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NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM
SYNTHESIS OF HIGHWAY PRACTICE

100

MANAGING STATE HIGHWAY FINANCE

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NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

Systematic, well-designed research provides the most effective approach to the solution of many problems facing highway administrators and engineers. Often, highway problems are of local interest and can best be studied by highway departments individually or in cooperation with their state universities and others. However, the accelerating growth of highway transportation develops increasingly complex problems of wide interest to highway authorities. These problems are best studied through a coordinated program of cooperative research.

In recognition of these needs, the highway administrators of the American Association of State Highway and Transportation Officials initiated in 1962 an objective national highway research program employing modern scientific techniques. This program is supported on a continuing basis by funds from participating member states of the Association and it receives the full cooperation and support of the Federal Highway Administration, United States Department of Transportation.

The Transportation Research Board of the National Research Council was requested by the Association to administer the research program because of the Board's recognized objectivity and understanding of modern research practices. The Board is uniquely suited for this purpose as: it maintains an extensive committee structure from which authorities on any highway transportation subject may be drawn; it possesses avenues of communications and cooperation with federal, state, and local governmental agencies, universities, and industry; its relationship to its parent organization, the National Academy of Sciences, a private, nonprofit institution, is an insurance of objectivity; it maintains a full-time research correlation staff of specialists in highway transportation matters to bring the findings of research directly to those who are in a position to use them.

The program is developed on the basis of research needs identified by chief administrators of the highway and transportation departments and by committees of AASHTO. Each year, specific areas of research needs to be included in the program are proposed to the Academy and the Board by the American Association of State Highway and Transportation Officials. Research projects to fulfill these needs are defined by the Board, and qualified research agencies are selected from those that have submitted proposals. Administration and surveillance of research contracts are the responsibilities of the Academy and its Transportation Research Board.

The needs for highway research are many, and the National Cooperative Highway Research Program can make significant contributions to the solution of highway transportation problems of mutual concern to many responsible groups. The program, however, is intended to complement rather than to substitute for or duplicate other highway research programs.

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NOTICE

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The Transportation Research Board evolved from the 54-year-old Highway Research Board. The TRB incorporates all former HRB activities and also performs additional functions under a broader scope involving all modes of transportation and the interactions of transportation with society.

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PREFACE

A vast storehouse of information exists on nearly every subject of concern to highway administrators and engineers. Much of this information has resulted from both research and the successful application of solutions to the problems faced by practitioners in their daily work. Because previously there has been no systematic means for compiling such useful information and making it available to the entire highway community, the American Association of State Highway and Transportation Officials has, through the mechanism of the National Cooperative Highway Research Program, authorized the Transportation Research Board to undertake a continuing project to search out and synthesize useful knowledge from all available sources and to prepare documented reports on current practices in the subject areas of concern.

This synthesis series reports on various practices, making specific recommendations where appropriate but without the detailed directions usually found in handbooks or design manuals. Nonetheless, these documents can serve similar purposes, for each is a compendium of the best knowledge available on those measures found to be the most successful in resolving specific problems. The extent to which these reports are useful will be tempered by the user's knowledge and experience in the particular problem area.

FOREWORD

*By Staff
Transportation
Research Board*

This synthesis will be of special interest to highway administrators and others concerned with funding mechanisms and procedures for managing limited resources.

Administrators, engineers, and researchers are continually faced with highway problems on which much information exists, either in the form of reports or in terms of undocumented experience and practice. Unfortunately, this information often is scattered and unevaluated, and, as a consequence, in seeking solutions, full information on what has been learned about a problem frequently is not assembled. Costly research findings may go unused, valuable experience may be overlooked, and full consideration may not be given to available practices for solving or alleviating the problem. In an effort to correct this situation, a continuing NCHRP project, carried out by the Transportation Research Board as the research agency, has the objective of reporting on common highway problems and synthesizing available information. The synthesis reports from this endeavor constitute an NCHRP publication series in which various forms of relevant information are assembled into single, concise documents pertaining to specific highway problems or sets of closely related problems.

Highway agencies are faced with the problem of meeting increasing maintenance and operational needs under severe financial constraints caused by inflated costs and reduced revenues. This report of the Transportation Research Board includes information on alternative funding sources and improved management procedures. Critical factors in the fiscal decision-making process are identified and analyzed.

To develop this synthesis in a comprehensive manner and to ensure inclusion of significant knowledge, the Board analyzed available information assembled from numerous sources, including a large number of state highway and transportation departments. A topic panel of experts in the subject area was established to guide the researcher in organizing and evaluating the collected data, and to review the final synthesis report.

This synthesis is an immediately useful document that records practices that were acceptable within the limitations of the knowledge available at the time of its preparation. As the processes of advancement continue, new knowledge can be expected to be added to that now at hand.

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Kenneth E. Cook, Transportation Economist, Transportation Research Board, assisted the NCHRP Project 20-5 Staff and the Topic Panel.

Information on current practice was provided by many highway and transportation agencies. Their cooperation and assistance were most helpful.

MANAGING STATE HIGHWAY FINANCE

SUMMARY

Increased costs for building, repairing, and maintaining highways combined with normal deterioration and a decrease in anticipated revenues have placed the transportation system of the United States in jeopardy. The condition of highway pavements in particular has rapidly declined during the past several years.

In some cases highways must compete with other transportation needs and special non-highway uses such as highway patrol and licensing functions. General inflation and increases in petroleum prices have caused highway costs to escalate. The increase in the time between project conception and completion has added to the problem of increased costs due to inflation.

Motor-fuel taxes have been an effective source of funds for the state highway programs. With only an occasional rate increase, these revenues kept pace with needs and inflation until the 1973 oil embargo. Since the embargo there has been a trend to the use of smaller, more efficient vehicles with a resultant decline in fuel consumption.

The effects of fiscal constraints on highway performance have been monitored in three areas: (a) pavement condition, (b) congestion, and (c) safety. The available data indicate that pavement condition has declined, a modest increase in congestion has occurred, and, although fatalities have increased since 1976, the fatality rate has not changed.

State transportation agencies are coping with fiscal constraints by making more efficient use of existing resources, reducing the scope of transportation services, and finding additional or new sources of funding. Good cash-flow management is essential. Switching from an accrual to a cash-flow operation can generate a one-time gain to an agency without any increase in taxes.

Some states have benefited by replacing patronage systems with personnel systems based on merit. A few states have organized their personnel systems to provide more flexibility in the use of personnel. Many states are using electronic data processing capabilities. Value engineering is being employed to explore alternative ways of accomplishing a specific objective. Some agencies identify cost-cutting measures and make them visible to legislators, the media, and the public. Other agencies have scaled back design standards; placed greater emphasis on road resurfacing, restoration, rehabilitation, and reconstruction; allocated fewer resources to new construction; and substituted facilities to encourage transit and van- and car-pool use. Other cost-reduction measures have included road and bridge abandonment, restrictive weight limits, consolidation of services and facilities, reduced subsidies to local gov-

ernment, cost-of-service pricing, and maintenance deferral. Cost-efficiency measures have frequently been accompanied by reduction in transportation services.

In addition to belt tightening and more effective use of resources, states have also sought changes in transportation funding mechanisms. In general, there are five related criteria for funding mechanisms: (a) yield and stability, (b) ease of collection and administration, (c) impact on investment, (d) equity, and (e) legality.

Seventeen states now levy fuel fees, either all or in part in a variable format. Many states have diverted a portion of highway user revenues to support other services. A few states have decreased the funds allocated to these diversions.

Although credit financing is a viable source of funding for some states, without a current revenue base, this type of financing can only postpone the actions that eventually will be necessary to bring costs and revenues into balance.

The critical factors in the fiscal decision-making process are: who makes the decision, relationships between decision-making groups, demonstrating needs, agency credibility, appeal of the funding proposal, and coalition of support.

Highways are the most extensive and visible public works facilities. Traditionally, public support for highways has been generous and based on the needs of a rapidly expanding economy for increased and improved transportation services. However, recently the question of whether adequate resources will be available to ensure the future viability of this massive system has surfaced.

A number of financial strategies are available to address current transportation finance problems. The strategies most likely to be successful are those that:

- Address the underlying causes of fiscal problems,
- Are based on a sound analysis of total transportation requirements and options, and
- Have the cooperation and support of decision-making and user-interest groups.

FISCAL CONSTRAINTS

INTRODUCTION

As the American Transportation Advisory Council, a coalition of private sector organizations, noted in its 1981 report (1):

Our total transportation system is obviously in trouble. The cost of building and repairing our transportation facilities has increased. However, capital investment, in real dollars, has gone down considerably. As necessary capital transportation construction work is deferred, the pace of deterioration continues to increase.

The council added that transportation is a capital-intensive system requiring large outlays for continuing renewal and preservation. The outlays have not been forthcoming in recent years, leading to system deterioration and performance degradation on a variety of fronts. Reversing this trend is a necessity if unparalleled personal and goods movement freedom in the United States is, at least in large measure, to be retained.

Among the various transportation modes and systems, the nearly 4 million miles of streets and highways are perhaps the most basic subsystem, accounting for about two-thirds of the total transportation financial needs (1). State agencies account for more than 60 percent of the total highway disbursements in the country, financed largely from highway user fee revenues, which in recent years have failed to keep pace with both inflation and needs (2). The states are faced with the difficult task of allocating and managing a large yet inadequate amount of funds for the care and upkeep of a highway system most basic to the American way of life.

Purpose of Synthesis

The purpose of this synthesis report is to examine the phenomena underlying today's fiscal dilemma, review the practices in various states for making better use of existing resources, and explore possible ways of increasing state funding for highway transportation.

The methods of coping with the fiscal constraints by making better use of available resources and reducing the scope of lower-priority services are examined in Chapter 2. The methods used to find new and increased revenues are discussed in Chapter 3. The factors in the technical and political processes that have led to successes and failures in obtaining additional funding are reviewed in Chapter 4.

CAUSES OF FISCAL CONSTRAINTS

There is compelling evidence to support the contention that this nation's investment in its transportation infrastructure has been declining since the late 1960s. Initially, this decline was related primarily to a slowdown in new construction—espe-

cially the building of multilane, limited-access freeways in urban areas. However, as the transportation system has matured, the retrenchment in capital investment has resulted, at least in several states, in an inadequate preservation and renewal of existing facilities. The highway system is not alone in this predicament; investment in other parts of the infrastructure, such as dams, water facilities, sewers, and other utilities, has also been reduced. (3).

