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# State and Local Finance Issues: Roads and Transit

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# Contents

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REVENUE FORECASTING METHODS IN WASHINGTON STATE Ralph F. Wilhelmi .....	1
BLOCK GRANT TRANSPORTATION FINANCING: THE INTERSTATE TRADE-IN EXPERIENCE Arnold J. Bloch and William H. Crowell .....	6
FINANCING LOCAL ROADS IN INDIANA: A STATUS REPORT Jon D. Fricker .....	10
ALLOCATING FEDERAL TRANSIT SUBSIDIES: A CRITICAL ANALYSIS OF ALTERNATIVES John Pucher .....	14
AN EQUITY ASSESSMENT OF FEDERAL HIGHWAY USER CHARGES Lloyd Henion and John Merriss .....	24
TRANSIT AND THE CALIFORNIA LEGISLATURE: A PRACTITIONER'S PERSPECTIVE Steven J. Schnaidt .....	31
MAXIMIZING THE USE OF PRIVATE CREDIT MARKETS FOR TRANSIT INVESTMENTS Jeffrey A. Parker .....	37
ALTERNATIVE PUBLIC FINANCING FOR IMPROVEMENT OF THE INDUSTRIAL CANAL LOCK IN NEW ORLEANS Walter C. Carlson .....	42

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# Revenue Forecasting Methods in Washington State

RALPH F. WILHELMI

## ABSTRACT

A portion of the work performed in developing and using an econometric forecasting model of Washington State fuel tax revenue is reported. The administrative and legal frameworks within which the model was developed are outlined, and the administrative inputs to the final forecast are detailed. A three-equation model of fuel demand is developed. The first equation forecasts gasoline gallonage; the second equation forecasts diesel gallonage; and the third equation is an identity that defines total fuel gallonage. Each forecast is by quarter on a seasonally adjusted annual basis. The quarterly forecasts are averaged to yield annual forecasts for 8 years. The annual forecast is then spread to months with seasonal adjustments for the current fiscal year. A tax rate is determined and a revenue forecast is developed. The results of the model forecasts are compared to actual fuel demanded during forecast periods (months, quarters, and fiscal years).

Forecasting of fuel tax revenues has assumed increasing importance in Washington during the past decade because of the impacts of fuel supply interruptions and an increase in fuel prices. Since the first fuel crisis in 1973, considerable emphasis has been placed on devising forecast procedures that are responsive to anticipated changes in fuel supplies, fuel prices, and general economic conditions.

In Washington State the current administrative and legal forecasting frameworks originated in the mid-1970s and have changed over the years to accommodate new legislative and administrative requirements. Work on an econometric model began in the summer of 1981 when two disparate forecasts, one using a saturation process and one using an econometric equation of monthly gasoline consumption, were prepared and the final revenue estimates were more than \$100 million apart for a biennium. Although both forecasts had supporters, the decision was made to develop a new econometric model that would incorporate assumptions from each of these forecasts in a more orderly and technically defensible way.

Thus, the disparate forecasts, a new legislative requirement for quarterly forecasts for the current biennium, and the desire to interlock the fuel tax forecast with other Washington State economic forecasts, all prompted the decision to initiate a new forecasting methodology based on econometric modeling procedures.

The legal and administrative backgrounds of the Washington State fuel tax forecast are outlined in this paper followed by a description of the technical and pragmatic reasons for selection of model variables and equations. The paper ends with a comparison of forecast predictions with actual fuel consumption and revenue collections.

## LEGAL FRAMEWORK

Washington State law requires quarterly estimates of future revenues for all state revenue sources for the current biennium. The Department of Licensing as the collector of fuel tax revenue has the legal responsibility to forecast this revenue. The Office of Financial Management (OFM) has the legal responsibility to forecast the economic conditions in the state for the same period as a basis for the forecast of revenues. The Washington State Department of Transportation (WSDOT) has the legal responsibility to manage the cash flow and expenditures from the Motor Vehicle Fund but does not have legal responsibility to estimate future revenues.

Thus, although WSDOT has no legal responsibility to estimate fuel tax revenues, the requirement to manage cash flow and expenditures from the Motor Vehicle Fund makes it fiscally prudent to estimate fuel taxes, which are the largest source of income for the Motor Vehicle Fund. To have input into the revenue forecast and at the same time meet cash management requirements, an interagency administrative framework was developed to provide direction to the overall forecast process.

## ADMINISTRATIVE FRAMEWORK

When Washington State first adopted a variable fuel tax in 1977, a committee was appointed to certify, semiannually, the official price used to determine the tax rate. During the past 5 years, as changes in the law occurred (e.g., the requirement of quarterly forecasts) this committee was transformed into the Gas Tax Revenue Task Force. The original reason for the task force (the need to certify an official price) no longer exists because the legislature eliminated the variable fuel tax provision. The task force has seven organizational members:

1. Office of Financial Management (OFM)
2. Legislative Transportation Committee (LTC)
3. Department of Licensing (DOL)
4. Department of Revenue (DOR)
5. Washington State Patrol (WSP)
6. Department of Transportation (DOT)
7. Washington State Energy Office (SEO)

Two organizations have more than one member on the task force. OFM has members from both the budget and economic forecasting sections and DOT has members from the economics, comptrollers, and management and operations sections.

All task force members have fiscal, legal, or forecasting reasons for committee membership. For example, OFM provides coordination with statewide economic forecasting and the Department of Revenue provides specific statewide fuel price averages derived from tax data submitted by the state's 1,200 service stations. The role of the task force in preparing the forecast will be referred to in the forecast procedure section that follows.

## METHODOLOGY

### Data Availability

In order that the fuel tax revenue forecasts be

consistent with other state agency forecasts, it was determined that quarterly data series or data to construct quarterly series should be available for use in the model. With this constraint in mind, the 18 variables given in Table 1 were considered.

Those variables that were seasonally adjusted were adjusted using the Census X-11 variant procedure (1) as applied in the EPS system (2). Because seasonal adjustment was available and the ambient temperature variable captures mainly seasonal differences, it was decided not to use ambient temperature because of the impracticality of forecasts during an 8-year period of deviations from the average temperature. Variables for business cycles, recession, lumber and wood products, and retail trade were also dropped from consideration because it was decided that those variables would be more difficult to forecast correctly during an 8-year period than the dependent variable, diesel fuel. Finally, variables for the stock and distribution of vehicles were withheld from consideration until an econometric model of their future values in Washington State could be developed. The vehicle model's results would then be used as exogenous input for estimating future fuel consumption.

#### Model Specification

Economic theory justifies the demand for fuel as a derived demand. In this case, fuel demand is derived from consumer demand for the transportation services that both fuel and a vehicle provide. The demand for fuel can be modeled directly or indirectly (3). An indirect model would estimate the demand for vehicle miles traveled (VMT), that is, the transportation service provided, and then estimate fuel by dividing VMT by average miles per gallon of the fleet. Estimates of total VMT are available from the state department of transportation and are developed from traffic counts by automatic traffic recorders spread throughout the state. It was decided that tax reports that specified gallons of fuel taxed were a

more consistent data source than gallonage derived from VMT. This decision was based on the knowledge that forecasting gallonage derived from VMT implies the need to estimate changes in fleet miles per gallon by season under varying weather conditions.

A model of fuel demand simulates either a static or a dynamic process. A static form of model infers that all the adjustment of the dependent variable to changes in the independent variables occurs in one period. A dynamic form of model assumes the response of the dependent variable to changes in independent variables occurs over a period of time. It was decided that the model should be of dynamic form. The equation chosen to estimate fuel consumption in Washington State can be classified as a dynamic, state adjustment, direct-fuel consumption model (3).

The state adjustment form implies that current demand is a function of both past and current values of independent variables. The model infers that it is possible to identify the value of the current dependent variable with various proportions of past and current independent variables. This is a distributed lag effect. Generally distributed lags assume that more recent periods are of greater importance and thus receive larger values. However, because of the difficulties involved in explaining equations with polynomial distributed lag operators to task force members, it was decided that four-quarter moving averages of both price and income would be used because the reasoning for moving averages was more readily understood. A four-quarter moving average infers two assumptions about the lag operator: (a) that each lag operator is of equal weight and (b) that the adjustment process takes one year to complete. An incorrectly specified order or length of lag can bias least-squares estimators (4). However, when there is no known lag length or order, a priori, there are no tests that indicate either length or polynomial rank with any degree of certainty (4).

