policy with the new EIS procedures. This permitted the preparation of a single draft EIS/alternatives analysis document. These regulations were an important step toward integrating highway and transit planning and reducing duplicative documentation (U.S. Dept. of Transportation, 1980b).

BART Impact Program

The San Francisco Bay Area Rapid Transit (BART) system was the first regional rail transit system to be built in the U.S. since World War II. It provided a unique opportunity for studying the impacts of such a system on the urban environment. The BART Impact Program was organized to evaluate the effects of

BART on the economy, environment, and people of the Bay Area. It began in 1972 with the start of BART system operation and lasted six years.

The study addressed a broad range of potential rail transit impacts, including impacts on the transportation system and travel behavior, land use and urban development, the environment, public policy, the regional economy, and social institutions and lifestyles. The incidence of these impacts on population groups, local areas, and economic sectors was also measured and analyzed (Metropolitan Transportation Commission, 1979a, 1979b).

The BART system included 71 miles of track with 34 stations of which 23 had parking lots. (Figure 14) The four lines had stations spaced one-third to one-half mile apart in the cities of San Francisco and Oakland, and two to four miles apart in the suburbs. In 1975 BART served a population of about 1 million persons residing in three counties. Fares range from $ .25 to $1.45, with discounts for the elderly, handicapped, and children. BART cost $1.6 billion to build of which 80 percent was locally funded (Metropolitan Transportation Commission, 1979a, 1979b).

The program produced a considerable amount of information on the impacts of BART and, by implication the impacts of rail systems on urban areas. Its major findings included:

- BART provided a significant increase in the capacities of the major regional travel corridors, particularly approaching the cities of San Francisco and Oakland. However, it had not provided a long-term solution for traffic congestion because the additional capacity had been filled by new trips that had previously been deterred by traffic congestion. It most effectively served suburbanites commuting to work in San Francisco.

- BART had been integrated into the Bay Area with a minimum of environmental and social disruption because of its careful planning and design.

- To date, BART had not had a major impact on Bay Area land use. Some land use changes were evident where BART provides travel time advantages, where communities had acted to support and enhance the system's impacts through zoning and development plans, and where market demand for new development was strong, as in downtown San Francisco. It was likely that many potential impacts had not yet had time to develop.

- The $1.2 billion expended in the Bay Area for BART construction generated local expenditures totaling $3.1 billion during a twelve-year period. However, over the long term, BART had not induced economic growth in the Bay Area; that is, the system had not measurably enhanced the competitive advantage of the region in relation to other metropolitan areas in the country (Metropolitan Transportation Commission, 1979a, 1979b).

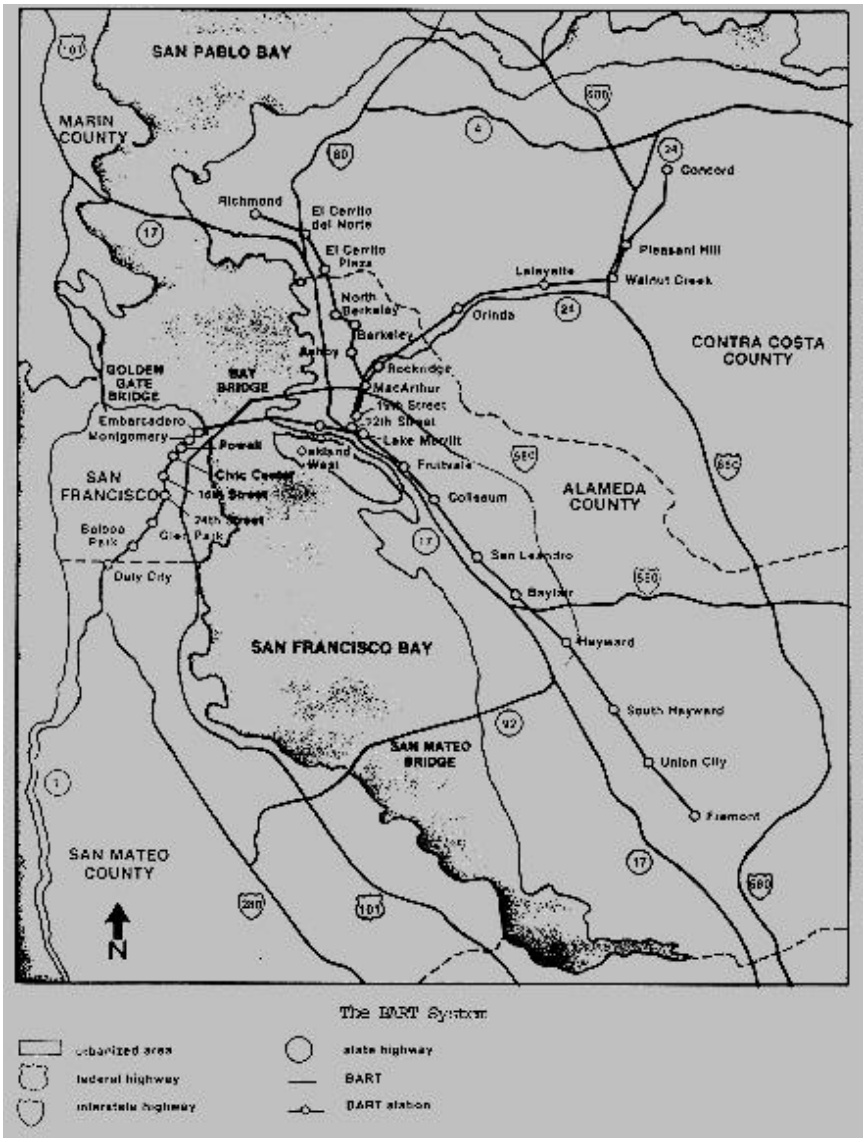


Figure 14

An important implication of the BART Impact Program's findings was that by itself rail transit could be expected to have only a limited impact on the various aspects of the urban environment. Existing local conditions and the enactment of supportive policies were more important in determining the influence of a rail system on an urban area. For example, neither BART nor any other similar rail system was likely to cause high density residential development nor discourage urban sprawl in an established urban area unless strong regionally coordinated land use controls were implemented.

Partly as a result of the BART experience, the Urban Mass Transportation Administration began to require localities building or planning to build new rail lines with federal assistance to commit themselves to a program of local supportive actions to enhance the project's cost effectiveness and patronage.

International Conferences on Behavioral Travel Demand

The Williamsburg Urban Travel Forecasting Conference gave widespread recognition to disaggregate behavioral demand models. The momentum created by this conference caused an upsurge in research in behavioral travel demand. The research was so extensive and widespread that the need arose for better interchange of ideas and developments.

To fill this void, the Transportation Research Board Committee on Traveler Behavior and Values began organizing a series of International Conferences on Behavioral Travel Demand. Later, the organizing role was performed by the International Association for Travel Behavior which was established in April, 1985. The conferences brought together those involved in travel demand research from many countries. The first one occurred in South Berwick, Maine in 1973 (Stopher and Meyburg, 1974). Later conferences were held in Asheville, North Carolina, in 1975 (Stopher and Meyburg, 1976); Melbourne, Australia, in 1977 (Hensher and Stopher, 1979); Grainau, Germany, in 1979 (Stopher, Meyburg and Brog, 1981); Easton, Maryland, in 1982 (Transportation Research Board, 1984b); Noordwijk, The Netherlands, in 1985 (Dutch Ministry, 1986); Aix-En-Provence, France, in 1987 (International Association for Travel Behavior, 1989); Quebec, Canada in 1991 (Stopher and Lee-Gosselin, 1996);.and, Santiago, Chile in 1994.

The proceedings of these conferences provide a comprehensive documentation of the progress in behavioral travel demand research and the important issues concerning the research community. The subject areas expanded from the development of multinomial logit models and attitudinal methods to encompass noncompensatory models, trip chaining, life-cycle and adaptation, activity-based analysis, and new approaches to data collection for travel behavior research (Kitamura, 1987).

Table 6 shows the workshop themes for the first six conferences. Disaggregate choice analyses and attitudinal methods were recurring themes at all of the conferences and were the main threads connecting the conferences. Their subthemes were also selected as workshop topics including aggregation issues, noncompensatory models, market segmentation, disaggregate trip distribution models, errors and uncertainty, and transferability. Various planning applications were addressed at the 1982 Easton conference. The themes of longitudinal analysis and stated preference methods were introduced at the 1985 Noordwijk conference (Kitamura, 1987).

Table 6
International Conference on Behavioral Travel Demand

Workshop Theme	1973	1975	1977	1979	1982	1985
Mathematics of Disaggregate Models	X	X	X	X	X	X
Attitudinal Measurements and Models	X	X	X	X		X
Policy Issues, Policy Relevance	X		X	X		
Travel Time Values	X	X	X			
Extension of Present Methodology	X					
Aggregation Problems	X					
Implementing Disaggregate Models		X		X		
Application of Behavioral Models		X		X		
Disaggregate Trip Distribution Models		X				
Household Structure and Adaptation		X		X		X
Supply-Demand Equilibrium		X	X			
Market Segmentation		X	X			
Activity Analysis and Trip Chaining			X	X		X
Accessibility and Mobility			X	X		
Freight Transportation			X			
Impact Assessment			X			
Transferability				X		X
Survey Methods, Data Needs				X	X	
Errors and Uncertainty				X		
Noncompensatory and Discontinuous Models				X		
New Transportation Technology				X		
Strategic Planning					X	
Long-Range Urban Systems Planning					X	
Project Planning					X	
Micro-scale Planning					X	
Systems Operations					X	
Travel Behavior Characteristics and Synthesis					X	
Quick-Response and Sketch-Planning Techniques					X	
Investment and Financial Analysis					X	
Longitudinal Analysis						X
Stated Preference Methods						X

Research recommendations from the conferences often served as the agenda for further work in the following years. The focus of these discussions was to gain a better understanding of travel behavior and to develop travel demand models with stronger theoretical bases. Using this approach, travel forecasting would become more sensitive to relevant policy issues, require less data to estimate, and be less costly and time-consuming to use.

Great strides were made in achieving these ends. But in doing so, a class of models was produced that was substantially different from conventional forecasting techniques. As a result, progress in diffusing these techniques into practice was slow. This gap in progress between application and research then became the major issue of concern in the field of travel forecasting. This issue was the focus of the 1982 conference in Easton (Transportation Research Board, 1984b).

National Ridesharing Demonstration Program

The oil embargo of 1973-1974 spurred government efforts to encourage commuter ridesharing. Ridesharing was considered to be a highly desirable approach to reducing drive alone commuting, and thereby reducing congestion, air pollution, and energy consumption. Moreover, ridesharing could be expanded at little or no cost in comparison to constructing or expanding highway facilities.

With the passage of the Emergency Highway Conservation Act of 1974, which authorized the use of Federal-aid highway funds for carpool demonstrations, the Federal government actively promoted and supported the development of ridesharing (U.S. Dept. of Transportation, 1980d). From 1974 and 1977, FHWA funded 106 carpool demonstration projects in 34 states and 96 urbanizes areas at a total cost of $16.2 million with the vast majority having a Federal matching share of 90 percent (Wagner, 1978).

The Department of Energy Organization Act of 1977 transferred to DOT responsibilities for transportation energy conservation programs and ridesharing education. Partly, as a result of these new responsibilities, DOT set a goal to increase ridesharing by 5 percent. To accomplish this goal, DOT established the National Ridesharing Demonstration Program in March, 1979. The two-year national program consisted of four major elements: a national competition to stimulate innovative and comprehensive approaches to ridesharing; an evaluation of those projects; technical assistance and training; and an expanded public information campaign (U.S. Dept. of Transportation, 1980d).

The National Ridesharing Demonstration Program funded projects at
17 sites for $3.5 million. Demonstration elements included employer based marketing, park-and-ride lots, vanpools, regional marketing, shuttle bus service, flextime, and legislative initiatives. An evaluation of these projects found the primary market for ridesharing to be multi-worker households with one car living far from the work site. Between 2% and 5% of the carpoolers surveyed indicated that the program affected their decision to form or maintain a carpool. Most commuter carpools were found to consist of informal arrangements between household members or fellow workers. The proportion of employees ridesharing and the size of carpools were found to increase with firm size. Flextime arrangements did not seem to affect ridesharing (Booth and Waksman, 1985).

Ridesharing continued to be a major alternative to driving alone. Gradually, it became integrated with other measures into more comprehensive congestion relief programs.

Urban Initiatives Program

The National Mass Transportation Assistance Act of 1974 authorized the use of federal funds for joint development purposes through the Young Amendment. The Young Amendment allowed local agencies to use federal funds to improve those facilities within the zone affected by the construction and operation of mass transit improvements that were needed to be compatible with land-use development. Assistance was available for establishing public or quasi-public corridor development corporations to accomplish this (Gortmaker, 1980).

The Urban Initiatives program, however, was not implemented until it was authorized in Section 3(a)(l)(D) of the Surface Transportation Assistance Act of 1978. This section of the Act authorized federal grants for land acquisition and the provision of utilities on land that was physically or functionally related to transit facilities for the purpose of stimulating economic development.

The Urban Initiatives program was one element of the DOT effort to implement President Carter's Urban Policy. The guidelines for the program were issued in April 1979 (U.S. Dept. of Transportation, 1979g). The program allowed expenditures for preconstruction activities (e.g., design and engineering studies, land acquisition and write-down, and real estate packaging) and items that connect transportation with land developments (e.g., pedestrian connections, parking and street furniture). Preference was to be given to projects that demonstrated that they advanced Urban Policy objectives.

During the three years of the program, 47 projects were funded in 43 urban areas. They integrated transportation projects with economic development activities. Many of these projects were transit malls or intermodal terminals. The program extended the traditional funding beyond direct transit projects to the related development tied to transit service (Rice Center, 1981).

The practice of setting aside federal funds for Urban Initiatives' projects was discontinued in March 1981. However, these types of activities continued to be eligible for funding under the regular transit programs.

Section 504 Regulations on Accessibility for the Handicapped

Section 504 of the Rehabilitation Act of 1973 provided that no person who is otherwise qualified should be discriminated against due to handicap in any program or activity receiving federal financial assistance. In 1976 the UMTA issued regulations that required “special efforts" in planning public mass transportation facilities that can be utilized by elderly and handicapped persons. It also required that new transit vehicles and facilities be accessible to handicapped. Handicapped groups thought the regulations were too vague and difficult to enforce (U.S. Dept. of Transportation, 1976c).

More stringent regulations were published in May 1979. They required all existing bus and rail systems to become fully accessible to handicapped persons within three years. This included fifty percent of the buses in fixed route service to be accessible to wheelchair users. For extraordinarily expensive facilities, the time limit could be extended to 10 years for bus facilities, to 30 years for rail facilities, and to 5 years for rail cars. Steady progress to achieve accessibility was required. New facilities and equipment were still required to be accessible to receive federal assistance (U.S. Dept. of Transportation, 1979f).

Transit authorities complained that the requirements were far too costly and sued the DOT for exceeding its authority. The U.S. Court of Appeals in a decision in 1981 said that the 1979 regulations went beyond the DOT's authority under Section 504. Following the decision, the DOT issued regulations on an interim basis and indicated that there would be new rulemaking leading to a final rule. The interim regulations required applicants to certify that “special efforts" were being made to provide transportation that was accessible to handicapped persons (U.S. Dept. of Transportation, 1981a).

Section 317(c) of the Surface Transportation Assistance Act of 1982 required the DOT to publish a proposed rule that would (l) include minimum criteria for the provision of transportation services to handicapped and elderly individuals, (2) a public participation mechanism, and (3) procedures for the UMTA to monitor transit authorities' performance. A NPRM was issued in September, 1983, (U.S. Dept. of Transportation, 1983f), and final regulations in May, 1986 (U.S. Dept. of Transportation, 1986b).

The 1986 regulations established six service criteria that applied to urban mass transportation for persons with disabilities: (1) anyone who is physically unable to use the bus system for the general public must be treated as eligible for the service; (2) the service must operate during the same days and hours as the general service; (3) the service must operate in the same geographic area; (4) fares for trips on the two services must be comparable; (5) service must be provided within 24 hours of a request; and, (6) restrictions or priorities for service may not be imposed based on trip purpose. The regulations did not require existing, inaccessible rail systems to be made accessible.

The amount of money transit authorities were required to spend in the service was limited to three percent of their operating expenditures to avoid undue financial burden on them. Transit authorities were given one year to plan the services and up to six years to phase them in. The planning process was required to involve disabled and other interested persons.

DOT's Section 504 regulations had long been controversial. The DOT was faced with the difficult job of accommodating both the concerns of the handicapped community for adequate public transportation and the concerns of transit authorities and local governments for avoiding costly or rigid requirements. This rulemaking process was of the most complex and protracted in urban transportation. It engendered a fierce debate between those who felt that handicapped persons should have the right to be mainstreamed into society, and those who believed that there were more cost-effective means of providing transportation for those persons using paratransit-type services.

National Transportation Policy Study Commission

The National Transportation Policy Study Commission was created by the Federal-Aid Highway Act of 1976 to study the transportation needs through the year 2000, and the resources, requirements, and policies to meet those needs. The Commission was composed of nineteen members; six Senators, six Representatives, and seven public members appointed by the President.

The Commission and its technical staff completed more than two years of analysis, consultant studies, and public hearings, and published its final reports, *National Transportation Policies Through The Year 2000*, and the *Executive Summary* in June of 1979 (National Transportation Policy Study Commission, 1979a and 1979b).

The report concluded that the existing level of investment was insufficient to meet growing transportation needs, and that a capital investment of over $4 trillion was required for the 15-year period 1976 to 2000. It further concluded that government overregulation was inhibiting capital investment, and that the maze of

federal agencies, congressional committees and conflicting policies were driving up costs and retarding innovation.

The report contained over 80 specific recommendations, reflecting several themes:

1. National transportation policy should be uniform across modes;
2. Federal involvement should be substantially reduced (greater reliance on the private sector and State and local government);
3. Federal actions should be subjected to economic analysis of benefits and costs;
4. The use of the transportation system to pursue non-transportation goals should be done in a cost-effective manner;
5. Transportation research and safety required federal involvement and financial assistance;
6. Users and those who benefit from federal actions should pay.

The National Transportation Policy Study Commission was unique because of the extent of Congressional involvement. Congress created the Commission, staffed it, chaired it with its own members, and determined the policy conclusions (Allen-Schult and Hazard, 1982).

Aspen Conference on Future Urban Transportation

As the decade drew to a close, the assault on the automobile never seemed so widespread. Energy conservation and environmental protection were national priorities. Fiscal resources were constrained and cost-effectiveness was the major criterion in urban transportation evaluations. Reversing central city decline was emerging as a key concern. And mobility for the transportation disadvantaged still required attention (Hassell, 1982). What was the future for urban personal mobility in the United States? Had the dominance of the automobile in the U.S. economy and society peaked?

To address these issues, the Transportation Planning Division of the American Planning Association sponsored the Aspen Conference on Future Urban Transportation in June 1979. The conference was supported and attended by representatives of both the public and private sector. The conferees could not reach a consensus on an image of the future but agreed on a range of factors that would be influential. Incremental planning was seen as the only feasible and desirable approach to the future (American Planning Association, 1979).

The conferees did conclude that there are "...no panaceas; no substantial increases in mobility due to new techniques...no quick or cheap energy solutions, and none without major environmental risks and costs...no promise of breakthrough in environmental technology...no major solutions through changes in living patterns or economic structure...no simple mechanism for restructuring urban form so as to reduce urban travel..." (American Planning Association, 1979). The conferees did make certain general recommendations for approaches to energy, mobility and accessibility, environmental, social, safety and economic issues. They concluded that, at least for the balance of this century, the automobile would continue to be the principal and preferred mode of urban transportation for the majority of the American people. Public transportation

would become increasingly important in supplying mobility. Both would require increased public investment from all levels of government (American Planning Association, 1979).

Highway Performance Monitoring System

During the mid-1970s, the FHWA shifted its approach to the biennial reporting of highway needs as required by Senate Joint Resolution 81 (P.L. 89-139). The earlier reports on highway needs contained estimates of the 20-year costs to remove all highway deficiencies throughout the nation (U.S. Congress, 1972b and 1972c). But, it had become apparent that, as highway travel and needs grew and national priorities changed, there would be insufficient funds to remove all highway deficiencies in the foreseeable future. Later reports, therefore, introduced the idea that "performance" could be used to measure the effectiveness of past highway investments and to analyze future investment alternatives (U.S. Congress, 1975).

To obtain continuous information on the performance of the national highway system, FHWA, in cooperation with the States, developed the Highway Performance Monitoring System (HPMS). The first use of this system was in the 1976 National Highway Inventory and Performance Study (U.S. Dept. of Transportation, 1975e). Data was collected on the highway system by functional class according to the functional realignment of Federal-aid systems that was required by the Federal-Aid Highway Act of 1973 to be accomplished by June 30, 1976.

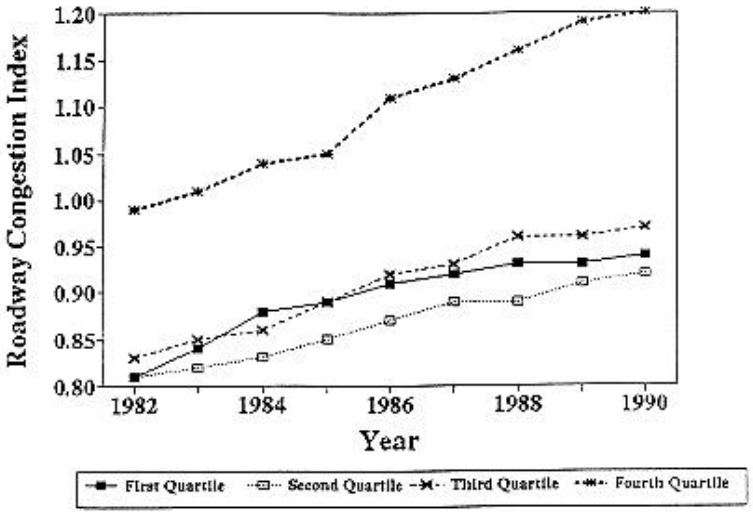
FHWA collected HPMS data annually from the States on a sample of highway sections. In selecting the sample, the highway system was first stratified into urbanized area, small urban and rural categories. Urbanized area data could be reported either individually or combined for an entire State. Within each category, highway sections were divided by functional class and traffic volume group using average annual daily traffic. A sampling rate was determined for each group of highway sections, with higher sampling rates for the higher functionally classified highway sections. For each sampled highway section, detailed information was collected on such items as: length, functional classification, geometric characteristics, traffic and capacity, pavement type and condition, structures, traffic signals, and parking (U.S. Dept. of Transportation, 1984e).

The first national highway needs report to use the HPMS data to describe the conditions and performance of the nation's highways was submitted to the Congress in 1981 (U.S. Congress, 1981). It showed the deterioration in highway system performance and rising congestion. Subsequent national highway needs reports used the HPMS data to monitor the changing performance of highway system (U.S. Congress, 1989).

The Federal Highway Administration also developed an analytical methodology that used the HPMS data to test national highway policy alternatives. Using this methodology, FHWA forecasted future highway investment requirements under various assumptions such as different highway travel growth rates, various highway conditions and performance levels and, the diversion of highway perk period travel to transit, alternative routes and off peak periods (U.S. Congress, 1989). In addition, the analytical methodology was adapted so that the States could perform the same types of analyses on the HPMS data for their individual data as was performed on the national data (U.S. Dept. of Transportation, 1987d).

Since the HPMS was the only comprehensive and continuous source of highway performance data that was available at the national and State level, it was also used to monitor the growth in urban highway congestion. (Lindley, 1987 and 1989; Lomax, et. al., 1988; Hanks and Lomax, 1989). Figure 15 shows the change in the congestion index by population density quartiles. (Shrank, Turner and Lomax, 1993)

Figure 15



Roadway Congestion Index Values Grouped by Population Density, 1982-1990

CHAPTER 10 — DECENTRALIZATION OF DECISIONMAKING

Through the decade of the 1970s there was a sharp increase in the range and complexity of issues required to be addressed in the urban transportation planning process. The combination of requirements and regulations had become burdensome and counter-productive. Organizations and techniques seemed unable to adapt with sufficient speed. It was becoming impossible to analyze all of the tradeoffs that were required. This problem was not confined to urban transportation but to most activities where the federal government was involved. It ushered in a new mood in the nation to decentralize control and authority, and to reduce federal intrusion into local decisionmaking (Weiner, 1983).