Evidence of this decline in highway investment can be documented in several ways. The rise and fall in total highway expenditures when adjusted for inflation is shown in Figure 1. However, in reality, the picture is even worse because highway use has continued to increase; hence, investment on a unit basis today is half of that 10 years ago (Figure 2). The relative political neglect of highways is also reflected in the decline of highway expenditures as a proportion of federal, state, and local budgets (Figure 3). A similar trend would be noted if highway investment were compared to the gross national product (4). Although this decline is partly the result of the maturity of the highway network, it also reflects the increased rates of growth of social-service budgets. The conclusion that in addition to reduced construction of new facilities, existing facilities are not being adequately preserved is amply supported in the 1981 report of the U.S. Secretary of Transportation to Congress on the status of the nation's highways, in which it was stated that during the 1970s, the percent of pavement in good condition declined in all systems, particularly in the Interstate system where it declined from 74 to 63 percent in the last half of the decade (5).

It should be noted that although the decline in highway investment is reviewed here and it is emphasized that higher levels of investment will be needed in the future, this synthesis should not be construed as recommending a return to the type of expenditures of the 1950s and 1960s. During that period, a large number of new, multilane, limited-access expressways were built. New construction to such an extent may not be needed today. However, what may not be well understood by the public is that expenditure needs for new construction have been replaced today by equally expensive needs for reconstruction, resurfacing, restoration, rehabilitation, safety improvements, etc. If current levels of highway service are to be maintained along with modest amounts of new construction to complete the missing links in the highway network or to serve those areas that are experiencing rapid growth and development, then current levels of highway investment will prove inadequate.

Clearly, state and local transportation agencies can improve their efforts in communicating these concerns to the public and the political electorate. In this task, the key elements are understanding and articulating the underlying forces that are causing fiscal constraints. It should be noted that not all states are experiencing the same degree of difficulty in meeting necessary transportation commitments. Also, the underlying forces are not uniform in either direction or strength. In general,

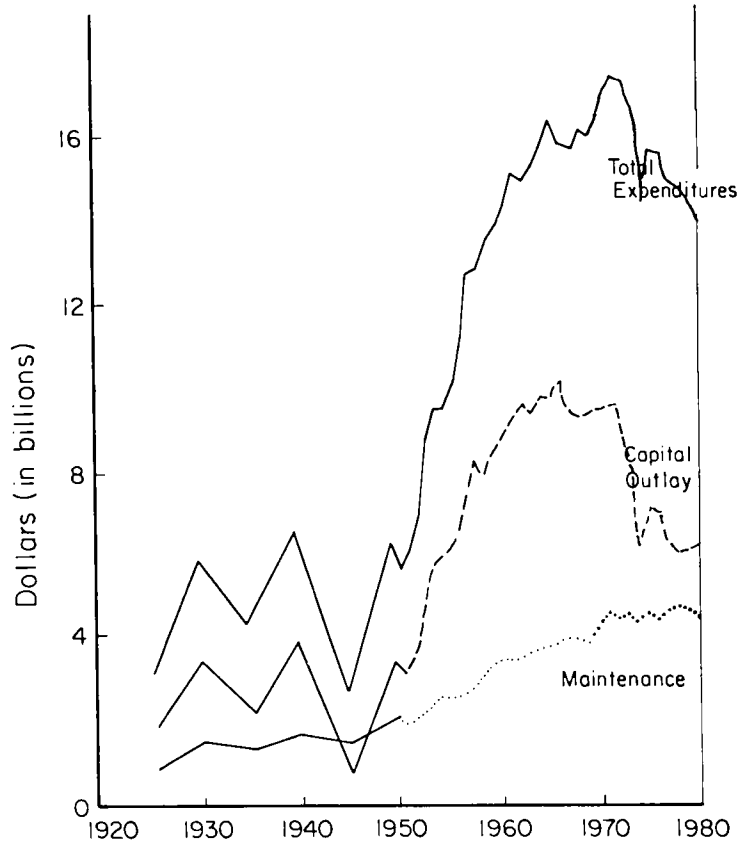


FIGURE 1 National highway system expenditures in constant dollars (2).

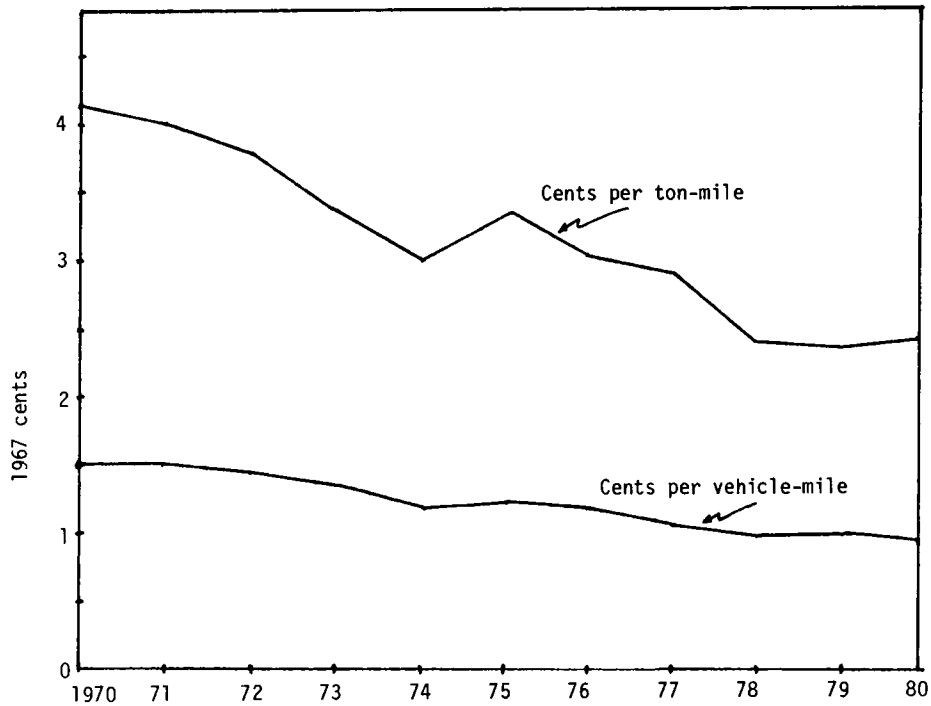


FIGURE 2 National highway expenditures per unit of travel (1967 constant dollars) (2).

however, the difficulties of the states can be traced to various combinations of upward pressure on costs, downward trend in revenues, and increasing demand for more and improved services.

Upward Pressure on Costs

The upward pressure on costs stems from several forces. General inflation and especially increases in petroleum prices have escalated highway costs well above the consumer price index during the 1970s (Figure 4). The price of petroleum-based asphalt, a key material in the highway program, has more than doubled since 1974, whereas highway revenues have increased only by one-third. Since 1980 highway inflation has abated, largely due to the recession and the decline in petroleum prices; however, the decline in petroleum prices may be short-lived.

The inflation problem has been further exacerbated by a significant increase in the time between project conception and completion. This increase is due to several reasons, including greater requirements in planning and development in terms of work scope (e.g., requirements for total environmental systems studies), number of participants (e.g., requirements for greater involvement of local governments, communities, and neighborhoods), and stages of approval. Many of these requirements are useful, often leading to better resolution of problems; nevertheless, they can lead to project delays and thus usually to higher costs. Sometimes project delays are due to the structure of the approval process; for instance, in some states approvals may be required from the state legislature (sometimes in separate steps, one authorizing a project or project phase and another funding it), from other state agencies such as a public utility commission or an environmental board, from federal agencies, and from local governmental units.

Highway costs have also increased because of deferred maintenance practices of the past. Funding constraints leading to postponement of necessary maintenance and rehabilitation work have caused accelerated deterioration, which, in turn, requires much more expensive remedial treatments. Project postponement can result in increased costs because of inflation. The current backlog of bridge deficiencies in the country is an example of this situation.

Greater than expected traffic loads in some states have caused extraordinary road damage and a resultant need for expensive road reconstruction. For instance, the increasing demand for coal following the quadrupling of oil prices led to a proliferation of strip mining with trucks hauling coal from mines to tipples or to markets on roads that had not been constructed to withstand this type of traffic. Similar problems exist in different parts of the country with the movement of agricultural products, lumber, oil, gas, minerals, and other bulk products.

State agencies that have a significant role in aiding or operating mass transit facilities can also experience additional pressures on highway budgets due to the deficits incurred by the transit facilities. If the costs of these facilities increase due to inflation and fare-box revenues stay constant, operating deficits, by definition, increase by a factor greater than the rate of cost inflation. (This multiplicative factor is equal to the ratio of costs and deficits.) State agencies with unified budgets thus may be faced with a tradeoff between the highway operating budget and transit operating subsidies. Highway budgets may also face competition from inflation in the costs of nonhighway functions that are funded from highway user revenues, such as highway-patrol operations and vehicle-licensing activities.

Unstable petroleum prices in the 1970s may also have caused many construction contractors to hedge their bids by either increasing prices or reducing their participation in highway proj-

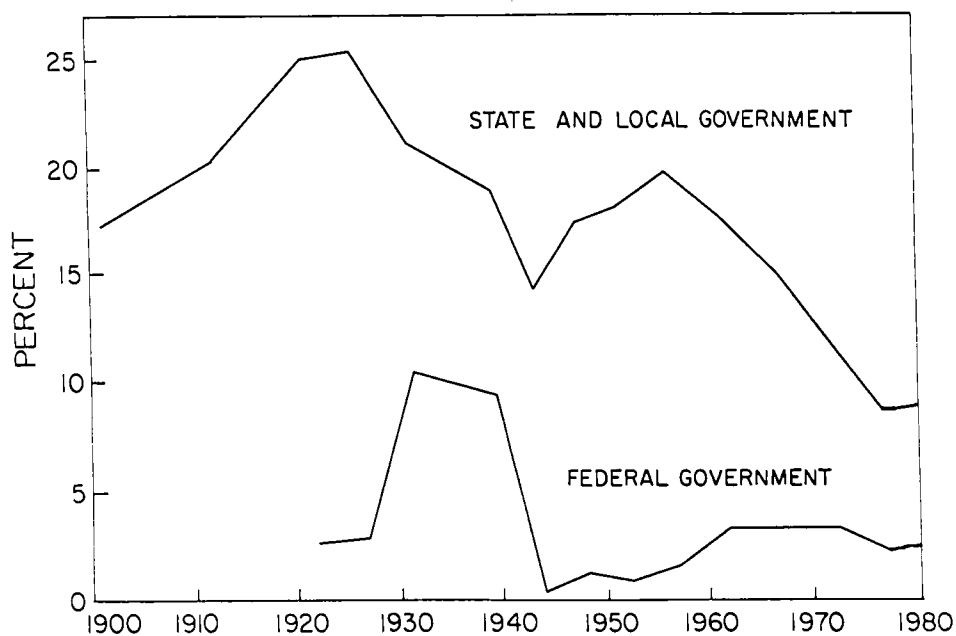


FIGURE 3 Proportion of budget spent for highways. (Source: *Census of Governments*, Bureau of Census, Washington, D.C.)

ects. As fuel prices have stabilized, many state agencies are finding increased competitive bidding for their projects and, as a result, are obtaining lower prices.

