State of the Practice: Investment and Financial Analysis

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Financing of transportation improvements emerged as a significant issue in the latter part of the 1970s and is rapidly becoming the key issue of the 1980s. Pat Choate has eloquently described in America in Ruins (1) the state of our public infrastructure. What transportation lobbyists have warned about for years is finally happening: U.S. highways and transit facilities are wearing out and at the same time the money to renew them is being reduced. Transportation needs are staggering. The latest cost estimate for completion of the Interstate system is $38.9 billion; Interstate 4R needs are about $47 billion. Estimated capital requirements for the primary, secondary, and urban systems in the 1980s amount to more than $100 billion just to maintain current conditions. Transit capital needs are estimated at more than $40 billion dollars.

At the same time, we face a national debate on the intergovernmental and private-sector responsibilities for addressing the problem. New Federalism proposes turning back federal highway and transit programs to the states while state and local governments are scrambling to prevent collapse of their infrastructure. Federal revenue enhancement is discussed but very much uncertain. Major new authorization bills for highway and transit must await answers to the revenue question. Major debate is heating up on the relative cost-allocation responsibilities for highway improvements. The federal government is proposing to withdraw from transit operating support.

I must admit great difficulty in focusing on analytical methods for the 1980s when the policy issues and program directions are so unsettled. But on the other hand, we know that there is a massive problem to be addressed and we must begin to rationally develop programs and financing mechanisms if we are to turn around the trend of deterioration in our transportation systems that we have witnessed during the last decade.

Some of the major issues in my mind as I begin this paper are as follows:

1. How can we overcome public resistance to financing mechanisms to meet our capital investment and maintenance needs?
2. To what extent can tools and techniques of the analyst and researcher help solve our financing problems? What tools do we need to respond to the maintenance focus of future programs?
3. Whose responsibility is it to do urban transportation financial planning and forecasting?
4. Shall we emphasize near-term operational agency accounting and budgeting processes (e.g., 2 years), short-range financial planning and programming (say, 3-5 years), mediumto longer-range financial planning (5-15 years), or all of these?

My contribution is to address the state of the practice. I have to make some assumptions in order to narrow the range of uncertainty in this topic and put some bounds on the problem. Therefore, I will focus the state of the practice in the following ways:

1. I will address financing mechanisms primarily at the local level. This is principally to focus the discussion on what I believe is the critical level for this workshop.
2. I will focus on mediumand longer-range financial planning (5-15 years) and not on near-term accounting and budgeting tools; it is not that the latter is not important but only that this makes the topic manageable and deals with what I believe is the principal focus of the workshop.
3. I will deal only briefly with related investment analysis and priority programming tools.

LOCAL FINANCING MECHANISMS

Some may question why this section is included in the paper dealing with methods. I believe that our analytical techniques must be capable of addressing the merits of specific revenue proposals and calculating the financial, travel, and equity impacts of each measure. There must be a sound basis for moving forward to elected officials with specific programs and revenue proposals. The primary local financing mechanisms for highway and transit are listed below (2):

1. Local highway-financing techniques
   - a. User pay mechanisms
     - (1) Motor fuel tax
     - (2) Motor vehicle fees and taxes
     - (3) Parking tax
     - (4) tolls
   - b. Nonuser mechanisms
     - (1) Property tax
     - (2) Sales tax
     - (3) Local payroll or income tax
     - (4) Bond financing
     - (5) Private financing

2. Local transit-financing techniques
   - a. Broad-based taxes and revenue sources
     - (1) Retail sales tax
     - (2) Property tax
     - (3) Payroll tax
     - (4) Income tax
     - (5) Occupancy and other taxes
     - (6) Lottery
   - b. Charges on motor vehicle users
     - (1) Motor fuel tax
     - (2) Motor vehicle tax
     - (3) Bridge and tunnel tolls
     - (4) Commercial parking tax
   - c. Charges on property benefitting from transit
     - (1) Service charges
     - (2) Special-benefit assessment
     - (3) Tax increments dedicated to transit
   - d. Borrowing strategies
     - (1) Conventional bonds
     - (2) Equipment trust certificates
     - (3) Tax-exempt industrial bonds
     - (4) Grant anticipation notes
   - e. Joint ventures with private sector
     - (1) Leasing air rights
     - (2) Leasing property adjacent to transit facilities
     - (3) Participation in land development

In contrast to the states, which primarily rely on user fees, local municipalities collect most of their local highway revenue (69 percent in 1979) from general-fund appropriations and property taxes. Table 1 shows the existing distribution of municipal highway revenue sources. A recent American Public Transit Association (APTA) survey (3) indicates that sales taxes and property taxes are the predominant sources of local transit financing.

Table 1. Local sources of municipal highway revenue.