President Reagan's Memorandum on Regulations

On January 29, 1981, President Reagan sent a memorandum to all major domestic agencies to postpone the implementation of all regulations that were to take effect within the coming 60 days (Reagan, 1981b). This was to provide time for the newly appointed Task Force on Regulatory Relief to develop regulatory review procedures.

The Executive Order 12291 on Federal Regulation was issued on February 17, 1981 (Reagan, 1981a). It established procedures for reviewing existing regulations and evaluating new ones. It required that a regulation have greater benefits to society than costs and that the approach used must maximize those benefits. All regulatory actions were to be based on a regulatory impact analysis that assessed the benefits and costs.

The order set in motion a major effort at the federal level to eliminate and simplify regulations and limit the issuance of new regulations. The impact on federal agencies was quickly felt.

Conferences on Goods Transportation in Urban Areas

The movement of goods in urban areas continued to be an important issue for planners, researchers and decisionmakers after the Conference on Urban Commodity Flow in December 1970 had concluded that goods movement needed more emphasis in the urban transportation planning process. Considerable progress was made in the ensuing years in gaining a better understanding of goods movement issues and problems, and in development of courses of action to lead to their resolution.

To facilitate an exchange of experiences and ideas among those concerned about urban goods movement, a series of conferences sponsored by the Engineering Foundation was held under the title of Goods Transportation in Urban Areas: in August 1973 at South Berwick, Maine (Fisher, 1974); in September 1975 at Santa Barbara, California (Fisher, 1976); in December 1977 at Sea Island, Georgia (Fisher, 1978); and, in June 1981 at Easton, Maryland (Fisher and Meyburg, 1982).

The conferences highlighted the progress that had been made in identifying problems and analysis techniques, and discussed changes in institutional arrangements, regulations, and physical facilities to improve the movement of goods. Yet, even after all of this work, most urban transportation planning

processes gave little attention to the movement of goods. There still was no generally accepted methodology for urban goods movement planning; no urban areas had collected the necessary data to analyze commodity (as opposed the vehicle) flows; and a consensus had not been reached on the data items to collect. Attempts at system-level goods movement models and demand forecasting techniques had not been successful (Hedges, 1985).

The fourth conference on goods transportation occurred at a time when the pace of deregulation was increasing. In this deregulated environment, barriers to entry were being removed, limitations on rates and rate structures reduced and the role of the public sector lessened. The emphasis shifted to transportation system management approaches that sought to make more efficient use of existing facilities and equipment. These strategies had short implementation periods, addressed specific site problems, could be carried out in an incremental manner and did not require extensive institutional coordination. Such approaches were appropriate for the deregulated environment that was emerging in which there was only limited interaction between the public and private sectors.

There remained after these conferences the need for a better understanding of the issues, more complete measurement of the phenomena, more thorough documentation of the accomplishments and wider dissemination of the information. The creation of effective cooperation among those concerned about goods movement problem, particularly the public and private sectors, was still being called for to improve the productivity of goods movement in urban areas (Fisher and Meyburg, 1982).

Airlie House Conference on Urban Transportation Planning in the 1980s

Concern had been growing in the planning community about the future of urban transportation planning. On the one hand planning requirements had become more complex, new planning techniques had not found their way into practice, and future changes in social, demographic, energy, environmental, and technological factors were unclear. On the other hand, fiscal constraints were tight and the federal government was shifting the burden of decisionmaking to state and local governments and the private sector. The future of planning was in doubt.

To address these concerns, a conference was held at Airlie House, in Virginia, on November 9-12, 1981, on Urban Transportation Planning in the 1980s. The conference reaffirmed the need for systematic urban transportation planning, especially to maximize the effectiveness of limited public funds. But the planning process needed to be adjusted to the nature and scope of an area's problems. It might not be the same for growing and for declining areas, nor for corridor- and for regional-level problems (Transportation Research Board, 1982b).

The conferees also concluded that the federal government had been overly restrictive in its regulations, making the planning process costly, time-consuming, and difficult to administer. It was concluded that the regulations should be stream-lined, specifying goals to be achieved and leaving the decisions on how to meet them to the states and local governments. The conferees called for a recognition of the need for different levels of 3C planning by urbanized areas of various sizes. Additionally, greater flexibility in the requirements for MPOs was recommended, with more responsibility given to the agencies that implement transportation

projects; and finally, less frequent federal certification was recommended (Transportation Research Board, 1982b).

Increased attention to system management and fiscal issues was needed, but long-range planning needed to also identify shifts in the major longer-term trends that would affect the future of urban areas. This strategic planning process should be flexible to fit local concerns (Transportation Research Board, 1982b).

The conference recommendations reflected the new mood that the federal government had over regulated and was too specific in its requirements. The planning process was straining under this burden, finding it difficult to plan to meet local needs. The burden had to be lifted for the planning process to be viable.

Federal-Aid Highway Act of 1981

The Federal-Aid Highway Act of 1981 established early completion and preservation of the Interstate system as the highest priority highway program. To ensure early completion, the act reduced the cost to complete the system by nearly $14 billion, from $53 billion to $39 billion, by limiting eligible construction items to those that provided a minimum level of acceptable service. This included: full access control; a pavement design to accommodate twenty year forecasted travel; meeting essential environmental requirements; a maximum design of six lanes in areas under 400,000 in population and eight lanes in larger areas; and, any high occupancy lanes previously approved in the 1981 Interstate Cost Estimate (ICE).

The act expanded the Interstate resurfacing, restoration and rehabilitation (3R) program by added reconstruction as an eligible category. This new category of the new 4R program included the addition of travel lanes, construction and reconstruction of interchanges, and the acquisition of right of way. Construction items that were removed from the Interstate construction program were eligible for 4R funding. The federal share was increased from 75 percent under the 3R program to 90 percent under the 4R program. Funds were to be allocated to states based 55 percent on Interstate lane miles and 45 percent on vehicle miles of travel. Every state with Interstate mileage had to receive a minimum of ½ of 1 percent of the funds for the program.

This act marked a shift in focus in the federal highway program toward finally completing the Interstate system and moving ahead with rehabilitating it.

E.O. 12372, Intergovernmental Review of Federal Programs

Office of Management and Budget's Circular A-95 (which replaced Bureau of the Budget Circular A-95) had governed the consultation process on federal grant programs with state and local governments since its issuance in July 1969. Although the A-95 process had served a useful function in assuring intergovernmental cooperation on federal grant programs, there were concerns that the process had become too rigid and cumbersome and caused unnecessary paperwork. To respond to these concerns and to delegate more responsibility and authority to state and local governments, the President signed Executive Order 12372, “Intergovernmental Review of Federal Programs,” on July 14, 1982 (Reagan, 1982).

The objectives of the Executive Order were to foster an intergovernmental partnership and strengthen federalism by relying on state and local processes for intergovernmental coordination and review of federal financial assistance and direct federal development. The Executive Order had several purposes. First, it allowed states, after consultation with local officials, to establish their own process for review and comment on proposed federal financial assistance and direct federal development. Second, it increased federal responsiveness to state and local officials by requiring federal agencies to "accommodate" or "explain" when considering certain state and local views. Third, it allowed states to simplify, consolidate, or substitute state plans for federal planning requirements. The order also revoked OMB Circular A-95, although regulations implementing this Circular remained in affect until September 30, 1983.

There were three major elements that comprised the process under the Executive Order. These were: establishing a state process, the single point of contact, and the federal agency's "accommodate" or "explain" response to state and local comments submitted in the form of a recommendation. First, a state could choose which programs and activities are being included under that state process after consulting with local governments. The elements of the process were to be determined by the state. A state was not required to establish a state process; however, if no process was established, the provisions of the Executive Order did not apply. Existing consultation requirements of other statutes or regulations would continue in effect, including those of the Inter-governmental Cooperation Act of 1968 and the Demonstration Cities and Metropolitan Development Act of 1966.

Second, a single point of contact had to be designated by the state for dealing with the federal government. The single point of contact was the only official contact for state and local views to be sent to the federal government and to receive the response.

Third, when a single point of contact transmitted a state process recommendation, the federal agency receiving the recommendation had to either: (1) accept the recommendation ("accommodate"); (2) reach a mutually agreeable solution with the parties preparing the recommendation; or (3) provide the single point of contact with a written explanation for not accepting the recommendation or reaching a mutually agreeable solution. If there was nonaccommodation, the Department was generally required to wait 15 days after sending an explanation of the nonaccommodation to the single point of contact before taking final action.

The regulations implementing Executive Order 12372 for transportation programs were published on June 24, 1983 (U.S. Dept. of Transportation, 1983a). They applied to all federal-aid highway and urban public transportation programs.

Woods Hole Conference on Future Directions of Urban Public Transportation

The transit industry was growing restless as the demands for and requirements on transit services were changing. Older cities were concerned about rehabilitation while newer ones were focused on expansion. Future changes in the economic base, land use, energy and sociodemographic characteristics were uncertain. The transit industry was coming out of a period where federal priorities and requirements had changed too frequently. Transit deficits had risen sharply over the previous decade and the federal

government had declared that it planned to phase out operating subsidies. And many were calling for the private sector to provide an increased share of transit services because they were more efficient.

A diverse group of conferees met at the Woods Hole Study Center in Massachusetts, September 26-29, 1982, to discuss Future Directions of Urban Public Transportation (Transportation Research Board, 1984a). The conference addressed the role of public transportation, present and future, the context within which public transportation functioned, and strategies for the future. Attendees included leaders of the transit industry and government, academics, researchers, and consultants. There were wide differences of opinion that had not disappeared when the conference concluded.

The conferees did agree that, "Strategic planning for public transportation should be conducted at both the local and national levels." The transit industry should be more aggressive in working with developers and local governments in growing parts of metropolitan areas to capitalize on opportunities to integrate transit facilities into major new developments. The industry needed to improve its relationship with highway and public works agencies as well as state and local decisionmakers. Financing transit had become more complex and difficult but had created new opportunities (Transportation Research Board, 1984a).

The conferees called for reductions in federal requirements and avoidance of rapid shifts in policy in the future. The federal government should have a more positive federal urban policy and the UMTA should be transit's advocate within the federal government (Transportation Research Board, 1984a).

Agreement could not be reached on the future role of urban transit. Some felt that the transit industry should only concern itself with conventional rail and bus systems. Others argued that transit agencies should broaden the range of services provided to include various forms of paratransit and ridesharing so as to attract a larger share of the travel market. Nevertheless, the conference was considered to be a first small step in a strategic planning process for the transit industry.

Easton Conference on Travel Analysis Methods for the 1980s

The Airlie House Conference on Urban Transportation Planning in the 1980s highlighted the shifts in planning that were occurring and were likely to continue (Transportation Research Board, 1982b). State and local governments would assume a greater role as the federal government disengaged, finances would be tighter, system rehabilitation would become more important and traffic growth would be slower.

A conference was held at Easton, Maryland, in November 1982 to discuss how well travel analysis methods were adapted to the issues and problems of the 1980s. This Conference on Travel Analysis Methods for the 1980s focused on defining the state of the art versus the state of practice, describing how the methods have been and can be applied, and identifying gaps between art and practice that needed more dissemination of current knowledge, research or development. The conference extended the discussions of the International Travel Demand Conferences but concentrated on the application of travel analysis methods and on improving the interaction between researchers and practitioners (Transportation Research Board, 1984b).

The conference reviewed the state of the art and practice and how they applied to the various levels of planning. There were extensive discussions on how capable travel analysis procedures were in dealing with major transportation issues and why they were not being extensively applied in practice (Transportation Research Board, 1984b).
The conferees found that in an era of scarce resources, sound analysis of alternatives would continue to be important. Travel analysis methods that were currently available were suitable for issues that could be foreseen in the 1980s. These disaggregate techniques, which had been developed during the 1970s, had been tested in limited applications and were now ready for widescale use. Their use in the analysis of small-scale projects, however, might not be justified because of their complexity (Transportation Research Board, 1984b).

It was clear, however, that new disaggregate travel analysis techniques were not being used extensively in practice. The gap between research and practice was wider than it had ever been. The new mathematical techniques and theoretical bases from econometrics and psychometrics had been difficult for practitioners to learn. Moreover, the new techniques were not easily integrated into conventional planning practices. Neither researchers nor practitioners had made the necessary effort to bridge the gap. Researchers had been unwilling to package and disseminate the new travel analysis methods in a form usable to practitioners. Practitioners had been unwilling to undergo retraining to be able to use these new techniques. Neither group had subjected these methods to rigorous tests to determine how well they performed or for what problems they were best suited (Transportation Research Board, 1984b).

The conferees concluded that the travel demand community should concentrate on transferring the new travel analysis methods into practice. A wide-range of technology transfer approaches was suggested. The federal government and Transportation Research Board were recommended to lead in this endeavor (Transportation Research Board, 1984b).

Surface Transportation Assistance Act of 1982

Through the decade of the 1970s there was mounting evidence of deterioration in the nation's highway and transit infrastructure. Money during that period had been concentrated on building new capacity and the transition to funding rehabilitation of the infrastructure had been slow. By the time the problem had been faced, the cost estimate to refurbish the highways, bridges, and transit systems had reached hundreds of billions of dollars (Weiner, 1983).

The Surface Transportation Assistance Act of 1982 was passed to address this infrastructure problem. The act extended authorizations for the highway, safety, and transit programs by four years, from 1983 to 1986 (U.S. Dept. of Transportation, 1983g). (Table 7) In addition, the act raised the highway user charges by five cents (in addition to the existing four cents) a gallon on fuel effective April 1, 1983. Other taxes were changed including a substantial increase in the truck user fees, which were changed from a fixed rate to a graduated rate by weight. Of the revenues raised from the five cent increase in user fees (about $5.5 billion annually), the equivalent of a four cent raise in fuel user charges was to increase highway programs, and the remaining one cent was for transit programs (Weiner, 1983).

The additional highway funds were for accelerating completion of the Interstate highway system (to be completed by 1991), an increased 4R (Interstate resurfacing, restoration, rehabilitation, and reconstruction) program, a substantially expanded bridge replacement and rehabilitation program, and greater funding for Primary, Secondary, and Interstate projects (Weiner, 1983).

The act authorized the administration of highway planning and research (HP&R) funds as a single fund and made them available to the states for a four year period. A standard federal matching ratio for the HP&R program was set at 85 percent. A 1½ percent share of bridge funds was authorized for HP&R purposes. As a result of the large expansion in the construction program, the level of funding increased substantially for the HP&R program and urban transportation planning (PL) purposes.

The act restructured federal urban transit programs. No new authorizations were made for the Section 5 formula grant program. Instead, a new formula grant program was created that allowed expenditures on planning, capital and operating items. Substantial discretion was given to state and local governments in selecting projects to be funded using formula grants with minimal federal interference. However, there were limitations on the use of the funds for operating expenses. The act provided for a distribution of funds into areas of different sizes by population; over one million, between one million and 200,000, under 200,000, and rural. Within these population groups, the funds were to be apportioned by several formulas using such factors as population, density, vehicle miles and route miles (Weiner, 1983).

The revenue from the one cent increase in highway user charges was to be placed into a Mass Transit Account of the Highway Trust Fund. The funds could only be used for capital projects. They were to be allocated by a formula in fiscal year 1983, but were discretionary in later years. The definition of capital was changed to include associated capital maintenance items. The act also provided that a substantial number of federal requirements be self-certified by the applicants and that other requirements be consolidated to reduce paperwork (Weiner, 1983).

A requirement was also included for a biennial report on transit performance and needs, with the first report due in January 1984. In addition, the act provided that regulations be published that set minimum criteria on transportation services for the handicapped and elderly.

The Surface Transportation Assistance Act of 1982 was passed under considerable controversy about the future federal role in transportation, particularly the Administration's position to phase out of federal transit operating subsidies. Debates on later appropriations bills demonstrated that the issue remained controversial.

Table 7
Surface Transportation Assistance Act of 1982

	Authorization Levels by Fiscal Year ($ Millions)			
	1983	**1984**	**1985**	**1986**

Highway Construction				
Interstate Construction	4,000.0	4,000.0	4,000.0	4,000.0
Interstate 4R	1,950.0	2,400.0	2,800.0	3,150.0
Interstate Highway Substitutions	257.0	700.0	700.0	725.0
Primary System	1,890.3	2,147.2	2,351.8	2,505.1
Secondary System	650.0	650.0	650.0	650.0
Urban System	800.0	800.0	800.0	800.0
Other Highway Programs	1,178.2	1,120.0	1,154.0	1,106.0
Subtotal-Highway	10,724.0	11,817.2	12,455.8	12,936.1
Highway Safety				
Bridge Replacement & Rehabilitation	1,600.0	1,650.0	1,750.0	2,050.0
Safety Construction	390.0	390.0	390.0	390.0
Other Safety Programs	199.5	205.3	205.6	155.6
Subtotal-Safety	2,189.5	2,245.3	2,345.6	2,595.6
Urban Mass Transportation				
Discretionary Capital Grants	779.0	1,250.0	1,100.0	1,100.0
Formula Grants	------	2,750.0	2,950.0	3,050.0
Interstate Transit Substitutions	365.0	380.0	390.0	400.0
R&D, Admin. & Misc.	86.3	91.0	100.0	100.0
Subtotal-Urban Transit	1,230.3	4,471.0	4,540.0	4,650.0
Total	**14,143.8**	**18,533.5**	**19,341.4**	**20,181.7**

Advent of Microcomputers

By the early 1980s there was a surge in interest and use of microcomputers in urban transportation planning. The FHWA and UMTA had increasingly focused their computer related research and development activities on the application of small computers. These technical support activities were directed at gaining a better understanding of the potential and applicability of microcomputers, promoting the development and exchange of information and programs, and evaluating and testing programs. Some software development was carried out, but most software was produced commercially.

A user support structure was developed to assist state and local agencies. This included the establishment of two user support centers; one at Rensselaer Polytechnic Institute for the transit industry and a second at the DOT's Transportation Systems Center (TSC) for transportation planning, transportation system management (TSM), and traffic engineering applications. Three user groups were formed under DOT

sponsorship; transit operations, transportation planning and TSM, and traffic engineering. These groups exchanged information and software, developed and promoted standards, and identified research and development needs. Assistance was provided through the user support centers. A newsletter, *MicroScoop*, was published periodically to aid in the communication process.

The FHWA and UMTA developed a one-day seminar entitled, "Microcomputers For Transportation" to acquaint users with the capabilities and uses of microcomputers. They also published reports on available software and sources of information (U.S. Dept. of Transportation, 1983d, 1983e). As the capabilities of microcomputers increased, they offered the opportunity of greater analytical capacity to a larger number of organizations. As a result, their use became more widespread.

New Urban Transportation Planning Regulations

The joint FHWA/UMTA urban transportation planning regulations had served as the key federal guidance since 1975 (U.S. Dept. of Transportation, 1975a). During 1980 there was an intensive effort to amend these regulations to ensure more citizen involvement, to increase the emphasis on urban revitalization and to integrate corridor planning into the urban transportation planning process (Paparella, 1982). Proposed amendments were published in October 1980. Final amendments were published in January 1981, to take effect in February.

These amendments were postponed as a result of President Reagan's January 1981 memorandum to delay the effective day of all pending regulations by 60 days. During this period the amendments were reviewed based on the criteria in the President's memorandum and Executive Order 12291. Consequently the amendments were withdrawn and interim final regulations were issued in August 1981. These regulations included minimal changes to streamline the planning process in areas under 200,000 in population, to clarify transportation system management, and to incorporate legislative changes (U.S. Dept. of Transportation, 1983c).

To obtain public comment on further changes in the regulations, FHWA and UMTA published an issues and options paper in December 1981, entitled Solicitation of Public Comment on the Appropriate Federal Role in Urban Transportation Planning. The comments clearly indicated the preference for fewer federal requirements and greater flexibility. Further indication of these views resulted from the Airlie House Conference on Urban Transportation Planning in the 1980s (Transportation Research Board, 1982b).

Based on the comments, the joint urban transportation planning regulations were rewritten to remove items that were not actually required. The changes in the regulations responded to the call for reducing the role of the federal government in urban transportation planning. The revised regulations, issued on June 30, 1983, contained new statutory requirements and retained the requirements for a transportation plan, a transportation improvement program (TIP) including an annual element (or biennial element), and a unified planning work program (UPWP), the latter only for areas of 200,000 or more in population. The planning process was to be self-certified by the states and MPOs as to its conformance with all requirements when submitting the TIP (U.S. Dept. of Transportation, 1983c).

The regulations drew a distinction between federal requirements and good planning practice. They stated the product or end that was required but left the details of the process to the state and local agencies, so the regulations no longer contained the elements of the process nor factors to consider in conducting the process (U.S. Dept. of Transportation, 1983c).

The MPO was to be designated by the Governor and units of general purpose local government. The urban transportation planning process was still the mutual responsibility of the MPO, state and public transit operators. But, the nature of the urban transportation planning process was to be the determination of Governor and local governments without any federal prescription. Governors were also given the option of administering the UMTA's planning funds for urban areas with populations under 200,000.

The revised regulations marked a major shift in the evolution of urban transportation planning. Up to that time, the response to new issues and problems was to create additional federal requirements. These regulations changed the focus of responsibility and control to the state and local governments. The federal government remained committed to urban planning by requiring that projects be based on a 3C planning process and by continuing to provide funding for planning activities. But it would no longer specify how the process was to be performed.

CHAPTER 11 — PRIVATE SECTOR PARTICIPATION

As the decade of the 1980s progressed there was a growing awareness that the public sector did not have the resources to continue providing all of the programs to which it had become committed. This was particularly true at the federal level of government. Moreover, by continuing these programs, governmental bodies were preempting areas that could be better served by the private sector. Governments and public agencies began to seek opportunities for greater participation of the private sector in the provision and financing of urban transportation facilities and services. In addition, the federal government sought to foster increased competition in the provision of transportation services as a means to increase efficiency and reduce costs. Changes in the transportation system were intended to be the outcomes of competition in the marketplace rather than of public regulation. This necessitated eliminating practices whereby unsubsidized private transportation service providers competed on an unequal basis with subsidized public agencies (Weiner, 1984).

Paratransit Policy

The range of public transportation services options known as “paratransit" was brought to national attention in a report by The Urban Institute (Kirby, et, al., 1975). Paratransit-type services had already been receiving growing interest (Highway Research Board, 1971a, 1973b; Transportation Research Board, 1974a, 1974b; Rosenbloom, 1975; Scott, 1975). Paratransit was seen as a supplement to conventional transit that would serve special population groups and markets that were otherwise poorly served. It was also seen as an alternative, in certain circumstances, to conventional transit. It fit well into the tenor of the times which sought low-cost alternatives to the automobile that could capture a larger share of the travel market. Paratransit could serve low density, dispersed travel patterns and thereby compete with the automobile.

The UMTA struggled for many years to develop a policy position on paratransit. The transit industry expressed concern about paratransit alternatives to conventional transit. Paratransit supporters saw it as the key option to compete against the automobile in low-density markets. It was the same debate that surfaced at the Woods Hole Conference on Future Directions of Urban Public Transportation (Transportation Research Board, 1984a).

Finally, in October 1982, the UMTA published the Paratransit Policy. Paratransit was portrayed as a supplement to conventional transit services that could increase transportation capacity at low cost. It could provide service in markets that were not viable for mass transit. Paratransit could also serve specialized markets (e.g., elderly and handicapped) and be an alternative to the private automobile. Its potential in rural areas was emphasized as well (U.S. Dept. of Transportation, 1982a).

The Paratransit Policy encouraged local areas to give full consideration to paratransit options. It supported the use of paratransit provided by private operators, particularly where they were not subsidized. The policy fostered reducing regulatory barriers to private operators, timely consultation with the private sector, matching services to travel needs, and integration of paratransit and conventional transit services (U.S. Dept. of Transportation, 1982a).

It was stated that UMTA funds were available for planning, equipment purchase, facility acquisition, capital, administrative, and research expenses. The UMTA preferred unsubsidized, privately provided paratransit, but would provide financial support where justified (U.S. Dept. of Transportation, 1982a).