There are several other factors that have contributed to cost increases in varying degrees. For example, design standards are a continuous source of controversy and debate, which cause project delays and often lead to cost increases. Adverse weather conditions and natural disasters have also required extraordinary expenditures in some states.

Downward Trend in Revenues

Ever since enactment by states and the federal government in the early part of this century, the motor-fuels tax has been a remarkably efficient mechanism for funding this nation's highway program. Revenues from this single source comprised about two-thirds of the total highway user revenues during the 1960s and 1970s, making it the pillar of highway finance. Throughout this period, until the Arab oil embargo of 1973, fuel-tax revenues kept pace with inflation and needs with only an occasional increase needed in the tax rate, which was levied on a fixed cents per gallon basis. Fuel consumption (hence, revenues) increased steadily because the driver population increased, per capita travel grew, vehicles became less fuel efficient, and the market for bigger, heavier vehicles increased.

Since the dramatic increases in fuel prices (in 1973 and 1974 and again in 1979 and 1980), most of the nation has witnessed a reversal of some of these trends and a leveling off in others. The most critical is the significant decline in fuel consumption due to increasing fleet fuel efficiency. Motor-fuel consumption has dropped not only because of government-mandated vehicle-fuel efficiencies (which have been incorporated into the manufacturing process by different means by automobile manufacturers), but also because of the shift from large to small

and medium cars by motorists. The new cars sold in the 1980s will have fuel efficiencies that are often better than twice those of the cars manufactured in the 1970s. By 1985 new automobiles are expected to average a fuel efficiency of 30 miles per gallon or more and average fleet efficiency (i.e., of all vehicles in use) should increase about 40 to 50 percent from the 15-miles-per-gallon consumption rate in 1979. If tax rates are unchanged, this would cut fuel-tax revenues by one-third.

Other factors have contributed to the problem of reduced revenue. The special tax exemption given to gasohol and other special fuels by the federal government and some states has reduced motor-fuel revenues. The increased use of diesel engines has raised concerns in some state agencies about loss of revenue from the use of home-heating fuel (which is virtually indistinguishable from diesel fuel) in these engines.

Trends in other highway revenues are mixed. Some states in which there has been a leveling off in driver-age population can expect a leveling off in revenues as well, if tax rates are held constant, from such sources as automobile registration fees and operating licenses. Conversely, states experiencing significant increases in population due to immigration, such as in the sun-belt region, can expect increases in revenues from these sources. Some ad-valorem taxes, such as vehicle-titling fees that are levied as a percentage of vehicle cost, have led to increased revenues because of vehicle price increases.

States that relied heavily on bonds during the 1960s and 1970s may find it difficult to continue the same degree of reliance in the 1980s because of the increase in interest rates and decrease in the current revenue funding base. Also, a high rate of bond use can lead to an increased percentage of current revenues used for debt service, thus limiting the revenues available for highway programs. Conversely, states that have been operating on a pay-as-you-go basis retain the option of bonds for capital finance. Some states have resorted to short-term loans, with money borrowed from the general fund and paid back

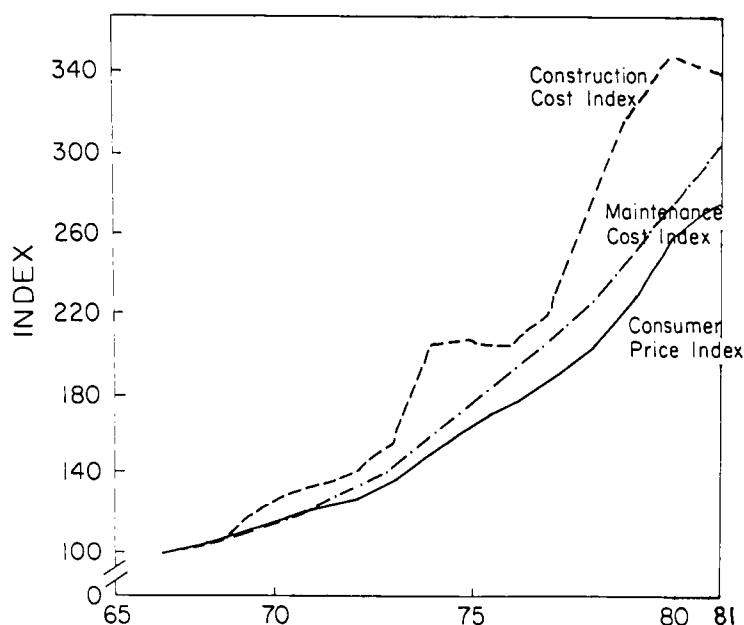


FIGURE 4 Inflation in the highway industry. (Source: Composite construction and maintenance of operation indices published by the Federal Highway Administration.)

over time (e.g., Virginia) or in the open market on 6- to 10-year terms (e.g., North Carolina and Nassau County, New York).

Another uncertainty regarding income involves federal budget decisions. In recent years, limitations (or ceilings) on annual project obligation authority have been imposed. Obligation authority was made available on a first-come, first-serve basis giving states an incentive to move expeditiously on federal-aid projects. Beginning in fiscal year 1981, the obligation authority has been prorated among the states, with 80 percent distributed on a pro-rata basis at the beginning of the fiscal year and the remaining 20 percent made available through an administrative procedure on August 1 (6). These actions make it difficult for states to estimate the amount of federal funds that can be obligated during a year. In addition, obligation authority control dictates that expenditures of federal funds must be from those categories that are subject to lapse; otherwise apportionment will lapse.

The impact of the Surface Transportation Assistance Act of 1982 on state highway finance remains to be seen. However, it is reasonable to assume that increases in available federal funds will require increases in the amount of matching state funds and serious study of the best balance between federal and state funds. There will be increased pressure on state legislatures to increase fuel taxes or to provide additional amounts from the general fund. The act allows the temporary advance of federal funds for some state matching; however, if the funds are not repaid by the end of fiscal year 1984, there will be a decrease in the amount of federal funds available in fiscal years 1985 and 1986.

Increased Demand

Some states, especially in the sun-belt region, experienced significant increases in population in the 1970s with the trends continuing into the 1980s; commensurately there has been an increase in demand for new highway facilities. The public's perception today is also different from that of 30 years ago; along with increased mobility and the Interstate system have come expectations for a higher class of roads. For instance, narrow lanes and steep grades that might have been acceptable in the past may not be tolerated today. And less than full design runs the risk of tort liability in an increasingly litigious society.

Even in a state with a low population growth rate, there is often demand for new facilities or upgrading of existing facilities, which may arise from intrastate population shifts, such as from urban to suburban or rural. The demand may also result from increased per-capita travel or truck traffic.

Increased awareness of energy conservation has also led to a greater demand for a variety of services perceived to be energy savers, including urban transit services, rural intercity passenger transit, exclusive bus lanes, car- and van-pool scheduling services, fringe parking lots near transfer facilities, and rail branchlines abandoned or scheduled to be abandoned by private rail carriers. In the states that do not have dedicated highway trust funds, these demands are in direct competition for funding with highway programs. Even in the states with dedicated highway funds, there is indirect competition for the consumer's tax dollar.

CHANGING INTERGOVERNMENTAL ROLES

Intergovernmental relations among local, state, and federal governments have always been important in highway finance. Local governments have relied on state grants-in-aid for local road maintenance and improvement and on the federal government for both categorical grants (e.g., federal-aid urban, bridge, off-system projects) and block grants (e.g., revenue sharing, community development).

State grants-in-aid to local governments typically are allocated from a portion of the state motor-fuel tax or a portion of the total state highway revenues. When state highway revenues decline, for example, because of declining fuel consumption, local grants-in-aid may be reduced as well. Depending on the cooperative spirit between local and state governments, local governments may seek a greater share of state user taxes, or aid the state in seeking increased user tax revenues.

Additional pressure to increase state grants-in-aid could result from federal cutbacks in block grants. Because property taxes constitute one of the main sources of locally raised revenues (often because some revenue sources may be preempted by the state) and because they are viewed as regressive, state legislators may face requests for increased local grants-in-aid to offset federal cutbacks.

Changes in federal categorical grants could also have significant effects on states. Historically, the Interstate program has been viewed as having a stimulative effect, spurring states to develop the Interstate system at an accelerated pace, whereas the primary, secondary, and urban programs, which have now been somewhat consolidated, were viewed as being substitutive (i.e., allowing states to increase other off-system improvements and to sustain their maintenance programs) (7). Recently, Congress initiated federal programs for restoring critical bridges (1976 Highway Act), rehabilitating the Interstate system (1981 Highway Act), and expanding these programs (Surface Transportation Assistance Act of 1982). The 1982 act may require states to find additional matching funds.

EFFECTS OF FISCAL CONSTRAINTS ON HIGHWAY PERFORMANCE

The most comprehensive data to date on the direct effects of the decline in capital investment, at the national level, come from the Highway Performance Monitoring System (HPMS) administered by the Federal Highway Administration in cooperation with state transportation agencies (8). Only physical and (selected) vehicle-operating characteristics are captured by this system. These characteristics can be grouped into three major areas: (a) pavement condition, (b) congestion, and (c) safety. The data described below should only be taken as indicative of trends, because the HPMS has only been in operation for a short time and the results have not been fully subjected to rigorous uniformity and statistical tests. These trends in pavement condition, congestion and safety are distributed widely throughout the country and do not exhibit any geographical pattern. This wide distribution of impacts is in line with the decline in capital investment, which has been widely experienced by all states.

Pavement Condition

Fair-to-poor pavement conditions were found on 38 percent of the Interstate highways in 1978 in contrast with 27 percent in 1975. On other freeway and arterial highways, fair-to-poor pavement conditions were found on 58 percent of the road miles in 1978 compared to 53 percent in 1975 and 50 percent in 1970. On collector roads, a similar trend can be noted with fair-to-poor pavements increasing to 74 percent in 1978 from 70 percent in 1975 and 66 percent in 1970 (5). Clearly, the percentage of good pavements on all systems has declined steadily throughout the 1970s. This deterioration has not been severe enough to significantly affect ride comfort; the primary shift has been from good to fair, with a smaller shift from fair to poor. However, by the middle and late 1980s, these trends could portend a rough ride for the motorist unless resurfacing and reconstruction activities are significantly expanded.