Under normal conditions there is no concern about availability of fuel. It is assumed, given the open economy of the United States, that fuel will flow

TABLE 1 Variables Considered

Variable	Historical Data Source
Miles per gallon	Environmental Protection Agency
Stock of cars and trucks	Federal Highway Administration State Department of Licensing
Distribution of cars by size and age	Department of Licensing
Price of gasoline	National Bureau of Labor Statistics State Department of Revenue/Department of Transportation
Population	Census
Driving age	
Household formation	
Age sex cohorts	
Personal income in Washington State	Bureau of Economic Analysis
Gas shortage dummy	Department of Transportation
Mt. St. Helens eruption dummy	Department of Transportation
Business cycle	National Bureau of Economic Research
Recession quarters dummy	National Bureau of Economic Research
Lumber and wood products	
Sales	Bureau of Economic Analysis
Employment	Washington State Employment Security Division
Retail trade	
Sales	Bureau of Economic Analysis
Employment	Washington State Employment Security Division
National gas consumption	Federal Highway Administration
Unemployment rate	Bureau of Labor Statistics
Ambient temperature	National Weather Service
Heating or cooling degree days	
Price indices	
CPI	Bureau of Labor Statistics
Implicit price deflator for personal consumption	Bureau of Economic Analysis
Fuel consumption	Department of Licensing
Gasoline	
Diesel	
Vehicle miles traveled	Department of Transportation

TABLE 2 Variables Defined

Variable	Definition
<b>Dependent</b>	
G1	Gallons of gasoline in Washington State by quarter at an annual rate
G2	Gallons of gasoline in Washington State by quarter at a seasonally adjusted annual rate
G3	G1 divided by driving age population
G4	G2 divided by population
G5	G2 divided by driving age population
<b>Independent</b>	
PG	The relative price of gasoline defined as a moving average over four quarters of the implicit price deflator for personal consumption-nondurables-gasoline and oil divided by the implicit price deflator for personal consumption
PN	A dummy variable that equals the nominal price of gasoline when the price exceeds its past nominal high and is zero at all other times when the nominal price of gasoline is defined as the implicit price deflator for personal consumption-nondurables-gasoline and oil
FM	Fleet miles per gallon approximated by a moving average over 14 quarters of the EPA MPG for new cars adjusted to reflect actual on-the-road experience
P1	Personal income defined as a moving average over four quarters at a seasonally adjusted annual rate of personal income for Washington State residents in 1972 constant dollars
P2	P1 divided by total population
P3	P1 divided by driving age population
C1	Gasoline crisis dummy variable that equals 1 for quarters (year : quarter) 1973:4, 1974:1, 1979:2, and 1979:3; zero at all other times
C2	Gasoline crisis dummy variable that equals 1 for quarters 1973:4, 1974:1 and 2, 1979:2, 3 and 4 and zero at all other times
C3	Gasoline crisis dummy variable that equals 2 in 1973:4, 1 in 1974:1, 2 in 1979:2, and 1 in 1979:3 and zero at all other times
MS	Mt. St. Helens dummy variable equals 1 in 1980:2, zero all other times
SD	Seasonal dummy variables—three seasonal dummy variables for winter, spring, and summer. Each variable was 1 for its respective season and zero for all other quarters

into Washington State as needed. However, because there were two periods of supply constraint for the entire United States during the period estimated, a dummy variable for gasoline crisis periods was used in all tested equations. A dummy variable is a binary variable that has the value of 1 when the condition exists (in this case a gasoline crisis period) and 0 when the condition does not exist.

Gasoline Demand Equations

In developing the forecast equation, 13 different gasoline-demand equations were analyzed. All of the equations were estimated over 40 quarters of observed data by an ordinary least-squares procedure (3). All of the variables used in any of the 13 equations are defined in Table 2. The variables used in each equation and the statistical results of each equation are given in Table 3.

All of the independent variables used in estimating each equation had theoretically proper signs even when the coefficients were not statistically significant (for instance, the coefficient of the Mt. St. Helens variable). Two variables, the past nominal high price of gasoline and the Mt. St. Helens dummy, were estimated at the request of members of the Gas Tax Revenue Task Force. Other task force members agreed not to include these variables in the forecast equation when they were found to have nonsignificant coefficients.

Ten of the 13 equations were eliminated from consideration as the forecast equation. The three reasons for elimination and the equations eliminated were (the letters refer to the equation column in Table 3):

1. Possible auto-correlation of error terms: Equations A, B, and M eliminated.
2. Nonsignificant variables included in the equations: Equations F, I, and L eliminated.
3. Inclusion of seasonal dummy variables in equation: Equations G and J eliminated.
4. Combinations of the foregoing three reasons: Equations C and K eliminated.

The three remaining equations (D, E, H) were ranked by their explanation of variance of the dependent variable. The equation with the best fit of the three (Equation H) was chosen to forecast future consumption.

FORECAST PROCEDURE

A fuel tax revenue forecast cycle begins with a meeting of the Gas Tax Revenue Task Force to determine the general economic assumptions for use in the forecast equations. The Department of Revenue provides the current statewide fuel price average semi-annually. All of the task force members discuss their views on future fuel prices and a consensus

TABLE 3 Variables and Statistical Results of Equations

Equation	Dependent Variable					Independent Variables										R <sup>2</sup>	Durbin-Watson	Normalized Standard Error	
	G1	G2	G3	G4	G5	PG	PN	FM	P1	P2	P3	C1	C2	C3	MS				SD
A		D				X		X	X								.8445	.61	.028
B		D				X		X			X						.9391	1.31	.017
C		D				X	*	X	X			X					.9443	1.35	.017
D		D				X		X	X				X				.9490	1.98	.016
E				D		X		X		X			X				.9332	2.02	.016
F				D		X	*	X		X			X				.9339	1.96	.016
G		D				X		X	X				X			X	.9676	1.89	.017
H					D	X		X			X		X				.9512	2.04	.016
I					D	X	*	X			X		X				.9512	1.97	.016
J				D		X		X		X			X		X		.9650	2.01	.019
K		D				X	*	X	X				X		X		.9681	1.85	.017
L			D			X		X	X				X		*		.9531	2.21	.016
M		D				X		X	X					X			.9573	1.23	.015

Note: D = dependent variable for equation, X = independent variable used in equation significant, \* = independent variable used in equation not significant.

price forecast is agreed on. The Office of Financial Management provides an official state forecast of the national and state economies based on the forecast of a national economic consulting firm (5). It also provides a short-term forecast of Washington State personal income, and the task force agrees to a long-term percentage increase to assume in the model. After these assumptions are made, the estimates are determined. Revisions in assumptions are possible if the fuel estimates are outside the range of outcomes held probable by a majority of the task force.

#### Gasoline Demand Equation

The equation used to forecast gasoline demand is given as Equation 1.

$$\text{GAS} = +0.501 - 0.173 \text{ PG} - 0.014 \text{ MPG} - 0.036 \text{ GC} + 83.96 \text{ PI} \quad (1)$$

(10.7) (-13.59) (-6.83) (-5.4)  
(9.61)

(t-statistics in parentheses all significant at 0.005 level)

where

- GAS = gallons of gasoline in Washington State per driving age population quarterly at a seasonally adjusted annual rate,  
 PG = relative price of gasoline, a moving average over four quarters of the implicit price deflator for personal consumption-nondurables-gasoline and oil divided by the implicit price deflator for personal consumption,  
 MPG = miles per gallon, a moving average over 14 quarters of Environmental Protection Agency (EPA) MPG for new cars adjusted for actual on-the-road experience,  
 GC = a gasoline crisis indicator variable set at 1 during (year : quarter) 1973:4, 1974:1 and 2; and 1979:2, 3, and 4, at 0 all other times, and  
 PI = personal income, a moving average over four quarters at a seasonally adjusted annual rate of personal income for Washington State residents in 1972 constant dollars per driving age population.

The gasoline price elasticity estimated by this equation is -0.36, which as an intermediate term price elasticity appears proper. A dynamic adjustment model for the state of Minnesota estimated a gasoline price elasticity as -0.34 (6). Also generally short-term price elasticity has been estimated at -0.20 and long-term price elasticity has been estimated from -0.65 to -0.85 (7), so -0.36 appears reasonable as an intermediate term (1 year) price elasticity.

#### Diesel and Total Demand Equations

The equation used to forecast diesel demand is given as Equation 2. The statistical information for that equation is also given. As noted earlier under the data availability section, there are ways to better estimate the historical diesel demand. However, it was decided that the difficulty of forecasting employment or sales in lumber and wood products or retail trade consistently would impart more variability to the estimate than using state personal income. Because diesel comprises only 10 percent of total fuel, the effect on the total fuel forecast of the variability of this estimate is mitigated.

$$\text{DSL} = -85.501 + 13.102 \text{ PI} \quad (2)$$

(-5.69) (18.08)

Normalized standard error = .073

$R^2 = .8931$

Durbin-Watson Statistic = 1.85  
 (t-statistics in parentheses all significant at .005 level)

where DSL is the gallons of diesel in Washington State by quarter at a seasonally adjusted annual rate and PI is the personal income, a moving average over four quarters at a seasonally adjusted annual rate of personal income in Washington State in 1972 constant dollars.

$$\text{TOT} = \text{GAS} + \text{DSL} \quad (3)$$

TOT = total taxable fuel gallons in Washington State

The identity used to forecast total fuel is given in Equation 3. This equation serves the purpose of collecting the total gallons of fuel forecast into one figure that can then be used to estimate total revenue when multiplied by the tax rate per gallon.

#### Monthly Forecast

Using the seasonal factors given in Table 4, a monthly forecast is derived for the current fiscal year. The seasonal factors were estimated using the seasonal adjustment procedure commonly known as the Census X-11 variant (1). These gasoline seasonal factors differ both in size and in rank order from those used in the short-term energy outlook model of national gasoline use (3). This difference was not deemed inappropriate because (a) the weather patterns in Washington State are somewhat different from national weather patterns, and (b) the Spearman rank correlation coefficient (0.7) is large enough to indicate a significant degree of similarity between the rankings, although the rankings were not equivalent.