Transportation Management Associations

The aftermath of two energy crises in 1973 and 1979, and the rise in traffic congestion, especially in suburban areas, prompted many employers to become involved in commuting issues. Employers used a number of approaches including subsidizing transit passes, ridesharing matching services, preferential treatment for pooling vehicles, flexible work schedules, and payroll deductions for transit passes and pooling activities (Schreffler, 1986).

These activities lead to the establishment of a number of transportation management associations (TMAs) starting in the early 1980s. TMAs were generally nonprofit associations formed by local employers, businesses, and developers to cooperatively address community transportation problems (Orski, 1982). TMAs were funded by membership fees, based on a voluntary assessment. Some TMAs were formed to specifically deal with transportation concerns, and others were elements of larger multipurpose organizations. Most TMAs served employment centers, usually in the suburbs, while others focused on downtown centers, and still others were regional in scope.

TMAs varied in the types of support that they provided to employees, customers, and tenants. These functions included the management of ridesharing programs, administration of parking management strategies, operation of internal circulation service, contracting for subscription bus services, administration of flexible work hours programs, management of local traffic flow improvements, and technical assistance and education. TMAs also served as the coordinating mechanism with public agencies to represent businesses' interest, organize private sector support for projects, and sponsor special studies.

The number of TMAs grew slowly through the 1980s and, by 1989, there were about 70 in operation or forming. Their support broadened as public agencies fostered the formation of TMAs through start up funding, technical assistance, and participating directly in the association. TMAs were considered to be a promising approach for involving the private sector in addressing commuting problems and maintaining mobility (Dunphy and Lin, 1990).

Revised Major Transit Capital Investment Policy

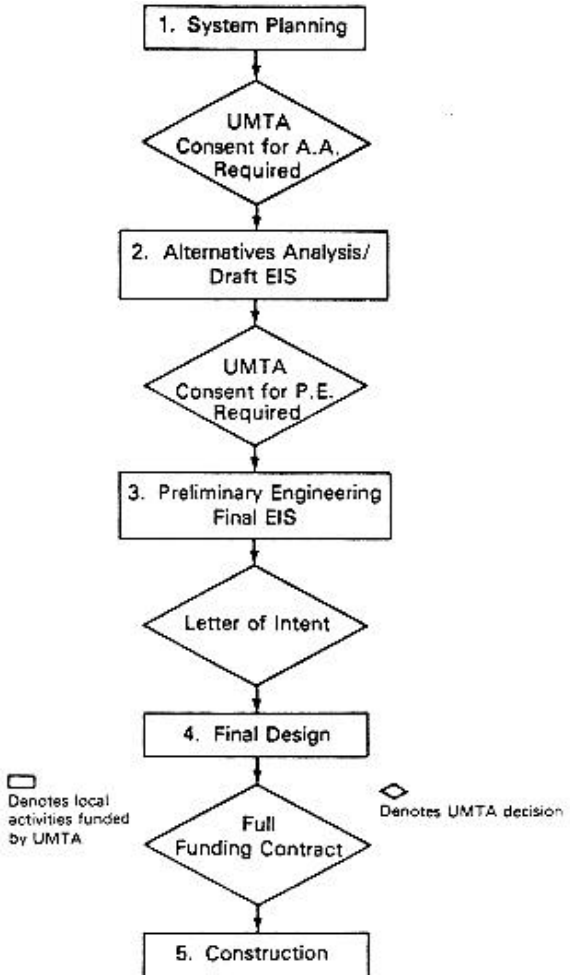
By the early 1980s there had been a huge upsurge of interest in building new urban rail transit systems and extensions to existing ones. Beginning in 1972 new urban rail systems had begun revenue service in San Francisco, Washington, D.C., Atlanta, Baltimore, San Diego, Miami and Buffalo. Construction was underway for new systems in Portland, Oregon, Detroit, Sacramento and San Jose. A total of 32 urban areas were conducting studies for major new transit investments in 46 corridors. It was estimated that if all of those projects were carried out, the cost to the federal government would have been at least $19 billion (U.S. Dept. of Transportation, 1984a).

The federal funds for rail projects came, for the most part, from the Section 3 Discretionary Grant program. This program was funded by the revenue from one cent of the five-cent increase in the user charge on motor fuels that was included in the Surface Transportation Assistance Act of 1982, and amounted to $1.1 billion annually. UMTA, however, was giving priority to projects for rehabilitation of existing rail and bus systems. Only $400 million annually was targeted for use on new urban rail projects. The resulting gap between the demand for federal funds for major transit projects and those available was, therefore, very large.

In an attempt to manage the demand for federal funds, UMTA issued a revised Urban Mass Transportation Major Capital Investment Policy on May 18, 1984 (U.S. Dept. of Transportation, 1984b). It was a further refinement of the evaluation process for major transit projects that had been evolving over a number of years. Under the policy, the UMTA would use the results of local planning studies to calculate the cost-effectiveness and local financial support for each project. These criteria would be used to rate the projects. The UMTA would fund only those projects that ranked high on both criteria to the extent that they did not exceed the available funds. The lower ranked projects were still eligible for funding if additional money became available.

The project development process involved a number of stages after which the UMTA would make a decision on whether to proceed to the next stage. (Figure 16) The most critical decision occurred after the alternatives analysis and draft environmental impact statement (AA/DEIS) was completed. During this stage, the cost-effectiveness of new fixed guideway projects was compared to a base system called the “transportation system management" alternative. This TSM alternative consisted of an upgraded bus system plus other actions that would improve mobility with a minimal capital investment, such as parking management techniques, carpool and vanpool programs, traffic engineering improvements and paratransit services. Often, the marginal improvement in mobility of a fixed guideway proposal over the TSM was found to be not worth the cost to construct and operate it.

Figure 16
UMTA Project Development Process
Major Investments



Projects were rated on cost-effectiveness and local fiscal effort after the AA/DEIS was completed. Local fiscal effort consisted of the level of funding from state, local and private sources. In addition the projects had to meet several threshold criteria. First, the fixed guideway project had to generate more patronage than the TSM alternative. Second, the cost per additional rider of the fixed guideway project could not exceed a preset value that UMTA was to determine. Third, the project had to meet all statutory and regulatory requirements.

The pressure for federal funds for new urban rail projects was so great, however, that the matter was often settled politically. Starting in fiscal year 1981, the Congress began to earmark Section 3 Discretionary Grant funds for specific projects thereby preempting UMTA from making the selection. UMTA continued to rate the projects and make the information available to Congressional committees.

In 1987, the Surface Transportation and Uniform Relocation Assistance Act established grant criteria for new fixed guideway projects along the lines that UMTA had been using. The projects had to be based on alternatives analysis and preliminary engineering, be cost-effective, and be supported by an acceptable degree of local financial commitment.

Transportation Demand Management

Suburban congestion became a growing phenomenon during the 1980s and had reached severe proportions by the early 1990s in many urban areas. Approaches used to serve downtown oriented travel were less applicable to the more diverse, automobile dominated suburban travel patterns (Higgins, 1990). Moreover, building new highway capacity had become considerably more difficult in an era of tight budgets and heightened environmental awareness. New strategies were developed to mitigate suburban congestion under the general category of transportation demand management (TDM).

Transportation demand management was a process designed to modify transportation demand. It differed from transportation system management (TSM) in that it focused on travel demand rather than on transportation supply and, often involved the private sector in implementing the strategies. TDM aimed to reduce peak period automobile trips by either eliminating the trip, shifting it to a less congested destination or route, diverting it to a higher occupancy mode or time shifting it to a less congested period of the day. TDM strategies often worked in conjunction with TSM measures. TDM had the additional attraction of increasing the efficiency of the transportation system at little or no cost (Ferguson, 1990).

Transportation demand management most often focused on a suburban activity center but was also used for CBDs and radial corridors (COMSIS, 1990). TDM strategies required the cooperation of many agencies and organizations including developers, land owners, employers, businesses associations, and state and local governments (Ferguson, 1990). In some instances, legal support was provided in the form of a trip reduction ordinance (TRO) to strengthen compliance with the TDM measures. The first areawide TRO was adopted in Pleasanton, California in 1984. A TRO provided some assurance that consistent standards and requirements would be applied to all businesses in the area and gave these businesses the legal backing to implement automobile reduction strategies. Although the main goal of most TROs was to mitigate traffic congestion, improvement in air quality was an important goal as well (Peat Marwick Main & Co., 1989).

Transportation demand management measures included improved alternatives to driving alone, such as pooling and biking; incentives to shift modes, such as subsidizing transit fares and vanpooling costs; disincentives to driving, such as higher parking fees and reduced parking supply; and, work hours management, such as flexible work hours and compressed work weeks (COMSIS, 1990). TROs required businesses and employers to establish a TDM plan, implement a TDM program, monitor progress, update the plan periodically, have a professionally trained coordinator and, in some instances, achieve a specified level of trip reduction with fines and penalties for violations.

Transportation demand management became more important in addressing suburban traffic congestion as urban areas found increasing difficulties to highway expansion and air quality problems became more widespread.

Private Participation in the Transit Program

The Reagan Administration was committed to a greater private sector role in addressing the needs of communities. They believed that governments at all levels should not provide services that the private sector was willing and able to provide, and that there would be increased efficiencies in a operating environment in which there was competition. Consequently, the Department of Transportation sought to remove barriers to greater involvement of the private sector in the provision of urban transportation services and in the financing of these services.

The instances of private provision of urban public transportation services and in public/private cooperative ventures had been increasing slowly. Transit agencies were having difficulty thinking in terms of private involvement in what they viewed as their business. Private transportation operators had voiced concerns that, in spite of statutory requirements, they were not being fully or fairly considered for the provision of public transportation service. But large operating deficits were creating pressure to find cheaper means to provide service and private providers were increasingly being considered. Some transit agencies were beginning to contract out services that they found too expensive to provide themselves.

To promote increased involvement of the private sector in the provision of public transportation services, the UMTA issued a Policy on Private Participation in the Urban Mass Transportation Program (U.S. Dept. of Transportation, 1984c). It provided guidance for achieving compliance with several sections of the Urban Mass Transportation Act. Section 3(e) prohibited unfair competition with private providers by publicly subsidized operators. Section 8(e) required maximum participation of the private sector in the planning of public transportation services. Section 9(f), which was added by the Surface Transportation Assistance Act of 1982, established procedures for involving the private sector in the development of Transportation Improvement Program as a condition for federal funding.

The Policy on Private Participation in the Urban Mass Transportation Program called for early involvement of private providers in the development of new transit services and for their maximum feasible participation in providing those services. The policy identified the principal factors that the UMTA would consider in determining whether recipients complied with the statutes. It indicated that private transportation providers must be consulted in the development of plans for new and restructured services. Moreover, private carriers must be considered where new or restructured public transportation services were to be provided. A true comparison of costs was to be used when comparing publicly provided service with private providers. An independent local dispute resolution mechanism was to be established to assure fairness in administering the policy.

This policy represented a major departure from past federal policy toward public transportation operators. Where public operators had had a virtual monopoly on federal funds for transit facilities, equipment and service, now they needed to consider private sector operators as competitors for providing those services.

National Transit Performance Reports

Assessments of the nation's public transportation systems and estimates of future needs to improve those systems had been made intermittently over the years. Several estimates had been made as part of multimodal national transportation studies (U.S. Dept. of Transportation, 1972b, 1975b, 1977c). Occasionally, Congress required that estimates of public transportation facility needs be made (U.S. Dept. of Transportation, 1972d, 1974b; Weiner, 1976b). Also, APTA and AASHTO made several estimates over the years of transit needs and submitted them to the Congress.

With the Surface Transportation Assistance Act of 1982, the Congress placed such reporting on a regular periodic basis. Section 310 of that act required biennial reports in January of even years on the condition and performance of public mass transportation systems, and any necessary administrative of legislative revisions. That section also required an assessment of public transportation facilities, and future needs for capital, operation and maintenance for three time periods: one, five, and ten years.

The first transit performance report was designed as the prototype for future reports. It focused entirely on current conditions and performance of the nation's public transportation systems but did not contain projections of future facility needs or costs. The report concluded that the transit industry was in transition and traditional markets were shifting. The industry continued to respond in a conventional manner by expanding service and focusing on peak-period demand. In addition, operating costs had increased dramatically while fares had not kept pace with inflation. Consequently, operating deficits and government subsidies had been increasing (U.S. Dept. of Transportation, 1984d).

The report indicated that the future federal role in mass transportation needed to consider: the program's efficiency, transit's infrastructure needs compared to other needs, opportunities for private sector involvement, and the State and local financial outlook (U.S. Dept. of Transportation, 1984d).

The second and third transit performance reports continued the focus on current performance and conditions of the nation's transit systems. They concluded that the transit industry had adequate funding in the form of public subsidies, but that it faced problems with efficiency and productivity. These problems resulted from a lack of competitive pressure on transit management and labor. They called for local reconsideration of the level of mass transportation provided, and the manner in which it was delivered and priced (U.S. Dept. of Transportation, 1987a and 1988a).

The reports recommended that State and local decisionmakers be given more responsibility in meeting local mobility needs, increased competition in the provision of transit services, more efficient use of financial resources, and in targeting cost recovery to beneficiaries, and greater involvement of the private sector in the provision and financing of transit service (U.S. Dept. of Transportation, 1987a and 1988a).

Charter Bus Regulations

The Urban Mass Transportation Act of 1964 defined mass transportation to specifically exclude charter services. Federal assistance for mass transportation was, therefore, not to be used to provide such

services. The federal government had thereby declared at the outset of the transit program that it confined its role to assisting only regular mass transit services. The Comptroller General ruled, however, in a 1966 case that buses purchased with federal funds could provide charter service if the service was incidental, and did not interfere with the provision of regular transit services for which the buses were purchased.

As public transit agencies engaged in charter bus operations, there was a concern, generally raised by private bus operators, that public agencies were competing unfairly. The argument was that public agencies were using federal subsidies to allow them to underprice their services and thereby foreclose private operators from charter service markets. The Federal-Aid Highway Act of 1973 sought to clarify the charter bus prohibition. It required all recipients of federal transit funds or highway funds used for transit to enter into an agreement with the Secretary of Transportation that they would not operate any charter service outside of their mass transportation service area in competition with private operators (U.S. Dept. of Transportation, 1982a).

The Housing and Community Development Act of 1974 gave the Secretary of Transportation the flexibility to tailor solutions to this problem to the individual situation. The agreements negotiated with recipients were to provide fair and equitable arrangements to assure that publicly and privately owned operators for public bodies did not foreclose private operators from the intercity charter bus industry where such operators were willing and able to provide such service. The National Mass Transportation Assistance Act of 1974 extended these charter bus provisions to federal financial assistance for operating expenses which was a new category of federal assistance established by that act (U.S. Dept. of Transportation, 1982a).

Regulations to implement these charter bus provisions were published in April 1976 (U.S. Dept. of Transportation, 1976d). Under the regulations, a public transit operator could not provide intercity or intracity charter bus service unless it was incidental to the provision of mass transportation service. A service was considered incidental if it did not: (a) occur during peak hours, (b) require a trip more than 50 miles beyond the recipient's service area, or (c) require a particular for more than six hours. If a public operator provided intercity charter service, the charter revenues had to cover its total costs and the rates charged could not foreclose competition from private operators. Some 79 separate costs had to be accounted for in the public operator's certification.

Both public and private operators found the regulation unsatisfactory. Public operators supported easing the restrictions on their provision of charter bus service as a means to provide supplemental revenue and improve their financial condition. Private operators preferred tightening the restrictions and strengthening enforcement, which they felt was inadequate. Moreover it was clear that the record keeping and certification requirements on grant recipients was unnecessarily burdensome.

Finding a balance between the views of public and private operators was extremely difficult, and UMTA struggled with the problem for a number of years. Shortly after issuing the regulation in 1976, the UMTA published an Advanced Notice of Proposed Rulemaking (ANRPM) requesting views on several issues and suggestions on how to make the regulation more effective. A public hearing was held in January 1977 to solicit additional comments. Afterwards, UMTA issued two additional ANRPMs in an attempt to obtain

the views of interested parties on a number of issues and possible options for modifying the regulation (U.S. Dept. of Transportation, 1981c and 1982b).
Finally, a NPRM was published in March 1986 (U.S. Dept. of Transportation, 1986a), and a final rule in April 1987 (U.S. Dept. of Transportation, 1987b). It prohibited any UMTA recipient from providing charter bus service using UMTA assistance if there was a private charter bus operator willing and able to provide the service. A recipient could provide vehicles to a private operator if the operator had insufficient vehicles, or lacked vehicles accessible to handicapped persons. An exception could be granted to a recipient for special events, or to small urban areas that could document cases of hardship.

Surface Transportation and Uniform Relocation Assistance Act of 1987

With five titles and 149 sections, the Surface Transportation and Uniform Relocation Assistance Act of 1987 (STURAA) was the most complicated piece of legislation up to that time on surface transportation matters. It was passed on April 2, 1987, over President Reagan's veto. The STURAA authorized $87.6 billion for the five year period from fiscal year 1987 to 1991 for the Federal-aid highway, safety, and mass transportation programs (Table 8). It also updated the rules for compensating persons and businesses displaced by federal development, and extended the Highway Trust Fund through June 30, 1994 (U.S. Dept. of Transportation, 1987c).

Title I, the Federal-Aid Highway Act of 1987, authorized $67.1 billion for highway and bridge programs over a five-year period. The basic features of the highway programs were extended at levels 10 to 25 percent below those in the Surface Transportation Assistance Act of 1982 (STAA).
Some $17.0 billion was authorized through 1993 for completion of all remaining segments of the Interstate system. A minimum of one-half percent apportionment for each state for Interstate construction was continued. The act authorized a $1.78 billion over five years to fund 152 specifically cited projects outside of the regular federal-aid highway programs. Each state was guaranteed a minimum of one-half percent of the newly authorized funds. This was considerably more than the 10 projects specifically cited in the STAA.

The act permitted States to raise the speed limit on Interstate routes outside urbanized areas from 55 to 65 m.p.h. With regard to bridge tolls, the act required that they be “just and reasonable" and removed any federal review and regulation. It provided for seven pilot projects using federal-aid funds, that were not to exceed 35 percent of the costs, in conjunction with tolls for new or expanded non-Interstate highway toll projects. Up to that time, federal-aid highway funds could not be spent on any public highway that had tolls on it, and the tolls had to be removed after the costs were paid off.

Table 8
Surface Transportation and Uniform Relocation Assistance Act 1987

	Authorization Levels by Fiscal Year ($ Millions)				
	1987	**1988**	**1989**	**1990**	**1991**

Highway Construction					
Interstate Constr.	3,000.0	3,150.0	3,150.0	3,150.0	3,150.0
Interstate 4R	2,815.0	2,815.0	2,815.0	2,815.0	2,815.0
Interstate Highway Substitutions	740.0	740.0	740.0	740.0	740.0
Primary System	2,373.0	2,373.0	2,373.0	2,373.0	2,325.0
Secondary System	600.0	600.0	600.0	600.0	600.0
Urban System	750.0	750.0	750.0	750.0	750.0
Bridge Replacement & Rehabilitation	1,630.0	1,630.0	1,630.0	1,630.0	1,630.0
Safety Construction	126.0	330.0	330.0	330.0	330.0
Other Programs	1,315.7	1,329.5	1,329.0	1,329.0	1,329.0
Subtotal-Highway	13,574.6	13,737.4	13,736.9	13,886.0	13,886.0
Highway Safety					
State/Community Grants	126.0	126.0	126.0	126.0	126.0
R&D Grants	33.0	33.0	33.0	33.0	33.0
Subtotal-Safety	159.0	159.0	159.0	159.0	159.0
Urban Mass Transportation					
Discretionary Grants	1,097.2	1,208.0	1,255.0	1,305.0	1,405.0
Formula Grants	2,000.0	2,350.0	2,350.0	2,350.0	2,350.0
Interstate Transit Substitutions	200.0	200.0	200.0	200.0	200.0
R&D, Admin. & Misc.	-----	50.0	50.0	50.0	50.0
Subtotal-Transit	3,297.2	3,558.0	3,605.0	3,655.0	3,755.0
Total	**17,161.6**	**17,504.5**	**17,561.0**	**17,760.0**	**17,860.0**

An allocation of one-quarter percent of major highway authorizations was set aside for a new cooperative research program directed at highway construction materials, pavements and procedures. This Strategic Highway Research Program (SHRP) was to be carried out with the cooperation of the National Academy of Sciences and AASHTO.

Title II, the Highway Safety Act of 1987, authorized $795 million over five years for safety programs in addition to the $1.75 billion for safety construction programs in the Federal-Aid Highway Act of 1987. It required the identification of those programs that are most effective in reducing accidents, injuries and deaths. Only those programs would be eligible for federal-aid funds under the Section 402 State and

Community Grant program. Safety “standards" which States must meet to comply with this program were redefined as “guidelines.”

Title III, the Federal Mass Transportation Act of 1987, authorized $17.8 billion for federal mass transit assistance for fiscal years 1987 through 1991. The act continued the Section 3 Discretionary Grant program at graduated authorization levels of $1.097 billion in FY 1987 rising to $1.2 billion in FY 1991 funded from the Mass Transit Account of the Highway Trust Fund. The program was to be split: 40 percent for new rail starts and extensions, 40 percent for rail modernization grants, 10 percent for major bus projects, and 10 percent on a discretionary basis.

Grant criteria were established for new fixed guideway systems and extensions. The projects had to be based on alternatives analysis and preliminary engineering, cost-effective, and supported by an acceptable degree of local financial commitment. A plan for the expenditure of Section 3 funds was required to be submitted to the Congress annually.

The act authorized $2.0 billion for FY 1987, and $2.1 billion annually for FYs 1988 through 1991 from the General Fund for the Section 9 and 18 Formula Grant programs. The cap on operating assistance for urbanized areas under 200,000 in population was increased by 32.2 percent starting with FY 1987 with additional increases tied to rises in the Consumer Price Index. It was unchanged from the Surface Transportation Assistance Act of 1982 for larger urbanized. Newly urbanized areas (1980 Census or later) were allowed to use up to two-thirds of their first year Section 9 apportionment for operating assistance. Revenues from advertising and concessions beyond FY 1985 levels no longer had to be included in net project cost.

Unobligated Section 9 funds remaining in the last 90 days of the availability period were allowed to be used by the Governor anywhere in the State. Advanced construction approval was authorized for projects under the Section 3 and 9 programs. The provision permitting three-for-two trade-in of capital assistance for operating assistance was repealed. The definition of eligible associated capital items was broadened to include tires and tubes, and the eligible threshold for such items was reduced from one percent to one-half percent of the fair market value of rolling stock. Section 9 funds were allowed to be used for leasing arrangements if it was more cost effective than acquisition or construction.

A new Section 9B formula grant program was established funded by a portion of the revenues from the Mass Transit Account of the Highway Trust Fund. The program funds, authorized at $575 million over four years from 1988 to 1991, were to be apportioned using the Section 9 program formula and could only be used for capital projects. The act also authorized $200 million annually for transit Interstate substitute projects.

A bus testing facility was authorized to be established and the testing of all new bus models required. A new University Centers program was authorized for the establishment of regional transportation centers in each of the 10 federal regions. The Buy America threshold for rolling stock was increased from 50 to 55 percent domestic content on October 1, 1989, and to 60 percent on October 1, 1991. The project cost differential was increased from 10 percent to 25 percent.

With regard to planning, the act required development of long-term financial plans for regional urban mass transit improvements and the revenue available from current and potential sources to implement such improvements.

Title IV, the Uniform Relocation Act Amendments of 1987, revised and updated some of the provisions Uniform Relocation Assistance and Real Property Act of 1970. The act generally increased payments for residences and businesses displaced by construction of transportation projects and broadened eligibility for payments under the program. FHWA was designated as the lead federal agency to develop regulations to implement the act.

Title V, the Highway Revenue Act of 1987, extended the Highway Trust Fund to June 30, 1993, and extended taxes and exemptions to September 30, 1993.

National Conferences on Transportation Planning Applications

By the mid-1980s, there was a broader range of issues than ever for urban transportation planners to deal with. State and local planning agencies had to be resourceful in adapting existing planning procedures to fit individual needs. Often planning methods or data had not been available when needed to adequately support planning and project decisions. Compromises between accuracy, practicality, simplifying assumptions, quicker responses, and judgement often resulted in innovative analysis methods and applications.

To share experiences, and highlight new and effective applications of planning techniques, a National Conference on Transportation Planning Applications was held in Orlando, Florida on April 20-24, 1987. The conference was dominated by practicing planners from State and local agencies, and the consulting community who described the application of planning techniques to actual transportation problems and issues (Brown and Weiner, 1987).