Congestion

The HPMS data show that whereas the frequency of delays is high, the deterioration in level of service has not been severe, partly because of the increased capacity on urban arterials. Although new highway construction declined dramatically during the 1970s (9), state and local agencies were apparently successful in expanding capacity by using less expensive methods, such as adding turning lanes and improving traffic signalization.

The volume-to-capacity (V/C) ratio of a roadway is a good indicator of level of service with respect to congestion. When the V/C ratio exceeds 0.80, severe congestion can occur, lead-

ing to lengthy traffic delays. In urban areas, the V/C ratio was found to be higher than 0.80 on 28 percent of the Interstate highways in 1978 compared to 23 percent in 1975 (a modest increase), and on 19 percent of the arterials and 8 percent of the collectors in 1978 compared to 15 percent and 4 percent, respectively, in 1970. Congestion in rural areas was negligible.

Safety

Since 1976 fatalities have increased slightly while the fatality rate (fatalities divided by one hundred million vehicle miles of travel) has held steady, after a history of significant decline during the previous 3 decades. In the last 5 years progress toward improved safety on the federal-aid highways has been offset by higher fatality rates on the less adequate, non-federal-aid roads (2).

SUMMARY

The discussion in this chapter suggests a complex pattern of forces, different in each state, contributing to the formation of fiscal constraints on transportation. The trends in investments and the effects on transportation performance have not gone unnoticed. Indeed, in 1980 and 1981 many states initiated changes in their highway funding structure, expenditure levels, and service expectations (see Chapters 2 and 3). The future responses of the states will also be greatly influenced by the need to match federal funding, the terms of aid (e.g., match ratio), and the structure of the federal aid programs.

CHAPTER TWO

MANAGING WITH EXISTING RESOURCES

State transportation agencies are coping with fiscal constraints by: (a) making more effective and more efficient use of existing resources; (b) reducing the scope of transportation services; and (c) finding additional or new sources of funding. The first two approaches are examined in this chapter; changes in funding structure are discussed in Chapter 3.

IMPROVED USE OF EXISTING RESOURCES

A state transportation agency can use existing resources more effectively and efficiently in a variety of ways, but, equally important, the public must perceive the agency as efficient and effective. There are many instances in which it can

be argued that this public perception has had more influence on the outcome of new funding proposals than any other factor. A discussion of some of the ways by which the states are stretching their shrinking transportation dollar is presented below.

Personnel Actions

Labor is an agency's most important resource and the best use of this resource requires a responsive personnel system. Yet the establishment of merit-based personnel selection and promotion systems is generally a political decision, often outside the scope of the powers of transportation managers. It should

be noted, however, that some states have benefited enormously, in terms of both efficiency and public image, by replacing patronage systems that had been abused with systems based on merit. Unionism has also grown among public employees. A few states have carefully organized their personnel systems into exempt positions, basic civil service, and career executive with modified civil service standards for policy positions. Such distinctions can give an agency more flexibility in the use of its personnel.

A responsive personnel system is especially important in times of scarce resources. Faced with declining revenues and increasing personnel costs, highway agencies have had to undergo substantial staff reduction in recent years. Some states have been able to achieve such reductions through attrition and shifting and retraining of personnel, whereas others have had to impose across-the-board reductions in force.

There has also been a tendency in some states to deliberately increase reliance on the private sector by contracting many services. For instance, many maintenance activities, such as bridge painting, crack sealing, surface treatment, and pothole patching, as well as various services ranging from design to audits, can be performed by contract.

Cash-Flow Management

The decision on the type of accounting system to be used by a transportation agency (accrual or cash flow) is also generally outside the powers of an agency. However, some states that use an accrual system may have the flexibility to simulate operation on a cash-flow basis by splitting the accrual basis across multiple years. (A simple example is distributing a highway contract encumbrance across multiple years based on estimated cash payouts.)

Switching from an accrual to a cash-flow operation can generate a one-time gain to an agency without any increase in taxes. The size of the one-time gain can be significant depending on the nature of the accrual system, annual revenues and cash payouts, and distribution of project durations.

Good cash-flow management also implies tight day-to-day control over all cash flows: receipts, disbursements, and investments. Many agencies are responsible for the collection of at least part of the receipts that support their operations (e.g., vehicle-licensing activities, federal project reimbursements), and there often are opportunities for expedited collection, deposit, and investment of these receipts. On the disbursement side, good cash-flow management can ensure that the maximum highway program is delivered consistent with a prudent cash reserve on hand.

Operating on a cash-flow basis requires a good system of predicting future cash flows and responding quickly to unexpected trends through controls on project lettings and other expenditure mechanisms (10,11). The availability of low-cost microcomputers linked to mainframe data bases can aid the development of these management controls.

Improved Use of EDP

Many states are discovering better ways to use their electronic data processing (EDP) capability. Originally, the use of

computers was restricted to automating basic, repetitive processes such as accounting transactions and vehicle/operator licensing. Next came models for financial and engineering planning, initially through batch-processing and then through interactive processing. Currently, some states are integrating computer capability with day-to-day transportation operations for physically and fiscally tracking projects (Project Management Systems); monitoring road condition and determining when, where, and what type of corrective treatments are necessary (Pavement Management Systems); and optimizing material and equipment use (Inventory and Utilization Information Systems). The use of data base systems operating in on-line inquiry and update modes, increasingly subjected to standard statistical and report generation packages, can bring information processing closer to users and increase the productivity of both the EDP staff and the users.

New developments in the use of EDP in transportation involve the use of microcomputers and minicomputers in planning and operations. In financial and strategic planning, microcomputers can allow users to model and experiment with "what if" questions using standard packages such as electronic work sheets. In operations, the use of computer-assisted design can speed up project design while telecommunication networks permit faster and increased sharing of information with possible improvements in productivity. The concept of "decision support systems," which combines data base management and models, can aid decision making at the executive level.

Value Engineering

Value engineering is a systematic approach to the analysis of projects whereby the purpose and function of each project element is assessed to explore alternative ways of accomplishing the same purpose and function at a lower total (life-cycle) cost without sacrificing quality. Many states have institutionalized the application of value engineering to their projects and often have value engineering coordinators who provide oversight on its use. Some states have also incorporated value engineering into construction activities with contract provisions that allow both the contractor and the agency to share in the realized savings.

Cost-Cutting Measures

In any large agency, new opportunities for cutting costs arise constantly as goals, operations, and people undergo change. Some states make specific allowance for periodic reviews to identify and implement such opportunities and give them visibility among legislators, the media, and the public. One state agency, for example, has established a practice of publishing a "report card" at about 6-month intervals, with a review of key performance indicators.

Another important vehicle for seeking cost efficiencies is the budget process. A structured budget process that facilitates identification of specific cost centers can assist agencies in examining the cost impacts of alternative ways of performing a given task.

Programmatic Changes

Partly in response to fiscal constraints and partly because of changes in road conditions, vehicles, and perceived user priorities, some states have made dramatic shifts in the composition of their transportation programs. Some of the key shifts include: (a) scaling back or downscoping highway design standards for considerable reduction in construction cost; (b) greater emphasis on road resurfacing, restoration, rehabilitation, and reconstruction (4-R) and fewer resources devoted to new construction (9); and (c) substitution of facilities to encourage increased transit use on highways in urbanized areas (e.g., park-and-ride and kiss-and-ride programs and exclusive bus, van-pool, and car-pool lanes).

The processes by which states make these changes in their transportation programs vary a great deal and defy a simple generalization. Major factors include previous project commitments, partially completed projects, the desire to match federal funds, emergency situations, legislative mandates, and formula allocations (12). Fiscal constraints also, of course, often play a dominant role, for there simply may not be many resources available after meeting escalating needs for maintenance and restoration.

REDUCTIONS IN SERVICE AND RESPONSIBILITY

Cost-efficient measures have frequently been accompanied by reductions in transportation services provided by state agencies. These reductions, manifested in terms of both the quantity and quality of services provided, can take several forms. Few agencies have attempted to draw public attention to these reductions, except for the most obvious—the postponement of a major project or a program of capital projects. Clearly, the question of how to provide the proper signals or message to the public about service reductions is a difficult one. Postponement of major capital commitments is the message generally given by agencies, in the belief that this dramatizes the fiscal problems. It may well be, however, that a more balanced approach to discussing and explaining service reductions will receive a more favorable response from the public and the media. Often a layman can more easily appreciate a service reduction that saves \$10,000 than one that saves \$10 million.

Transportation service reductions can fall into three general categories: (a) rationalization of the transport network; (b) rationalization of services; and (c) deferred recapitalization and maintenance. Rationalization refers to the elimination of marginal facilities and services; clearly, what is marginal depends on the amount of resources available and the relative priority of the services. A discussion of the reductions typically instituted or underway in the states is presented below.

Road and Bridge Abandonment

The abandonment of roads and bridges generally is only practiced when alternative routes are available to the residential and commercial traffic affected by the abandonment. Where such alternative routes result in lengthy detours (especially in rural areas) and a higher level of congestion (especially

in urban areas), highway agencies are likely to face opposition to the proposed abandonment.

In some cases state agencies have been able to transfer responsibilities for roads and bridges to local governments or other entities. Such transfer may not save money to the donor in the short run because the receiving entity usually requires the roads to be in “acceptable” form; however, it can ease the work load and lead to savings for the state agency in the longer term. The transfer arrangement can also result in increased state grants-in-aid to the local governments for continuing road maintenance.

Two other practices for reducing service and responsibility are the closing of low-volume roads during the winter to avoid snow-removal costs, and converting deteriorated pavements to gravel roads. The latter strategy is often effective for roads used primarily by trucks, e.g., in hauling coal from mines to tipples.

Restrictive Weight Limits

A widespread practice is the imposition of restrictive weight limits on deteriorated roads and bridges, thus prohibiting heavy vehicles. Some states place 10 to 15 percent of state roads and bridges under such restrictions. This practice is also widely followed by local governments on local roads.

Consolidation of Services and Facilities

Consolidation of service facilities is another widespread practice. Facilities typically consolidated include state regional maintenance and engineering units and vehicle- and driver-license processing facilities. Such consolidation need not result in significant service reduction. Indeed, one state that eliminated its regional license processing operations claims that its processing by mail is sufficiently fast so as not to cause any major inconvenience to the public. Also, by eliminating the personal waiting time, this practice represents, at least for some motorists, an improvement in service.