Source	Amount ($000 000 000s)		Percentage of Local Revenue Sources	
	1970	1979	1970	1979
General fund	0.9	3.1	38	53
Property tax	0.6	0.9	25	16
Highway-user revenue	0.2	0.5	8	9
Miscellaneous receipts	0.3	0.6	12	10
Bond proceeds	0.4	0.7	17	12
Total	2.4	5.8		

States and localities are obviously faced with many problems and inadequacies in existing revenue sources. Some of these problems include

1. A revenue base that is not sensitive to inflation,
2. Fluctuating construction costs,
3. Fluctuating fuel consumption,
4. Sensitivity to social and political pressures (e.g., Proposition 13), and
5. Increasing demands for transportation facilities, services, and maintenance.

The specific solution to highway and transit financing is unique to each local area. However, it is clear that additional revenue is needed in most areas. User-oriented mechanisms have been generally found to be more acceptable to the public and more equitable. However, they have suffered from the inability to keep pace with inflation. In contrast, nonuser mechanisms generally have the reverse characteristics. The magnitude of financial needs in most areas will likely require a package of mechanisms, user and nonuser.

Creative financing is the name of the game in real estate and should become the game plan for transportation in the 1980s.

Private-sector financing is put forth as one of the solutions. Toll financing is being considered. Metropolitan area sales and gas taxes (added on to those of the state) are being more widely explored. Employer taxes are being explored for transit financing. Special-assessment districts have been used successfully and may have wider application.

I will not begin to offer the pros and cons of the various mechanisms but, suffice to say, we must explore all of these and more. There are many legal and institutional issues associated with several of these. Also, there is little information available on what, if any, analytical techniques have been applied to determine impacts and equity among specific revenue mechanisms.

FINANCIAL PLANNING AND FORECASTING

A survey of FHWA field offices to collect recent examples of urban transportation financial planning studies confirmed my expectations that comprehensive urban transportation financial planning is not occurring to any significant extent. Following is a brief overall summary of studies submitted.

Eighteen reports were received based on our request for examples of financial planning contained in urban transportation planning reports. These reports addressed in varying degrees the anticipated revenues to meet projected capital improvement costs. They were prepared by 4 states, 1 city, 1 chamber of commerce, and 12 MPOs.

Twelve of the reports were long-range urban transportation studies to the year 2000. Six were in the short to medium (5- to 10-year) range. Six dealt with highways, four solely with transit, and eight with both modes. Most reports were for intermediate and large metropolitan areas. Five, however, were for smaller urbanized areas.

Generally, all reports expressed the need for financial planning, largely because of the uncertainty of federal funding, inadequacy of revenues, inflation and rapidly rising capital, and operational and maintenance costs. Most reflected the need for increased revenues to meet the shortfall between projected costs and revenues from existing sources.

The most recent studies decried the uncertainty of future federal funding, particularly since federal funding provided the bulk of available revenues. Most difficult to predict was the federal funding for Interstate substitution, the Federal Aid Urban System (FAUS), revenue sharing, and transit capital grants and operating subsidies. Most reports projected future federal funding on the basis of past funding, but few placed real confidence in these estimates. Several stated that stable funding could only come from increased federal motor fuel taxes.

Some of the reports recommended a more equitable disbursement of federal and state funds by the states and requested elimination of other agency revenues from state fuel taxes. Several reports stressed the need for greater state fuel taxes and other taxing mechanisms to improve state highway revenues.

Inflation causes considerable difficulty to fiscal forecasting. Most of the reports used constant dollars in estimating future costs. Some used different inflation rates (high or low) to give a range of future costs. Almost all of the long-range studies reported that inflation greatly exaggerated the differential between fixed revenues and spiraling costs.

Most of the earlier studies offered little or no solution to the sizeable shortfalls between revenues and costs other than increasing revenues from federal sources. The more recent studies, however, recommended that increased revenues be found from local sources.

The following were recommended as potential local revenue sources for highways and transit:

1. Local-option fuel tax,
2. Local sales tax,
3. Local income tax,
4. Commuter tax,
5. Employer/employee tax,
6. Household tax,
7. Payroll tax,
8. Municipal bonds,
9. Special-assessment districts,
10. General fund,
11. Transit impaction fees,
12. Increased fares,
13. Parking fees and licenses,
14. Tolls,
15. Merchant subsidies,
16. Equipment trust certificates (transit),
17. New buy/lease arrangements (transit),
18. Real estate value increment, and
19. Private financing.

Private financing for highway capital improvements was discussed in several reports. Land developers routinely fund the development of local streets and all or portions of arterials that abut on or provide access to the development. Also, adjacent property owners are frequently assessed for street improvements. In some cases, special-assessment districts are formed to fund road and street

improvements that would benefit the district. The Baltimore Regional Planning Commission reports that nearly 10 percent of Baltimore County's highway capital program is paid by developers and petitioners and is not considered as income to the general fund. Benefit assessments, merchant subsidies, and value capture are other techniques for raising private funds.