The conference surfaced several important issues. First, the realm of urban transportation planning was no longer solely long-term at the regional scale. The conference gave equal emphasis to both the corridor and site level scale of planning in addition to the regional level. Many issues at the local level occurred at finer scales, and planners were spending considerably more effort at these scales than at the regional scale. The time horizon too had shifted to short-term with many planning agencies concentrating on rehabilitating infrastructure and managing traffic on the existing system.

Second, the microcomputer revolution had arrived. Microcomputers were no longer curiosities but essential tools used by planners. There were many presentations of microcomputer applications of planning techniques at the conference.

Third, with tighter budgets and the increasing demands being placed on them, transportation planning agencies found it increasingly difficult to collect large-scale regional data sets such as home-interview, origin-destination surveys. Consequently, there was considerable discussion on approaches to obtain new

data at minimal cost. Approaches ranged from expanded use of secondary data sources such as census data, to small stratified sample surveys, to extended use of traffic counts. However, low cost approaches to updating land use data bases were not available.

Fourth, there was concern about the quality of demographic and economic forecasts, and their affects on travel demand forecasts. It was observed that errors in demographic and economic forecasts could be more significant than errors in the specification and calibration of the travel demand models. With this in mind, there was discussion about appropriate techniques for demographic forecasting during periods of economic uncertainty.

Fifth, there was identified a clear need to develop integrated analysis tools that could bridge between planning and project development. The outputs for regional scale forecasting procedures could not be used directly as inputs for project development but there were no standard procedures or rationales for performing the adjustments. Without standard procedures, each agency had to develop their own approaches to this problem.

This conference demonstrated that there was considerable planning activity at the State and local level. Much of this activity showed that planning agencies were adapting new ideas to local transportation problems within the constraints of time and money available to them.

The conference was the first in a series that occurred on a two-year cycle. The series focused on planning applications of traditional techniques adapted for new situations, innovative techniques, and research needs to improve planning practice (Second Conference on Application of Transportation Planning Methods, 1989; Third National Conference on Transportation Planning Applications, 1991; Faris, 1993; Engelke, 1995)

Smuggler's Notch Conference on Highway Finance

Highway revenue had been increased during the early 1980's with a four-cent raise in the federal highway user charge by the Surface Transportation Assistance Act of 1982, and by raises in many State user fees. Yet, even with these raises, highway needs were forecasted to increase faster than revenue. With the federal funding commitment defined in legislation to increase modestly, the financial burden for constructing and maintaining the nation's highways would fall more heavily on State and local governments. State and local officials were, therefore, looking for additional funding resources.

In response to this issue, the American Association of State Highway and Transportation Officials sponsored a National Conference on State Highway Finance entitled “Understanding the Highway Finance Evolution/Revolution" at Smuggler's Notch, Vermont on August 16-19, 1987. The conference was organized to discuss the response to growing highway needs and potential funding sources. Five major funding techniques were addressed: user fees, nonuser fees, special benefit fees, private financing, and debt financing (American Association of State Highway and Transportation Officials, 1987a).

The conferees concluded that highway officials would need to develop a clear vision of the public's real need, a thorough understanding of the authorizing environment, and the organizational capacity to implement the plans that were envisioned. Further, it was concluded that user fees remained the most promising and among the most equitable sources of highway funding. Nontraditional funding sources were found to be supplements to not replacements for traditional sources.

Moreover, highway programs could be more successful if they were presented as products of a process that combined sound fiscal planning with sound engineering. These programs would, also, be better received if they were related to key policy issues such as economic development and tourism (American Association of State Highway and Transportation Officials, 1987a).

Revised FHWA/UMTA Environmental Regulation

In August 1987, after more than four years of work, the FHWA and UMTA published changes to their joint environmental regulation as part of the overall DOT effort to streamline Federal regulations and time consuming procedures. The regulation provided more flexibility to field offices to decide whether projects required comprehensive environmental assessments (U.S. Dept. of Transportation, 1987e).

The new regulation changed the manner in which categorical exclusions were handled. These categories of actions were considered to have no significant environmental impacts. Previously, a project had to fall into one of the specified categorical exclusions to allow a FHWA or UMTA field office to process it without requiring an comprehensive environmental assessment. The new regulation allowed field offices to review projects that meet the criteria for categorical exclusion and determine if an comprehensive environmental assessment was required based on a review of the project documentation.

The new regulation also clarified that a supplemental environmental impact statement (EIS) would only be required for changes in highway or transit projects where those changes would cause additional significant environmental impact not evaluated in the original EIS.

The regulation clarified and consolidated the requirements for public involvement in the FHWA and UMTA project development processes. With regard to the FHWA requirements, the earlier regulation specified the various elements in an acceptable public involvement process including such items as the procedure for public hearings, content of notices, timing of the process and those to invite to the public hearings. The revised regulation required the States to develop their own public involvement procedures, and eliminated the FHWA requirement for State Action Plans. These State procedures were to have public involvement integrated into the project development process, and to begin public involvement early and maintain it continuously throughout. The public involvement procedures had to be fully coordinated with the NEPA process and cover such issues as public hearings, information to be presented at hearings, and transcripts of hearings. At least one public hearing was required after the draft EIS (DEIS) was completed and circulated for review. This was also the case for UMTA projects. States were given one year after publication of the regulation to develop their procedures.

Other changes were made to update the regulation to bring it into conformance with changes in other areas. This included removing references to A-95 clearinghouse to conform with E.O. 12372 "Intergovernmental Review of Federal Programs," as well as those references to MPOs which were covered under the new joint FHWA/UMTA urban transportation planning regulation.

Los Angeles' Regulation XV

As part of a long range plan to achieve the National Ambient Air Quality Standards by 2010, the Los Angeles Southern California Air Quality Management District (SCAQMD) issued Regulation XV. Under Regulation XV, each employer of 100 more employees had to ensure that its workforce achieved a certain "average vehicle ridership" (AVR) for journeys to work which occur between 6:00 a.m. and 10:00 a.m. The AVR was calculated by dividing the number of employees arriving at the work site by the number of autos arriving at the work site during those hours. Regulation XV went into effect on July 1, 1988, and applied to all or part of six counties in Southern California. The regulation affected almost 7,000 firms, agencies, and institutions employing about 3.8 million workers. (Giuliano and Wachs, 1991)

The regulation specified a different AVR depending on the location. Central business district employers had to achieve a AVR of 1.75 persons per vehicle while employers in outlying areas had to meet a AVR of 1.3 or 1.5 persons per vehicle All of the targets were above the existing AVR of 1.1 persons per vehicle. Employers had to submit plans to the SCAQMD for achieving their specified AVR within one year using measures such as subsidized ridesharing, free and preferential parking for carpools and vanpools, monthly transit passes, and provision for bicycle parking. At the end of the year, if the company had not implemented the plan it was subject to a fine. If the company had implemented the plan but fell short of the required AVR, it had to revise the plan and implement it the next year. This result was not considered a violation, and a fine was not assessed. (Wachs, 1990)

The AVR goal established for the region was quire ambitious, resulting in more than a 20 percent increase, but the result was more modest. The AVR increased 2.7 percent, from 1.226 to 1.259 during the first year of the program. The percentage of workers driving to work decreased from 75.8 percent to 70.9 percent with the shift going primarily to carpools.

CHAPTER 12 — STRATEGIC PLANNING

By the early 1990s, there were major changes underway that would have significant effects on urban transportation and urban transportation planning. The era of major new highway construction was over in most urban areas. On a selective basis gaps in the highway system would be closed and a few new routes would be constructed, but the basic highway system was in place. However, the growth in urban travel was continuing unabated. With only limited highway expansion possible new approaches needed to be found to serve this travel demand. Moreover, this growth in traffic congestion was contributing to degradation of the urban environment and urban life and needed to be abated. Previous attempts at the selected application of transportation system management measures (TSM) had proven to have limited impacts on congestion, providing the need for more comprehensive and integrated strategies. In addition, a number of new technologies were reaching the point of application, including intelligent vehicle highway systems (IVHS) and magnetically levitated trains.

Many transportation agencies entered into strategic management and planning processes to identify the scope and nature of these changes, to develop strategies to address these issues, and to better orient their organization to function in this new environment. They shifted their focus toward longer term time horizons, more integrated transportation management strategies, wider geographic application of these strategies, and a renewed interest in technological alternatives.

The shortage of financial resources was still a serious concern. In the debate over the reauthorization of the Intermodal Surface Transportation Efficiency Act of 1991, there was considerable over the level of funding, the amount of flexibility in using those funds, and the degree of authority that local agencies would be given in programming the funds.

National Council on Public Works Improvement

Concern for the nation's deteriorating infrastructure prompted the Congress to enact The Public Works Improvement Act of 1984. The act created the National Council on Public Works Improvement to provide an objective and comprehensive overview of the state of the nation's infrastructure. The Council carried out a broad research program

The Council's first report provided an overview of available knowledge, explored the definition of needs, and reviewed key issues including the importance of transportation to the economy, management and decision making practices, technological innovation, government roles, and finance and expenditure trends (National Council on Public Works Improvement, 1986). The second report was a series of study papers assessing the main issues in nine categories of public works facilities and services, including highways and bridges (Pisarski, 1987b), and mass transit (Kirby and Reno, 1987).

The final report of the Council concluded that most categories of public works were performing at only passable levels, and that this infrastructure was inadequate to meet the demands of future economic growth and development. Highways were given a grade of C+ with the Council concluding that although the decline of pavement conditions had been halted, overall service continued to decline. Spending for system

expansion had fallen short of need in high growth suburban and urban areas, and many highways and bridges still needed to be replaced. Mass transit was graded at C-, and the Council concluded that transit productivity had declined significantly, and that is was overcapitalized in many smaller cities and inadequate in large older cities. Mass transit faced increasing difficulty in diverting persons from automobiles, and was rarely linked to land use planning and broader transportation goals (National Council on Public Works Improvement, 1988).

Part of the problem was found to be financial with investment in public works having declined as a percent of the gross national product from 1960 to 1985. The Council recommended that all levels of government increase their expenditures by as much as 100 percent. It endorsed the principle that users and other beneficiaries should pay a greater share of the cost of infrastructure service. The Council also recommended clarification of government roles to focus responsibility, improvement in system performance, capital budgeting at all levels of government, incentives to improve maintenance, and more widespread use of low capital techniques such as demand management and land use planning. The Council called for additional support for research and development to accelerate technological innovation, and for training of public works professionals.

Transportation 2020

With the completion of the National Interstate and Defense Highway System provided for in the Surface Transportation and Uniform Relocation Assistance Act of 1987, there was a need for a new focus for the nation's surface transportation program in the post-Interstate era. Debates accompanying the passage of the 1982 and 1987 surface transportation acts demonstrated the lack of consensus on future surface transportation legislation which could, potentially, manifest itself in the form of a reduced Federal surface transportation program.

To address this concern, AASHTO created the Task Force on the Transportation 2020 Consensus Program in February 1987. The purposes of the task force were to: assess the nation's surface transportation requirements through the year 2020; develop options for meeting those requirements at the Federal, state, and local level; and, achieve a consensus on how to meet those requirements (American Association of State Highway and Transportation Officials, 1987b). The Task Force involved the participation of more than 100 state and local government groups, highway-user organizations and trade and industry associations.

As a part of the fact-finding stage of the program, 65 public forums were held throughout the United States under the leadership of the Highway Users Federation for Safety and Mobility in cooperation with state transportation agencies to obtain information on transportation needs and problems (Highway Users Federation, 1988).

In addition, a Conference on the Long-Range Trends and Requirements for the Nation's Highway and Public Transit Systems was held in June, 1988 in Washington, D.C. (Transportation Research Board, 1988). The conference objective was to identify the nature and level of demand for future highway and public transit services and their future role. The conference addressed economic growth, demographics and

life style, energy and environment, development patterns and personal mobility, commercial freight transportation, new technology and communications, and resources and institutional arrangements.

The conference concluded that as the year 2020 approached: there will continue to be modest economic growth; population increases will be concentrated in the non-white groups, particularly in the South and West; there will be further decentralization of residences and work places into suburban areas; the automobile will remain the predominant mode of transportation; the reduction in air pollution and energy use will pose a greater challenge; new technologies will not be realized unless there is a concerted effort by the public and private sectors; states and localities will need to play a greater role in funding and planning.

In September, 1988, the Transportation 2020 group published *The Bottom Line*, which summarized their estimates of surface transportation investment requirements through the year 2020 (American Association of State Highway and Transportation Officials, 1988). They reported that a $80 billion annually was needed for highways and $15 billion annually was needed for public transportation from all sources, including Federal, state and local governments just to maintain the transportation infrastructure. To maintain the current level of service in the face of increased travel in the future, a more than 40 percent increase over existing funding levels would be required.

Twelve key associations of Transportation 2020 formed a Transportation Alternatives Group (TAG), to analyze information from the 2020 process and formulate national strategies. The recommendations of TAG were directed toward increasing the level of funding for the preservation and expansion of nation's surface transportation system, greater flexibility, increased emphasis on safety, assurance of equitable cost allocation, greater regulatory uniformity in freight transportation, improvement in air quality, attention to intermodal access, support for intercity and rural public transportation, and renewal of surface transportation research, especially for intelligent vehicle highway systems (Transportation Alternatives Group, 1990). These recommendations were used to develop and consolidate support for a new broad national surface transportation program.

Williamsburg Conference on Transportation and Economic Development

As public funds for transportation investment became more constrained, there was a growing interest in demonstrating the benefit of these investments on economic development. Transportation planners and policy makers sought to justify transportation investment not just as another expenditure but as a factor that would increase economic productivity and international competitiveness. Some research at the macro economic level showed that a strong relationship existed between public capital investment and private sector productivity, profitability, and investment (Aschauer, 1989).

The primary difficulty for transportation planners in addressing this issue was isolating the economic consequences of the transportation investments and comparing them with the consequences of other public and private investments. A further problem was the establishment of causal relationships between specific transportation investments and subsequent economic events.

To address these issues, an international conference on "Transportation and Economic Development," was held in Williamsburg, Virginia, on November 5-8, 1989. The conference focused on evaluating the methods and modeling techniques for relating transportation investment to economic development. A series of case studies was examined to assess this relationship at the State and regional level (Transportation Research Board, 1990a).

The conference concluded that the primary benefits of a transportation investment accrued to the user in terms of savings in travel time, cost, and accident reduction. Economic impacts measured the secondary benefits that affected income, employment, production, resource consumption, pollution generation, and tax revenues. Existing economic impact models were found to be limited in their ability to duplicate the complex reality of a dynamic economy, lacking in empirical data, and often unreliable in practice.

The conference also concluded that a good transportation system was a necessary but not sufficient condition for development. The correlation between the level of infrastructure investment and income found in prior studies had not been shown to be a causal relationship. The conference stressed that there was still a need for research to develop causal-based methodologies.

National Transportation Strategic Planning Study

With the start of the decade of the 1990s fast approaching and a new century not far off, there was concern about the future of the nation's transportation system. The concern was expressed in the House Report on the 1988 DOT Appropriations Report:

> "With the scheduled completion of the Interstate highway system in 1992, the growing constraints on expansion of airport capacity, and the projected doubling of traffic by the year 2000 in many of our large urban areas, the federal government will be faced with major decisions in the early 1990s about its role, responsibility, and choice of options to continue the development and improvement of our future transportation network. The Committee believes it is a major national economic, social, and defense priority to ensure that this country continues to have the best transportation network in the world."

To address these issues, the 1988 Department of Transportation Appropriations Act called for a long-range, multimodal study to the year 2015 for transportation facilities and services to carry persons and goods. The National Transportation Strategic Planning Study (NTSPS) was completed in March 1990 (U.S. Dept. of Transportation, 1990a). It was the first national transportation assessment to be conducted by DOT in 15 years, and the first to analyze all modes of transportation to the same level of detail.

The NTSPS report provided an overview of the Nation's transportation system and identified future investments required to maintain and develop the infrastructure. The report analyzed the trends and key factors expected to influence transportation demand and supply over the next 25 to 30 years, including demographics, the economy, energy, and the environment. It examined important issues including trends in passenger and freight movements, international comparisons of infrastructure, usage and policies; economic deregulation; safety, security and accessibility; and new technology.

The report included an analysis of each of the six individual transportation modes: aviation, highway, public transportation, railroads, pipelines and waterborne, and defense transportation. The modes were analyzed in terms of current conditions and performance, forecast future travel demand, funding sources, key issues, and future investment requirements. Finally, the report synthesizes the results of five urban areas studies which were conducted by local planning agencies.

The National Transportation Strategic Planning Study was used as background for and to provide support to *A Statement of National Transportation Policy* issued by Secretary Samuel K. Skinner in February 1990 (U.S. Dept. of Transportation, 1990b). It was the first comprehensive policy statement issued by DOT in over decade. In preparing the policy, DOT engaged in an extensive outreach program through public hearings, focus group sessions, seminars with transportation experts, informal discussions and correspondence. DOT launched the program by issuing an overview of the nation's transportation system and an identification of issues (U.S. Dept. of Transportation, 1989a). A conference was held in Washington, D.C. at National Academy of Sciences
in July, 1989 to open the public debate on national transportation policy (U.S. Dept. of Transportation, 1989b).

At the end of the one year process, the policy was published. It set forth new directions for national transportation policy which were grouped under six themes:

- maintain and expand the Nation's transportation system;
- foster a sound financial base for transportation;
- keep the transportation industry strong and competitive;
- ensure that the transportation system supports public safety and national security;
- protect the environment and the quality of life;
- advance U.S. transportation technology and expertise.

The policy also set out the strategies and actions to accomplish the various objectives encompassed by the six themes.

Intelligent Vehicle Highway Systems

As highway congestion grew, with its concomitant air pollution, accidents, and economic losses, new approaches were being sought to improve mobility and alleviate these problems. One approach was the development and application of intelligent vehicle highway systems (IVHS), often referred to as “smart cars" and “smart highways".

IVHS technologies developed from advances in electronics, communications, and information processing. They incorporated advanced communications technology, computers, electronic displays, warning systems, and vehicle/traffic control systems, and allowed for two-way communications between highways and drivers. Although the United States had taken the early lead in the late 1960s and early 1970s in researching these technologies through the programs such as Electronic Route Guidance System (ERGS)

and Urban Traffic Control Systems (UTCS), further development lagged in the United States while the Japanese and Europeans mounted aggressive, well funded research and development programs in the 1980s.

Concerned about the loss of U.S. leadership, the Congress directed the Secretary of Transportation to: assess ongoing European, Japanese and U.S. IVHS research initiatives; analyze the potential impacts of foreign IVHS programs on the introduction of advanced technology for the benefit of U.S. highway users and on U.S. vehicle manufacturers and related industries; and, make appropriate legislative and/or programmatic recommendations.
The report, completed in March 1990, described IVHS technologies in terms of advanced traffic management systems, advanced driver information systems, freight and fleet control systems, and automated vehicle control systems (U.S. Dept. of Transportation, 1990c). The report concluded that the use of IVHS technologies had the potential to reduce congestion, promote safety, and improve personal mobility. There would, however, need to be extensive testing to determine which IVHS technologies were most cost effective. U.S. industry and the public would have to become more involved in IVHS or the European and Japanese manufacturers could gain a competitive advantage from their extensive research and development programs.

The report recommended the establishment of a national cooperative effort to foster the development, demonstration, and implementation of IVHS technologies. The federal role would be in the areas of coordination and facilitation of research and development, planning and conducting demonstrations and evaluations, coordination of standards and protocols, and participating in research related to DOT's operating and regulatory responsibilities. Developing and marketing IVHS technologies would be the responsibility of the private sector, and state and local governments would still be responsible for highway operations and traffic management. Parallel development in both the highway infrastructure and the vehicle would be required to order for these technologies to be successful.

In April 1990, a national leadership conference in Orlando, Florida, "Implementing Intelligent Vehicle Highway Systems," brought together senior executives from the private sector. The conference recommended the establishment of a new organization to guide the development and coordination of IVHS activities (Highway Users Federation, 1990). As a result, in July 1990, IVHS America was established by the Highway Users Federation and the American Association of State Highway and Transportation Officials (AASHTO) to bring together private companies, state and local governments, and the research community.

The advent of IVHS technologies had opened a new chapter in surface transportation. IVHS had quickly become an accepted concept and generated wide ranging research and development projects. Demonstrations began in Los Angeles, California in July 1990, with the Pathfinder project, and the next year in Orlando, Florida, with the TravTek project, both designed to evaluate the usefulness of an advance traffic information systems.

Lawsuit Against the Metropolitan Transportation Commission's Travel Models

In June, 1989, two environmental organizations, the Sierra Club Legal Defense Fund and the Citizens for a Better Environment, filed lawsuits in the Federal District Court of Northern California claiming that the State of California, the Metropolitan Transportation Commission (MTC) of San Francisco, and other regional agencies had violated the provisions of the Clean Air Act Amendments of 1977 by not doing enough to meet the clean air standards (Garrett and Wachs, 1996).

The subject of the litigation was an non-attainment element included as part of the Bay Area's 1982 SIP for meeting the CO and ozone air quality standards by 1987. That element was to consider delaying any proposed highway projects that would worsen emissions. The case focused on the general issue of the effects of increased highway capacity on reducing transit usage, discouraging infill and densification, increasing highway speeds, inducing highway travel, promoting population growth and economic development, and enabling the spread of urban sprawl, all of which would contribute to greater air pollution emissions (Harvey and Deakin, 1991).

The role of transportation in the SIP was estimated through the air quality and transportation conformity analyses. The transportation plan was required to contribute to meeting the air quality standards by a specified date. The MTC undertook a conventional “state of the practice" analysis to determine the emissions impacts of the transportation plan. The environmental groups argued that conventional regional travel forecasting models overstated the emissions benefits of highway investments by fully reflecting speed improvements on reducing emissions but showing little or none of the induced travel resulting from faster times (Harvey, and Deakin 1992).

Table 9 shows the possible responses to highway capacity increases argued by the environmental organizations (Stopher, 1991). The environmental organizations argued that the MTC travel models did not take account of all of these travel responses. Consequently, MTC proposed an analysis procedure with feedback to trip generation, auto ownership, residential location, and employment location. MTC argued that practical models of regional growth as a function of infrastructure investments were not available. The Court accepted the proposed conformity analysis procedure. However. the Judge qualified the decision noting that nothing in his reading of the 1990 Clean Air Act Amendments of 1990 would preclude EPA from requiring a growth analysis in future guidance. In May, 1992, after three years of effort, the Court ruled that MTC was making reasonable progress in cleaning the region's air. All parties agreed that there were no technical issues remaining (Harvey, and Deakin 1992).

This lawsuit masked a turning point in urban transportation planning and analysis. The dispute centered on the differences of the two sides on the role and purpose of planning. Throughout the 1950s and 1960s, transportation plans were used as a general set of guidelines to assist decision makers to formulate policy and not always available to the public. More recently, transportation plans were seen as providing guidance for solving specific problems. With extensive public participation, plans were considered to be programs of actions, and in some instances, a “contract" between the various concerned groups and the government. Plans were to respond to changing conditions and binding on those who proposed them (Garrett and Wachs, 1996).

Table 9
Travel Response to Highway Capacity Increases

- **Forgone Trips.** Trips that have been forgone because of congestion now will be made. This will result in an absolute increase in numbers of trips using the facility that has been expanded.

- **Peak Spreading.** There will be a reduction in peak-spreading from people no longer delaying trips or starting early to avoid congestion. This will result in a shift of trips between the traditional off-peak periods to the peak periods and is likely to restore the pre-capacity increase level of congestion in the peak.

- **Route Changes.** Trips that may have used parallel or nearby alternatives routes, in order to avoid congestion, may now divert and take the new facility, if the capacity increases boosts travel speeds above those of competing routes.

- **Chained Trips.** Trips that have been made part of an existing trip through trip chaining may now be "unchained," effectively adding more trips to the total. In particular, home-to-work trips that may have been used for side trips to shopping, banking, other personal errands, etc., may now be replaced by several "out-and-back" trips from home for the same purposes.

- **Destination Changes.** Trips made to nearby, but less-desired locations may now be made to further-away, more desired locations, leading to an increase in trip lengths and therefore lengthening the distances that trips are made on the expanded facility.