Sometimes selected services can be consolidated without incurring the problems that accompany consolidation of facilities. For example, several states have concluded that not all of the regional engineering districts or offices need to be full-service facilities. Thus certain services, such as the project development phases or structure design, can be consolidated in a few districts or centralized into one function. Although this may increase travel and communication costs, these increases may be more than offset by lower personnel requirements and the cost-effective utilization of personnel.

Reduced Subsidies

Grants-in-aid to local governmental units for local streets and mass transit operations are often fixed by law through dedication of certain revenue sources (in part or in full). Some state agencies have been successful in getting traditional state-local shares rearranged—often by arguing that high-volume state facilities must be given higher priority over low-volume, locally used facilities. This would then result in a reduction in

local services unless local funding is increased to replace the state subsidies.

Cost-of-Service Pricing

One strategy that has been pursued will not lead to a reduction in transportation services, provided that users pay for the services. The practice of assessing services that in the past usually had been provided free of charge or below cost has accelerated over the last few years. Typical of such services are the provision of maps, permits, and various inspections, and consulting aid to local agencies.

Charging tolls on a highway or bridge facility is another form of direct cost-of-service pricing. Although the construction of new toll roads decreased practically to a halt during the 1970s, many states are reassessing earlier plans to turn existing toll roads to toll-free roads. States that had used federal aid to improve toll roads or bridges and, as a requirement, made a pledge to remove tolls upon redemption of the original construction bonds, later sought Congressional approval for retaining those tolls in order to pay for continuing maintenance and improvement.

Reduction in Highway Standards and Services

Lower design standards sometimes represent a rational downscaling of highway features or a reduction in highway service or usually both. For example, in building a two-lane highway on a four-lane right-of-way, narrow lanes and shoulders and a less smooth riding surface may all be appropriate for the expected traffic load from a cost-effectiveness point of view, even if a reduction in the level of service provided is involved. Because cost-effectiveness (or lack of it) is usually in the eye of the beholder, such proposals for reducing the scale of highway features often become the subject of much controversy.

Examples of reductions in highway services include the abandonment of the "bare pavement" policy in winter operations in some snow-belt states, closure or reduced hours of operation for Interstate and primary road rest areas, less frequent and reduced grass mowing and herbicide spraying, reduced street and interchange lighting, and a reduction in litter pickup and other roadside activities that may affect aesthetics but do not significantly affect pavement life.

Explaining these types of service reductions to the public is usually a delicate matter. Where the amount of traffic affected by the service reduction and the magnitude of the impact on a user are small, the service reductions may be accepted after adequate explanation of the fiscal constraints. Unfortunately, some such service reductions may not necessarily be cost-effective. For instance, although reductions in essential preventive maintenance services, such as bridge painting, may not arouse the ire of the public, this practice could be costly later if the bridge deteriorates prematurely because of corrosion.

Recapitalization and Maintenance Deferral

Unfortunately, fiscal problems have forced many states to extend service reductions to the point where there is insufficient maintenance and recapitalization of the original investment. The increased road and bridge closures and the restrictive weight limits are in many cases, although not always, the result of past deferrals of needed activities. Although attention given by the states to 3-R type of improvement needs has increased, a large backlog and cost inflation continue to make the job of keeping up and catching up tougher. A reduction in standards from reconstruction to resurfacing, and from resurfacing to thin surface treatments, will not solve the problem because of the shorter lives of these treatments. Clearly, states must avoid getting into this cycle and those states in the cycle must break out. This will require a different funding mechanism. [Some states have been successful in seeking a new funding structure (see Chapter 3).]

CHANGES IN FUNDING MECHANISMS

In addition to reducing transportation services and making more effective use of resources, the states have also sought changes in their transportation funding mechanisms in order to keep up with needs and halt the decline in revenue associated with declining fuel consumption. In seeking these changes, careful and clear presentation of documented needs and the gap between needs and revenues is obviously paramount (13). Recent national efforts to monitor highway performance (8) and relate system maintenance costs to level of service (14) and the use of pavement management systems by the states (15) may contribute to the production of better data and analyses to support needs estimates.

CRITERIA FOR SELECTING FUNDING OPTIONS

Before reviewing the types of funding changes that the states have sought, it is useful to examine the criteria that state agencies have used for selecting the funding options presented to their legislatures. In general, there are five interrelated criteria (16, 17): (a) yield and stability; (b) ease of collection and administration; (c) impact on investment; (d) equity; and (e) legality.

Yield refers to the amount of revenue generated by a particular source or funding mechanism, and stability refers to the predictability of the yield (less uncertainty the better) and growth over time. The motor-fuel tax levied on a fixed-cents-per-gallon basis was ideal in the past because of yield and steady, predictable growth over time. Recently, however, its yield has been deteriorating and its stability has been questioned.

State transportation agencies are concerned with minimizing the costs of collection and administration, because such costs come off the top of revenues generated by a funding source. Sources that create excessive burdens in terms of reporting requirements can also create a negative image for the agency. The ease and efficiency of collection depend on a number of factors, such as who pays, how often, and the accompanying documentation. The fixed-levy gasoline tax is a simple source of collection because it is usually collected from fuel wholesalers and distributor/dealers instead of fuel service stations (the former group containing far fewer members than the latter) and reporting requirements are minimal. In comparison, taxes collected at the retail level incur greater collection, audit, and administration costs.

Some funding sources could have undesirable or unforeseen side effects, such as on business investment. For instance, high severance taxes on minerals could lead to a reduced level of mining by making it less competitive with operations in other states with lower taxes.

The perceived equitableness of a funding source is influenced by many factors. Two important factors are: (a) uniformity

across different classes; and (b) income regressivity. The former refers to whether various user groups pay their "fair share" of highway cost. Income regressivity refers to the size of the payment as a proportion of income. If this proportion declines significantly as income increases, the funding source is said to be regressive. Regressivity, traditionally, has not been a major issue in highway finance, but it has been important in transit where a low-fare policy has been defended on income equity grounds. Equity between users and nonusers and among users has been a controversial issue in highway funding, and states often conduct cost-allocation studies to determine appropriate shares.

Finally, as states attempt to mend their transportation fiscal fabric, the use of new funding mechanisms carries the risk of legal challenge from those who may see the mechanism as being inequitable or the risk of creating undesirable side effects. The legality of a new funding source and the full implications of its statutory provisions are often established only after extensive testing in court. Instead of breaking new ground with the accompanying risk of halting revenue collection due to court-imposed injunctions and litigation, state agencies often look for funding sources that have precedents in other states.

One additional issue that merits attention is the relationship among revenues, highway needs, and benefits. Among the several attractive features of the fixed-levy motor fuel tax is the direct relationship between highway use (hence, costs to the transportation agency, benefits to the user) and revenues. Few other revenue sources involve such a direct relationship. As agencies explore new funding mechanisms, they are likely to be questioned by the public and the legislature on the relationship or lack thereof between funding source and highway use (17).

FUNDING OPTIONS

The first modern highway user tax was levied by New York in 1901 in the form of a vehicle-registration fee. This practice soon became widespread and by 1921 every state required registration fees. Today this category of fees also includes a variety of additional levies such as those for driver licenses, vehicle titles, and vehicle inspections.

The second type of user tax to be levied was the motor-fuel fee, first adopted by Oregon in 1919. This tax also spread quickly throughout the country, and by 1929 all states levied fuel fees.

In addition to the registration and fuel fees, some states also adopted "third structure" taxes, which primarily apply to heavy trucks and consist of a rate schedule that may vary according to weight, axles, or distance of travel. Today state and local governments also make use of a myriad of other revenue sources, including federal aid, bonds, tolls, general funds, property taxes, mineral severance taxes, parking charges, and fines.

The trends in state highway revenue sources, after distribution to local governments, are presented in Table 1. In 1921 the vehicle-registration fee was the predominant highway user tax, although property taxes, general funds, and bonds were also significant contributors to the highway program. By 1935 the highway program was beginning to be largely borne by user taxes, and in 1965 federal and state user fees combined to peak at 90 percent of the total state highway income (the ratio is 98 percent if bonds and investment income are included, because the former are serviced from and the latter derived, in part, from user revenues).

The contribution of user revenues to state highway income, in proportional terms, has declined since 1950 from 64 percent to 51 percent in 1965 (due to the establishment of the Highway Trust Fund and increased federal aid) and to 46 percent in 1980 (due to the drop in fuel-tax receipts). Meanwhile, opportunities, even though they exist, are few for large increases in contribution from local aid, bonds, or investment income, which has kept attention focused on user fees.

States have attempted to restructure their highway finances in order to make them less vulnerable to the effects of declining fuel consumption and cost inflation. In 1976 the state of Washington converted its motor-fuel levy to a variable tax within an established range. After the 1979–1980 round of fuel-price increases and double-digit inflation, the movement spread to several states. In 1981 40 states increased the amount of funds provided for highway maintenance and capital investments. In most cases, these financial actions did not alter the financial structure; i.e., they provided for a higher level of user fees but did not change the fee mechanism itself. Hence, in these situations where no structural change has occurred, the forces creating financial constraints (as discussed in Chapter 1) could continue to exert pressures. Some of the funding actions did, however, involve innovative changes, generally restructuring motor-fuel fees.

State legislators and highway user groups are also particularly sensitive to the question of appropriate balance in the highway fee structure. This is evident in the funding actions taken by the 40 states in 1981. The use made by the states of

major funding sources is presented in Table 2. The funding sources include:

- Motor fuel fees,
- Automobile registration and license fees,
- Truck fees and permits,
- Highway bonds,
- General funds (i.e., nonuser revenues),
- Transfer of highway patrol responsibility to general fund, and
- Motor-vehicle or parts sales tax.

The above list is by no means a complete enumeration of the funding sources used by states for financing highways, which is provided elsewhere (19–21), but instead a classification of the more common fees. Specific funding sources that are of special interest because of their stability and yield potential are discussed below.

MOTOR-FUEL FEES

Some states have been successful in changing their financial structures for a more effective response to today's realities. Currently, 17 states levy fuel fees, either all or in part, in a variable form whereby revenues are a function not only of fuel consumption but generally also of fuel price (Table 3). Under a variable form of motor-fuel pricing, the per-gallon levy paid by the motorist may change in response to a change in the variables that are part of the pricing scheme, such as fuel price, highway cost, consumer price index, etc. These changes in the per-gallon levy may be constrained by minimum and maximum limits.