A literature review for a recently initiated FHWA contract on the use of private funds for highway improvements has revealed some additional examples of private-sector involvement in highway funding.

In Broward County, Florida, a computerized model has been prepared to assess charges to developers for necessary roadway and intersection improvements within a 4- to 6-mile radius of the development. A trip-generation and assignment procedure is used to determine the impact on roadways and intersections. The developer is assessed when there is a projected impact on the level of service, and the funds are accumulated in a trust fund until the improvements have been made.

In Denver, Colorado, quasi-public special-improvement districts are funding and constructing infrastructure improvements. Under enabling state law the districts have authority to tax property within the district. With taxing authority, the district is able to use general obligation bonds to finance its capital improvements. Three contiguous districts in southeast Denver have formed the Southeast Public Improvement Authority. The plan for the joint authority has 42 road improvements with an estimated cost of $18 million. This includes an interchange on I-25. Although the district is quasi-public and must obtain reviews and approvals from local agencies, it is essentially a creation of private property owners.

A brief description of the individual financial studies follows.

Urban Area Transportation Study, Winston-Salem, North Carolina

In a joint state department of transportation and MPO study, three different scenarios were employed as a means of forecasting future funding availability to implement the transportation plan. They are

1. Funding continuing at current trends,
2. Funding continuing at historic trends, and
3. Funding below current trends.

In each scenario, a low and a high forecast are given in terms of lane miles that can be constructed. This is obtained by combining lane miles funded federally or by the state and lane miles funded by private developers. On this basis a detailed listing of projects by lane mile is given for each scenario. The report uses lane miles for selection and comparison; the conclusion is that it is not possible to estimate future costs at this time.

Regional Transportation Plan, Portland, Oregon

A comprehensive plan for the development of transportation facilities to serve the expected needs to the year 2000 was presented. It documents the substantial public financial commitment required for both highways and transit and the necessity for the development of new sources of revenue.

The report discusses federal, state, and local funding sources and compares revenues to costs. The total cost of capital highway improvements, operation, maintenance, and rehabilitation is estimated at $2.3 billion (1981 dollars). Normal revenues are expected to leave a shortfall of $1.25 billion, which must be borne by increasing non-highway-related local revenue sources. Additional sources of revenue are not detailed other than to provide several general financing options that are available to the region.

The financial analyses for the recommended light rail transit system show that it will cost approximately $2.5 billion to build and operate. Even with an assumed federal operating subsidy, there will be an annual operating shortfall of approximately $226.8 million. Local sources for meeting the shortfall were not identified.

Future of Transit Operating Finance, Southern California

The future impacts of California's Proposition A, the phase-out of federal subsidies as they affect the transit operation in Southern California, are discussed. Over the past 15 years transit in the Southern California Association of Governments (SCAG) region has gone from a self-supporting system to a much larger operation that now requires $300 million per year in subsidies. These subsidies are not attributable to the growth of the system but rather to a steady decrease in real fare rates and somewhat less to the real increases in operating cost per patron.

There are 38 transit operators in the area; the Orange County Transit District is the largest. The operators in Los Angeles and Orange Counties are in the most trouble with the pending loss of operating subsidies.

Some recommendations are made to return to zone fares and to reduce and eliminate some discount fares. The possibilities of raising revenues by the establishment of benefit-assessment districts is discussed. Benefit assessment is based on existing space for operations rather than for capital improvements. Value-capture mechanisms are suggested for new development.

A paper on the value-capture tactic is included with the report and an assessment is shown for a hypothetical Mid-Wilshire site. These mechanisms are to be more fully reported in an upcoming transit capital study.

Financing Transportation Improvements, Rapid City, South Dakota

The report's objectives were to determine the area's future transportation needs to the year 2000 and to assess the area's ability financially to meet these needs. As noted, it makes little sense to propose transportation improvement programs beyond the area's ability and desire to implement them.

The report addresses the following financial concerns:

1. Financial resources currently available,
2. Year 2000 financial resources, and
3. Adequacy of projected financial resources to meet transportation needs.

A number of recommendations for increasing revenues are made, e.g., special assessments, equitable distribution of funds, systematic monitoring of revenues and expenditures, bonding for capital improvements, increased utilization of tax levies, and special innovative taxes such as a city gas tax and an incremental tax.

Street and Road Maintenance Needs, San Francisco Bay Area

This study outlines the needs of the Bay Area's

cities and counties for increased revenues by local gas tax to offset spiraling maintenance costs and reduced revenues. There are 17 000 miles of county roads and city streets in the Bay Area. Yearly maintenance needs amount to $268 million. Local jurisdictions have budgeted only $167 million for maintenance yearly, which is $101 million short of the required amount.