TABLE 4 Seasonal Factors

Month	Gasoline Factor	Diesel Factor
January	0.8909	0.6361
February	0.8602	1.0358
March	1.0004	1.1887
April	0.9856	1.0834
May	1.0223	0.9752
June	1.0502	1.0581
July	1.0893	1.0181
August	1.0988	0.8289
September	1.0255	1.1908
October	1.0430	0.8402
November	0.9675	1.2467
December	0.9663	0.8980

#### Analysis of Forecast Versus Actual

Various representations of the percentage differences between forecast estimates and actual gallonage are given in Table 5. Because the normalized standard error of the gasoline equation is 1.6 percent and the error of the diesel equation is 7.3 percent, these two figures can be compared to those of the root mean squared error (RMSE) for the quarterly forecast.



TABLE 5 Forecast Error

Time Period	Forecast Estimate	Gasoline (%)	Diesel (%)	Total Fuel (%)
Monthly	RMSE	5.0	19.5	4.6
	Average	3.7	15.0	3.5
	Largest	11.0	44.0	11.0
Quarterly	RMSE	2.8	11.1	3.5
	Average	2.7	10.0	2.9
	Largest	6.0	17.0	5.0
Annual	RMSE	2.1	11.7	2.0
	Average	2.0	7.0	1.0
	Largest	3.0	11.0	2.0
Monthly for fiscal year to date	RMSE	2.0	11.3	1.7
	Average	1.3	9.8	1.4
	Largest	4.0	22.0	3.0

The average annual error for the total fuel equation is 1 percent. This annual error figure also applies to a total revenue figure for fuel tax and enables budget projections to be more precise than in the past. The average monthly error of 3.5 percent with the largest error of 11 percent of total fuel on a monthly basis makes it difficult to manage cash flow. But the error of 3.5 percent is lower than the monthly error before the current model. In addition, the monthly fiscal year-to-date error has the lowest RMSE from which it can be inferred that above-average months usually follow below-average months.

Legal codes that define when tax deposits should be made compound the cash flow difficulties. Cash flow deposits vary depending on administrative cut-off dates. In the past money deposits made in February have been as much as 75 percent below estimates and in March as much as 80 percent above estimates. The variation of mail deliveries and number of working days between the 25th of the month (the date taxes are required to be mailed) and the last day of the month will continue to cause difficulties in monthly cash flow estimates.

#### FUTURE APPLICATIONS

As the technical expertise of the members of the task force grows and their confidence in statistical procedures increases, further refinements of the model may be considered. Refinements that will be proposed for the gasoline equation are use of vehi-

cle stock attributes and a polynomial distributed lag operator on personal income.

The diesel forecast equation will be studied to find ways to reduce forecast error. This reduction will be important as the percentage of total fuel that is diesel fuel increases. The percentage of vehicles using diesel fuel and the split of the commercial versus personal-use diesel vehicles are possible variables for inclusion in the equation.

Extension of similar forecast procedures to vehicle registrations and fees forecasts will also be started. Past vehicle stocks, changes in age distribution and household size are variables that will be considered for use in the vehicle forecast model.

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# Block Grant Transportation Financing: The Interstate Trade-in Experience

ARNOLD J. BLOCH and WILLIAM H. CROWELL

## ABSTRACT

In 1974 Congress began the Interstate Highway Trade-in program, which allows urban areas the option not to build an Interstate segment, but instead to use an amount equal to the segment's cost for transit projects. Since then the program has been expanded to allow highway substitute projects as well. The program has infused a massive amount of funds into a relatively small number of urban areas. The program resembles a block grant in many ways. Urban areas are awarded a set amount of funds and state and local governments determine how to spend the funds and to what modes they should be directed. The experience of the program demonstrates the diversity of local decision making, but also shows how important national concerns (in this case, infrastructure repairs) can be addressed without strict categorical grant programs. Finally, trade-in also demonstrates one difficulty block grants generally experience: reluctance of the federal government to relinquish control.

Since 1944 Congress has enacted legislation to encourage the construction of an Interstate highway system. From its original authorization that year, to the landmark 1956 legislation, through later acts that added nearly 2,000 route miles to the originally planned system, nearly \$200 billion (expressed in 1979 dollars) in combined federal and state funds have been spent on nearly 43,000 miles of Interstate construction, which represents two-thirds of total federal highway funding. At the same time, however, anti-highway sentiments were growing within a number of the nation's urban areas, often focusing on proposed urban Interstate links. Increasingly, city and state officials were faced with a difficult, no-win decision: either proceed with highway plans in the face of mounting community and political opposition or not build the highway and lose a substantial infusion of federal funds into the area (at a highly favorable 90:10 matching share arrangement). Eventually Congress responded to this dilemma in 1968 by passing the first legislation that began to alter the rate of Interstate construction.

## INTERSTATE CONSTRUCTION TO INTERSTATE TRADE-IN: CATEGORICAL TO BLOCK FINANCING

The 1968 Howard-Cramer Amendment allowed Interstate-for-Interstate transfers, giving states the right not to build a particular Interstate highway while permitting an equivalent-cost Interstate to be built elsewhere. But by the early 1970s it was clear that Howard-Cramer was not an adequate solution. In areas such as Boston, Philadelphia, and Washington, D.C., where strong anti-highway and pro-transit sentiment

existed, highway-for-highway transfers were an unsatisfactory option.

Out of this dissatisfaction came the trade-in amendment included in the Federal-Aid Highway Act of 1973. This amendment allowed urbanized areas, on joint request of the local government and the governor and approval by the U.S. Department of Transportation (DOT), to withdraw an Interstate segment and use the equivalent funds to finance the same types of transit capital projects that qualify under Section 3 of the Urban Mass Transportation Act (e.g., construction of facilities and vehicle purchases). The amount of funds authorized for these substitute projects was to be equal to the approved estimated cost of building that highway segment. Substitute projects were to be funded from general revenues, not the Highway Trust Fund, at an 80:20 matching ratio, equivalent to the UMTA Section 3 matching ratio.

Since 1973 the trade-in provision has been amended five times; the latest amendment was December 1982. The history of the trade-in evolution has generally been one of expansion: more segment types eligible for withdrawal, increased valuation of the withdrawn segment, expanded choice of the use of trade-in funds, tapping of the Highway Trust Fund, increased federal matching share for substitute projects, and extension of the date during which withdrawals and substitute projects can be implemented. From 1976 to the present, trade-ins can be enacted for proposed Interstate segments both within urbanized areas and for connecting separate urbanized areas within a state. The authorized value of the withdrawn segment was the most recent, congressionally approved construction cost estimate plus the effects of inflation on the highway construction industry. In addition, the unobligated balance of an authorized trade-in continued to be adjusted quarterly for the same inflationary impacts. (These inflation adjustments have ended in 1984; however, to compensate recipients, all unobligated balances will be boosted by about 20 percent.) Obligations are made for a wider range of projects, including not only the types of transit capital projects that are eligible under UMTA Section 3 but also highway capital projects normally funded from one of many federal-aid highway funding systems (i.e., Interstate, primary, secondary, and urban). Funds for highway projects come from the Highway Trust Fund; funds for transit projects come from general revenues. The trade in funds pay 85 percent of any substitute project, with only 15 percent required from state or local sources. This compares favorably with UMTA Section 3 projects (80 percent) and federal-aid to primary, secondary, and urban systems projects (75 percent).

## Utilization of the Trade-in Mechanism

Interstate highway segment withdrawals were allowed through September 30, 1983 (except for those segments under court injunction, which still can be withdrawn through fiscal year 1985). During the

previous 10 years, nearly 30 urban areas have traded in a total of 56 Interstate highway segments in 48 separate trade-in actions. Nearly 340 miles of Interstate segments were involved in these actions; the longest is a 41.1 mile highway between Providence, Rhode Island, and Fall River, Massachusetts. Pittsburgh and the Washington, D.C. area share in withdrawing the shortest links, 0.4-mile segments, from their respective central business districts (CBDs).

A number of urban areas have enacted multiple trade-ins, including separate links of the same highway or beltway system, and unrelated Interstate links. The Washington, D.C. area (including adjacent Virginia and Maryland) has been the most prolific user of the trade-in program. Between 1975 and 1983 it withdrew 13 segments totaling 18.7 miles, in 9 separate actions.

Significant opposition to highway construction led to eventual trade-in in a number of urban areas. In Boston it was the strong anti-highway movement that actually contributed to the creation of the trade-in option. But as early as the first Washington, D.C. withdrawal in 1975, some urban areas envisioned trade-in as a means of supporting new transportation priorities over earlier established expressway objectives. Such new priorities included creation of rail transit service (Portland, Oregon; Sacramento; San Francisco; and Washington, D.C.), upgrading of existing transit services (New York City and Philadelphia), and rehabilitation or reconstruction of existing bridge and highway facilities (Albany, Portland, and Tucson). Other areas still considered expressway objectives as most important and enacted trade-ins as a means of completing expressway projects that were either more important or less controversial than the withdrawn Interstate facility (Baltimore, Hartford, Philadelphia, and Pittsburgh). Finally, a few urban areas still supported the need for a highway facility within the Interstate corridor, but enacted a trade-in as a means of constructing a scaled-down facility in place of the withdrawn segment and also as a means of having funds available for other highway or transit projects (Denver; Omaha; Salem, Oregon; and Waterloo, Iowa).