There are four major types of variable fuel taxation in practice, which fall into two general categories:

- The primary motor-fuel fee, levied on a fixed-cents-per-gallon basis, is periodically determined as a fixed *percentage* of fuel price or indexed to some cost basis.
- A supplementary levy is added to the primary motor-fuel fee (which is, generally, a fixed levy). The supplement can be in three forms:

1. A *sales tax*, generally levied at the retail level.
2. A *percentage supplement*, based on fuel price (i.e., state or local governments levy a percentage tax in addition to the fixed-cents-per-gallon fee) either at the retail or wholesale level.
3. An *indexed supplement* (the index is related to any of several bases, such as fuel price, highway cost, consumer price index, etc.).

Table 4 lists the states using the four types of variable fuel taxation described above. In the first group of states, the fuel tax is generally computed as a specified percentage of the fuel price and then levied on a cents-per-gallon basis at the pump. In the second group of states, motorists pay both the fixed levy and the general sales tax on fuel purchases. In the third group of states, the percent supplement need be no different from the sales-tax supplement in operation. However, the percent levy can be a vehicle for a "new" tax source as carefully distinguished from existing taxes. For instance, Connecticut passed

TABLE 1
STATE HIGHWAY REVENUE TRENDS (%) (18)

Revenue Source	1921	1935	1950	1965	1975	1980
User Fees ^a						
Fuel tax ^a	1	38	39	31	30	25
Registration fees ^a	22	21	22	14	15	16
Tolls	-	2	3	6	6	5
SUBTOTAL	23	61	64	51	51	46
Federal Aid	18	23	16	39	33	38
Other						
General revenue	15	1	2	1	4	7
Bonds	35	12	15	6	8	4
Investments	1	1	1	2	3	4
Local aid	8	1	2	1	1	1
SUBTOTAL	59	16	20	10	16	16

^aNet revenue after distributions to local government.

TABLE 2
MAJOR HIGHWAY FUNDING SOURCES AND ALLOCATIONS (EXCLUDES AUTOMATIC CHANGES DUE TO VARIABLE TAXES) CHANGED BY LEGISLATION IN 1981^a

State	Motor Fuel Fees	Automobile Registration/License Fees	Truck Fees and Permits	Bonds	General Funds	Transfer Highway Patrol	Motor Vehicle or Parts Sales Tax
Alabama							
Alaska							
Arizona		X	X		X		X
Arkansas							
California	X	X	X				
Colorado	X	X					X
Connecticut			X	X			
Delaware	X			X			
District of Columbia	X		X				
Florida		X	X		X		
Georgia							
Hawaii	X						
Idaho	X		X	X			
Illinois				X			
Indiana	X	X	X				
Iowa	X	X					
Kansas							
Kentucky							
Louisiana							
Maine			X	X	X		
Maryland							
Massachusetts		X	X				
Michigan							
Minnesota	X	X	X	X			X
Mississippi	X		X				
Missouri		X	X				
Montana					X	X	
Nebraska							
Nevada	X	X	X				
New Hampshire	X	X	X				
New Jersey		X	X				
New Mexico					X		
New York							
North Carolina	X	X	X				
North Dakota		X	X		X		
Ohio	X		X		X		
Oklahoma					X		
Oregon	X		X				
Pennsylvania	X						
Rhode Island	X						
South Carolina	X		X				
South Dakota	X		X				
Tennessee	X		X				
Texas		X	X				
Utah	X	X	X				
Vermont	X	X	X		X		
Virginia			X				
Washington	X	X	X	X			
West Virginia		X	X		X		
Wisconsin	X	X	X				
Wyoming					X		

^aBased on information compiled by Highway Users Federation, Washington, D.C., and the Federal Highway Administration.

a percent levy on petroleum refined in the state, entitling it as a Gross Earnings Tax. Pennsylvania and New York called their percent levies Oil Franchise Taxes, which are applied to motor-fuel sales at the wholesale or distributor levels. In all three cases, the percent levies give the connotation of a business

tax as opposed to a consumer tax. Indeed, there is some likelihood that not all of the percent levies may be passed on to consumers due to fuel-price competition and federal-tax write-off as a cost of doing business in the states. The last category in Table 4 consists of Ohio, which imposes a fixed levy

TABLE 3
STATUS OF MOTOR-FUEL FEES BY TYPE IN 1981

Category	Type of Motor-Fuel Fee	No. States	States
1	Fees levied in fixed cents per gallons	34	Alabama, ^b Alaska, Arkansas, Arizona ^a , Colorado, Connecticut, Delaware, Florida, Idaho, Iowa, Kansas, Louisiana, Maine, Maryland, Minnesota, Missouri, Montana, Nevada, New Hampshire, New Jersey, North Carolina, North Dakota, Oklahoma, Oregon, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, West Virginia, Wisconsin, Wyoming
2	Fees levied in variable form	6	District of Columbia, Kentucky, Massachusetts, New Mexico, Rhode Island, Washington
3	Fees levied in both fixed and variable forms	11	California, Georgia, Hawaii, Illinois, Indiana, Michigan, Mississippi, Nebraska, New York, Ohio, Pennsylvania

^aArizona enacted a variable tax in 1981; in 1982 it was suspended and replaced with a schedule of subsequent rate increases.

^bDelaware law prescribes a variable-tax mechanism, but the tax is in effect a fixed levy because of legislated minimum and maximum constraints.

TABLE 4
STATUS OF VARIABLE MOTOR-FUEL TAXES IN 1981

Fee Type	No. States	States	Rate
Variable Primary Motor-Fuel Fee	6	District of Columbia	Indexed to CPI
		Kentucky	9% wholesale
		Massachusetts	10% wholesale
		New Mexico	Indexed to wholesale
		Rhode Island	10% wholesale
Sales Tax Supplement ^a	8	California	7¢/g + 4.75% retail
		Georgia	7.5¢/g + 3% retail less state tax
		Hawaii	8.5¢/g + 4% retail
		Illinois	7.5¢/g + 4% retail
		Michigan	11¢/g + 4% retail
		Mississippi	9¢/g + 5% retail
		New York	8¢/g + 4% retail less state tax
		Indiana	10¢ + 8% of price over \$1.00 + 4% retail
Percent Levy Supplement ^b	2	Nebraska	11¢/g + 2% retail
		Pennsylvania	11¢/g + 3.5% wholesale less taxes
Indexed Supplement	1	Ohio	7¢/g + 3.3¢ indexed to fuel consumption and maintenance cost

^aAmong the states with a sales tax supplement, California, Georgia, Hawaii (for the period 1981-1984), Illinois, and Mississippi use at least part, if not all, of the proceeds for highways, whereas in Indiana and Michigan these fees support mass transportation. By inference, from an examination of New York's unified budget, sales tax proceeds in that state also support mass transportation.

^bConnecticut and New York have also passed percent levies, but this legislation is in litigation.

of 7 cents per gallon and a 3.3 cents-per-gallon supplement, which is computed so that it rises with increasing maintenance cost and decreasing motor-fuel consumption.

Clearly, motor-fuel taxation has moved away from uniformity (the use of a fixed cents-per-gallon levy) and has become more complex as states experiment with alternative structures. Changes in motor-fuel taxation between 1978 and 1981, the period in which the major changes occurred, are given in Table 5. In most states, the first thrust was to convert the fixed levy into variable form. Where this failed, compromises were often made, resulting in increases in the fixed levy or the provision of supplement levies or both. In the case of the supplement levies, apparently it was easier for some states to extend their general sales tax to previously exempt motor-fuel sales or to earmark for transportation motor-fuel sales-tax revenues that previously went into the general treasury. In other instances, supplement levies were enacted for such reasons as tapping a different form of taxation, ensuring against windfall revenues, and providing better funding stability than would occur with fixed or variable forms of taxation alone.

TABLE 5
CHANGES IN MOTOR-FUEL TAXATION (1978-1981)

Type of Motor-Fuel Fee	No. States			
	1978	1979	1980	1981
Fees levied in fixed cents per gallon	46	44	39	34
Fees levied in variable form	1	1	5	6
Fees levied in both fixed and variable form	4	6	7	11

As states examine new funding mechanisms and as specific draft legislation is drawn up, a number of policy questions arise and need to be addressed, including: (a) Will the new revenues be dedicated for transportation, thus permitting the agency to develop long-term plans with some assurance of funding continuity? (b) How will the funding mechanism be structured if revenues are to be shared among different agencies (e.g., state and local) or directed for different purposes (e.g., highways, mass transit, and rail).

In the case of variable motor-fuel taxation, a number of operational (or administrative) issues also arise, such as whether a percent levy will be applied at the wholesale or retail level, whether federal and state fixed levies will be excluded from the base fuel price for purposes of tax computation, etc. Some of these issues are listed in Table 6.

There are additional ways by which states can improve the yield from motor-fuel fees, including reduction or elimination of tax exemptions for special fuels such as gasohol and methanol and for special groups such as agricultural and transit equipment, conversion of tax exemptions to tax refunds that can be claimed upon proof of eligibility, reduction of allowed shrinkage rates on fuel, and charging for fuel inspection.

Although the variable form of motor-fuel taxation has the potential to offset, at least to some extent, the revenue-deteriorating effects of inflation (in terms of reduced purchasing power) and declining fuel consumption, Zettel has pointed out some possible adverse effects: "Adjustment of fuel taxes alone to compensate for inflation will shift burdens among classes of highway users" (19, pp. 6-9). If revenues from other sources,

especially first- and third-structure taxes, do not also increase step by step with motor-fuel revenues, or at least approximately, then the original balance in the tax structure might indeed shift and require periodic adjustment. In addition, there is the danger that a variable tax will make (or be perceived to make) highway funding immune from periodic legislative oversight. Where the question of immunity from legislative oversight has arisen, state lawmakers have carefully limited the range within which the variable tax may vary. Such limits may take the form of restrictions on either the tax rate or changes in the tax rate during a year.

VEHICLE SALES/TITLING TAXES

Many states apply sales taxes to vehicle or parts purchases. Not only can these revenues be significant, they are also likely to keep up with inflation. However, even though a few states, such as Texas, make these revenues available for transportation, the more usual practice is for the revenues to be deposited into the general fund and used for nontransportation purposes. (In Texas, the vehicle sales tax proceeds go into the general fund, which then makes up any shortfall in the highway account.)

Instead of a sales tax, some states (e.g., Maryland) impose an ad-valorem titling tax and allocate the proceeds for highways. The titling tax is required to be paid when a vehicle is first titled in the state. The yields can be high because the tax is levied as a percentage of the vehicle purchase price (18, 22).