- **Mode Changes.** People who have chosen to use transit or carpools will now return to using solo drive. This will also result in an absolute increase in auto trips on the expanded facility.

- **Auto Ownership.** If auto use increases, auto ownership will eventually exhibit increases, also, provided that the shift away from transit and carpool is maintained.

- **New Development.** In the longer term, if congestion levels are lowered for sufficient time, developers can be expected to seek additional development that will increase the number of residents and jobs in the vicinity of the expanded facility.

Geographic Information Systems

After years of development, geographic information systems (GIS) were beginning to be used by planning agencies to support analysis and decisionmaking. GIS was a computerized data management system designed to capture, store, retrieve, analyze, and display spatially referenced data. Data bases that were geographically coded were accessible more quickly and cheaply than would otherwise be the case. Moreover, GIS allowed the use of information from different data bases that would be too difficult or too expensive to use together had they not been geographically coded. Geographic information systems also

facilitated moving between different scales of planning where data had to be aggregated or disaggregated between different zone systems and networks with different levels of detail (Weiner, 1989).

A number of transportation planning agencies made extensive commitments of time and money to develop GIS capability for their urban areas. GIS was used to manage land use, population, and employment data for input to the Urban Transportation Planning System (UTPS) to estimate trip generation rates. GIS was also used to generate plots of output files including volumes, bandwidths, facility types, and other link attributes. In addition, the GIS thematic mapping capabilities were used to analyze and present data from the Census Bureau's Urban Transportation Planning Package (UTPP). GIS capability allowed areas to merge land use data from field surveys with existing data bases.

The Census Bureau developed a digital map data base that automated the mapping and related geographic activities to support its survey programs. This system, known as Topologically Integrated Geographic Encoding and Reference (TIGER), was available as the base map for a local GIS. In an early demonstration, TIGER in conjunction with a GIS was used to produce base maps and data files for transportation planning and analysis. It facilitated the integration of the Census UTPP and local data bases. The TIGER file was finally developed for the entire country.

Most States were developing GIS capabilities and applications as well (Vonderohe, et. al., 1991). Computer software was generally acquired from private vendors. Applications included highway inventories, pavement management, accident analysis, bridge management, project tracking, environmental impact analysis, and executive information systems.

Transit agencies were also adapting GIS to performing their planning functions (Schweiger, 1991). These functions included ridership forecasting, service planning, map design and publishing, facilities management, customer information services, and scheduling and run-cutting. Most transit agencies obtained their software from commercial sources.

The development of GIS capabilities and applications required a major commitment by an entire organization of staff and money. It was an evolving phenomenon with new applications and products continuously being developed (Moyer and Larson, 1991). In addition, computer and information resources were also improving. Nevertheless, GIS expanded the capability of agencies to conduct analyses and support decision makers.

National Maglev Initiative

As the expense and difficulty in expanding or building new airports and highways in crowded intercity travel corridors grew, other forms of transportation were being considered to relieve congestion and to provide more efficient service. Among these alternatives was the expansion of high speed rail service in the United States. High-speed passenger rail was already operating in Europe and Japan, and magnetically levitated trains were being actively developed by the Germans and Japanese.

The earliest involvement of the United States with high speed rail (defined as traveling 125 m.p.h. or faster) predated the creation of the Department of Transportation. Under the High Speed Ground Transportation Act of 1965, the Federal Railroad Administration (FRA) ran a research program in high speed ground transportation and a demonstration program involving the Metroliner and Turbo Train. The demonstrations showed that improved railroad trip times between cities in the Boston-Washington Corridor would attract passengers to the railroad.

Under the same act, the Department undertook a planning program to determine the best form of transportation to emphasize for passenger movement in the Northeast Corridor. This eventually led to the Northeast Corridor Improvement Project in 1976 which invested over $2.3 billion in improved rail transportation. That project resulted in 2 hour and 30 minute, 125 m.p.h. Metroliner service from Washington to New York.

In the 1970's, the Department's research and development program funded studies of two types of maglev vehicles with the intention of selecting the most desirable system for testing. FRA's Office High Speed Ground Transportation expended over $2.3 million on maglev research between 1971 and 1976. Much of the research was done through contracts with Ford Motor Company, The Stanford Research Institute, and the Mitre Corporation. In 1974, a prototype linear induction motor research vehicle produced from this research set a world speed record of 255 m.p.h. By the time that the program was terminated in 1976, the research had produced a scale model demonstration (U.S. Dept. of Transportation, 1990d).

Following the termination of U.S. government funded research, companies in Japan and Germany continued the development of maglev systems with substantial support from their governments. In the U.S., private industry virtually abandoned its interest in high-speed maglev systems. However, UMTA supported research on low-speed urban maglev systems with Boeing Company until 1986.

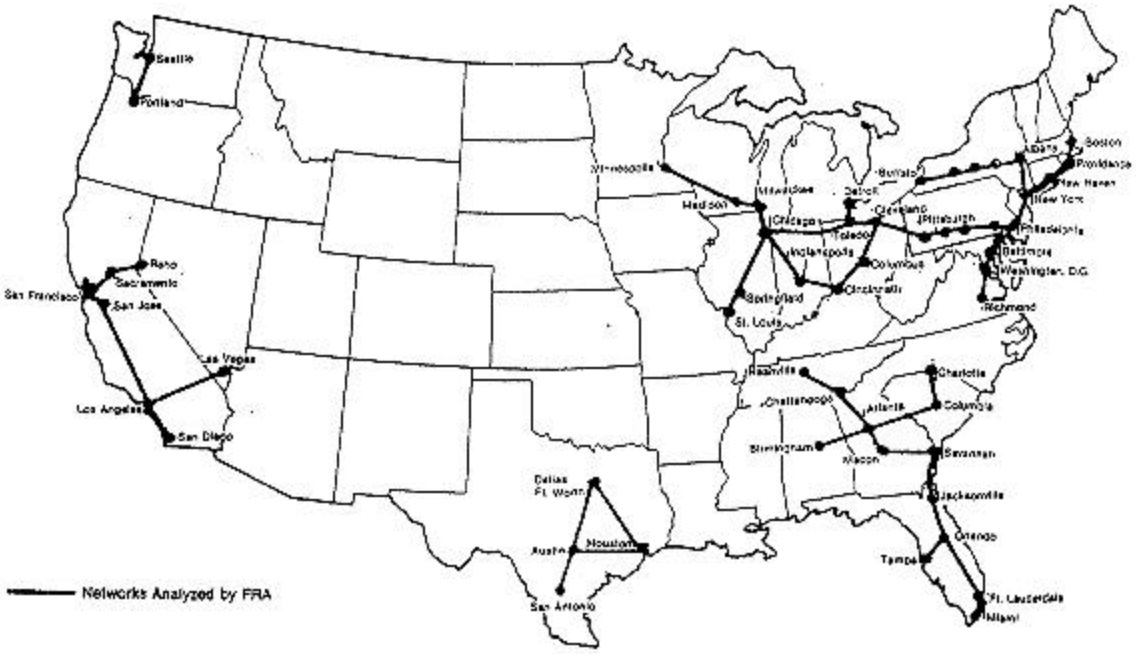
During the 1980's, through its emerging corridors program, FRA funded market feasibility studies for the development of high speed rail systems in several dense corridors. Under this program, grants for ten corridor studies were made totaling $3.8 million.

Then, after years of little interest or activity in magnetic levitation technology, the National Maglev Initiative (NMI) was launched in January, 1990, to assess the potential of maglev transportation in the U.S. This initiative was a joint undertaking of FRA, the U.S. Army Corps of Engineers and the Department of Energy in partnership with the private sector and state governments. The goal of the cooperative effort was to improve intercity transportation in the 21st century through the development and implementation of commercially viable, advanced maglev systems.

The NMI included a review of the safety, engineering, economic, and environmental aspects of maglev systems. Projects under the NMI analyzed maglev subsystems and components to improve performance, reduce costs and lower risks. System concept development projects evaluated new approaches for maglev that could be used as the basis for an advanced maglev system.

A preliminary assessment of the potential for maglev implementation in the U.S. concluded that as many as 2,600 route-miles might be economically feasible, depending on the assumptions used (U.S. Dept. of Transportation, 1990d). (Figure 17) This assessment of financial feasibility would be refined as the NMI developed additional information and the analyses became more sophisticated.

Figure 17
Potential Maglev Corridors



In November 1990, the TRB completed a Study of High-Speed Transportation in High-Density Corridors in the United States was completed by the Transportation Research Board (Transportation Research Board, 1990b). The study assessed the applicability of a wide range of technology options for serving the major high density travel corridors in the United States over the intermediate to long term. The study concluded that there were a number of available high-speed rail technologies that could operate at speeds up to 200 m.p.h., and that systems under development would be able to exceed this speed. Higher speed, however, would come at an additional cost and energy penalties.

The major cost of these systems were in the acquisition of the right of way and construction of the guideway, stations and supporting structures. The most important factor in determining financial viability of these systems, whether public or private, was ridership. The primary market for these systems was in the 150-500 mile trip range and in competition with air travel. It was unlikely that any U.S. corridor could support a high-speed rail system to the degree that it would cover capital and operating costs. Furthermore, there were no institutional arrangements to support the development of high-speed rail systems in the U.S.

The TRB report recommended that maglev offered a better research opportunity because of its potential for higher speeds and lower costs than conventional technology. Further research under the NMI should be conducted and the results reviewed to determine the need for additional research and development.

Clean Air Act Amendments of 1990

In the years after the passage of the Clean Air Act Amendments of 1970, considerable progress was made in reducing air pollution in the nation's urban areas. Average automobile emissions dropped from 85 grams per mile of carbon monoxide (CO) in 1970 to 25 grams per mile in 1988. Lead usage in gasoline dropped by 99 percent between 1975 and 1988. From 1978 to 1988, transportation related emissions decreased 38 percent for CO, 36 percent for hydrocarbons, 15 percent for nitrogen oxides (NOX). The reduction occurred despite a 24 percent increase in vehicle miles of travel during the same period. Nevertheless, by 1988, 101 urban areas failed to meet national ambient air quality standards (NAAQS) for ozone, and 44 areas failed to meet the NAAQS for CO (U.S. Dept. of Transportation, 1990a).

In June 1989, President Bush proposed major revisions to the Clean Air Act. In the Congress, the bill was extensively debated and revised before it was passed. On November 15, 1990, the President signed the Clean Air Act Amendments of 1990.

Of the eleven titles in the act, two in particular directly pertained to transportation. Title 1 addressed the attainment and maintenance of NAAQS. Non-attainment areas were classified for ozone, CO, and particulate matter in accordance with the severity of the air pollution problem. Depending upon the degree to which an area exceeded the standard, that area was required to implement various control programs and to achieve attainment of the NAAQS within a specified period of time. The areas that were furthest out of compliance were given the longest length of time to achieve the standards. (Table 10)

Those urban areas that were classified as “Non-attainment areas" had to undertake a series of transportation actions that accumulated with the degree of severity. Urban areas classified as “marginal" for ozone compliance had to complete an emissions inventory within two years of enactment and every three years thereafter. In addition, these areas had to correct their existing inspection/maintenance (I/M) programs. “Moderate" areas had to submit revised State Implementation Plans (SIPs) that reduced volatile organic compounds (VOC) emissions by 15 percent from 1990 baseline emissions over the 6 years following enactment. In addition to the 15 percent reduction, emissions arising from growth in VMT had to be offset. Reductions from other Federal programs including tailpipe emission standards, evaporative controls, and fuel volatility could not be credited toward the 15 percent reduction. These areas also had to adopt a basic I/M program (Hawthorn, 1991).

Table 10
Classification of Areas Under The Clean Air Act Amendments of 1990

Class	No. of Areas	Attainment Date	Transportation Provisions
OZONE (NAAQS = .12 parts per million)			

Marginal	39	3 Years	Emissions Inventory
Moderate	32	6 Years	Emissions reduction of 15% in 6 years (2.5% per yr.)
Serious	16	9 Years	After 6 years, 3% per yr. VMT reduction
Severe	7	15 Years	After 2 years, TCMs to offset travel growth and employer trip reductions
Extreme	1	20 Years	Possible heavy-duty vehicle restrictions
CARBON MONOXIDE (NAAQS = 9 parts per million)			
Moderate	38	Dec. 31, 1995	VMT forecasts in SIPs and automatic contingency measures
Serious	3	Dec. 31, 2000	After 2 years, TCMs to offset travel growth, oxygenated fuel and economic disincentives

“Serious" areas, in addition to meeting the requirements for moderate areas, had to show “reasonable further progress.” These areas had to submit SIP revisions within 4 years of enactment that included all feasible measures to achieve VOC emission reductions of 3 percent annually for each consecutive 3-year period beginning 6 years after enactment. For areas with 1980 populations of 250,000 or more, a clean-fuel program had to be established which required fleets of 10 vehicles or more to use non-polluting fuels. Areas exceeding 200,000 in population had to adopt an enhanced I/M program within two years of enactment. After 6 years, and for each third year after that, areas had to demonstrate that vehicle emissions, congestion levels, VMT and other relevant parameters were consistent with those used in the SIP. If not, an SIP revision was required within 18 months that included transportation control measures (TCMs) to reduce emission levels consistent with the levels forecasted in the SIP (U.S. Environmental Protection Agency, 1990).

Urban areas that were classified as “severe" had to meet the requirements for “serious" areas and also submit SIP revisions within two years of enactment which identified and adopted TCMs to offset the growth in emission and the growth in trips or VMT. This offset was in addition to the 2.5 percent annual reduction required for “moderate" areas. The SIP had to include a requirement for employers of 100 of more to increase average work trip passenger occupancy by not less than 25 percent above the average for all work trips in the area. Employers had to submit compliance plans within two years of SIP submission demonstrating compliance four years after submittal of the SIP.

“Extreme" areas, those which exceeded the standard by more than 133 percent, had to meet the requirements for “severe" areas. In addition, the SIP could contain measures to reduce high-polluting or heavy-duty vehicles during peak traffic hours.

Similar provisions were established for the two categories of CO Non-attainment areas. Areas classified as “moderate" had to submit an emissions inventory within two years of enactment and every three years thereafter. For some areas, fuel with a 2.7 percent oxygen content 2.7 was required during winter months. Within two years of enactment, moderate CO areas had to revise their SIPs to contain VMT forecasts until

attainment using EPA guidance for the forecasting. Some of these areas had to adopt an enhanced I/M program within two years of enactment. For the most severe of the moderate areas with 1980 populations of 250,000 or more, a clean-fuel program had to be established which required fleets of 10 vehicles or more to use non-polluting fuels. All SIP revisions had to include contingency measures to be automatically implemented if VMT levels exceed projections or if attainment by the deadline was missed.

In addition to meeting the requirements for moderate areas, "serious" CO areas had to submit SIP revisions within 2 years of enactment that included TCMs to reduce CO emissions and offset emission increases from VMT growth and the seasonal use of oxygenated fuel. The oxygen content of the fuel had to be sufficient in combination with other measures to provide for the attainment of the CO standard by the applicable date. If the area failed to meet the standard, a program of TCMs and economic incentives had to be implemented.

The "conformity" provisions in the 1990 Act were expanded from the Clean Air Act Amendments of 1977. A conformity determination was required to assure that Federally approved or financially assisted projects or actions conform to a SIP. The 1990 provisions shifted the emphasis from conforming to a SIP to conforming to a SIP's purpose of eliminating and reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of the standards. In addition, no activity could cause or contribute to new NAAQS violations, nor increase the frequency or severity of any existing violations of any standard, nor delay the timely attainment of any required NAAQS. The new provisions still required the DOT and MPOs to make conformity determinations but they were to be much more dependent on quantitative analyses (Shrouds, 1991).

The process recognized that transportation-related air quality issues had to be analyzed on a system-wide basis and be controlled through regional strategies to be effective. Consequently, projects had to be analyzed in the aggregate rather than on a project basis as previously required. At the project level, three conditions had to be met in order to make a conformity determination. One was that the project come from a conforming plan and program. The second was that the design concept and scope of the project had not changed once the plan and program were found to conform. Third was that the design concept and scope of the project at the time of the conformity determination for the program was adequate to determine emissions. If the project had changed, it had to be reanalyzed with the other projects in the conforming plan and program to determine that it would not increase emissions or otherwise interfere with meeting the deadlines (Shrouds, 1991).

The Clean Air Act Amendments of 1990 expanded the "sanctions" where states failed to carry out requirements of the Act. Previously, sanctions were only applied for failing to submit a SIP. Under the new provisions, sanctions could additionally be triggered when EPA disapproved a SIP or a State or MPO failed to implement any SIP provision. Moreover, sanctions could be imposed for failures unrelated to transportation or mobile sources, for example, for failures related to stationary sources.

Under the 1990 provisions, there were two mandatory sanctions. They were withholding approval of Federal-aid highway projects, and a two-for-one emissions offset for new or modified stationary sources. Areas had 18 months to correct the deficiency before the sanctions took effect. Previously, sanctions could

only be applied to the Non-attainment area. The 1990 provisions expanded the application of sanctions to any portion of the State that EPA determined reasonable and appropriate. The 1990 Act also expanded the list of projects that were exempt from the sanctions. These project types included: safety demonstrations, transit capital, HOV lanes and other HOV incentives, traffic flow improvements which would reduce emissions, fringe parking, single occupant vehicle disincentives including pricing, and incident management.

The planning procedures of the 1990 Act required State and local agencies to review and update, if necessary, the SIP planning, implementation, enforcement, and funding responsibilities. It also required the certification of the Leading Planning Organization (LPO) to prepare the SIP, which was to include local elected officials, representatives of the State and local air agency, MPO, and State DOT. The 1990 Act expanded the boundaries for Non-attainment areas to the metropolitan statistical area (MSA), unless the Governor requested the exclusion of certain unaffected portions.

The 1990 Act called for the development of implementation guidance on various aspects of the process. EPA, in consultation with DOT, was to issue guidance for forecasting VMT within 6 months of enactment. Transportation planning guidance was to be issued within 9 months by EPA in consultation with DOT and State and local officials. EPA, with concurrence of DOT, was to issue criteria and procedures for conformity determinations within 12 months of enactment. Also within 12 months of enactment, EPA was to issue guidance on the formulation and emission reduction potential of 16 TCMs including public transit, trip reduction ordinances, HOV lanes and traffic flow improvements.

Title 2 of the Clean Air Act Amendments of 1990 contained provisions related to mobile sources. The Act set more stringent emission standards for automobiles and light duty trucks to be met between model years 1996 to 2003; beginning with 40 percent of vehicles in 1994 and increasing to 100 percent by 1998. An additional 50 percent reduction was to be required after 2003 if EPA found that it was necessary and technologically feasible. Emission control equipment need to be warranted for 10 years and 100,000 miles.

A pilot program was set up for the sale of clean fuel vehicles in California. Other cities could opt-in to the program. The Act also required government and private fleets in polluted areas to purchase 30 percent of the vehicles to be clean fueled. The Act required the sale of “reformulated gasoline" with specified oxygen content in the nine cities with the most severe ozone problems. It also required the sale of gasoline with higher oxygen content to reduce winter CO pollution. As of January 1, 1996, lead was banned from use in motor fuel.

Particulate matter standards for buses were set at .10 grams per brake horsepower hour in model year 1993. EPA was directed to set bus emission standards and could by regulation require the purchase of alternate fueled buses in urban areas over 750,000 population.

The Clean Air Act Amendments of 1990 created a major challenge to transportation planners to continue to provide urban mobility while meeting the requirements to improve air quality under tight time deadlines.

Strategic Planning and Management

Planning in many transportation agencies evolved through the 1970s from a long range multiyear process directed at developing projects for implementation to attempts that considered possible future events and planned strategically to influence them. A 1983 review of strategic planning in transportation agencies found that some form of strategic planning existed in a few state transportation and port authority organizations (Meyer, 1983). The main problem with these early efforts was that there was little connection between these plans and the day-to-day operations of the agency. Consequently, few of these strategic plans were implemented (Tyndall, et. al, 1990).

In 1982, the Pennsylvania Department of Transportation began a process which marked a fundamental change in strategic planning which became known as "strategic management." The Department established an iterative process that linked its strategic planning to day-to-day management and operations as a means to deal effectively with the continually changing internal and external environments in which they had to function.

An NCHRP project, "Strategic Planning and Management Guidelines for Transportation Agencies," reviewed the status of strategic planning in transportation agencies and developed guidelines for successfully institutionalizing it (Tyndall, et. al, 1990). The project found 25 transportation agencies nationwide that were actively engaged in some form of strategic planning and management. It also found that many other agencies had little interest in or understanding of strategic management and focused instead on day-to-day operational deemed more important.

Although there was no consensus on the definition of strategic management, an operating definition was adopted for the project. "Strategic management is an interactive and ongoing process consisting minimally of the following fundamental components: mission statement (including goals and objectives), environmental scan, strategy development, action plan development, resource allocation, and performance measurement" (Tyndall, et. al, 1990).

The project developed guidelines for transportation agencies to evolve their current management system into a strategic management system. It recognized that there were many approaches to effective strategic management. The essential ingredients were a future vision, involvement of all managers, top level commitment, integration of existing management systems and processes, and focused planning of activities.

Strategic planning and management was gradually adopted by more transportation agencies in coming to grips with the many changes that they faced and to improve their organization's effectiveness.

Americans With Disabilities Act of 1990

The Americans With Disabilities Act (ADA) was signed by President Bush in July 1990 after passage by the Congress with an overwhelming majority. The ADA prohibited discrimination on the basis of disability in both the public and private sectors. Its primary purpose was to make it easier for persons with disabilities to become part of the American mainstream.

In April 1991, DOT issued a proposed regulation to implement the ADA. The new regulation incorporated and amended those regulation governing Section 504 of the Rehabilitation Act of 1973. The new regulation applied to all providers whether they received Federal funds or not, whereas the earlier regulation only applied to Federal fund recipients. The Department of Transportation had previously issued a regulation on October 4, 1990, that required transit authorities to only buy or lease accessible transit vehicles. A plan to implement the new regulation had to be submitted by January 26, 1992, and implemented by July 26, 1992, one year after the ADA was signed into law (U.S. Dept. of Transportation, 1991a).

A major feature of the new regulation was the requirement that any operator of a fixed route transit system provide paratransit or other special services to persons with disabilities. The paratransit service had to be comparable to the level of service provided to individuals without disabilities who use the fixed route system.

The regulation required that the paratransit services be provided to all origins and destinations within a corridor of a given width on each side of any fixed transit route. The service area width varied depending upon the population density. The service had to be operated the same days and hours as the fixed route service. A 24-hour advanced reservation system was required where service had to be provided if requested on the previous day. The fare had to be comparable with the base fare of the fixed route service. Each transit system had to establish a system to determine eligibility for the new paratransit service. A waiver provision was included if the transit system could demonstrate that providing full blown paratransit service would cause an undue financial burden. The system was still required service to the extent that it could.

Under the regulation, transit systems with inaccessible commuter, rapid and light rail stations would be required to identify “key" stations, following a public participation process, and make them accessible to persons with disabilities within three years. “Key" stations were those with high volumes, transfer points, ends of lines, and stations that served major activity centers. Some extensions were available for “key" stations, up to 20 to 30 years, as long as certain progress was made in making other stations accessible.

The regulation also incorporated the proposed standards by the Architectural and Transportation Compliance Board for accessible vehicles and facilities, issued in April, 1990.

DOT estimated the average annual cost for providing paratransit service. These costs ranges from $28.7 million for the ten largest urban areas, $10 million for other areas over 1 million in population, to $750,000 for areas under 250,000 in population. DOT indicated that there would not be additional Federal funds to implement this regulation.

Intermodal Surface Transportation Efficiency Act of 1991

With the completion of the National Interstate and Defense Highway System provided for in the Surface Transportation Assistance Act of 1982, the debate on the reauthorization of the surface transportation legislation focused on the nature and size of the post-Interstate program. Clearly, the shortage of financial resources was still a serious concern, as well as the issues of an increase in the Federal gas tax, the level of funding for the program, the amount of flexibility in using those funds for other than highway purposes, the

Federal matching share, and the degree of authority that local agencies would be given in programming the funds. Other issues were also in dispute relating to the continuance of Federal transit operating assistance, criteria for new rail transit systems, and the earmarking of funds for specific highway and transit projects.