At the time that all trade-ins were enacted, their total value exceeded \$10 billion. As of the end of 1983, \$6.4 billion had been obligated to nearly all the urban areas involved. Because unobligated balances have accrued in value, some \$7 billion was left to be obligated at the beginning of 1984.

Transit substitute projects received \$4.6 billion, or 72 percent of all obligations through 1983. Most has gone to only two areas: Washington, D.C., which has used its \$2.2 billion almost exclusively to build and equip its new subway system, and Boston, which has spent more than \$1.4 billion on its existing rapid transit system.

Highway substitute projects have received slightly less than \$1.8 billion or 28 percent of all obligations. Chicago has received 44 percent of this amount and Portland more than 9 percent.

The broad spectrum of substitute projects that have been funded so far are briefly described in the following paragraphs.

#### Transit

1. New rail facilities. The major projects include construction of the Metro heavy rail system in Washington, D.C. and the extension and relocation of heavy rail lines in Boston. In addition, Baltimore

is funding construction of its new heavy rail system. Finally, both Portland and Sacramento will build new light rail lines using substitute funds.

2. New rail equipment. Philadelphia has purchased new vehicles for heavy and light rail systems. As part of their major construction projects, both Washington, D.C. and Boston have also purchased new vehicles.

3. Rail reconstruction and rehabilitation. New York City, Philadelphia, and the New Jersey portion of the New York City area have funded extensive track and station rehabilitation projects in their subway and commuter rail systems. Hartford is renovating a CBD intercity rail station. San Francisco will rehabilitate a commuter rail line.

4. Bus purchases. Albany, Hartford, Philadelphia, and Tucson have all purchased new buses for existing transit systems.

5. Other. Denver has built a CBD transit mall. Albany, Chicago, and Philadelphia have built, reconstructed, or rehabilitated transit vehicle storage and repair facilities. Denver has instituted a ride-sharing program.

#### Highway

1. Replacement facility. Omaha and Denver are constructing expressway facilities situated in the same corridor as the withdrawn Interstate. Salem, Oregon, will do the same for an arterial to replace the withdrawn Interstate.

2. Other new expressway or arterial construction. Omaha, Philadelphia, Pittsburgh, and San Francisco are constructing expressway and arterial facilities elsewhere in the urban area. Tucson has added lanes to an existing Interstate facility.

3. Reconstruction or widening of collectors and local streets. A number of urban areas, including Chicago, Denver, Hartford, Portland, and Salem, have funded these types of substitute projects.

4. Rehabilitation or reconstruction of bridges. Many urban areas have also funded these types of projects, primarily focussing on small-scale but crucial central city bridges. These urban areas include Chicago, Cleveland, New York City, the New Jersey portion of New York City, Portland, and Salem.

Most urban areas have formally or informally stated that they would like to spend a majority of their remaining trade-in funds on highway projects. Seventeen urban areas estimate that they will spend between 51 and 100 percent of available funding on highway projects. Only six areas would choose to spend a majority on transit projects. Of the remaining funds, approximately 60 percent would be used for highway projects under current planning.

#### The Implications of Trade-in

The trade-in option converts funds that are provided to build a particular highway segment into funds that can be used for a diversity of transit and highway purposes, anywhere in an urbanized area, according to a programming schedule established by the funding recipients. In other words, funds previously available under a categorical grant program (i.e., federal-aid Interstate), where the end use is strictly controlled by a previously approved design proposal and by Interstate highway standards and procedures, are now available under a format that resembles a block grant (i.e., the trade-in program). Although never openly declared a block grant, the main objective of establishing and later expanding the trade-in program has always been to give

state and local governments greater control over the use of a particular funding source while reducing federal control, which is essentially the meaning of a block grant.

Because significant interest currently exists in the block grant format as a federal funding mechanism, it is useful to examine the performance of the trade-in program within this context. Three issues are addressed here: (a) the effect on the federal-state-local government relationship, (b) the diversity of substitute projects, and (c) the limitations of block grant concepts.

#### Government Relationship

Under the normal categorical grant structure of federal transportation funding, the federal government has a clearly defined relationship with state and local government. Essentially, FHWA deals with the state on federal-aid highway programs and with the urban area on UMTA Section 3 grants. The regional metropolitan planning organization (MPO) becomes involved through the various mandates of federal urban transportation planning guidelines.

The channels are less defined in the trade-in program, however. Trade-in requests must be approved by the governor and local officials, but may be initiated by any of the parties. Requests to the federal government for substitute project funding must be submitted by the governor, but may be developed by any of the parties (although project development and programming is subject to the same urban transportation planning guidelines as other highway and transit projects). The result has been that among the urban areas that have enacted trade-ins, the levels of government that assume lead planning and implementation roles vary greatly.

States have played the primary roles in Boston, Denver, Hartford, Omaha, and New Jersey trade-ins. Local governments have played a more important role in Duluth, Memphis, New York City, Pittsburgh, Portland, Salem, and Tucson. In Albany, Cleveland, Minneapolis, and Washington, D.C., the MPO was the most prominent level of government. In seven other areas, the trade-in request or substitute project development responsibilities were shared in some manner by local, state, and regional bodies.

The particular level of government that assumes the lead position in the trade-in process is a function of various factors, among them the importance of an Interstate link to a state or regional highway plan, the relative prominence of state and local departments of transportation in urban transportation planning and financing, the general powers invested in the MPO, and the relative political clout wielded by the governor, mayor, city or county legislatures, state departments of transportation, and so forth. The relative importance of these factors is highly specific to the given urban area. The absence of a federal structure assigning lead and secondary responsibilities have contributed to delays in both the withdrawal request and substitute project development processes (e.g., Chicago, Hartford, Memphis). It almost certainly has resulted in a considerable amount of negotiation and compromise among the various parties involved (e.g., Cleveland, Minneapolis, Portland). But this is not necessarily bad, and it may have resulted in a more representative local consensus on transportation needs and remedies than typically is achieved through the formal structure of other FHWA and UMTA funding programs.

Another aspect of the state-local government relationship involves matching share. Under the Interstate program, the federal government provides

90 percent of the costs, and the local matching share is 10 percent. Over the years, this 10 percent matching share has almost always been provided by the state government. A system of state highway revenue generation and disbursement to urban areas to cover expenses under the Interstate program (and other federal-aid programs) has been in place for some time, with changes having occurred incrementally, primarily after FHWA created or deleted new categorical grant programs or program criteria.

The trade-in program created a radically new situation. With the 85 percent/15 percent setup, a previously authorized sum of money suddenly necessitated 5 percent more matching share (and before 1978, 10 percent more for transit projects and 20 percent more for highway projects). Corridor-directed funding suddenly became urban area-directed funding, potentially affecting overall disbursement formulae. Finally, transit projects were now eligible to be funded, a drastic change from the point of view of the states, because some states were restricted by law or longstanding policy from providing matching shares for transit projects.

Despite these inherent difficulties, providing the matching shares for trade-in substitute projects has not been a significant problem. In some cases, the state is still providing the complete matching share, whether for highway or for transit purposes (e.g., Chicago, Indianapolis, New Jersey). Various arrangements have been worked out in other areas, for example:

- Baltimore: State pays all transit share and highway share outside city limits; city of Baltimore picks up the share on its own municipal highway substitute projects;
- Duluth: Localities will assume the share, but will also receive some remunerative support from the state;
- Memphis: Fifty percent of transit funded by state and 50 percent by city; and
- Portland: State will pay transit share in return for Portland giving up federal aid urban systems (FAUS) funding.

The MPOs in some areas have helped bring about firm matching-share commitments from relevant municipalities and counties (e.g., Albany, Cleveland, and Minneapolis). It can be concluded that if the federal source of funds is viewed as particularly beneficial (i.e., substantial sum, high federal share, and continual), then matching-share arrangements for block grants are not difficult to achieve (despite a co-existing, highly formalized system of matching-share arrangements for other FHWA and UMTA programs).

#### Substitute Project Diversity

Trade-in funds have been (a) used for various purposes, (b) used to fund various size projects, (c) distributed either within the original highway corridor or throughout the urban area or both, and (d) either combined with other federal or state and local funding sources or segregated from them. This diversity reflects considerable variation in the planning preferences and transportation needs of urban areas.

During discussions with state and local transportation officials in the urban areas that have enacted trade-ins, a common fear expressed was that detrimental effects would occur from a wholesale conversion of the federal funding structure into one or a few block grants. Among the prominent concerns was that large and publicly visible construction projects would consume such a large portion of the

funds available to an urban area that vital but less visible reconstruction and rehabilitation projects would always be underfunded. Many of these officials were relieved that a highly structured categorical grant program existed to fund important smaller projects through such programs as FAUS, bridge rehabilitation and reconstruction, and so forth.