In the study it is estimated that a 1-cent local gas tax would raise $26 million a year, which necessitates a regional gas tax of 5 cents to meet the maintenance shortfall for the next several years. Recent state legislation allows counties to piggyback on the state gasoline tax.

Chamber of Commerce Regional Mobility Plan, Houston, Texas

A unique plan was that prepared by the Houston Chamber of Commerce in cooperation with state and local agencies. Such an undertaking indicates the concern of the private sector in advocating transportation needs to facilitate economic development.

The Chamber's multimodal regional mobility plan includes (a) more than 170 miles of added capacity on existing freeways, (b) almost 300 miles of new freeways, (c) more than 30 miles of high-capacity transit ways, (d) about 1400 miles of new arterial streets and roads, (e) new grade separations at roads and railroads, (f) several thousand new buses, (g) maintenance and park-and-ride facilities, and (h) rehabilitation of old freeway surfaces.

The estimated cost of the plan is a staggering $16 billion (1981 dollars) over the next 15 years. Existing sources will yield an estimated $6.9 billion over this same period, leaving a shortfall of $9.3 billion.

The report summarizes the options available to close the gap. New funding sources include

1. An increase in the area's share of state funds to 30 percent,
2. The implementation of a 50 percent fare-box increase,
3. The conversion of the motor fuel tax to a percentage and a significant increase,
4. The application of state and local sales tax to motor fuels,
5. An increase is motor vehicle registration fees,
6. The dedication of motor vehicle sales tax revenues,
7. The use of toll facilities wherever feasible,
8. An increase in city and county capital expenditures for bridges and roads,
9. The reestablishment of the state public transportation fund, and
10. The issue of revenue bonds for selected MTA capital improvements.

The feasibility of private-sector participation is also discussed.

The analytic base for most of these studies must be described as relatively primitive. Trend-line analysis is generally the most sophisticated forecasting technique used. Little or no impact assessment is conducted. The operator-specific studies tend to be more quantitive and analytic. Only one study dealt extensively with maintenance needs.

The state of the practice reflects financial planning as often a last step in the planning process and too often an afterthought. The long-range transportation plan is adopted, and then questions begin to surface regarding the financial feasibility. Existing revenue sources are examined and projected through a trend-line procedure. A shortfall is quickly identified and suggestions for additional revenue are mentioned generally without thorough analysis or recommendations for implementation of specific mechanisms. Only in relatively few cases are there systematic efforts to fiscally constrain the transportation plan through an iterative process. Life-cycle costing is not yet a reality in most plans and analyses. Some higher-growth areas are beginning to develop ultimate land use and transportation plans, to cost them out, and then gradually to pare the plans and program based on likely revenues.

The desirable components of a financial or fiscal planning study would seem to include doing the following:

1. Review and analyze existing revenue sources;
2. Forecast revenue based on existing revenue sources;
3. Cost out transportation plans and/or long-range program;
4. Compare proposed plan and/or long-range program costs with projected revenues;
5. Consider changes in plan or program emphasis (e.g., TSM);
6. Constrain plan or program and/or develop new or expanded revenue mechanisms;
7. If plan or program is to be significantly constrained, cycle back through travel and land use forecasts;
8. If new or expanded revenue sources are to be developed, analyze revenue potential, pros and cons, impacts, etc., and provide concrete recommendations for state and local officials;
9. Cycle back through process as necessary.

These steps are shown conceptually in Figure 1.

HIGHWAY FINANCIAL FORECASTING METHODS

A brief review of state transportation revenue-forecasting methods may provide some insight for improved urban financial planning methods. The Oregon Department of Transportation surveyed the other states in October 1981 regarding their revenue-forecasting procedures. Thirty-two states reported on such procedures.

The different forecasting techniques or types of models were classified as follows:

1. Historical trend analysis (including simple linear regression analysis with time as the independent variable) coupled with an assessment of conditions expected over the forecast period;
2. Single-equation multiple-regression model;
3. Multiple-equation econometric model; and
4. Other.

The results are summarized in Table 2.

Several conclusions emerge from this limited (and admittedly unscientific) survey of the fuel tax revenue-forecasting procedures used by other states. Perhaps the most obvious is that the various states use a wide variety of different forecasting methods. In terms of the complexity of the procedure, these range from what one state characterized as a simple educated-guess approach to relatively complex multiple-equation econometric models.

The largest number of states continue to rely primarily on a relatively nonformalized judgment approach to forecasting their fuel tax revenues. Typically this involves an analysis of historical and current trends and a judgmental assessment of how these trends may be modified by national and local conditions expected over the forecast period.

The second largest number of states use a single-

Figure 1. Financial forecasting and the transportation planning process.