TABLE 6
OPERATIONAL ISSUES IN VARIABLE MOTOR-FUEL TAXATION

Issues	Variable Primary Motor-Fuel Fee	Sales Tax Supplement	Percent Levy Supplement	Indexed Supplement
• Should percent levy be applied on wholesale or retail fuel price?	X		X	*
• Should different types and grades of fuel be distinguished for tax purposes?	X	X	X	*
• Should base fuel price include or exclude federal and state taxes?	X	X	X	*
• How often in a year should the tax be computed and by whom?	X		X	X
• If the levy is constrained by minimum, maximum, and other limits, what should these limits be?	X		X	X
• What should the method of indexing (fuel price, cost, inflation, etc.) be?				X

*Applicable if index is based on fuel prices.

GRADUATED VEHICLE-REGISTRATION FEES

Most automobile registration fees are either flat fees or graduated according to weight or horsepower. In a few states, the fees are computed as a function of the vehicle's age and value. In Oklahoma, for instance, the fee for a new automobile is computed as a base cost of \$19 plus \$1.50 for each \$100 over \$649.99 in factory-delivered price. Fees in subsequent years are computed as 90 percent of the previous year's fees. This type of a vehicle-registration-fee mechanism, although more complex than a flat fee, is less regressive and provides more options toward achieving target revenues. The increased flexibility is gained because revenues can be enhanced by adjusting the base fee (\$19 in the above example), the cutoff for the base fee (\$649.99), the variable cost (\$1.50), or the schedule of fee reductions in future years (90 percent per year).

THIRD-STRUCTURE TAXES

Weight-distance taxes, currently imposed by eight states, can be a productive source of revenue, although they may be subject to business economic cycles. Although admitting to some dispute concerning the administrative cost and burden of these taxes, Zettel finds them simple (in economic concept), rational, and worthy of further attention (19, pp. 3–29):

... [A]s we look to the future, within the next decade or two ordinary fuels taxation may become less and less tolerable as a way of recovering highway costs. This might be the result of new fuel consumption patterns, new types of fuel, and new power systems. Conceivably, mileage taxation, at least for the heavy vehicles, might become the only rational highway-user revenue source. It could largely replace both fuel and weight taxes as it has already done for diesel vehicles in Oregon, Idaho, and Wyoming.

Looking further down the road, fuels taxation may fail for burden distribution among small vehicles as well—for example, in the event of an explosion in population of electric vehicles. It may be necessary to devise mileage taxes (or to find another measure, other than fuel consumption, that is correlated with highway use) for application to all classes of vehicles.

REDUCTION OF TRANSFERS AND DIVERSIONS

Many states allocate part of the highway user revenues to support such services as highway patrol, driver education, and other nonhighway activities (e.g., transit). The budgets of these programs and services often increase significantly from year to year even if, at the same time, highway revenues decline or show little increase. In 1978, at the state level, about \$2.1 billion was allocated to nonhighway purposes out of available revenues of \$15.6 billion—a 13.4 percent net transfer and diversion rate (2). Eliminating or reducing these transfers and diversions makes available more funds for highway maintenance and capital activities. In 1980 the rate fell to 13.0 percent (\$2.1 billion out of net receipts of \$16.2 billion).

The net transfer and diversion rate takes into account allocations from general funds to highways. Such general fund allocations have increased recently for a variety of reasons, including recognition of declining real highway investment, existence of general fund surplus, and reluctance to increase highway taxes. For example, Hawaii channeled its existing motor-

fuel sales tax revenue away from the general treasury into highways—albeit for a temporary 3-year period. Mississippi increased the portion of its existing motor-fuel sales tax revenue directed for highways—again for a temporary period (through fiscal year 1984). Florida increased the proportion of license-tag fees allocated to highways, whereas Arizona increased the highway share of motor-vehicle and parts sales tax revenues. Because this form of aid may not be dedicated, it may be temporary and easily withdrawn, especially during a recession when general funds run low.

CREDIT FINANCING

Credit financing has been extensively used in the past and remains a viable option for some states under certain circumstances as noted below. As of the end of 1980, the total net highway indebtedness of state governments totaled \$18.6 billion, of which one-third was derived from toll revenue bonds. This level of indebtedness, about equal to current user tax receipts, gives a misleading picture because it is unevenly distributed among the states. Thus some states, without any debt, are in excellent position to use credit financing, whereas, at the other extreme, some are not. The majority of the states, however, may be able to utilize credit financing in significant quantity under certain conditions.

The appropriate conditions for bond financing obviously have to do with a state's financial situation, its credit status, and the market conditions governing bond yields and maturity periods. One way for a state to improve the terms is to issue revenue bonds or limited general obligation (G.O.) bonds instead of unconditional G.O. highway bonds. For example, a state faced with a current capital need for \$400 million could use the revenue bond approach if it could dedicate approximately \$40 to \$55 million (depending on the terms of the bonds) of annual revenues to debt retirement. Thus, if attempts to raise sufficient highway taxes and fees to meet the capital need out of current revenues fail, one alternative would be to raise highway taxes by a smaller amount and leverage the proceeds through credit financing. Sound cash management techniques may be able to further improve on the attractiveness of this option.

It should be emphasized that use of credit financing without a sound current revenue base can only postpone the actions that must eventually be taken to bring costs and revenues into balance. Often, the postponement may exacerbate the consequences.

OTHER FUNDING SOURCES

In addition to the revenue sources related to highway use, several states have dedicated portions of other taxes for highways. Prominent among these are natural resource severance taxes, e.g., taxes on gas, coal, oil, and minerals. The justification for using these proceeds for highways stems, in part, from the exceptional impacts on the highway network occasioned by the development and transportation of these resources. Two states, Massachusetts and Mississippi, use proceeds from a tax on cigarette sales for highways, whereas Maryland has dedicated a portion of the corporate income tax for highways.

CONCLUSION

Clearly, there are several sources of revenues and a large number of packages combining different sources that can be utilized by a state for increasing transportation funding. In developing these financial strategies, a transportation agency will need to carefully evaluate options according to the criteria mentioned earlier so that the final product(s) meets the indi-

vidual needs of the state. In addition to the inherent feasibility of a viable financial strategy, various other factors will also significantly affect the legislative outcome of the strategy, including the timing of a legislative bill, the credibility of the agency, the case made for meeting transportation needs, and the political negotiation process in the state (see Chapter 4).

CHAPTER FOUR

CRITICAL FACTORS IN THE FISCAL DECISION-MAKING PROCESS

INTRODUCTION

The reasons for the current fiscal pressures on highway transportation and the various methods for dealing with these pressures were examined in the previous chapters of this synthesis. It is becoming increasingly clear to transportation professionals that the flat, cents-per-gallon gasoline tax is unlikely to be as satisfactory a means of financing as it was in the past, in light of a continuing decline in gasoline consumption and the likelihood for disruption in petroleum supplies. However, this is not to suggest that the fixed levy should be abandoned. A higher levy, coupled with a mix of other revenue sources that exhibit better stability and yield potential, might suffice, or be appropriate, for meeting a state's needs. During 1980 and 1981, a number of states did modify the motor-fuel tax into a variable or a hybrid (fixed and variable) format and broadened the funding base to lessen dependence on fuel revenues. However, the current oil glut has shown that even a variable gasoline fee format is no panacea—indeed, absence of a floor for the variable fee schedule could result (and in some states has resulted) in revenue losses due to a decline in fuel prices.

The process of bringing about a change in transportation funding is examined in this chapter. A discussion of the critical factors in this process and some of the reasons for the success or failure of state agencies in gaining new funding or altering the structure of their funding is presented.

WHO MAKES THE DECISIONS?

The question of who makes the decisions may seem simplistic, but many transportation funding proposals fail because their justification is directed at the wrong audience. Sometimes it is difficult to identify the decision makers, but generally it is a set or subset of the following: the top executives of the transportation agency, the budget office and the governor's office;

the transportation and appropriation committees of the legislature and key staff aides; and the key leaders in the legislature (e.g., caucus leaders and whips). All of these individuals can be influenced to varying degrees by their constituencies, which may include other representatives in the legislature, key political action groups (citizen, industry, labor, highway user, issue groups), local elected officials, and citizens of the state. (In some states, transportation funding proposals are submitted for action to the entire state electorate by, for example, referendum.

The decision-making process itself can be hierarchical and iterative in nature, with the decision makers possibly being different at each step in the hierarchy. For instance, when the funding proposals originate in the transportation agency, the agency's chief executives, generally in consultation with the budget and governor's offices, decide on the specifics of the proposal. A different set of decision makers is involved when the proposal is drafted for specific action by a legislative committee and by the full legislature. Because successful passage of a funding proposal may require unanimous or near-unanimous agreement of all of these key decision makers, the utmost attention must be given to the analysis, drafting, and packaging of the funding proposal and to its guidance through the various steps of the decision-making process.

Relationships Among Decision-Making Groups

The relationships among the decision-making groups obviously can have a significant influence on both the decision-making process and the outcome. At the simplest level, the relationships may be characterized as being either cooperative or conflictual. The relationships may be influenced by several factors including political-party competition, interpersonal relations, differences in ideology and beliefs, and perceptions about each other's roles and capabilities.

CRITICAL FACTORS THAT AFFECT THE DECISION-MAKING PROCESS

Within this overall setting of a hierarchical, iterative process involving many decision-making groups and a variety of inter-group relationships, several major factors can contribute to the success or failure of transportation funding proposals. These factors may be expressed in terms of the following questions:

- Has the need for funding been adequately demonstrated and communicated?
- Does the agency have credibility (e.g., is it perceived as an efficient manager of resources)?
- Does the funding proposal, including both the receipts and the allocations (disbursements), have broad appeal and is the timing of the proposal politically appropriate?
- Does the proposal carry a coalition of support?

Demonstrating Need

Need can be demonstrated and perceived in a number of ways. When road and bridge conditions deteriorate significantly, this becomes the most convincing, albeit not the most desirable, evidence of a need for change (in funding or management practices or both). Where changes in road conditions are gradual, which is the typical situation in adequately funded and managed programs, need must be demonstrated by forecasts of future conditions under continuation of the current funding structure. Such forecasts can be based on a variety of assumptions and analytical techniques. The most credible forecasts are those that (a) are easy to understand, (b) are based on a comprehensive or systems view, and (c) examine the factors affecting both revenues and expenditures. Analyses that are incomplete, inconsistent, or too complex or confusing can damage an agency's credibility.

In a review of some of the successes and failures of transportation funding proposals over the 1979–1981 period, the establishment of need clearly appeared to be a factor that had a strong influence on the outcome. Officials in several states noted that enactment of funding bills had been favorably affected by the perception of legislators that there was a need for change in highway funding. In some cases, this perception arose from the deterioration in road conditions, and in others from agency cutbacks in staffing, capital projects, and subsidies to local governments. In most cases, the agencies also presented studies to show future highway conditions under prevailing revenue trends.