The bill that was finally signed into law by President Bush on December 18, 1991, opened a new era in surface transportation. The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) authorized $151 billion over six years for highways, mass transit and safety programs. (Table 11) In a major breakthrough, the Act created a surface transportation program with flexible funding that opened the door to new opportunities to address statewide and urban transportation problems. (U.S. Dept. of Transportation, 1991b)

The purpose of the Act was set forth in its statement of policy:

> "It is the policy of the United States to develop a National Intermodal Transportation System that is economically efficient and environmentally sound, provides the foundation for the Nation to compete in the global economy, and will move people and goods in an energy efficient manner."

Title I, Surface Transportation, established a new National Highway System (NHS) consisting of 155,000 miles (plus or minus 15 percent) of Interstate highways, urban and rural principal arterials, and other strategic highways. The final system was to be proposed by the by the Department of Transportation, after consultation with the States, and be designated by law by September 30, 1995. In the interim, the NHS was to consist of highways classified as principal highways. The NHS was funded at $21 billion over six years at a 80 percent Federal matching share. States could transfer up to 50 percent of their funds to the Surface Transportation Program, and up to 100 percent in States with Non-attainment areas with approval of the U.S. Department of Transportation.

The Interstate system retained its identity even though it became part of the NHS. It was renamed the "Dwight D. Eisenhower National System of Interstate and Defense Highways." Funding was provided for completion of the remaining links and for continuation of the Interstate maintenance and Interstate Transfer programs. ISTEA created a new block grant program, the Surface Transportation Program (STP), which made funds available for a broad range of highway, mass transit, safety and environmental purposes. STP funds could be used for highway construction and 4R; bridge projects; transit capital projects; carpool, parking, bicycle and pedestrian facilities; highway and transit safety improvements; traffic monitoring, management and control facilities; transportation control measures; and wetland mitigation efforts.

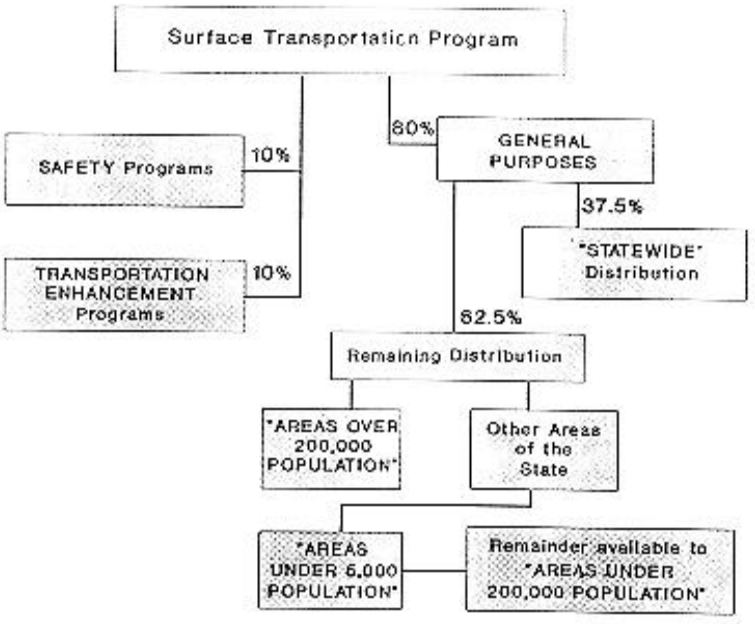
Table 11
Intermodal Surface Transportation Efficiency Act of 1991

	Authorization Levels by Fiscal Year ($ Millions)						
	1992	**1993**	**1994**	**1995**	**1996**	**1997**	**Total**
Surface Transportation							
NHS	3,003	3,599	3,599	3,599	3,600	3,600	21,000
I Construction	1,800	1,800	1,800	1,800	0	0	7,200
I Maintenance	2,431	2,913	2,914	2,914	2,914	2,914	17,000
I Substitutions	240	240	240	240	0	0	960
STP	3,418	4,096	4,096	4,096	4,097	4,097	23,900
Bridge Rep & Reh	2,288	2,762	2,762	2,762	2,763	2,763	16,100
Demo Projects	543	1,225	1,159	1,101	1,101	1,101	6,230
Cong & Air Qual	858	1,028	1,028	1,028	1,029	1,029	6,000
Other Programs	1,875	761	816	801	828	828	5,910
Equity Adjust	2,236	2,055	2,055	2,055	4,055	4,055	16,512
Subtotal	18,692	20,479	20,469	20,396	20,387	20,389	120,812
Highway Safety							
State/Community	126	171	171	171	171	171	981
Safety R&D	44	44	44	44	44	44	264
Traffic & Vehicle Safety	69	71	74	77	0	0	291
Other Programs	39	11	11	11	4	4	80
Subtotal	278	297	300	303	219	219	1,616
Mass Transit							
Discretionary	1,342	2,030	2,050	2,050	2,050	2,900	12,422
Formula	1,823	2,604	2,643	2,643	2,643	3,741	16,096
Rural	106	152	154	154	154	218	937
I Substitutions	160	165	0	0	0	0	325
Elderly & Disabled	55	70	69	69	69	97	428
Plan & Research	120	164	161	161	161	224	987
Administration	37	50	49	49	49	70	304

Subtotal	3,643	5,235	5,125	5,125	5,125	7,250	31,499
Motor Carrier Safety							
Safety Grants	65	76	80	83	85	90	479
Safety Functions	49	0	0	0	0	0	49
Other	7	1	1	0	0	0	9
Subtotal	121	77	81	83	85	90	537
Research							
BTS	5	10	15	15	20	25	90
Bus Testing	4	0	0	0	0	0	4
University Centers	5	6	6	6	6	6	35
Research Institutes	11	9	9	6	6	6	47
IVHS	94	113	113	113	113	113	659
Subtotal	119	138	143	140	145	150	836
Total	**22,850**	**26,226**	**26,118**	**26,047**	**25,961**	**28,098**	**155,300**

The STP was authorized at $23.9 billion over six years at a 80 percent Federal matching share. Additional funds could be transferred to the program from the so called equity adjustments. Each State was required to set aside 10 percent of the funds for safety construction activities and another 10 percent for transportation enhancements, which included bicycle and pedestrian facilities; acquisition of scenic easements, or scenic or historic sites; landscaping and beautification; preservation or rehabilitation of historic sites; preservation of abandoned rail corridors including conversion to bicycle or pedestrian trails; control of outdoor advertising; archaeological research; and mitigation of water pollution from highway runoff. The remaining 80 percent had to be allocated statewide as shown in Figure 18. (U.S. Dept. of Transportation, 1992a)

Figure 18
Allocation of Surface Transportation Program Funds



The Bridge Replacement and Rehabilitation program was continued with minor changes. Up to 40 percent of a State's funds could be transferred to the NHS or STP. In addition, 539 special projects were Congressionally designated at a total cost of $6.2 billion.

A new Congestion Mitigation and Air Quality Improvement Program was established, with a 80 percent Federal matching rate, for transportation projects in ozone and carbon monoxide Non-attainment areas. These projects must contribute to an area meeting the NAAQS. If a State does not have any of these areas, it could use the funds as if they were STP funds. The funds were to be distributed based on each State's share of population in Non-attainment areas weighted by the degree of air pollution. A minimum apportionment of ½ percent was guaranteed to each State.
The were a number of equity adjustment provisions in the ISTEA that were designed to achieve equity in funding levels among the States.

The 90 Percent Minimum Allocation and Donor State Bonus addressed equity between contributions to the Highway Trust Fund and allocations for major program categories. A sum of $2 billion annually was set aside to reimburse States for highway segments constructed with State funds that were later incorporated into the Interstate system. Another equity account was established to insure that annual State shares would not be reduced from prior year amounts. The 90 percent of Payment Guarantees assured that States would receive 90 percent of their contributions to the Highway Trust Fund for all highway programs except special projects.

Special projects and programs were created is several areas. The National Magnetic Levitation Prototype Development Program was authorized at $725 million to develop a prototype maglev system selected from applicants from across the Nation. A Maglev Project Office was to be established jointly between the Department of Transportation and Cops of Engineers. A separately funded $25 million High Speed Ground Technology Development Program was created to demonstrate and promote new high speed ground technologies already under construction or in operation. Another provision of the Act allowed the use of Federal-aid highway rights of way for commuter or high speed rail, maglev systems and mass transit facilities where there was sufficient land or space and that would not adversely affect automobile safety.

Tolls were permitted on Federal-aid highway facilities to a much greater degree than in the past. Projects that would become eligible for Federal funding was expanded to include initial construction of toll facilities, 4R work on toll facilities, and reconstruction or replacement of free highways (except Interstate facilities), bridges and tunnels and conversion to toll facilities. The Federal matching share for highway projects was 50 percent and 50 or 80 percent for bridges and tunnels depending on the nature of the work.

A Congestion Pricing Pilot Program was established for five congestion pricing pilot projects with up to three of them on Interstate highways. The program was funded at $25 million annually with a 50 percent Federal matching share. In addition, the ISTEA created a program to fund State planning, design, and development activities of Scenic Byways.

The Symms National Recreational Trails Act of 1991, in Title IB, provided $180 million over six years for the creation and maintenance of recreational trails for motorized and non-motorized vehicles. A new trust fund was created in Title VIII to finance the program, drawing 0.3 percent of the revenues to the Highway Trust Fund. Funds were to be allocated to the States based in part on the amount of non-highway recreational fuel used and could be used for land acquisition, construction, maintenance, restoration, and education.

ISTEA strengthened the metropolitan planning process and expanded the role of MPOs in project selection and transportation decision making. MPOs continued to be required in all urbanized areas with population of 50,000 or greater. Existing MPO designations remained valid unless revoked by the Governor and local units of government representing 75 percent of the affected population in the metropolitan area or as otherwise provided under State or local procedures. New MPO designations or redesignations could be made by agreement between the Governor and local units of government representing 75 percent of the affected population in the metropolitan area or in accordance with applicable State or local law. More than one MPO could be designated for an urbanized area if the Governor determines that the size and complexity of the area warrant it. Where more than one MPO existed in an urban areas, they were to consult with each other and the State to coordinate plans and programs. (Highway Users Federation, 1991)

Metropolitan area boundaries were defined for carrying out the metropolitan transportation planning process and for expenditure of STP funds suballocated to areas over 200,000 in population. The boundaries were to be established by agreement between the Governor and the MPO and were to encompass the current urbanized area and the area to be urbanized during a 20 year forecast period, and could extend to the MSA

or CMSA boundary. In Non-attainment areas, the boundary had to encompass the Non-attainment area unless the MPO and Governor decided to exclude a portion.

Large urbanized areas over 200,000 in population were designated as transportation management areas (TMAs). These areas had additional requirements related to congestion management, project selection, and certification. The Governor and MPOs could request additional designations as TMAs.

Each metropolitan area had to prepare a long range plan, updated periodically, that identified transportation facilities which functioned as an integrated transportation system, including a financial plan, assess capital investment and other measures to preserve the existing transportation system, and make the most efficient use of existing transportation facilities to relieve congestion, and indicated appropriate enhancement activities. A reasonable opportunity for public comment was required before the long-range plan was approved. In Non-attainment areas, development of the long-range plan had to be coordinated with the development of transportation control measures for the State implementation plan required under the Clean Air Act.

ISTEA required MPO's to include consideration of 15 interrelated factors in the development of their 20-year metropolitan transportation plan. (Table 12) One important factor was the effect of transportation decisions on land use and development and consistency with land use and development plans. Abbreviated planning procedures could be prescribed for areas not designated as TMAs based on the complexity of the transportation problems, however, not in Non-attainment areas for ozone and carbon monoxide.

In TMAs, the transportation planning process had to include a congestion management system (CMS) for the effective management of new and existing transportation facilities through the use of travel demand reduction and operational strategies.

A Transportation Improvement Program (TIP) was required to be developed by the MPO in cooperation with the State and transit operators. The TIP has to be updated at least every two years and approved by the MPO and Governor, with a reasonable opportunity for public comment prior to approval. The TIP had to include a priority list of projects and a financial plan consistent with the funding that could be reasonably be expected to be available.

In TMAs, all projects, except those on the NHS, and projects under the Bridge and I-maintenance programs, were to be selected by the MPO in consultation with the State from the approved TIP in accordance with the priorities established in the TIP. The other projects were to be selected by the State in cooperation with the MPO from the approved TIP. In all other metropolitan areas, projects were to be selected by the State in cooperation with the MPO from the approved TIP.

Table 12
Metropolitan Transportation Planning Factors

1. Preservation of existing transportation	8. The need for connectivity of roads within the

facilities and, where practical, ways to meet transportation needs by using existing transportation facilities more efficiently. 2. The consistency of transportation planning with applicable Federal, State, and local energy conservation programs, goals and objectives. 3. The need to relieve congestion and prevent congestion from occurring where it does not yet occur. 4. The likely effect of transportation policy decisions on land use and development and the consistency of transportation plans and programs with the provisions of all applicable short- and long-term land use and development plans. 5. The programming of expenditures on transportation enhancement activities as required in section 133. 6. The effects of all transportation projects to be undertaken in the metropolitan area, without regard to whether such projects are publicly funded. 7. International border crossings and access to ports, airports, intermodal transportation facilities, major freight distribution routes, national parks, recreation areas, monuments, historic sites, and military installations.	metropolitan area with roads outside the metropolitan area. 9. The transportation needs identified through the use of the management systems required by section 303 of this title. 10. Preservation of rights-of-way for construction of future transportation projects, including identification of unused rights-of-way which may be needed for future transportation corridors and identification of those corridors for which action is most needed to prevent destruction or loss. 11. Methods to enhance the efficient movement of freight. 12. The use of life-cycle costs in the design and engineering of bridges, tunnels, or pavement. 13. The overall social, economic, energy, and environmental effects of transportation decisions. 14. Methods to expand and enhance- transit services to increase the use of such services. 15. Capital investments that would result in increased security in transit systems.

Federal certification of the transportation planning process was required for TMAs at least every three years. TMAs that were not certified were subject to funding sanctions. One percent of highway funds, except those for Interstate construction and substitution, were authorized for metropolitan transportation planning (PL). Additional funds could be spent from the NHS and STP programs. States were required to develop formulas for distributing PL funds using, based on population, status of planning, and metropolitan transportation needs, attainment of air quality standards and other factors necessary to carry out applicable Federal laws.

ISTEA created a new requirement for States to undertake a continuous statewide transportation planning process modeled on the metropolitan transportation planning process. States were required to develop a long-range plan covering all modes of transportation, coordinated with the transportation planning carried out in metropolitan areas, with opportunity for public comment. The State plans and programs were to provide for the development of transportation facilities that functioned as an intermodal State transportation system. Twenty factors were specified to be considered in the process. (Table 13)

A statewide transportation improvement program (STIP) was required to be developed and Federally approved at least every two years. The STIP was to be consistent with the long-range statewide and metropolitan transportation plans and expected funding, and there had to be opportunity for public comment. In Non-attainment areas, the STIP had to conform to the SIP. Two percent of Federal-aid highway funds were made available for planning and research programs. Not less that 25 percent of these funds had to be used for research, development, and technology transfer activities, unless the State certified that planning expenditures would exceed 75 percent of the funds. Statewide planning activities were also eligible under the NHS and STP programs.

Table 13
Statewide Transportation Planning Factors

1. The results of the management systems required pursuant to subsection (b).
2. Any Federal, State, or local energy goals, objectives, programs or requirements.
3. Strategies for incorporating bicycle transportation and pedestrian facilities in projects where appropriate throughout the State.
4. International border crossings and access to ports, airports, intermodal transportation facilities, major freight distribution routes, national parks, recreation and scenic areas, monuments and historic sites, and military installations.
5. The transportation needs of nonmetropolitan areas through a process that includes consultation with local elected officials with jurisdiction over transportation.
6. Any metropolitan area plan developed pursuant to section 134.
7. Connectivity between metropolitan areas within the State and with any metropolitan areas in other States.
8. Recreational travel and tourism.
9. Any State plan developed pursuant to the Federal Water Pollution Control Act.
10. Transportation system management and investment strategies designed to make the most efficient use of existing transportation
12. Methods to reduce traffic congestion and to prevent traffic congestion from developing in areas where it does not yet occur, including methods to reduce motor vehicle travel, particularly single-occupant motor vehicle travel.
13. Methods to expand and enhance transit services and to increase the use of such services.
14. The effect of transportation decisions on land use and land development, including the need for consistency between transportation decisionmaking and the provisions of all applicable short-range and long-range land use and development plans.
15. The transportation needs identified through use of the management systems required by section 303 of this title.
16. Where appropriate, the use of innovative mechanisms for financing projects, including value capture pricing, tolls, and congestion pricing.
17. Preservation of rights-of-way for construction of future transportation projects, including identification of unused rights-of-way which may be needed for future transportation corridors, and identification of those corridors for which action is most needed to prevent destruction

facilities. 11. The overall social, economic, energy, and environmental effects of transportation decisions.	or loss. 18. Long-range needs of the State transportation system. 19. Methods to enhance the efficient movement of commercial motor vehicles. 20. The use of life-cycle costs in the design and engineering of bridges, tunnels or pavement.

One of the factors that had to be considered in both the metropolitan and statewide planning processes was the results of the management systems. This refers to the requirement that States and metropolitan areas develop, establish and implement six management systems for: highway pavement, bridges, highway safety, traffic congestion, public transportation facilities and equipment, and intermodal transportation facilities and systems. These management systems were to be designed to obtain the optimum yield from the transportation system.

Title II, the Highway Safety Act of 1991, continued the non-construction highway safety programs at $1.6 billion for the six-year period. The Act expanded the list of uniform guidelines for the State and Community Highway Safety Grant Program. Amounts from this program were made available for specific purposes to encourage the use of safety belts, motorcycle helmets, alcohol countermeasures, and National Driver Register. The Act reauthorized the Highway Safety R&D program and regular NHTSA activities. It also made permanent the law allowing a 65 mph speed limit on rural sections of non-Interstate highways constructed to appropriate standards.

Title III, the Federal Transit Act Amendments of 1991, authorized $31.5 billion for the six-year period. The Act renamed the Urban Mass Transportation Administration to be the Federal Transit Administration (FTA) to reflect the broader responsibility of the agency. The Section 3 Discretionary and Formula Capital Grant program was reauthorized with minor changes. The funds were split 40 percent for new starts, 40 percent for rail modernization and 20 percent of bus and other projects. The Federal matching share was increased from 75 percent to 80 percent.

New fixed guideway projects had to based on the results of alternatives analysis and preliminary engineering, and justified by expected mobility improvements, environmental benefits, cost effectiveness and operating efficiency and supported by an acceptable degree of local financial commitment. These criteria could be waived if the project was in an extreme or severe Non-attainment area and is included in the SIP, if the project requires less that $25 million in Section 3 funds, if the Federal share is less than one-third, or the project if the project is funded entirely with FHWA funds.

The Act established a three-tier formula for distributing rail modernization funds. The first $455 million was to be distributed to nine urbanized areas using statutory percentages. The next $45 million was to be allocated to six urbanized areas using specified percentages in the statute. Tier three distributed the next $70 million 50 percent to the urbanized areas mentioned in the previous two tiers, and 50 percent to the other urbanized areas with fixed guideway systems seven or more years in operations according to the Section 9 rail formula. Any remaining funds were to be distributed according to the Section 9 rail formula.

Authorization for bus and other projects totaled $2.5 million. At least 5.5 percent were to be spent in non-urbanized areas.

The Section 9 Formula program was authorized at $16.1 billion for the six-year period. There were few changes in the program structure. The funds could be used for highway projects in TMAs if the requirements of ADA were met, and if the MPO approved, and if there was a balanced local approach to highway and transit funding. Operating assistance caps became subject to an annual inflation adjustment.

Funding for the Section 18 Small Urban and Rural Transit program was raised from 2.93 to 5.5 percent of the Section 9 program. Funds could be used for a new category of intercity bus service. The Section 16(b)(2) program, which provides transportation services for elderly and disabled, was authorized at 1.34 percent of the Section 9 program. Funds could be used for service contracts and could go to nonprofit groups.

A new Transit Planning and Research program was established and funded by a 3 percent set aside from the entire transit program. This program replaced the Section 6 Research, Section 8 Planning, Section 10 Managerial Training, Section 11(a) University Research, Section 8(h) Rural Transportation Assistance Program (RTAP), and Section 20 Human Resources programs. Of these funds, 45 percent was for MPOs for Metropolitan Transportation Planning, 5 percent for RTAP, 10 percent to States for planning, research, and training, 10 percent for a new Transit Cooperative Research Program (TCRP) to be administered by the TRB, and 30 percent for a National Planning and Research program. The metropolitan transportation planning requirements paralleled those in Title I. An additional amount was made available for the University Centers program.

Title IV, the Motor Carrier Act of 1991, reauthorized the Motor Carrier Safety Assistance Program (MCSAP) and required State uniformity in vehicle registration and fuel tax reporting. MCSAP funds could be used for State enforcement of Federal truck and bus safety requirements, drug interdiction, vehicle weight and traffic enforcement, uniform accident reporting, research and development, and public education. The Act required that States join the International Registration Plan and the International Fuel Tax Agreement. The Act limited the use of longer combination vehicles to those States and routes where they were lawful on June 1, 1991.

Title V, Intermodal Transportation, established a national policy to encourage and promote development of a national intermodal transportation system. It created an Intermodal Advisory Board and an Office of Intermodalism in the Office of the Secretary to coordinate policies to promote intermodal transportation, maintain and disseminate intermodal transportation data, and coordinate intermodal research. The Act authorized a program to develop model State intermodal transportation plans, including systems for collecting intermodal data, at $3 million with no more than $500,000 to any one State. The Act also established a National Commission on Intermodal Transportation to report to the Congress by September 3, 1993.

Title VI, Research, provided major increases in funding for research and applied technology. The Act authorized $108 million to implement the results of the Strategic Highway Research Program (SHRP) and

for the Long Term Pavement Performance Program. The responsibilities of the National Highway Institute were expanded and they were allowed to charge fees to defray the costs of their programs. The Act authorized the Federal government to engage in collaborative research and development with other private and public organizations with up to a 50 percent Federal share. A new International Highway Transportation Outreach Program was established to inform the U.S. highway community of foreign innovations and promote U.S. expertise and technology internationally.

The Act established a Bureau of Transportation Statistics to compile transportation statistics, implement a long-term data collection program, issue guidelines for data collection, make statistics accessible, and identify information needs.

The transit bus testing program was expanded to include emissions and fuel economy. A new National Transit Institute was established to develop and administer training programs for those involved in Federal-aid transit activities. Five new University Transportation Centers were added to the original ten to be funded by FHWA and FTA. In addition, five University Research Institutes were established.

Part B of this Title, Intelligent Vehicle-Highway Systems (IVHS) Act, established a six-year program with funding of $659 million with $501 for the IVHS Corridors program and $158 for IVHS research and development. The Act required the promotion of compatible standards and protocols to promote the widespread use of IVHS technologies, the establishment of evaluation guidelines for operational tests, and the establishment of an IVHS clearinghouse.

The Act also called for the development of a completely automated highway and vehicle system which would serve as the prototype for future fully automated IVHS systems. The fully automated roadway or test track was to be in operation by the end of 1997. The IVHS Corridors program was designed to provide operational tests under real world conditions. Corridors which meet certain criteria could participate in the development and implementation of IVHS technologies.

Part C, Advanced Transportation Systems and Electric Vehicles, established a program for advanced mass transportation systems including electric trolley buses, alternative fuel buses, or other systems that employ advanced technology to operate cleanly and efficiently. The Federal government could pay a 50 percent share for at least three consortia to acquire plant sites, convert the plant facilities, and acquire equipment for developing or manufacturing these systems.

Title VII addressed air transportation. Title VIII, the Surface Transportation Revenue Act of 1991, extended the Highway Trust Fund through fiscal year 1999. The Act reduced the motor fuel tax rate by 2.5 cents after September 30, 1995 to 11.5 cents for gasoline and 17.5 cents for diesel fuel. At that time, the Mass Transit Account would be credited with 1.5 cents per gallon of the tax with the remainder going to the Highway Account.