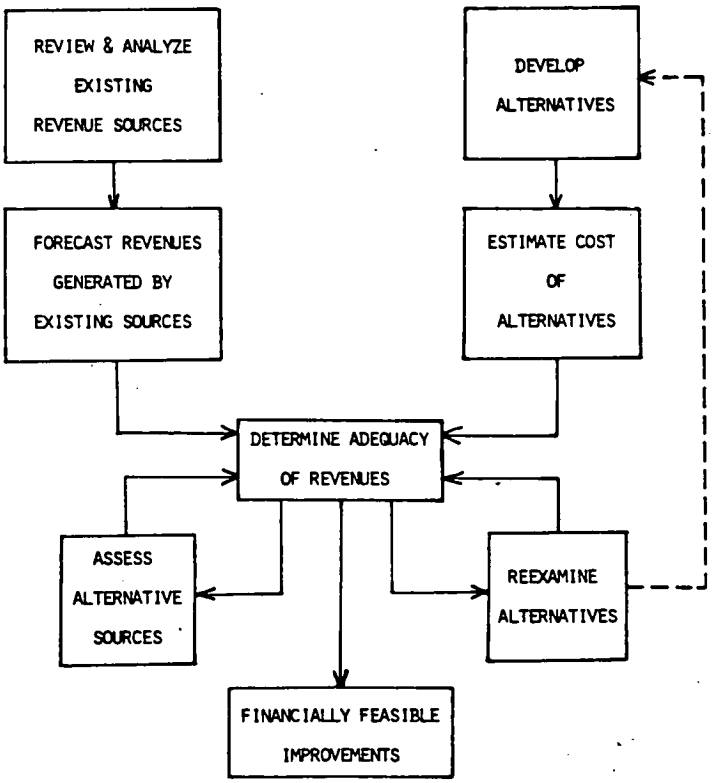


Table 2. Classification of fuel tax revenue-forecasting methods used by states.

State	Forecasting Method Used: Historical Trend Analysis	Single-Equation Multiple-Regression Model	Multiple-Equation Econometric Model	Other
Alabama	X		[a]	[a]
Arkansas	X			
California		X		
Connecticut		X		
Delaware	X			
Florida	X			
Hawaii				X
Idaho		X		
Illinois	X			
Indiana	X			
Iowa	X			[b]
Kansas	X			
Kentucky			[a]	X
Mississippi		X		
Missouri	X			
Montana	X			
Nebraska	X			
Nevada	X			
New Mexico				X
New York	X			
North Carolina		X		
Ohio	X			
Pennsylvania	X			
Rhode Island			X	
South Dakota	X		[a]	
Texas			X	
Utah		X		
Virginia			X	
Washington		X		
West Virginia	X			
Wisconsin			X	[b]
Wyoming	X			

Note: Data are from the Oregon Department of Transportation.
[a]Has used this method in the recent past but is not currently using it.
[b]Is experimenting with but does not yet actually use this technique as primary forecasting method.

equation multiple-regression model as their primary forecasting method. Although the precise form of these equations varies from state to state, fuel consumption (or fuel tax revenue) is typically modeled as a function of a limited number of independent variables such as real income per capita, number of registered vehicles per capita, and the real price of gasoline. The forecast values of the independent variables are usually obtained from a national econometric service such as Data Resources Inc. or from an econometric model of the overall state economy.

It appears that relatively few states use a more complex multiple-equation econometric model approach as their primary fuel tax revenue-forecasting procedure. A few states have used this type of approach in the past but have found that a simpler approach tends to forecast just as well and has the added advantage of being easier to explain and use. At any rate, the more complex multiple-equation models that are used by some states tend to be fairly specific to these states and thus are often not easily adaptable for use by other states.

NCHRP (Project 8-22) sponsored the formulation of a forecasting method to project state transportation revenues that takes into consideration current and anticipated changes in economic and energy conditions and policies. The procedure emphasizes forecasts of the principal determinations of highway revenue: motor fuel consumption, motor vehicle registration, and licensed drivers. This model is in the process of being tested in several states.

The model, as with most other state revenue-forecasting models, would have application to urban transportation only to the extent that gas tax and motor vehicle revenues are to be analyzed. As mentioned earlier, these user mechanisms are a relatively small part of local financing sources.

Financial management and forecasting at the

county and municipal levels is principally focused on budgeting and accounting and the function is generally housed in the budget office. Forecasts generally have a one- to two-year horizon. Local governments are showing considerable interest in multiyear forecasting, i.e., projecting revenues and expenditures for three to five years. The perceived advantages are to be able to take steps earlier to ensure that revenue and expenditure gaps will not occur and that the jurisdiction need not resort to last-minute measures to avoid fiscal difficulties. Transportation expenditures and revenues are of course part of the overall local financial-forecasting process, although transportation expenditures generally account for less than 10 percent of local budgets.