A survey of methods used by the states in preparing needs studies is presented in *NCHRP Synthesis of Highway Practice 72 (13)*. The report also presents a generalized procedural framework for estimating needs of each transportation mode and tempering those needs in light of limited financial resources. Critical steps in this process are:

- Determine the total transportation system requirements over the long term, i.e., developing the “big picture.”
- Develop criteria for determining transportation deficiencies, using, for example, design, safety, or performance standards.
- Develop criteria for establishing priorities. Two important criteria used by many states are (a) maintenance of existing

roads and bridges and (b) matching of all available federal funds.

- Identify system and project deficiencies.
- Establish project priorities for each mode. Projects are often grouped in the following categories in order to facilitate establishment of priorities: (a) committed projects that are high-priority items carried over from previous years; (b) physical replacement projects that may have been recently identified; (c) federally funded projects requiring state/local match; (d) minimum maintenance requirements; (e) minimum new projects or services to serve land-use changes, population growth, and needs of commerce and industry; and (f) remaining projects.
- Develop funding program packages and options. Alternative packages can include: (a) continuation of existing funding levels; (b) an inflation rate increase; (c) an inflation-adjusted increase; (d) the sum needed to match federal funds and undertake high-priority maintenance and capital projects; and (e) a sum negotiated between the executive and legislative branches of government.
- Analyze the impact of each program package and option.
- Evaluate possible new sources of funds.
- Make recommendations for programs and levels of funding.
- Negotiate funding and program options.

Figure 5 shows the sequence and the relationships among the steps involved in the framework for estimating transportation needs within constrained financial resources (13). The last few steps of this framework parallel the budget process. As stated in *NCHRP Synthesis of Highway Practice 72 (13)*, p. 19):

... [T]he major negotiations will likely be between the governor and the key members of the legislature who are responsible for recommending new funding sources. The amount of new funding that is approved (if it is approved) may bear no relationship to the amount recommended during the technical analysis. For example, if the program package selected for implementation requires an additional \$50 million, but there is only \$30 million available from a surplus general revenue account (the only possible additional revenue), then the \$30 million will have to be acceptable. The entire study process would have been at least partially successful, because documentation would have been required in any case to justify additional funding.

Obviously, short-term solutions to long-term funding problems are not the best solutions; they may simply delay the more painful decision of raising taxes to some later date. The essential point is that the transportation analysis must be comprehensive and thoroughly documented to provide the facts necessary to allow for a view of the problem that is longer range than simply a 1- or 2-yr estimate of project and funding needs.

Agency Credibility

Credibility and, to some extent, trust between the negotiators are often critical in the budget process. Agency credibility is frequently synonymous with the credibility of top executives of the agency. In extreme cases where this credibility is low, the legislature or public may be reluctant to increase transportation funding. In one state, where an agency was rocked by charges of inefficiency, changes in transportation funding were turned down year after year, even though there was considerable and mounting evidence that additional resources were needed.

Appeal of the Funding Proposal

The specific financial mechanism chosen to increase transportation funding, its timing, and the ties established between cost and benefit can also affect the outcome. For example, in some states early efforts to change the motor-fuel tax from flat to variable failed because the legislators, although willing to approve increases in the cents-per-gallon tax rate (which was done in some cases), were unwilling to turn over the "purse strings" to an agency. Whether this outcome would have been

different if the proposals had been drafted with some "protection" (e.g., ceiling on the tax rate) is open to speculation, but there is no doubt that the decision makers did not approve of the financial mechanisms that had been proposed.

In another case, a funding proposal apparently failed in part because an adequate relation was not demonstrated between the generated revenues and the ends to which they would be used. This can be a particularly acute problem with general fund or unified fund financing of transportation because a user group or subset of decision makers may be convinced that their

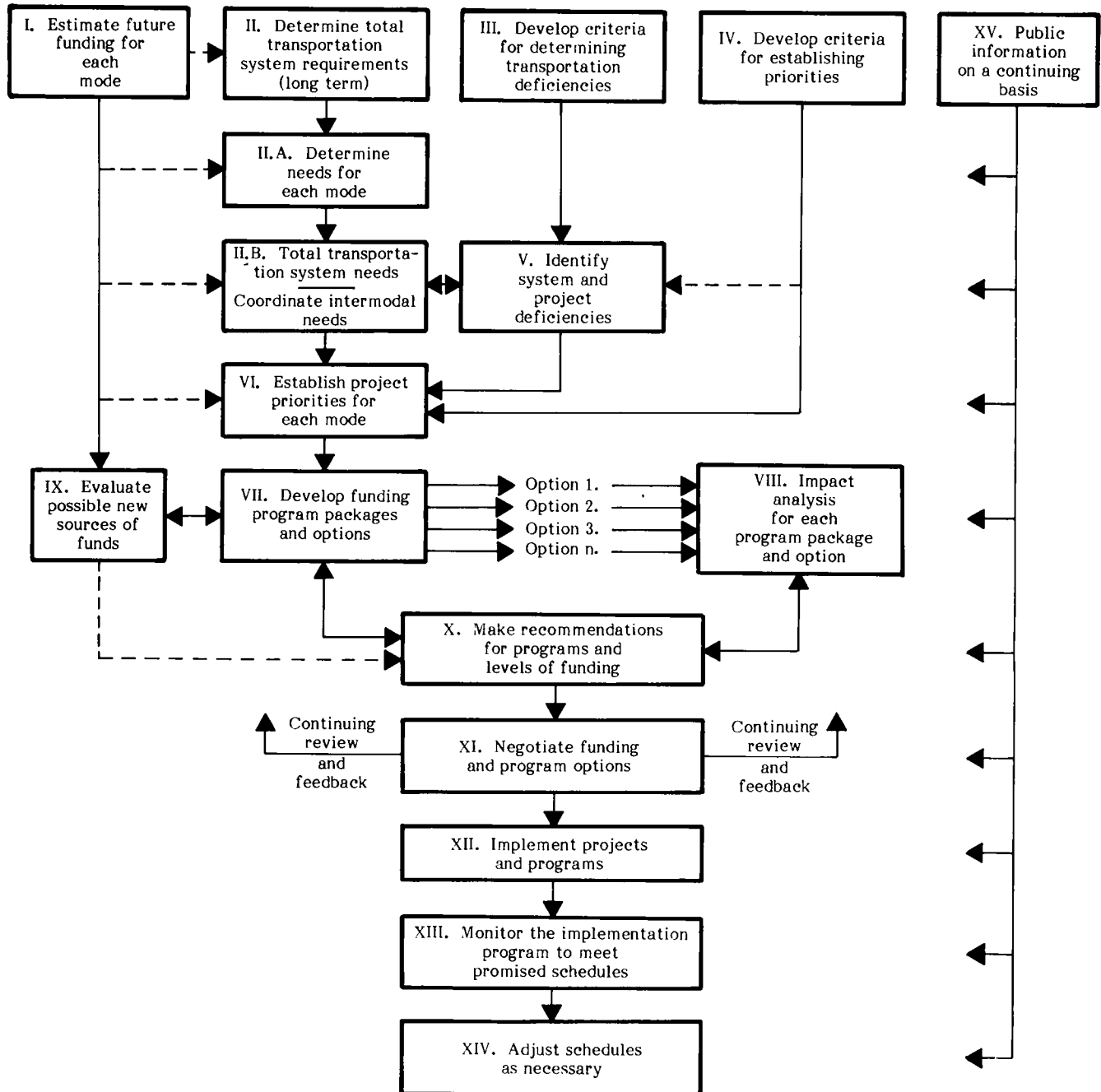


FIGURE 5 Generalized procedural framework for estimating transportation needs within constrained financial resources (13, p. 8).

tax revenues would (mostly) benefit other groups. Although not insurmountable, these problems need special attention to clarify the relationship between who pays for and who benefits from the funding proposal.

Coalition of Support

The chances for enactment of a funding proposal are greatly enhanced if it has a broad coalition of support. Several methods are used by the states to build such support, including interactions and consultations with industry and user groups, pursuit of broad-based funding to spread cost responsibility over a wide spectrum of users, and public education efforts concerning the effects of and need for transportation investments.

SUMMARY

The process of bringing about change in transportation funding is complex, dynamic, and probably unique to each state and

even each situation. However, a review of recent funding successes and failures suggests some clear guidelines:

1. Identify and maintain cooperative relationships with estimating transportation needs within constrained financial resources
2. Demonstrate need for transportation funding in a consistent and on-going basis through such efforts as monitoring road conditions and making future program and funding projections under alternative scenarios. Early and continuing communication of this need to the public, user groups, and members of the executive and legislative branches of the government is paramount.
3. Establish agency credibility (for example, by documenting and publicizing efficiency and performance improvements).
4. In advancing transportation funding proposals, use mechanisms that are likely to carry broad appeal. Identify such mechanisms by consulting with decision-making groups and industry and user groups.
5. Develop a coalition of support by building a consensus first on the need for highway transportation funding and then on the specific means of providing the resources.

CHAPTER FIVE

CONCLUSIONS

Without continuing maintenance and capital improvements performed as necessary, the effectiveness of physical facilities declines, public support is lost, and useful service life terminates prematurely. Highways are the most extensive and visible of modern public works facilities. Their construction, maintenance, and operation consume enormous resources. For example, the Interstate system, billed as the world's largest public works project, has cost about \$84 billion to date and will require still another \$40 billion for additional construction and substantial sums for annual maintenance and preservation. But it is only recently that the questions of whether or not adequate resources will be available to ensure the future viability of this massive system and what alternative expenditures can or must be foregone are being faced and given the necessary attention.

Traditionally, public support for highways has been generous. This support has been founded on the needs of a rapidly expanding economy for increased and improved transportation services, the enormous attractiveness of a system that promised

a highly flexible, comfortable, and personal level of mobility, and a general abundance of the required resources. However, there is increased awareness that resources are finite, and highway agencies must fight an increasingly competitive battle to obtain their share of the scarce public dollar. The battle is made more challenging by the fact that it must be won largely on the grounds of preserving mobility and, to a lesser extent, on the promise of major new construction to expand mobility.

A number of strategies are available to state and local governments in addressing their financial problems, including making better use of existing resources and reducing low-priority programs and services (see Chapter 2) as well as seeking funding changes (as discussed in Chapter 3). The financial management strategies and tactics most likely to be successful are those that (a) address the underlying causes of the fiscal problems, (b) are based on sound analysis of total transportation requirements and options; and (c) have the cooperation and support of decision-making and user-interest groups.

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