Results of the trade-in program indicate, however, that open-ended funding sources are used for a variety of purposes. As the program developed, urban areas even showed a greater proclivity to fund a variety of smaller bridge, highway, and transit reconstruction and rehabilitation projects rather than the major construction efforts undertaken by Boston and Washington, D.C. Obviously this reflects, in large part, a growing tendency among urban areas to repair existing infrastructure to meet current needs rather than to expand infrastructure and services to satisfy new or latent travel demand. What is also apparent is the relative ease in which a block grant-type funding source can be used even as local transportation priorities shift dramatically.

Indeed, the 9-year experience of the trade-in program is a clear indication of the growing desire for a change in overall federal transportation funding policies. Trade-in actions demonstrate the types of otherwise underfunded projects that various states and local areas want in exchange for another project with solid fiscal backing--that is, an Interstate highway previously identified as important. Highway projects, and in particular so-called 4R projects (resurfacing, restoring, rehabilitating, and reconstructing) have emerged as the main substitute project choices among trade-in actions in urban areas. This trend has been carried over into the mainstream of federal transportation financing. The 1982 Surface Transportation Assistance Act (STAA) infuses a significant amount of new funding into highway programs in general, and 4R-type funding in particular. The trade-in block grant type program clearly served as a barometer to this development.

#### Limitations of the Block Grant Concept

The formal structure of the trade-in program makes it appear similar to the structure of a block grant. However, before 1983, the informal process of federal funding restricted the full block grant potential of trade-in. Although withdrawal approval means formal authorization of funds to an urban area for substitute projects, obligations can only be made if Congress has appropriated sufficient funds for a given fiscal year. Congressional appropriations for the trade-in program increased from \$61 million in fiscal year 1974 to \$954 million in fiscal year 1980 to the fiscal year 1982 level of \$828 million. Despite the increase in appropriation amounts to approximately \$800 to \$900 million, the U.S. Department of Transportation could have obligated more than \$1 billion for substitute projects if given the budgetary approval. A survey conducted by the Chicago Area Transportation Study in March 1981 revealed that among only 16 of the currently qualifying 25 urban areas, substitute projects proposed for fiscal year 1982 amounted to between \$1.1 billion and \$1.2 billion.

The constraints imposed by low trade-in appropriation levels caused some urban areas to postpone (or identify alternative funding sources) some substitute projects, either because they required large up-front funding that may not have been available, or because they required a steady flow of funds over several years that could not be guaranteed. In recent years, Congress not only specified a level of

appropriations but also how much was to be spent on transit versus highway, and how much was to be distributed to each of the various urban areas. The apportionments resulted in many changes in the choice and scheduling of substitute projects.

The results of these appropriation constraints were that (a) urban areas lost flexibility in the types of projects they could choose (i.e., especially the mode and size of the project), (b) federal control over funding program direction was once more restored (although control shifted from DOT to Congress), and (c) as funding constraints continued, trade-in became a less reliable federal source of funding and was therefore taken less seriously by urban areas. The net effect was a diminution or actual loss of the block grant characteristics created by the trade-in program.

Beginning in 1983, however, much of this restrictiveness on the block grant nature of the trade-in program was removed by the 1982 STAA. The 1982 STAA substantially increased highway substitute project appropriations--from approximately \$300 million (fiscal years 1980-1982) to more than \$700 million (fiscal years 1983-1986). Although transit appropriations were reduced from approximately \$500 to \$600 million (fiscal years 1980-1982) to \$300 to \$400 million (fiscal years 1983-1986), this reflected in large part the lessened demand for such funds. However, the particular action most responsible for the easing of federal control and restrictions is the adoption of a standardized means of apportioning the majority of annual trade-in appropriations. Seventy-five percent of annual appropriations for trade-in highway projects and one-half of all transit trade-in funds are to be apportioned to urban areas on the basis of a congressionally approved cost estimate of completing substitute projects (similar to the way in which Interstate construction funds are apportioned). Remaining funds are to be distributed at the discretion of the Secretary of the U.S. Department of Transportation. All these changes should significantly improve both the reliability of the trade-in program as a funding source and its flexibility as a block grant-type mechanism.

#### CONCLUSIONS

The impact of the Interstate highway trade-in program has been significant. First, it has injected a massive amount of federal funds into a relatively few urban areas for various transit and highway needs. Some \$6.4 billion in federal funds have been obligated to nearly 30 urban areas from July 1974 through 1983. By the time all authorizations are fulfilled, more than twice that amount will be obligated. These funds have been and will continue to be an important supplement to other federal, state, and local transportation funding sources.

Second, the trade-in program has greatly expanded the principle of making traditional highway-oriented programs available for transit purposes. The FAUS program was the first highway program opened for transit uses, but only about 5 percent of total FAUS funds obligated have been used for transit projects. The trade-in experience has been dramatically different. Nearly 72 percent of obligations made through 1983 have been for transit purposes. And some 40 percent of future obligations are expected to be for transit purposes. The effects have been varied and important--from construction of a major portion of the Washington, D.C. Metro subway system to a CBD transit mall in Denver. It can be asserted that the use of trade-in funds for transit purposes paved the way for the tapping of the Highway Trust Fund for large-scale UMTA funding in 1983.

Third, and most important, the trade-in program has demonstrated in a major way that a categorical funding program can be made more flexible and yet remain an effective and responsible source of federal financing. Funds have been used for the complete range of eligible projects--from rail transit and freeway construction, to bus fleet and bridge replacement, to transit station and local street rehabilitation. Often there have been delays in generating a list of proposed substitute projects, especially because a diverse set of governments and interests must reach a consensus without the benefit of rigid guidelines for using particular funds as prescribed by the federal government. But, on the other hand, there has rarely been any difficulty in generating matching shares for Interstate trade-in projects, which indicates the value of the program as viewed by its users. Overall, the trade-in experience demonstrates the potential success of future block grant mechanisms for federal urban transportation financing.

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## Financing Local Roads in Indiana: A Status Report

JON D. FRICKER

#### ABSTRACT

Indiana, like almost every other state, is slipping farther behind in the struggle to repair and maintain its deteriorating roads and streets. Just as the way in which this difficult situation developed in Indiana may differ from the details of other states' experiences, so might Indiana's efforts to cope with the problem. Many states raised motor fuels taxes in 1983 to supplement the funds made available by the 1982 Surface Transportation Assistance Act. However, only a portion of these road funds will be available at the county and city levels. Described in this paper are several programs recently introduced in Indiana that are specifically directed to road and street maintenance and repair at the local level. By reviewing these programs, seeing the degree to which they have been implemented, and examining the reasons for their less-than-universal use in Indiana, other states may be able to learn valuable lessons for devising their own techniques for generating revenue.

In 1959 the federal gasoline tax was set at 4 cents per gallon. During the next 23 years, the costs of building and maintaining roads increased considerably. Only the steady increase of automobile travel

during the 1960s and early 1970s kept the Highway Trust Fund revenues on the rise as well. By the late 1970s automobile travel began to level off, and even decrease, which therefore caused a decrease in gallons of gasoline sold. After years of discussion and some false starts, the 1982 Surface Transportation Assistance Act (STAA) became law in January 1983. It replaced the 1978 STAA legislation by increasing the federal motor fuel tax to 9 cents per gallon, 1 cent of which was to be set aside for mass transit programs.

Since 1956 Indiana had been a donor state with regard to the Highway Trust Fund. Having completed most of its Interstate segments in the early years of that construction program, Indiana suffered the two-edged sword of the Highway Trust Fund allocation formula: (a) few uncompleted Interstate sections to attract federal funds and (b) an Interstate system of advancing age to maintain with the use of state funds. In recent years Indiana has ranked near the bottom in percentage of federal fuel tax revenues returned as federal highway assistance. In response to this problem, Indiana became one of the first states to structure its state motor fuels tax (MFT) on an ad valorem basis. The formula for the gasoline tax rate (GTR), in terms of the average pre-tax price (APTP) of all gasoline sold during the previous 6-month period (as of January 1 and July 1), is

$$GTR = 0.08 (APTP - \$1.00) + \$0.10 \quad (1)$$

rounded off to the nearest 1/10th cent, where

$$APTP = \frac{\text{Gross Sales} - (\text{State} + \text{Federal Taxes})}{\text{No. of Gallons Sold}} \quad (2)$$

Because this formula was enacted in 1980, at a time when fuel prices were rising rapidly, the legislators placed a ceiling of 16 cents per gallon on the tax. Fortunately, they also saw fit in 1981 to make it a ratchet tax: the amount per gallon could never go down, only up. The tax reached a level of 11.1 cents per gallon in 1981 before reduced travel and more fuel-efficient cars caused a 7.7 percent decrease in fuel consumed in Indiana. Add price drops due to the oil glut and, without the ratchet, the tax would have fallen to 9.4 cents per gallon.