TRANSIT FINANCIAL-FORECASTING METHODS

A recent UMTA publication (4) describes transit state of the practice in financial forecasting. Discussions were held with 26 operators throughout the United States. Discussions with the operators attempted to examine both the annual budgeting process and the longer-range forecasting procedures, e.g., five years. However, only in rare instances has a great deal of effort been devoted to planning beyond the one-year horizon. Most operators cited too many unknowns and external factors as the reasons for not being able to perform credible longer-range financial planning. Discussion focused on four areas: fare revenues, labor costs, maintenance costs, and nonfederal subsidies.

The discussion revealed that methods, data processing, and data-collection procedures were designed for operating departments and accounting functions, not for financial forecasting. Two observations were made: (a) financial planners and operating staff must work together, and (b) much of the data needed by both groups should come from the same source. Transit financial forecasting is described as a process of integrating information internal to a transit agency together with external information for the purpose of determining what resources will be required for a given level of service or alternatively what level of service can be provided with a given level of resources. Financial forecasting picks up where the accounting and budget function leaves off and is a forward-looking emphasis on the economic consequences of alternative assumptions.

At the Airlie House conference in 1981, a paper by Jones and Wentworth for the financing workshop described the development of their new modular financial-forecasting system at Tri-Met in Portland, Oregon. Figure 2 shows a schematic financial-forecasting system. The system would include a number of techniques or models, each forecasting a distinct segment of costs or revenues, which are applied together to predict future cash flows for the agency. Having examined this structure in the light of the state of the art, Jones and Wentworth went on to suggest research needs in five areas: standardization of financial-planning package(s) for transit agencies, development of applications portfolio of revenue-forecasting models, development of applications portfolio of operations cost-forecasting models, development of applications portfolio of capital programming and construction models, and provision of training and support.

The proposed financial-forecasting system does not explicitly link to the travel demand forecasting process. Ideally, transit pricing and operating strategies would feed not only into the cost models but also into the travel demand modeling process.

INVESTMENT ANALYSIS AND PRIORITY PROGRAMMING TOOLS

Although there has been significant progress at the statewide level in the use of needs assessment, in-

Figure 2. Transit financial-forecasting system.

REVENUE MODELS		COST MODELS	
INPUT	Revenue Line Items	Cost Line Items	INPUT
NON-CAPITAL REVENUES	Fare Revenues Tax Base Revenues Federal Operating Assistance (Section 5) Federal Technical/Demonstration Grants Miscellaneous (interest on investments, etc.) State Operating Assistance Other	Bus Operator Costs Other Transportation and Operations Costs Fuel Maintenance General and Administrative including pension cost	OPERATING COSTS
CAPITAL REVENUES	Federal Capital State Capital Local Capital Other Local Assistance	Capital Costs: Vehicles, facilities and equipment Vehicle replacement Debt Service Project Scheduling Life-cycle Costing	CAPITAL COSTS
OUTPUT	SUMMARY FINANCIAL FORECAST		OUTPUT

vestment analysis, and priority programming tools, little application has been made to the urban transportation planning process. At the statewide level the highway needs and investment analysis process typically deals with capital, operational, and maintenance options as simply conceptualized in the matrix shown below, which portrays trade-offs between and within the capital, operational, and maintenance categories of investment (5):

	Total Funding Level		
Needs	$X	$Y	$Z
Capital			
Option 1	X^1	Y^1	Z^1
Option 2	X^2	Y^2	Z^2
Option 3	X^3	Y^3	Z^3
Maintenance			
Option 1	X^4	Y^4	Z^4
Option 2	X^5	Y^5	Z^5
Option 3	X^6	Y^6	Z^6
Operating			
Option 1	X^7	Y^7	Z^7
Option 2	X^8	Y^8	Z^8
Option 3	X^9	Y^9	Z^9

The urban planning process and travel demand forecasting have principally focused on alternative capital plans and programs. We need to reorient our focus and the tools with which to analyze alternative investments. It appears that new tools linking highway maintenance and rehabilitation with operations and major construction investments and then with urban travel demand forecasting procedures would be a necessary input to investment analysis and priority programming. Outputs of the travel demand forecasting process such as volumes, speeds, and truck movements provide useful input to determining maintenance, operational, and capital needs and assessing cost-effectiveness of such investments, but there must also be a link back to travel demand as investment levels change.

Some existing statewide highway investment tools that may have some application to urban investment analysis include the Highway Performance Monitoring System (HPMS) models, HWY NEEDS model, HIAP model (6), and pavement management tools developed by FHWA and others. HWY NEEDS is primarily used to analyze highway capacity and geometric deficiencies section by section. HIAP is a priority programming tool (taking input from HWY NEEDS or other similar models) and is based on maximizing user benefit. HPMS models that will soon be made available to the states will provide the capability to do more complex investment analyses by calculating performance measures for each investment level.

Pavement management is of great interest now, both to FHWA and the states. A number of pavement management information systems have been developed. The systems generally rank pavement sections based on factors such as deflection, roughness, and cracking. Composite indices of performance are generally calculated.