CHAPTER 13 — SUSTAINABLE DEVELOPMENT

As the concern for the effects of transportation on living quality and the environment grew, broader approaches to transportation planning were being developed. This concern was being expressed not only in the United State but worldwide. The term "sustainable development" became popularized in 1987 when the World Commission on Environment used it to describe a process of economic growth with "the ability to ensure the needs of the present without compromising the ability of future generations to meet their own needs." The global impact of transportation on the environment was reemphasized at the United Nations Conference on the Environment in Rio de Janeiro, Brazil, in 1992 which focused on global climate change.

To respond to those concerns, the Administration developed *The Global Climate Action Plan* which contained nearly 50 initiatives designed to return U.S. greenhouse emissions to their 1990 levels by the year 2000 (Clinton and Gore, 1993). In addition, President Clinton appointed a Council on Sustainable Development which completed the report *Sustainable Development: A New Consensus for Prosperity, Opportunity, and a Healthy Environment for the Future* (The President's Council on Sustainable Development, 1996).

Passage of the Intermodal Surface Transportation Efficiency Act of 1991 and the Clean Air Act Amendments of 1990 demonstrated the concern for the air pollution effects of increased motor vehicle travel. The acts created the "conformity" process to assure that transportation plans and projects contribute to the NAAQS. This process had a major impact on the urban transportation planning process - increasing its complexity and requiring greater accuracy and precision in the results.

The concern for environmental quality and sustainable development brought renewed interest in the relationship between land use development patterns and transportation demand. Neo-traditional town planning was advanced as one approach to promoting increased use of transit, more walking and biking trips and fewer automobile trips. This was to be achieved with higher densities, mixed use development, and infill projects designed to improve the overall living environment.

The conformity process and the potential effects of transportation on development focused attention on the ability of transportation and air quality models to forecast travel demand and air pollution accurately. To address these concerns, the Federal government established the Travel Model Improvement program to develop new and improved travel forecasting techniques for use by states and MPOs.

Charlotte Conference on Moving Urban America

Passage of the Intermodal Surface Transportation Assistance Act of 1991 and the Clean Air Act Amendments of 1990 opened a new era in planning and decisionmaking concerning urban transportation projects. The acts provided greater flexibility while mandating new institutional arrangements, and stronger environmental constraints. A conference was held in Charlotte, North Carolina, on May 6-9, 1992, to provide initial guidance under these Acts on the appropriate planning and decisionmaking process needed to develop projects that would improve urban mobility with emphasis on efficiency, concern for the

environment, and recognizing the shared responsibilities among responsible agencies, and affected groups. (Transportation Research Board, 1993)

The conference's five workshops covered: State transportation plans, State implementation plans (SIPs), management systems, transportation improvement programs (TIPs), and metropolitan long-range plans. The findings of the conference address a broad range of issues. The success of flexible funding depends on decisions that are made cooperatively by State and local officials. Inclusion of the EPA without compromising its regulatory function is critical to successfully blending air quality and transportation planning into a single integrated function. States and MPOs must expand participation to involve the full range of community interests if the new scope of planning is to be meaningful. Federal guidance should be general and flexible; Federal agencies should support local initiatives undertaken in advance of regulation and encourage experimentation. Federal agencies should be clearinghouses to provide timely exchange of ideas and should provide technical assistance to upgrade analytical tools and training needed by the planning profession.

The multiple factors that must be considered in adopting State and regional transportation plans should be expanded to include quality of life issues. The transportation-land use connection demand special attention. The complexity of the combined transportation and air quality planning must be simplified.

The conferees agreed that ISTEA had appropriately moved the planning process into a broader institutional context involving more stakeholders and had increased the flexibility for State and local agencies to fashion solutions suited to local needs and priorities

Travel Model Improvement Program

Passage of the Intermodal Surface Transportation Efficiency Act of 1991 and the Clean Air Act Amendments of 1990 brought increased concern about the limitations of travel forecasting procedures to meet the requirement of these acts. Current travel forecasting procedures had been in use for almost 30 years, and although some improvements had been made over the years, these procedures were basically the same as those originally developed in the early 1960's. (Weiner, 1993a and 1993b)

Current procedures were limited in terms of their ability to analyze the types of alternatives envisioned by these acts and in their ability to accurately estimate the impacts of these alternatives. Further, many changes had occurred in the demographic diversity and development patterns of the nation, in transportation and telecommunications technologies, and in computer hardware and software capabilities, such as GIS techniques, that needed to be incorporated into these procedures.

The Travel Model Improvement Program (TMIP) was established by the DOT and EPA in the Fall of 1991 to address these needs. TMIP was directed at upgrading travel analysis and forecasting techniques for application by State and local agencies - both for passenger and freight. (Weiner and Ducca, 1996) The program consisted of five tracks of activity. Track A, Outreach, was designed to improve the state of practice in State and local transportation agencies using technical assistance, training, manuals of practice, newsletters, conferences, and clearinghouse functions. Track B, Near Term Improvements, was directed at

capturing the best new techniques and approaches used in the traditional travel forecasting process and make them generally available to local planning agencies. It focused on making immediate improvements to the existing procedure to meet the new legislative requirements in a timely manner.

Track C, Long Term Improvements, was intended to develop a new generation of travel forecasting procedures. A new approach, termed TRansportation ANalysis and SIMulation System (TRANSIMS), was developed by Los Alamos National Laboratory. TRANSIMS, a regionwide microsimulation procedure, was a complete redesign of the entire forecasting process, simulating the behavior of households, individuals and the operation of vehicles on the transportation network.

Track D, Data, addressed data needs both to support upgrading current methods and to develop new techniques, eventually leading to guidance on changing data collection programs. The new procedures were expected to alter data needs and usage, eliminating the need for some data elements and requiring other new data elements. Track E, Land Use, was designed to improve the quality of land use forecasting techniques, including both the need for regional forecasting models and the need to understand the effects of urban design on travel.

TMIP evolved from defining user needs, to product development and testing, to product delivery and implementation. The program provided useful techniques and assistance to the user community to upgrade their travel analysis techniques. It stimulated a renewed interest improving the quality travel analysis procedures.

Livable Communities Initiative

The Livable Communities Initiative (LCI) was created by the Federal Transit Administration to promote transit as the means to strengthen the link between transportation and communities. The LCI was intended to provide an alternative to low density sprawl development patterns served primarily by automobiles with higher density, mixed use development reinforced with travel demand and parking management policies. (U.S. Dept. of Transportation, 1996a and 1996b) The LCI was designed to promote and support transit-oriented design (TOD) or neo-traditional urban design. (Beimborn, et. al., 1991 and Rabinowitz, et. al., 1991)

The objectives of the LCI were to: (1) strengthen the link between transit and community planning including supportive land use policies and urban design; (2) stimulate active and diverse participation by the community in the decisionmaking process; (3) increase access to employment, education, and other community facilities an services; and, (4) leverage resources from other Federal, State and local programs.

Under the LCI, 16 projects were funded for a total cost of $68.9 million with $35.0 million covered by FTA. These projects included a wide range of facilities as part of transit projects such as a child care center, police station, community center, bus shelters, information kiosks, improved safety enhancements, bus and bicycle access, transit plaza, Head Start facility, health care clinic, and library.

Energy Policy Act of 1992

The Energy Policy Act of 1992 passed after extensive debate. The Act was wide ranging covering matters of energy production, conservation, waste disposal, alternative fuels, and taxes and tax incentives. Several provisions directly related to transportation.

The Act increased the limit on tax-exempt transit benefits to $60 per month for those transit riders receiving the benefits. It made parking benefits over $155 per month taxable to the automobile users. These two provisions moved towards leveling the playing field on subsidies to automobiles and transit.

A phase in schedule was established for alternative fuel vehicles for certain vehicle fleets. Alternative fuels included compressed natural gas, ethanol, methanol, propane, electricity, and hydrogen. The phase in was to reach 75 percent of Federal fleet vehicle acquisitions by 1999, 75 percent of State fleet vehicle acquisitions by 2000, and 90 percent of acquisitions for certain company vehicle fleets by 1999.

The Act authorized $50 million a year for 10 years for electric motor vehicle demonstration programs, and $40 million for a 5-year period for electric motor vehicle infrastructure and support systems development program. It authorized $35 million annually for three years to demonstrate alternative fuel urban transit buses.

Transportation Implication of Telecommuting

The 1992 DOT Appropriations Act required the Department of Transportation to conduct a study of the potential for telecommuting to reduce traffic congestion and the resulting air pollution, energy consumption, accidents, and construction of new transportation facilities (U.S. Dept. of Transportation, 1993a).

The study reviewed the trends in telecommunications, and the factors affecting telecommuting. Telecommuting was defined as a worker making an electronic trip instead of a physical trip in a vehicle. Telecommuting could be from a home, a telework center, or from some other remote location. It could occur only one day a week, or for the majority of the week.

The study concluded that telecommuting was being practiced on a substantial and rapidly increasing scale. The number of telecommuters was forecasted to grow from 2 million in 1992 to between 7.5 and 15.0 million by 2002. It also suggested that over the next decade telecommuting had the potential to provide substantial public benefits in reducing congestion, air pollution, traffic accidents, and energy consumption. The study cautioned that the emergence of latent travel demand could diminish congestion and air quality benefits. Telecommunication services and equipment were considered to be adequate for most existing applications of telecommuting, but high-bandwidth communication capabilities would be useful currently, and would be needed in the future.

The study made a number of recommendations, some of which had already been implemented. First, the DOT, should actively promote telecommuting as a traffic demand measure to reduce the use of automobiles. Second, under ISTEA, telecommuting projects should be eligible for federal funding to develop

telecommuting programs which could include planning, management, organization, promotion, marketing, training, and public awareness campaigns, but not the acquisition and equipping of facilities such as telework centers. These telecommuting programs had to be part of a transportation plan and program developed by State and local agencies. The Intermodal Surface Transportation Efficiency Act of 1991 authorized Federal funding of transportation projects or programs having air quality benefits under the Clean Air Act, which would include a wide range of telecommuting activities (Weiner, 1994).

The DOT proposed to work with state and local governments and the private sector to monitor telecommuting activities and to disseminate relevant information on telecommuting as a travel demand management measures (COMSIS, et. al., 1993).

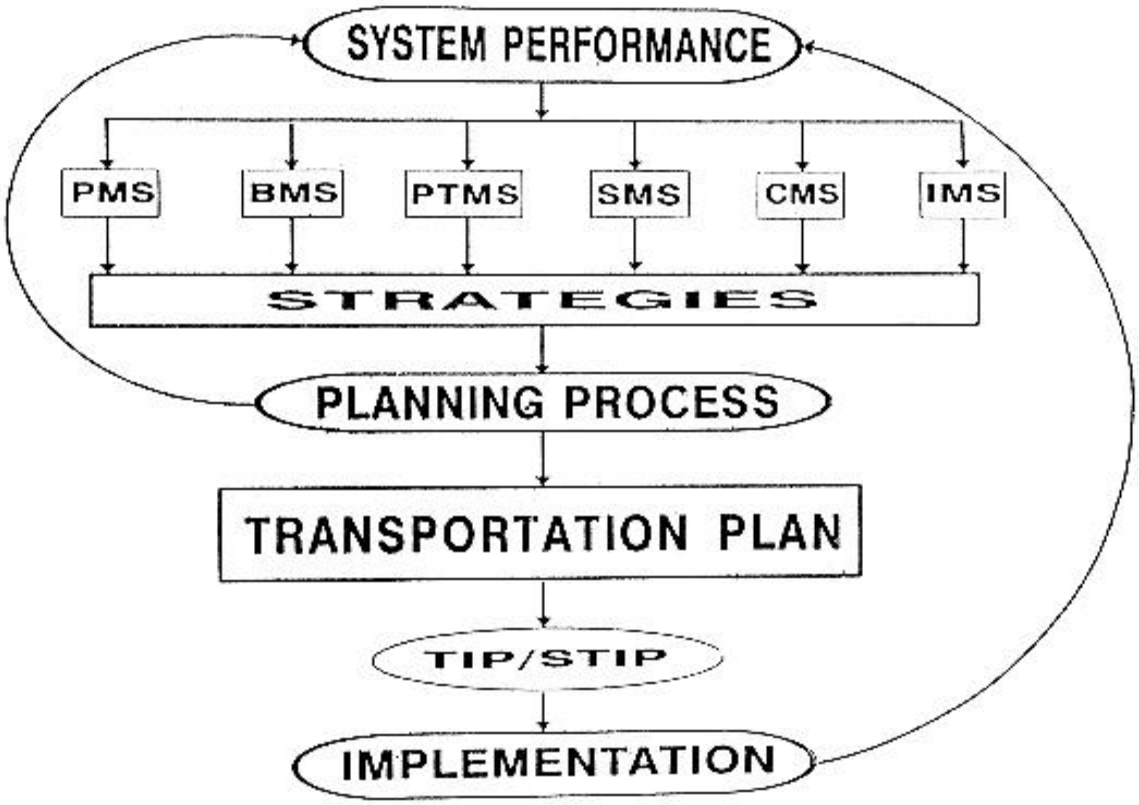
Metropolitan and Statewide Planning Regulations

Regulation implementing the statewide and metropolitan transportation planning provisions of the Intermodal Surface Transportation Efficiency Act of 1991, were issued in October 1993 (U.S. Dept. of Transportation, 1993b). These regulations closely followed the legislative requirements.

The metropolitan transportation planning regulations addressed the major elements of the process required to produce the long-range transportation plan and the shorter-term transportation improvement program (TIP). The regulations emphasized a formal proactive and inclusive public involvement process that provided ample opportunity for community participation. It required explicit consideration of the 15 planning factors cited in ISTEA. The regulations provided guidance on the conduct of Major Investment Studies (MIS) for the analysis of new transportation facilities or substantial increase in facility capacity (U.S. Dept. of Transportation, 1995).

The regulations addressed the integration of the management systems into the overall planning process, and the linkage between transportation and air quality planning in the conformity requirements. (Figure 19) It set forth the financial planning requirements to assure that financial resources were reasonably available to implement all elements of the transportation plan. The metropolitan transportation planning process was required to be self-certified annually by the states and MPOs, and to be reviewed at least every three years by FHWA and FTA to determine if the process meets the requirements in the regulations.

Figure 19
Planning and Management Systems



The statewide transportation planning requirements closely paralleled the metropolitan planning requirements. States were required to prepare a long-range statewide intermodal transportation plan which considered the 23 factors cited in ISTEA. These plans had to be linked to the metropolitan plans developed by the MPOs. The statewide transportation planning process had to give sufficient opportunity to provide input from users, transportation providers, and the public (U.S. Dept. of Transportation, 1996c).

States were also required to prepare a short-term statewide transportation improvement program (STIP). which included all capital and operating projects to be funded by the federal government or requiring federal action. The STIP had to include the metropolitan TIPS verbatim and be consistent with the statewide plan. The STIP had to be financially constrained by year to those projects for which the sources of funding could be identified. The statewide transportation planning process was required to incorporated the results of the management systems which were focused on performance improvement and asset management (U.S. Dept. of Transportation, 1996c).

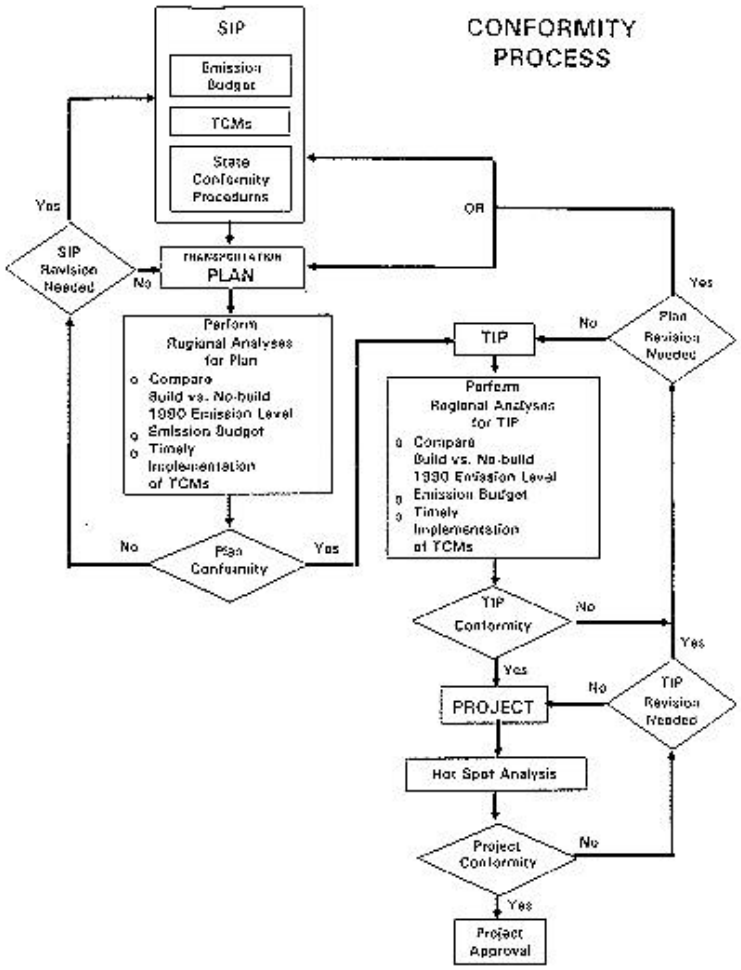
Transportation - Air Quality Conformity Regulations

The U.S. Environmental Protection Agency issued regulations for the transportation conformity provisions of Section 176 of the Clean Air Act Amendments of 1990 (CAAA) in November 1993, after two years of heated discussions between transportation and environmental groups. (U.S. Environmental Protection Agency, 1993) "Conformity" was defined in the CAAA as the assurance that transportation plans and programs aim to meet the same goals set forth for air quality improvements in state Implementation Plans (SIPs) for cleaner air. Transportation conformity was in the 1977 amendments to the Clean Air Act but was not clearly defined. The CAAA correctly that problem.

The regulations established the procedures and criteria for conformity determinations on transportation plans, programs, and projects. (Figure 20) Conformity determinations must be made in nonattainment areas and maintenance areas (areas previously in nonattainment but now in attainment). To achieve conformity, plans must be analyzed to assure that the resulting air quality emissions would be within the level established by the SIP. The conformity analysis must include all regionally significant transportation projects. The STIP and TIP were also subject to conformity determinations, as well as individual transportation projects. The transportation plans, STIPs and TIPs, and individual transportation projects must also seek to implement the transportation control measures (TCMs) called for in the SIP. (Shrouds, 1995)

The conformity requirements significantly changed the process for developing transportation plans, programs, and projects, and increased the emphasis on demand management strategies and operational improvements to the existing transportation infrastructure. The conformity requirements increased the demands on travel and air quality forecasting procedures to be more accurate and more sensitive to travel demand management strategies. They also caused a greater level of cooperation between the transportation and air quality agencies.

Figure 20
Conformity Process



Transportation Management Systems

The Intermodal Surface Transportation Efficiency Act of 1991 required states and metropolitan areas to develop and implement six systems for managing: highway pavement (PMS), bridges (BMS), highway safety (SMS), traffic congestion (CMS), public transportation facilities and equipment (PTMS), and intermodal transportation facilities and systems (IMS). These management systems were intended to be tools that provided information to assist state and local decision makers in selecting cost-effective policies, programs, and projects to protect and improves the nation's transportation infrastructure.

ISTEA required that the states establish these transportation management systems in fiscal year 1995 and certify that they had done so by January 1, 1995. Failure to do so could result in 10 percent of the funds

apportioned to the state be withheld. States and MPOs were to cooperate in the development and implementation of the management systems. Transportation needs identified through the management systems had to be considered in the metropolitan and statewide planning process. In TMAs, CMSs had to provide for effective management of new and existing transportation facilities through the use of travel demand reduction and operational management strategies.

Interim final regulations were issued in December, 1993 to implement the management systems provisions of ISTEA. (U.S. Dept. of Transportation, 1993c) They addressed procedures for systematically collecting and analyzing information as well as integration of the management systems into the overall planning process. Definitions of the management systems are shown in Table 14 (U.S. General Accounting Office, 1997).

Table 14
Definitions of Transportation Management Systems

Management System	Definition
Pavement management system	This system provides information for use in implementing cost-effective reconstruction, rehabilitation, and preventative maintenance programs and results in pavements designed to accommodate current and forecasted traffic in a safe, durable, and cost-effective manner.
Bridge management system	This system, among other things, includes procedures for collecting, processing, and updating bridge inventory data; predicts bridge deterioration; identifies projects to improve bridge conditions, safety, and serviceability; estimates costs; and determines least-cost strategies for bridge maintenance, repair, and rehabilitation.
Safety management system	This system is a systematic process for reducing the number and severity of traffic accidents by incorporating opportunities to improve highway safety in all phases of highway planning, design, construction, and maintenance. It includes collecting an analyzing highway safety data; disseminating public information and providing educational activities; and ensuring coordination among the agencies responsible for different safety elements (such as vehicle, roadway, and human factors).
Congestion management system	This system is a systematic process that provides information on a transportation system's performance and alternative strategies to alleviate congestion and enhance the mobility of persons and goods. The system includes monitoring and evaluating transportation system performance, identifying alternative strategies to alleviate congestion, assessing and implementing cost-effective strategies, and evaluating the effectiveness of the implemented actions.
Public transportation	This system is a systematic process for collecting and analyzing

management system	information on the condition and cost of transit assets (e.g., maintenance facilities, stations, terminals, equipment, and rolling stock) on a continual basis, identifying needs, and enabling decisionmakers to select cost-effective strategies for providing and maintaining transit assets in serviceable condition.
Intermodal management system	This system is a systematic process for identifying linkages between modes of transportation, defining strategies for improving the effectiveness of modal interactions, and evaluating and implementing these strategies.

However, there was concern that the management systems had substantially increase the data collection and reporting burden of the states and MPOs. Consequently, the requirement for these transportation management systems was eliminated and made optional at the discretion of the states by the National Highway System Designation Act of 1995. Nevertheless, many states continued the development and implementation of these management systems often customized to their own needs. (U.S. General Accounting Office, 1997)

E.O. 12893 Principles for Federal Infrastructure Investment

Executive Order 12893, issued on January 26, 1994, set forth the Principles for Federal Infrastructure Investment, which applied to all Federal agencies with infrastructure responsibilities. (Clinton, 1994a) It required that all investments be based on a systematic analysis of benefits and costs, including both qualitative and quantitative measures. These analyses had to compare a comprehensive set of options including managing demand, repairing facilities, and expanding facilities.

The order called for the efficient management of infrastructure including a focus on improving the operation and maintenance of facilities, as well as the use of pricing to manage demand. The order required agencies to seek private sector participation in investment and management of infrastructure. Federal agencies were to encourage state and local recipients to implement planning and management systems that support these principles.

E.O. 12898 on Environmental Justice

President Clinton issued Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," on February 11,1994. (Clinton, 1994b and 1994c) The order was designed to focus attention on the environmental and human health conditions in minority communities and low-income communities to ensure that all federal programs and activities do not use criteria, methods, or practices that discriminate on the basis of race, color, or national origin.

The Executive Order required that environmental impact process under NEPA be used to address environmental justice issues. Under that process, federal actions and projects be analyzed to include the human health, economic, and social effects on minority communities and low-income communities.

Mitigation measures had to address the significant and adverse environmental effects on minority communities and low-income communities. The affected communities must have opportunities to provide input in the identification of impacts and mitigation measures.

In May 1995, DOT sponsored a Conference on Environmental Justice and Transportation: Building Model Partnerships to develop strategies and build workable partnerships to address the concerns related to environmental justice. The conferees made a number of major recommendations: (1) ensuring greater stakeholder participation and public involvement in transportation decision making; (2) directing resources to identify and address discriminatory outcomes, disproportionate impacts, and inequitable distribution of transportation investments and their civil rights implications; (3)improving research, data collection, and assessment techniques; (4) promoting interagency cooperation in transportation planning, development, and program implementation to achieve livable, healthy, and sustainable communities (Environmental Justice Resource Center, 1996) In April 1997, DOT issued an order that established procedures to achieve environmental justices as part of its mission (U.S. Dept. of Transportation, 1997).

Conference on Institutional Aspects of Metropolitan Transportation Planning

After several years under ISTEA, the DOT and TRB sponsored a conference to assess the progress in implementing the metropolitan transportation planning provisions of the act, and the capacity of MPOs to carry out the provisions of the act (Transportation Research Board, 1995a). The conference brought together officials from federal and state agencies, MPOs, universities, consulting firms, and community activist groups to discuss a wide ranges of issues regarding the metropolitan transportation planning regulations.