Even with the ratchet the Indiana Department of Highways (IDOH) has had insufficient funds to carry out a program that keeps pace with the deterioration of Indiana's roads and bridges. The state needs to resurface 1,000 centerline-miles of its 11,000-mile state highway system each year to keep up with the damage. But in recent fiscal years (FY), the following number of miles have been repaved: 494 in FY 1981, 533 in FY 1982, 288 in FY 1983, and 135 in FY 1984. If current projections for motor fuels and truck tax revenues are correct, the state will have only enough money from this source to repave 100 miles in FY 1985.

The 1982 STAA was good news for Indiana. The state had been receiving a return of only 65 percent of its contributions to the Highway Trust Fund as federal assistance under the old formula. The new act made the minimum return 85 percent. This, along with certain other measures, caused Indiana's allocation to more than double.

But the STAA fails to solve--and even inadvertently creates--some problems. For example, the new revenues cannot be used for the state highway system. In addition, no additional money was provided for the federal-aid secondary highway system. In Indiana these are general two-lane, low-volume roads extending into rural areas. These roads comprise 40 percent of federal highways in the state, and they, too, need resurfacing. The matching fund requirements of the STAA create an ironic problem for Indiana: unless the state can raise an additional \$146 million in highway funds in the fiscal years 1984 and 1985, it could lose \$212 million of its \$457 million in federal allocations (1). In summer 1983 IDOH diverted almost \$10 million from its 100 percent state-financed resurfacing program to help match federal-aid dollars. This meant that more than 100 miles of state highways did not receive the resurfacing work as scheduled. As of this writing, the Indiana General Assembly is considering a \$55 million supplemental appropriation to enable IDOH to obtain the \$242 million in federal highway aid for which Indiana is eligible in FY 1985 and to restore funds to the state resurfacing program.

Indiana's counties, cities, and towns face a similar problem. Their federal road and bridge funds have also doubled to more than \$60 million per year. To use these funds, however, local governments will need to raise about \$18 million per year in matching funds. Given the mixed blessing of the STAA in Indiana, and the state's barebones approach to its own highway system, the local governments would appear to have few places to turn for financial support. Several of the more interesting options available to cities and counties in Indiana are described in this paper.

#### THE LOCAL OPTION HIGHWAY USER TAXES

In 1980 the Indiana General Assembly passed legislation authorizing any county to adopt a local-option highway-user tax (LOHUT). LOHUT is actually two taxes that must be adopted at the same time:

1. A surtax of between 2 and 10 percent levied on the vehicle excise tax paid annually at the time of registration by owners of automobiles, motorcycles, and trucks lighter than 11,000 lb.

2. A wheel tax of between \$5 and \$40 per vehicle placed on all vehicles not subject to the excise surtax. The wheel tax vehicle categories are:

- Buses (except church buses),
- Recreational vehicles,
- Semi-trailers,
- Tractors,
- Trailers, and
- Trucks above the 11,000-lb class.

The vehicle excise tax is collected at the local level by branches of the State Bureau of Motor Vehicles. This money is transferred to a joint account from which the county treasurer may make withdrawals twice a year. Typically, this money is earmarked for parks, education, emergency services, and other nonhighway activities. Therefore, the LOHUT is designed to obtain some transportation-related use from funds generated by an annual local assessment on vehicles.

In 1981 only three of Indiana's 92 counties passed a LOHUT. These were among 10 counties eligible for a special distressed road fund (discussed next) if they passed a LOHUT. In 1982 only six more county councils took the same action. Most of the objections centered on the following problems:

1. The amount of revenue generated was insufficient to justify the politically risky act of passing a new tax in an era of tax limitation movements. Years before it became commonplace, Indiana established a ceiling on local property taxes that severely restricts the financial capability of local governments.

2. The revenues generated would be distributed to cities, towns, and counties on a road-mileage basis. Because cities and towns in Indiana have a population-to-mileage ratio seven times as large as areas under county jurisdiction, cities and towns opposed LOHUT. City and town residents would be paying more and getting less than county residents.

3. The wheel tax categories made no distinctions between heavy-duty industrial or farm trailers and light-weight, seldom-used boat trailers. At \$5 the revenues generated would not be worth the political effort. At \$40 the tax is clearly unfair to owners of light-trailers. The same problem occurred in choosing a fair tax for a single truck category that included vehicles with weight classes from 12,000 to more than 66,000 lb.

In 1982 three groups representing local government officials (the Indiana Association of Cities and Towns, the Association of Indiana Counties, and the Indiana Association of County commissioners) proposed revisions in the 1980 LOHUT Act that addressed the foregoing problems. After some revisions, the Indiana General Assembly:

1. Retained the excise surtax range at 2 to 10 percent, but established a minimum surtax amount at \$7.50. Because the excise tax rate declines with vehicle age and many drivers are holding their cars longer, the \$7.50 "floor" will generate nearly 50 percent more money.

2. Specified that LOHUT revenues shall be distributed according to the same local road and street account (LRSA) formula that is used to allocate some of the state's MFT revenues (see Figure 1). Applying statewide figures, the changes in allocations are given in Table 1.

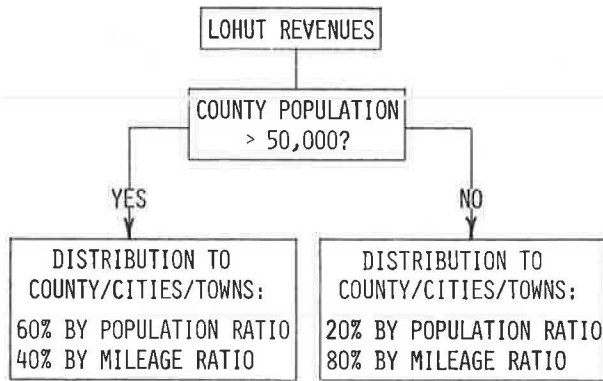


FIGURE 1 The local road and street account (LRSA) formula.

TABLE 1 Changes in LOHUT Revenue Distributions

	1980 LOHUT Act (%)	1983 LOHUT Revisions	
		County Population	
		More Than 50,000 (%)	Less Than 50,000 (%)
County	83	57	74
Cities and towns	17	43	26

In the first year of this revised law, only four more counties have joined the LOHUT fold. Why so few? Following is a brief summary of the arguments in favor of and in opposition to a LOHUT.

#### Arguments Favoring LOHUT

1. The quality of some local roads has become intolerably poor, and no other remedy is available.
2. The most appropriate solution to local problems is local initiative.
3. If the problem is not serious enough for local public agencies to take some action, how can the state government be expected to acknowledge the need?
4. Taxing vehicle owners is a more equitable way to pay for the roads they use than appropriating general revenues raised through property taxes.
5. The money raised by a LOHUT remains in the local area. The existing license branches will, by law, collect the taxes with a fee of only 15 cents per vehicle. No money need be invested in a new bureaucracy or lost to a central clearinghouse.
6. All LOHUT revenues, unlike vehicle excise and motor-fuel tax collections, must be applied directly to construct, reconstruct, repair, or maintain local roads and streets.
7. LOHUT funds have a higher marginal value than existing funds. Because the wages, salaries, and overhead costs of a city or county highway department are already budgeted, any new funds from a LOHUT are allocated directly to road and street projects. In local public agencies where lack of funds causes underutilization of personnel and equipment, this is especially important.
8. The federal gasoline tax was 4 cents per gallon for more than 30 years. A \$5 to \$40 annual payment is a locally oriented, relatively inexpensive way of trying to catch up.

#### Arguments Against LOHUT

1. This new tax is not justified. Services can

be cut elsewhere, or the cheaper of private contractors or in-house resources can be used, but no new taxes should be levied. (It should be pointed out, however, that Indiana law prohibits transfers of funds to and from highway accounts.)

2. The LOHUT concept is unfair because:

- It hurts people on fixed incomes.
- It is independent of vehicle use; an increase in the MFT would be more equitable.
- Because it is based on a county's vehicle registrations, a LOHUT taxes residents of that county, whereas drivers from non-LOHUT counties use the same (improved) roads without paying for them.
- It does not guarantee that a particular neighborhood road will receive attention. A tax based on the increase in road quality, assessed against the residents benefited and proportional to their frontage, would be more equitable. [Indiana law does contain a separate provision for "projects by assessment," but it does not apply to local government projects. There is a precedent, however, for citizens subsidizing county work on their roads (2).]
- Even under the improved allocation formula, drivers from cities and towns pay a higher percentage of LOHUT taxes as a group (approximately 60 percent statewide) than their governments will receive in revenues (see Table 1).

3. A county that passes a LOHUT will lose trucking, truck-related, and truck-dependent business (and their vehicle registrations) to non-LOHUT counties. A range of businesses from construction firms to dry cleaners make this point. Likewise, counties with universities whose students register their vehicles there may lose many registrations to the students' home counties. Because part of the state's MFT revenue distribution formula involves the number of vehicle registrations, any tax that drives away discretionary registrations can be counterproductive.

4. An increased tax on trucks will drive up retail prices.

5. Cities and towns derive revenue from a county council decision, but lose the opportunity to decide how the next tax dollars (if any) are raised from its citizens.

6. There are too many roads; some serve only a few families, and some are maintained at too high a standard.

Each of these arguments, of course, has its own degree of validity. In most cases, the opposition has prevailed. But the increasing frequency with which LOHUT proposals are being discussed in public hearings and voted on by county councils indicates the relentless deterioration of local roads and the recognition that increased assistance from the state is an unlikely immediate solution.