Remaining structural life is estimated based on AASHTO relationships from the road tests. At least one MPO, Metropolitan Transportation Commission (MTC), in Berkeley, California, has done a pavement management inventory and analysis. MTC provided staff support to the counties and cities in the region to develop their backlog costs (deferred maintenance) and ongoing maintenance costs. Backlog costs for the area were estimated to be $300-500 million. Annual ongoing maintenance costs are estimated at $268 million. Local jurisdictions only budgeted $167 million in the last year. Figure 3 (7) shows how deterioration accelerates as roads get older. If maintenance is not done, pavement condition worsens and the street segment slides down the curve into the next maintenance category and repair costs accelerate.

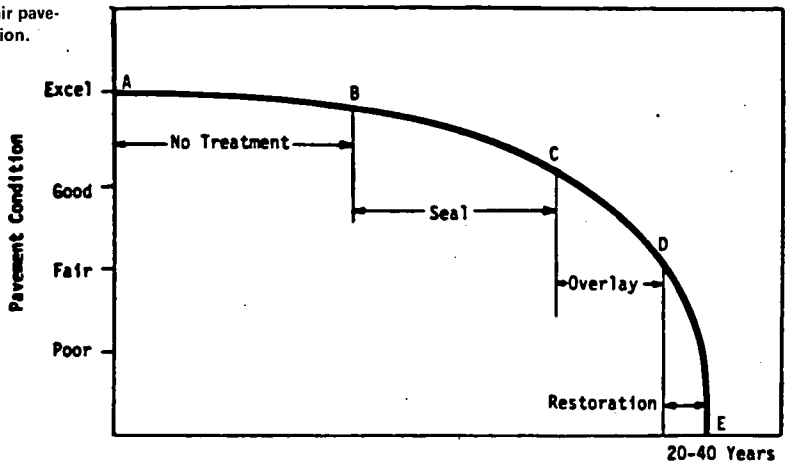
INTERGOVERNMENTAL RESPONSIBILITIES

Many actors come into the process when we move from travel forecasting into financing and implementation issues. The role of the MPO in all of this is less than clear. Budgeting and short-range financial planning are traditionally operational agency responsibilities and should probably remain that way. Improvements are needed in those areas, as described in the section on transit financial forecasting. There does seem to be a void in medium-range to longer-term urban financial planning (5-15 years), which from our informal survey is beginning to be filled by MPOs and in a few cases states, cities, operators, or even the private sector. As with other areas of transport planning and project development, the specific state and local transit or highway responsibilities for financial planning and investment analysis are difficult to generalize. MPOs have traditionally focused on long-range capital transportation planning with little attention to financial forecasting, alternative levels of investment, and maintenance needs. Transit operators and municipalities with local transit and street functions are typically involved with the budgeting process and very short-range financial forecasting. The state DOTs have made the most progress in medium- to longer-range financial planning, investment analysis, and programming. These analyses generally cover both rural and urban sections of the state highway system. State revenue mechanisms are developed principally to fund the state system; there is some passthrough to help fund county and municipal systems.

What then are the roles of the MPOs and local operational agencies? Transit agencies are attempting to move beyond their one-year budgeting focus to a three- to five-year short-range financial planning horizon. Municipalities and counties are struggling to do the same with their street and road responsibilities. To the farthest extent possible, they are searching for other revenue mechanisms. The MPO then may have a longer-range role in the 5- to 15-year horizon to assess capital and maintenance needs, alternative investment levels, and revenue mechanisms for the transit and highway system in the region. But what functional or administrative systems should be included? State responsibility and input on the higher-level systems are obvious. To the extent that local transit agencies and highway agencies assess needs on their systems, these can be input to a regional financial and investment analysis.

Assuming that this can be accomplished technically, what then is the MPO role in analyzing revenue mechanisms? The various roads and streets in a metropolitan area are the financial responsibility of the state, counties, and cities, each with their separate revenue mechanisms. On the transit side, revenue generation is often the responsibility of a regional transit authority. The MPO as a forum of local elected officials will certainly have a policy role in debating new or expanded revenue mechanisms in the area, particularly where areawide revenue schemes are being debated. The state policy role is also important in determining highway and transit revenue mechanisms, improvement programs, and state aid to localities for highways and transit. Again, it is very difficult to generalize such responsibilities.

Figure 3. Treatments needed to repair pavement at different stages of deterioration.