As background for the conference, the U.S. Advisory Commission on Intergovernmental Relations (ACIR) prepared the report, *MPO Capacity: Improving the Capacity of Metropolitan Planning Organizations to Help Implement National Transportation Policies* (Advisory Commission on Intergovernmental Relations, 1995). This study reviewed the progress of the transportation planning process in a number of metropolitan areas. The study found that MPOs experienced several changes resulting from ISTEA including: increased public participation, improved air quality analysis procedures, enhanced intergovernmental coordination, and consideration of intermodal issues. Conversely, MPOs raised concerns with regard to: increased regulatory burden and workload levels, uncoordinated deadlines, unachievable expectations, disrupted relationships within the MPO, and strained relationships with the state departments of transportation. The report recommended several actions directed at developing a capacity building program for MPOs and supporting regulatory relief.

The conferees discussed issues related to: roles and responsibilities, public participation, fiscal reality, technical linkages, decision making, and integrating related activities into the process. The general consensus of the conference participants was that ISTEA had provided numerous opportunities to enhance the metropolitan transportation planning process. Although areas of concern were noted, along with items that needed further research and possible changes, the overall sentiment supported the basic concepts of ISTEA. The recommendations from the conference were consistent with and complementary to those in the ACIR report. They focused on improved technical assistance, procedural development, development of

training programs and case studies of good practice, and better communication among those involved in the metropolitan transportation planning process around the country. There was also a call to simplify many aspects of the process.

Implications of Expanding Metropolitan Highway Capacity

The Clean Air Act Amendments of 1990 and the Intermodal Surface Transportation Efficiency Act of 1991 focused attention of the issue of the travel inducing effects of expanding highway capacity in metropolitan areas and the potential impacts on air quality and energy consumption. This issue of the effect of highway expansion on induced travel had been debated for many years resulting in much conjecture and no consensus. The Transportation Research Board undertook a study to evaluate the evidence regarding the impacts of highway capacity additions on traffic flow, travel demand, land use, vehicle emissions, air quality, and energy use. (Transportation Research Board, 1995b) Of particular concern was the ability of current forecasting techniques to accurately estimate the impacts of expanded highway capacity on improving traffic flow and resulting air pollution effects.

The study included an extensive review of research and experience. It concluded that current analytical methods were inadequate for addressing Federal regulatory requirements for estimating emissions and ambient air quality. Modeled estimates were imprecise and limited in their account of changes in traffic flow characteristics, tripmaking, and land use attributable to transportation investments. The accuracy implied in EPA's conformity regulations demanded a level of analytic precision beyond current modeling capabilities. The complex and indirect relationship between highway capacity additions, air quality, and energy use, which is heavily dependent upon local conditions, makes it impossible to generalize about the effects of added capacity on air quality and energy use even with improved models.

In the end, the study concluded that polices to curb the growth in motor vehicles would have a relatively small effect on air quality. Major highway capacity additions would likely have greater effects but could take a longer period to impact spatial patterns and induced travel, an eventually air quality. Improvements in vehicle technology would yield greater air quality benefits than the focus on curbing travel growth.

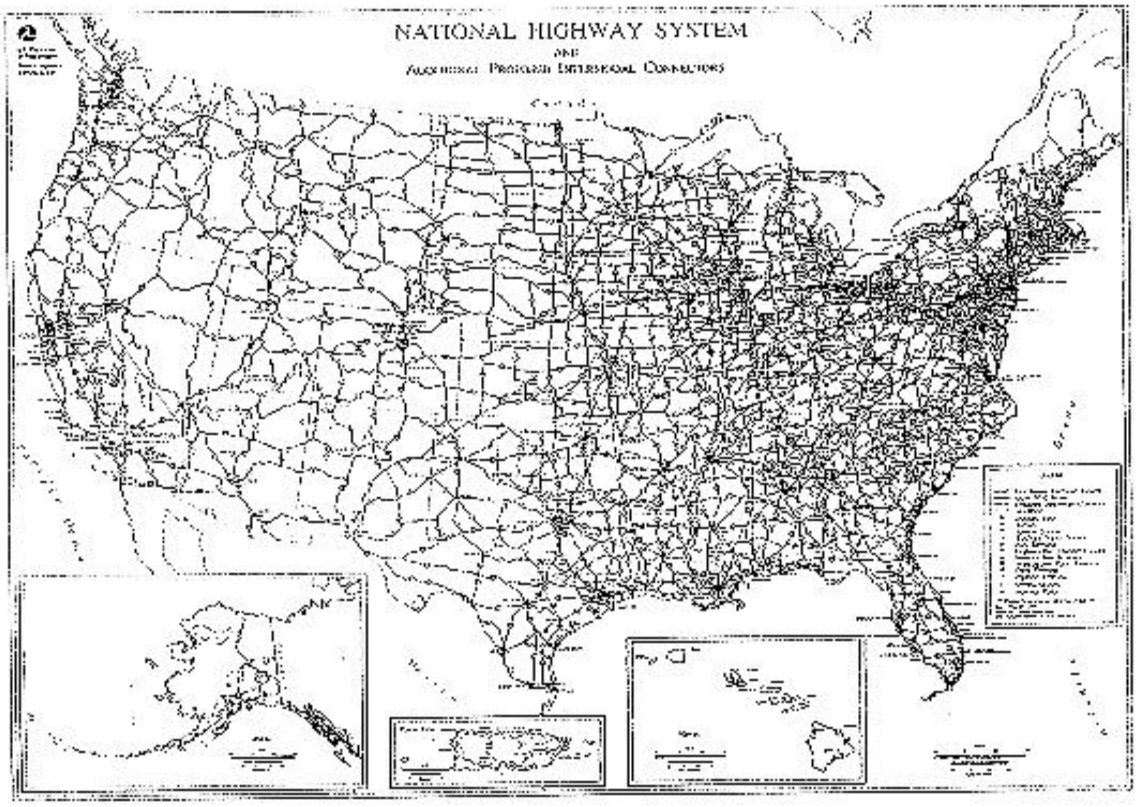
National Highway System Designation Act of 1995

The Intermodal Surface Transportation Efficiency Act of 1991 required the DOT to submit a proposed National Highway System to provide an interconnected system of principal arterial routes which will serve major population centers, international border crossings, ports, airports, public transportation facilities, and other intermodal transportation facilities and other major travel destinations, meet national defense requirements, and serve interstate and interregional travel.

The proposed NHS was developed by DOT in cooperation with the states, local officials and metropolitan planning organizations and submitted to the Congress on December 9, 1993. The NHS was designated into law on November 28, 1995 when President Clinton signed the National Highway System Designation Act of 1995. (Figure 21) The system consisted of 160,00 miles which included the Interstate system. The

NHS represented 4 percent of the nation's roads and carried 40 percent of all highway traffic and 70 percent of all truck traffic. About 90 percent of the population lived within 5 miles of a NHS road.

Figure 21



National Highway System

In addition to designating the NHS, the 1995 Act repealed the national 55 mile per hour speed limit for cars and trucks, and removed the funding penalties for States that failed to enact motorcycle helmet laws. (Bennett, 1996)

The Act created a State Infrastructure bank (SIB) Pilot Program that could included up to 10 States. The program no new Federal funds but could be capitalized by State contributing up to 10 percent of several categories of funds. These funds had to be matched by 25 percent in no-Federal funds.

The Act eliminated the requirement in ISTEA for management systems making them optional by the States. It added a sixteenth factor, recreational travel and tourism, to be considered by MPOs in developing transportation plans and programs. It also clarified that transportation conformity requirements of ISTEA and the Clean Air Act apply only to nonattainment areas or those areas subject to maintenance plans.

Major Investment Studies

Prior to the Intermodal Surface Transportation Efficiency Act of 1991, the Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) had different project development procedures for

major projects, specifically FTA's Alternatives Analysis requirements and FHWA's highway corridor planning procedures. (Cook, et. al., 1996) These procedures were replaced by the requirements of Major Investment Studies (MIS) which were incorporated into the Metropolitan Planning regulations implementing the metropolitan planning requirements of ISTEA. (U.S. Dept. of Transportation, 1993)

The MIS regulations required that for any major transportation investment a study evaluate all reasonable alternative multimodal transportation improvement strategies to address the problems within the corridor of subarea The MIS was to be a cooperative process among the various agencies and stakeholders to establish a range of alternative investments or strategies, and evaluate the effectiveness and cost effectiveness of the alternatives in attaining local, State, and national goals and objectives. The process was to include consideration of direct and indirect costs of the alternatives and such factors as mobility improvements, social, economic and environmental costs, safety, operating efficiency, land use, economic development, financing, and energy consumption. The public involvement process had to be proactive to provide opportunities for various interest groups to participate. The analysis was to be consistent with Executive Order 12893 on Principles for Federal Infrastructure Investments.

A conference was held on February 25-28, 1996, in San Francisco, California to determine how well the process was working after more than two years of experience. The conference focused on: policy issues, the relation of MIS to the overall planning and project development process, management and institutional issues affecting MIS, and the decision process for the MIS. The conference concluded that MIS was a useful technique which focused on defining problems, then built a process to reach a consensus on appropriate solutions. It reflected the objectives of ISTEA of improved mobility, intermodalism, innovation, flexibility, improved air quality, using new technologies, involving the public in decisionmaking, coordination of transportation investment with land use, environment, and other community interests.

The guidance on MIS provided sufficient flexibility to adapt to local conditions. However, further improvements were needed in the areas of collaborative relationships among the various levels of government and across transportation modes as well as clarification between the MIS process and NEPA procedures. MIS needed to be more fully integrated into the metropolitan planning process, and financial planning should accompany alternatives analysis. The experience with MIS needed to be more generally disseminated. A continuing education process needed to be carried out for decisionmakers, the public, and other stakeholders for an effective MIS process.

National Transportation System

In late 1993, Secretary Peña unveiled the proposed National Highway System (NHS) and stated his intention to launch work on a National Transportation System (NTS) initiative. In doing so, he set in motion a process that would draw upon the National Performance Review (NPR) for direction, influence the development of a Departmental proposal for the reauthorization of the surface transportation financial assistance programs, and begin to position the Department to assess and analyze the performance of the transportation system from the customer's perspective. The NTS initiative was embodied in the first goal of Secretary Peña's Strategic Plan for the Department, “Tie America Together.”

The Secretary directed that extensive public hearings be held to involve the transportation community and interested citizens in the development of a comprehensive NTS. There was widespread concern and opposition to the initial idea of developing a map of a designated NTS. As a result, the Department shelved the idea of developing a specific NTS map. The NTS initiative was refocused on the development of a process for evaluating the nation's transportation system. The NTS evolved to embody a number of ideas:

- A concept that recognizes the interaction between the nation's goals and objectives and the components of the nation's transportation system;

- A method of looking at the total transportation system and focusing on the social and economic outcomes that are ultimately what the customers use transportation to accomplish;

- An institutional framework for a cooperative partnership among the Federal government, State and local agencies, the private sector, and the general public;

- A technical process bringing the user perspective to the forefront with analytical and measurement tools to build the capability to assess performance, identify issues and problems, evaluate policy options, and develop strategies; and,

- A strategic planning structure for the future development of the nation's transportation system.

A Progress Report on the National Transportation System Initiative was produced that described the development and use of a set of national transportation performance measures and a national transportation network analysis capability. These tools would be used in the assessment of the nation's transportation system, the identification and analysis of key issues effecting transportation, and the analysis of policy, program management and regulatory options. The results of those efforts were intended for presentation in biennial reports on the state of the national transportation system. (U.S. Department of Transportation, 1996)

Making the Land Use, Transportation, Air Quality Connection (LUTRAQ)

In 1990, the 1,000 Friends of Oregon created the Making the Land Use, Transportation, Air Quality Connection (LUTRAQ) project in response to a proposal to build a bypass around the southwest side of Portland, Oregon. The project analyzed the use of transit oriented development (TOD) in conjunction with a light rail system as an alternative to a proposed highway bypass with more tradition low density suburban development patterns. The land use development using neo-traditional town planning principles was designed to encourage more walking, biking, and transit use as an alternative to the increased use of automobiles. (Bartholomew, 1995 and 1,00 Friends of Oregon, 1997)

LUTRAQ reviewed current land use-transportation models, implemented improvements to the modeling capability, developed a land use-transportation alternative around a light rail line and TOD, analyzed the highway bypass and light rail alternatives and, developed a series of implementation actions for the light rail/TOD alternative.

The study concluded that the light rail/TOD strategy could significantly reduce congestion, automobile trips, VMT, and air pollution emissions over the highway bypass alternative. It was the only alternative to satisfy the Clean Air Act requirements. The Portland area regional government endorsed the LUTRAQ plan and incorporated its components into the region's 50-year land use and transportation plan.

CHAPTER 14 — CONCLUDING REMARKS

Urban transportation planning evolved from highway and transit planning activities in the 1930s and 1940s. These efforts were primarily intended to improve the design and operation of individual transportation facilities. The focus was on upgrading and expanding facilities. Early urban transportation planning studies were primarily systems-oriented with a twenty-year time horizon and region-wide in scope. This was largely the result of legislation for the National System of Interstate and Defense Highways which required that these major highways be designed for traffic projected twenty years into the future. As a result, the focus of the planning process through the decade of the 1960s was on this long-range time horizon and broad regional scale.

Gradually, starting in the early 1970s, planning processes turned their attention to shorter-term time horizons and the corridor-level scale. This came about as the result of a realization that long-range planning had been dominated by concern for major regional highway and transit facilities with only minor attention being paid to lesser facilities and the opportunity to improve the efficiency of the existing system. This shift was reinforced by the increasing difficulties and cost in constructing new facilities, growing environmental concerns, and the Arab oil embargo.

Early efforts with programs such as TOPICS and express bus priorities eventually broadened into the strategy of transportation system management. TSM encompassed a whole range of techniques to increase the utilization and productivity of existing vehicles and facilities. It shifted the emphasis from facility expansion to provision of transportation service. The federal government took the lead in pressing for changes that would produce greater attention to TSM. At first there was considerable resistance. Neither institutions nor techniques were immediately able to address TSM options. A period of learning and adaptation was necessary to redirect planning processes so that they could perform this new type of planning. During the 1980s, urban transportation planning had become primarily short-term oriented in most urbanized areas.

By the early 1990s, there were major changes underway that would have significant effects on urban transportation and urban transportation planning. The era of major new highway construction was over in most urban areas. However, the growth in urban travel was continuing unabated. With only limited highway expansion possible, new approaches needed to be found to serve this travel demand. Moreover, the growth in traffic congestion was contributing to degradation of the urban environment and urban life, and needed to be abated. Previous attempts at the selected application of transportation system management measures (TSM) had proven to have limited impacts on congestion, providing the need for more comprehensive and integrated strategies. In addition, a number of new technologies were reaching the point of application, including intelligent vehicle highway systems (IVHS) and magnetically levitated trains.

Many transportation agencies entered into strategic management and planning processes to identify the scope and nature of these changes, to develop strategies to address these issues, and to better orient their organization to function in this new environment. They shifted their focus toward longer term time horizons, more integrated transportation management strategies, wider geographic application of these strategies, and a renewed interest in technological alternatives. Approaching the year 2000, the focus of urban

transportation planning shifted to addressing growing congestion, meeting the NAAQS, reducing global warming, and supporting sustainable development. There were also changes to make the urban transportation planning process more inclusive for citizen groups and individuals.

Through its evolutionary development, the urban transportation planning process had been called upon to address a continuous stream of new issues and concerns, methodological developments, advances in technology, and changing attitudes. Usually it was the requirements from the federal government to which the planning process was responding. Major new issues began affecting urban transportation planning in the latter half of the 1960s and on through the 1970s. The list of issues included safety, citizen involvement, preservation of park land and natural areas, equal opportunity for disadvantaged persons, environmental concerns (particularly air quality), transportation for the elderly and handicapped, energy conservation and revitalization of urban centers. More recently these have been joined by concerns for deterioration of the highway and transit infrastructure and its effect on economic growth. Traffic congestion, air quality, global warming, and sustainable development have now become the major concerns of urban transportation planning.

During this same period there have been advocates for various transportation options as solutions to this vast array of problems and concerns. They ran the gamut from new highways, express buses, heavy and light rail transit systems, pricing, automated guideway transit, paratransit, brokerage, dual-mode transit, IVHS and maglev. It was difficult at times to determine whether these options were advanced as the answer to all of these problems or for just some of them. Transportation system management was an attempt to integrate the short-term, low capital options into reinforcing strategies to accomplish one or more objectives. Transportation demand management seeks to merge various strategies to affect travel behavior and its effects on congestion and air quality. Alternatives analysis was designed to evaluate tradeoffs among various major investments options as well as transportation management techniques. However, broader evaluation approaches are needed to assess effects of a wide array of strategies on travel demand, land development and environmental quality.

Transportation planning techniques have also evolved during this time. Procedures for specific purposes were integrated into an urban travel forecasting process in the early urban transportation studies in the 1950s. Through the 1960s improvements in planning techniques were made primarily by practitioners, and these new approaches were integrated into practice fairly easily. The FHWA and UMTA carried out extensive activities to develop and disseminate analytical techniques and computer programs for use by state and local governments. The Urban Transportation Planning System (UTPS) became the standard computer battery for urban transportation analysis by the mid 1970s.

During the 1970s new travel forecasting techniques were developed for the most part by the research community largely in universities. These disaggregate travel forecasting approaches differed from the aggregate approaches being used in practice at the time. They used new mathematical techniques and theoretical bases from econometrics and psychometrics that were difficult for practitioners to learn. Moreover, the new techniques were not easily integrated into conventional planning practices. Communication between researchers and practitioners was fitful. While researchers were developing more appropriate ways to analyzing this complex array of issues and options, practitioners stayed wedded to the

older techniques. The gap between research and practice is only gradually being closed. The requirements of the Clean Air Act Amendments of 1990 are forcing a reevaluation of travel forecasting procedures that is likely to bring significant improvements.

Microcomputers have become integrated into all aspect of urban transportation planning and the use of GIS is spreading. But, few agencies have the resources to develop their own software and are left to the vagaries of the commercial market. Moreover, microcomputers are now available to smaller agencies and even interest groups. This provides the opportunity for analyses to be carried out by these organizations but may increase the difficulty of achieving consensus.

The 1990s have brought new challenges to urban transportation planning organizations. After a decade of decentralization of authority and responsibility, urban transportation planning is faced with the problems of low density land development patterns, congestion and air pollution which need to be addressed at the regional scale or even on a Statewide basis. The institutional arrangement in most urban, however, areas does not lend itself to the coordination and integration of the various elements needed to bring about more efficient land use patterns. The institutional arrangement is fragmented vertically between various level of government; horizontally among the large number of local units of government; and functionally among transportation, land use, air quality, and other service areas. There is little effort aimed at merging these institutions in most urban regions. In a few instances, states have begun to provide some institutional integration. But, increased coordination between air quality and transportation planners will be needed if the requirements of the 1990 Clean Air Act Amendments are to be met.

The demands on urban transportation planning are now greater than ever. The range of issues that need to be addressed is continuing to lengthen. Analytical requirements are more comprehensive and exacting than previously was true. Some states have requirements beyond those of Federal agencies. However, little effort is being made to assist urban transportation planning agencies to meet these demands and requirements. Funding for research and development had gradually declined and the funding for urban transportation planning had not kept pace with increasing requirements. The Travel Model Improvement Program (TMIP) was one modest effort to fill these needs.

The budgets of urban transportation planning agencies are still tight. There is little money for methodological development or research. Data bases in many areas are old and agencies face difficulties in collecting large-scale regional data sets such as home-interview, origin-destination surveys. The NPTS and Census' UTPP have provided an opportunity for the updating of older data bases at a reduced cost. However, many urban transportation planning agencies had not upgraded their travel forecasting procedures for some time and a large scale effort will be needed to carry out this task.

All of this demonstrates that urban transportation planning is still dynamic and changing to further adapt to new issues and needs.

APPENDIX A — REFERENCES

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APPENDIX B — LIST OF ABBREVIATIONS

AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
AGT	Automated Guideway Transit
ANPRM	Advanced Notice of Proposed Rulemaking
APTA	American Public Transit Association
ATA	American Transit Association
BART	Bay Area Rapid Transit
BOB	Bureau of the Budget
BPR	Bureau of Public Roads
BTS	Bureau of Transportation Statistics
3C	Continuing, Comprehensive, and Cooperative
CAFE	Corporate Average Fuel Economy
CATI	Computer-Assisted Telephone Interviewing
CATS	Chicago Area Transportation Study
CMS	Congestion Management System
CEQ	Council on Environmental Quality
COG	Council of Governments
CUTS	Characteristics of Urban Transportation Systems
CUTD	Characteristics of Urban Transportation Demand
DMATS	Detroit Metropolitan Area Traffic Study
DPM	Downtown People Mover
DOE	Department of Energy
DOT	Department of Transportation
DEIS	Draft Environmental Impact Statement
EIS	Environmental Impact Statement
E.O.	Executive Order
EPA	Environmental Protection Agency
ERGS	Electronic Route Guidance System
FARE	Uniform Financial Accounting and Reporting Elements
FAUS	Federal Aid Urban System
FHWA	Federal Highway Administration
FONSI	Finding of No Significant Impact
FTA	Federal Transit Administration
FY	Fiscal Year
GIS	Geographic Information Systems
GRT	Group Rapid Transit
HEW	Department of Health, Education, and Welfare
HHFA	Housing and Home Finance Agency
HHS	Department of Health and Human Services
HOV	High Occupancy Vehicle
HPMS	Highway Performance Monitoring System

HP&R	Highway Planning and Research
HRB	Highway Research Board
HUD	Department of Housing and Urban Development
ICE	Interstate Cost Estimate
IM	Instructional Memorandum
I/M	Inspection/Maintenance Program
IPG	Intermodal Planning Group
IRT	Institute for Rapid Transit
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITE	Institute of Transportation Engineers
ITLUP	Integrated Transportation and Land-Use Package
IVHS	Intelligent Vehicle-Highway Systems
LCI	Livable Communities Initiative
LPO	Lead Planning Organization
LRV	Light Rail Vehicle
LRT	Light Rail Transit
LUTRAQ	Making the Land Use, Transportation. Air Quality Connection
MIS	Major Investment Study
MPO	Metropolitan Planning Organization
MSA	Metropolitan Statistical Area
NCHRP	National Cooperative Highway Research Program
NEPA	National Environmental Policy Act of 1969
NHS	National Highway System
NMI	National Maglev Initiative
NPTS	Nationwide Personal Transportation Study
NPRM	Notice of Proposed Rulemaking
NTS	National Transportation System
OMB	Office of Management and Budget
OTA	Office of Technology Assessment
QRS	Quick Response System
PATS	Pittsburgh Area Transportation Study
PCC	Electric Railway Presidents' Conference Committee
PLANPAC	Planning Package (of computer programs)
PPM	Policy and Procedure Memorandum
PRT	Personal Rapid Transit
3R	Resurfacing, Restoration, and Rehabilitation
4R	Resurfacing, Restoration, Rehabilitation and Reconstruction
SEWRPC	Southeastern Wisconsin Regional Planning Commission
SHRP	Strategic Highway Research Program
SIP	State Implementation Plan
SLRV	Standard Light Rail Vehicle
SLT	Shuttle Loop Transit
SMD	Service and Methods Demonstration

SMSA	Standard Metropolitan Statistical Area
SOV	Single Occupancy Vehicle
STIP	Statewide Transportation Improvement Program
STP	Surface Transportation Program
TAG	Transportation Alternatives Group
TCM	Transportation Control Measure
TCP	Transportation Control Plan
TCRP	Transit Cooperative Research Program
TDM	Transportation Demand Management
TRO	Trip Reduction Ordinance
TIGER	Topologically Integrated Geographic Encoding and Reference
TIP	Transportation Improvement Program
TMA	Transportation Management Association
TMA	Transportation Management Area
TMIP	Travel Model Improvement Program
TOD	Transit-Oriented Design
TOPICS	Traffic Operations Program to Improve Capacity and Safety
TRANSIMS	Transportation Simulation and Analysis System
TRB	Transportation Research Board
TSM	Transportation System Management
UMTA	Urban Mass Transportation Administration
UPWP	Unified Planning Work Program
UTCS	Urban Traffic Control Systems
UTPP	Urban Transportation Planning Package
UTPS	Urban Transportation Planning System