#### SPECIAL FINANCING AUTHORITY

Ten counties in southwest Indiana have been provided special financing authority, because of severe deficiencies in their road systems. To increase the funding for road improvement projects, these counties may use (a) interest-free loans from a \$10 million Distressed Road Fund or (b) bond issues for building and upgrading roads and bridges. To be eligible for either method, the county must first enact the LOHUT.

The Distressed Road Fund (DRF) was created in



1981 with \$5 million in off-the-top deposits from MFT and special fuel tax receipts. In 1982 and 1983 \$2.5 million per year was added to complete the fund. To date, 5 of the 10 counties have enacted a LOHUT, only 2 have received interest-free loans, but other counties are expected to apply soon.

With almost \$9 million in the DRF and many counties unable to match federal funds made available by the STAA, the 1983 Indiana General Assembly created greater access to \$5 million of the DRF. Local government units may now apply for interest-free loans if the unit

1. Is eligible to receive motor vehicle highway account (MVHA) funds, a portion of MFT allocations;

2. Certifies that it does not or will not have sufficient funds to meet the federal matching requirement; and

3. Agrees to allow the state auditor to divert its future MVHA distributions to repay the DRF directly if the unit fails to repay the loan within 2 years. This revision makes greater use of an existing fund at a time of great need and few alternative funding sources.

#### CUMULATIVE BRIDGE FUNDS

These funds are an important supplementary source of revenue for the construction, maintenance, and repair of bridges and grade separations. Since 1951 Indiana statutes have authorized county commissioners to establish a county-wide tax levy on all taxable personal and real property for the purpose of accumulating bridge construction and repair funds. More recently, maintenance activities became a legitimate use of the funds, and city councils and town boards were given the same authority. Funds are now available to conduct countywide bridge inspections and safety ratings--important elements in the federal-aid application process, in addition to their immediate role in maintenance management and public safety.

The annual tax levy may not exceed 30 cents per \$100 assessed valuation. Each enactment may not be for more than 5 years duration, except for bridge leasing (discussed in the next section). The tax may be reduced or rescinded during this 5-year period. These tax receipts must be held in a special account, and, although the temptation has been great in recent months, they "shall not be expended for any [other] purpose" (3).

Currently, at least 82 of Indiana's 92 counties maintain a Cumulative Bridge Fund. Unfortunately, the need for bridge repairs is immense. Among the state's 11,129 off-system bridges, most of which are under county jurisdiction, are: (a) 3,668 that are restricted to light traffic, closed to all traffic, or in need of immediate repair to stay open and (b) 3,951 that can no longer safely serve their traffic loads because of out-moded design features. At the present rate, it will take more than 30 years to take care of the current backlog of substandard bridges (4).

#### LEASING OF BRIDGES

Although not strictly a revenue-generation tech-

nique, this provision of the 1971 Indiana Code gives county commissioners an option that may stretch county bridge funds. The commissioners "may enter into a contract of lease with any (profit or not-for-profit) corporation...duly admitted to do business in...Indiana" (5). Such a contract shall not extend longer than 15 years and must be supported by a petition signed by 50 taxpaying citizens of the county. The commissioners must then determine that a need exists for such a bridge. The county may not commit itself to leases exceeding the estimated annual revenue from a Cumulative Bridge Fund levy of 20 cents per \$100 assessed valuation. In this case, the levy may be enacted for the length of the lease or 15 years, whichever is less.

Although this method has not been implemented in Indiana, there has been recent interest in the idea. It offers much the same features as the safe-harbor leasing provisions of the federal tax law used by many transit operators. The operators avoid the purchase price of new vehicles, while private corporations who are the eventual buyers also acquire the ability to claim tax advantages from the equipment as it depreciates. In a similar way, counties could avoid or pass on the high cost of bridge construction or replacement in exchange for a mutually beneficial long-term lease agreement.

#### CONCLUSIONS

Indiana's road and bridge problems are typical of those in most states, especially at the local level. But provisions have been made for Indiana counties and municipalities to generate funds to replace, match, or supplement assistance from the state and federal governments. As the list of arguments for and against a local option highway user tax indicated, there are no obvious solutions to the problem of revenue generation. The self-reliant, home rule philosophy so many Hoosiers ascribe to must be balanced against the availability of more federal assistance. The project categories for which these federal dollars are specified must be compared with the greatest needs of the local transportation network. It is a matter of philosophy and a question of trade-offs. At least the local public agencies in Indiana have a number of useful options at their disposal. Their experiences can be instructive to other states seeking innovative responses to the road and bridge revenue shortfall.

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# Allocating Federal Transit Subsidies: A Critical Analysis of Alternatives

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## ABSTRACT

The federal transit program needs to be improved to be more efficient and more equitable. Few program objectives have been achieved despite a massive infusion of subsidy funds into the transit industry. The potential effectiveness of various proposed revisions in the federal program is assessed. Alternative revisions include a multimodal transportation block grant, three types of transit block grants, a user-side subsidy fund, a productivity-based bonus fund, and a system of varying federal matching rates for different types of expenditures. Hypothetical alternatives, as well as past and current federal programs, are evaluated on the basis of 10 criteria. Overall, the combination of a multimodal block grant and a user-side subsidy fund is superior to other types of revisions.

Subsidies to the American transit industry increased dramatically during the past decade. The total operating and capital subsidy from all levels of government increased from \$518 million in 1970 to \$7,812 million in 1980 (1). Despite this massive infusion of funds, vehicle miles of transit service increased by only 11 percent during the decade and ridership increased by only 7 percent (2, pp.55,58). These figures suggest that the direct benefits of subsidies for transit riders have not been commensurate with the size of the subsidy increase. Moreover, most studies indicate that the social and environmental benefits of transit subsidies have also been disappointingly small (3, pp.431-441; 4, pp.37-55; 5).

The apparent ineffectiveness of the subsidy program can be partly explained by rapid cost increases that accompanied subsidy growth. From 1970 to 1980 operating cost per vehicle mile increased from an average of \$1.02 to \$3.11 (2, pp.47-58). Capital costs per transit vehicle and per mile of rail system construction increased almost four-fold (1).

Compounding the financial problems caused by increasing per-unit costs, transit service improvements have, in some cases, focused on the most expensive types of transit. For example, 69 percent of the cumulative federal capital subsidy from 1965 to 1980 was allocated to rail rapid transit and commuter rail although these rail modes carry only 26 percent of the nation's transit passengers (2, pp.55, 69; 6). Similarly, most transit service expansion--both bus and rail--has been in the suburbs, where transit is the most unprofitable, due to long trip distances and few riders per vehicle (3, pp.277-291; 7). This expansion has occurred at the cost of reduced service in the central city, where short trips predominate and where transit vehicles are more fully occupied, if not actually overcrowded (8).

The design of the transit subsidy program may be the cause of its ineffectiveness. As the overall

level of subsidy increased between 1970 and 1980, the federal proportion of financing increased from 26 percent to 53 percent. With the increase of state aid from 12 percent to 17 percent of the total subsidy during this period, the share of the burden borne by local governments decreased from 62 percent to only 30 percent (1).

Currently, less than one-third of the transit subsidy burden is directly relevant to local government officials. Consequently, when weighing the projected costs and benefits of a proposed project, local officials may be tempted to consider only the small local share of costs, and to undertake projects whose benefits fall far short of total costs yet exceed local costs. Indeed, some critics have argued that the generation of local employment alone may provide sufficient incentive for local officials to support expensive capital projects--with 80 percent to 85 percent federal financing and an average of 10 percent state financing (3, pp.7-8,31-49). Similarly, urban areas that receive generous federal operating assistance (40 to 50 percent in many cities) have initiated or maintained highly unprofitable routes and types of service that local officials probably would not have been willing to finance on their own.

It also appears that none of the federal, state, or local subsidy programs has made funding levels sufficiently contingent on cost control, ridership gains, or the achievement of social, environmental, and economic goals. Only a few states tie subsidy payments to performance indicators, and even these states set aside only a small fraction of the state subsidy to reward efficient systems. Until 1983 the federal government took no account of system performance in allocating funds, and even now, less than 10 percent of the federal transit subsidy is distributed on the basis of a performance indicator (9).

The fiscal crisis of mass transit has provoked substantial research on transit finance, including a few studies examining alternative revisions of the federal subsidy program that would encourage greater effectiveness and cost control (10,11). The new federal transportation law, passed by Congress in December 1982, partly reflects the recommendations of these studies, but in most respects it runs directly counter to them (9). Various types of revisions in the federal program would have introduced better incentives for local decision makers. For example, a range of federal matching rates could have been established, with high-priority types of expenditures (such as maintenance) receiving more generous federal assistance than other types of expenditures. Alternatively, the old program could have been replaced entirely by a transit block grant, whose amount would be tied directly to levels of output (vehicle hours or vehicle miles), ridership, or locally raised revenues. A more fundamental revision would have been the adoption of a comprehensive transportation block grant, whose allocation between highways and transit as well as between capital and operating expenses would be at the discretion of local officials. These overall changes could have been supplemented by a bonus fund to

reward productivity improvement or a user-side fund to subsidize fares or special services for low-income, elderly, and handicapped riders.