JURISDICTION	TREATMENT NEEDED (% of Area) (Approx. Position on curve) NT (A-B)	S (B-C)	OL (C-D)	R (D-E)	BACKLOG COST (millions) of $	CYCLICAL NEEDS (millions) of $	CYCLICAL EXPENDITURES (millions) of $
Alameda Co.	40	38	14	7	23.3	3.6	0.6
Napa County	72	22	6	0	1.8	1.5	1.6
Alameda	76	16	7	1	1.0	0.7	0
Albany	60	19	19	2	0.8	0.1	0.2
Berkeley	38	17	19	27	19.6	1.3	0
Daly City	63	17	16	4	3.9	0.8	0.3
Fremont	68	11	18	3	11.7	2.2	0.5
Oakland	31	20	44	5	37.9	3.2	0.3
San Francisco	60	28	9	2	12.5	7.9	3.5
San Leandro	69	23	6	2	1.9	1.0	0.5
San Mateo	59	37	4	0	2.2	1.1	0.2
TOTALS (for sample)	56	24	15	5	116.5	23.7	7.7

WHERE DO WE GO FROM HERE?

Some obvious conclusions emerge from this discussion:

1. We do have a financial crisis in meeting urban transportation needs. Federal policy directions have increased uncertainties in local financing.
2. Expanded and new state and local revenue sources must be found to finance urban transportation needs.
3. Medium-range to longer-term urban transportation financial planning must be instituted to lend realism to plans and programs. Some interaction will be necessary among transportation plans, financial plans, and land use plans.
4. Intergovernmental responsibilities for budgeting, short-range fiscal analyses, and medium-range to long-term financial planning must be clarified.
5. Responsive analytic techniques are needed to analyze and forecast revenue mechanisms and associated impacts.
6. Improved transit operator cost and revenue models are needed. These models should also link with the travel demand forecasting process.
7. We need new or revised urban highway investment analysis tools that can analyze maintenance, reconstruction, and TSM and major construction alternatives and interact with the urban travel demand forecasting process.

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Research Needs

1. Impact of deregulation on urban public transportation services

a. Assess the magnitude of new service options to be introduced in a deregulated environment
b. Assess the probable impact of new service options on demand for each service and shift from other services
c. Assess the potential change in revenue from the introduction of new service options
d. Assess the potential change in fare structure and the resulting impact on demand for the services
e. Assess the probable pricing policies that may result from the introduction of competing services of different quality
f. Assess the impact on each market segment of each of the above steps

2. Evaluation of investment in traffic operational improvements

a. Develop better estimate of user benefits, fuel consumption, and air-quality impacts of traffic operational system efficiency improvements
b. Gather data for
(1) Various vehicles in the fleet
(2) Stop and speed-change cycles and respective fuel consumption data under different system configurations and levels of service

3. Alternative services--introduction of new service

a. Determine shifts in demand as a result of introduction of new services
b. Determine financial success or viability of a new service and impact on existing service
c. Develop better understanding of factors that would influence ridership choice and the extent to which they would influence it (factors other than service variables such as fare, time, frequency)

4. Estimation of highway goods-movement demand

a. Use prior research to document our current understanding of highway goods-movement demand--its characteristics and sensitivity to cost allocation and regulation issues
b. Collect information and data as necessary to address gaps in our current understanding of highway goods-movement demand
c. Develop relationships between demand characteristics and economic and institutional factors affecting emand characteristics at two levels--system and facility specific
d. Develop guidelines on application of these relationships for revenue and demand estimation in systems and project-planning contexts
e. Disseminate study results

5. User-side subsidies to increase revenues and service diversity

a. Develop analysis to explore types, costs, and benefits of user-side subsidy programs for transit systems of different sizes and complexities as well as demand and added net revenues from increased fare levels for the general riding public
b. Look at cost impacts of different selected eligibility-group definitions
c. Analyze conditions (e.g., regulatory, financial) needed for private-sector investment to provide new services that are eligible for receipt of user-side subsidies
d. Set up demonstration projects to generate missing analysis data (e.g., large city public transit user-side subsidies) and refine analysis methods

6. Impact of ridesharing on transit revenues

a. Assess feasibility of initiating a ridesharing-vanpooling program in area in coordination with transit service
b. Determine ridership for ridesharing
c. Estimate effect on transit ridership
d. Estimate effect on transit service level and possibility of reduced fixed-route cost
e. Determine effect on traffic volumes
f. Estimate resulting tr nsit deficit structure

7. Financial impacts of highway management

a. Assess the cost and travel behavior impacts of such strategies as automobile-restricted zones, congestion pricing, alternative toll policies, etc.
b. Improve current demand models to specify these strategies and to obtain empirical results on which to calibrate travel behavior

8. Estimation of land value changes as result of transport investment by using demand-analysis principles and tools

a. Look at both cross-sectional and most important longitudinal response to actual investments
b. Correlate measured change in land value with both accessibility and facility demand by recognizing exogenous factors (e.g., availability of vacant/developable parcels, zoning)
c. Model developer's potential response to alternative value-capture mechanisms

9. Analysis of financial impacts of parking-management strategies

a. Analyze response to longitudinal changes in parking-fee levels and structure
b. Differentiate fringe from independent parking facilities