The purpose of this paper is to describe the most promising alternative redesigns of the subsidy program and to evaluate each alternative, as well as the old and current federal programs, on the basis of a comprehensive set of criteria.

#### CRITERIA

The following criteria, which are the key to choosing among the alternatives, were developed:

1. Productivity and cost control.
2. Service level and distribution.
3. Fare policy.
4. Ridership levels.
5. Distribution of funds among cities, states, and regions.
6. Impact on poor, minorities, elderly, and handicapped.
7. Flexibility in changing circumstances.
8. Correspondence with transportation needs of each city.
9. Independence in local decision making.
10. Administrative costs.

Clearly, the selection of evaluative criteria is a subjective matter. Although few would doubt the appropriateness of considering the foregoing criteria, there is certainly room for disagreement on their relative importance. Some observers, for example, may support a program that encourages a high proportion of operating costs to be covered by passenger fares. Others may favor just the opposite. Similarly, independence in local decision making may be an advantage for some, whereas others may prefer a high degree of federal control.

All of the criteria relate to the effectiveness of the transit program in a broad sense--namely, to maximize the benefits of transit for any given amount of subsidy. This goal is perhaps clearest in the first criterion, which considers the extent to which different subsidy designs encourage productivity improvement, reductions in the growth of per-unit costs, moderate wage settlements, and the elimination of highly unprofitable and underused types of services. This first criterion overlaps the second, which examines the impact of alternative subsidy designs both on overall service levels in each city and on the distribution of services by type of service, by time of day, and by portion of the urban area. Together the impacts on service and fares (the third criterion) largely determine the impact on ridership (the fourth criterion). This latter impact is especially important, because the direct benefits of transit for riders as well as the indirect social and environmental benefits of transit are mainly a function of--and reflected by--ridership levels.

The fifth and sixth criteria both deal with equity; that is, equity among geographic areas as well as among individuals. More than almost any other federal program, transit subsidies have been attacked because most of the funds have been concentrated in only a few states, or in only a few cities. This has been an important factor in congressional deliberations, and it has a significant effect on the political feasibility of any transit subsidy program. An equally important equity issue involves how each alternative subsidy program would affect disadvantaged groups. Will the poor, for example, face disproportionately large fare hikes and service cutbacks, or are they likely to benefit

from the new incentives introduced by each alternative program?

The last four criteria deal with a range of practical considerations. Ideally, a subsidy program should be adaptable to changing circumstances. As populations change, as travel patterns shift, as government budgets vary from year to year, a subsidy program should be flexible enough to deal with changing transportation needs while responding to the changing availability of government funds. Moreover, a program should be sensitive to the different transportation needs of different areas. In one city, there may be a pressing need for transit improvements, whereas in another, highway expenditures may merit top priority. Similarly, there may be a need for operating funds in one city, whereas capital funds for infrastructure improvement may be required in another.

It is probably desirable that a program encompass different needs and priorities. The eighth criterion overlaps the ninth--the degree of independence in local decision making. It is debatable whether local officials are more likely to make wise decisions than federal officials. Some observers might argue that if the federal government finances most of the subsidy, it ought to determine the objectives that are to be pursued and strongly influence how funds are spent. Others would argue that federal officials are too far removed from the actual situation in each city to understand what is really needed, or what is feasible. Finally, the administrative costs of each alternative must be taken into account.

Together, these 10 criteria form the basis for a comprehensive evaluation of alternative redesigns of the federal subsidy program and of the actual programs that have been in effect. It is possible to imagine additional considerations, but the chosen criteria probably include the most important factors.

Of course, it cannot be expected that a proposed alternative should satisfy all the criteria. Indeed, to some extent, there are conflicts among the criteria. For example, maximizing the nation's transit ridership could probably be achieved most effectively by concentrating subsidy funds in high-density, transit-oriented areas where additional service is likely to be more intensively used than it would be in low-density, automobile-oriented areas. This concentration of funds--and of additional service--in areas that already have the most transit service would leave automobile-oriented areas with even less transit than exists currently. Although it would maximize transit riderships nationwide (for any given amount of subsidy), such a strategy may increase inequities in the distribution of subsidy funds and service among geographic regions, and may further reduce the mobility of the carless disadvantaged living in low-density areas. Thus, there are inevitably trade-offs among some of the criteria.

The analysis that follows is primarily qualitative and conjectural in nature. Because there is little actual experience with the alternative programs--either in the United States or abroad--it is impossible to predict with certainty exactly how each alternative would perform on each criterion. In most cases, however, it is possible to assess the nature or direction of each type of impact on the basis of the incentives and distribution formulas inherent in each alternative. Even such a limited analysis highlights the relative advantages and disadvantages of alternative subsidy programs.

Before evaluating hypothetical alternatives to the old federal subsidy program, it is appropriate to assess this program according to the same criteria that will be used to evaluate various revisions that were considered as well as the new federal program that actually resulted.

## EVALUATION OF THE OLD FEDERAL PROGRAM

The most significant aspects of the old federal transit program were its categorical nature, the degree of federal oversight, and the way funds were distributed among urban areas. [For a detailed discussion of the program and its evolution, see Meyer and Gomez-Ibanez (4, pp. 37-55; 10; 12; 13).] The program was categorical in that most available funds were restricted in use, and depending on use and source different federal matching rates applied. For example, the so-called Section 3 funds, which in 1980 accounted for \$1.7 billion of the total \$4.1 billion federal subsidy, could only be used for capital projects approved by the Secretary of the U.S. Department of Transportation on a case-by-case basis. The federal matching rate for Section 3 capital grants was 80 percent, and there was no statutory limit on the amount each urban area could receive.

In contrast, most Section 5 funds (\$1.6 billion in 1980) could be used for either capital or operating expenses, but a higher federal match was provided if capital expenditures were chosen (80 percent versus a maximum of 50 percent for operating expenses). A special category of Section 5 funds could only be used for bus replacement (about \$0.4 billion of the \$1.6 billion total). The maximum Section 5 funding for each urban area was determined by a formula based primarily on population and population density. Also, no state's portion of a single metropolitan area could receive more than 30 percent of the nation's total Section 5 funds. The result of these stipulations was that the federal government financed the maximum 50 percent of transit operating subsidies in most low-density, automobile-oriented cities but substantially less than 50 percent in high-density, transit-oriented cities (e.g., 22 percent in New York) (14).

There were two additional sources of capital subsidies. In 1980 \$26 million in federal transit aid was provided through the Urban Systems program, which allowed state and local officials to choose between capital expenditures for highways or transit. The federal matching rate, however, was less than for Section 3 or Section 5 funds (70 percent versus 80 percent). Moreover, the total amount of available federal funding was much less. Finally, Interstate transfer funds provide an 85 percent federal match for transit capital projects built in lieu of formerly approved links in the Interstate highway network that have been deemed unnecessary by state and local officials. Interstate transfer grants--which must be approved by the Secretary of Transportation on a case-by-case basis--amounted to \$675 million in 1980.

In short, the old federal transit program, under the 1978 Surface Transportation Act, comprised a variety of grant provisions, with a range of matching rates, approved uses, application procedures, distribution methods, and degrees of federal oversight. Overall, there was a strong bias toward capital subsidies. Not only did they entail higher federal matching rates, but the total amount of federal funds that could be used for capital expenditures was much larger than the amount that could be used for operating expenses. Almost 60 percent of program funds were distributed at the discretion of federal officials, who therefore had considerable influence in determining which transit projects were undertaken. Finally, all federal funds were stipulated in compliance with numerous regulations--including labor rules, accessibility requirements (for the elderly and handicapped), environmental standards, social impact assessments (especially for minor-

ities), guarantees of citizen participation, and requirements to purchase American-built equipment.

There were a number of ways in which the old federal program may have encouraged inefficiencies. First, it provided no incentives for cost control. Indeed, the higher the costs, the larger the federal subsidy received--both for operating and capital subsidies. Subsidy amounts were not tied to levels of service or ridership. In addition, the especially high capital matching rate created a bias toward expensive capital investment. As indicated by Tye (15) and Hilton (5), this led to inadequate maintenance of existing infrastructure and equipment. Moreover, there was an incentive to spend the maximum possible federal funding, regardless of the intrinsic desirability of the actual projects undertaken. Favorable employment impacts alone were generally sufficient to offset the small proportion of capital costs (10 percent or less) borne by local governments.

Inefficiencies were not limited to the capital subsidy program. It appears likely that operating subsidies might have encouraged excessive increases in wages and fringe benefits, declining labor productivity, unwarranted service expansion, and the maintenance of highly unprofitable and underused types of service. In an econometric analysis of the finances and operations of 77 U.S. transit systems in 1979 and 135 systems in 1980, Pucher et al. (16) found that for every additional dollar of federal operating subsidy, operating costs per bus hour increased by 62 cents. Thus, cost increases associated with federal subsidies consumed almost two-thirds of the subsidy--controlling, of course, for other factors affecting costs.

It does not appear that federal subsidies had favorable impacts on service levels, fares, or ridership. The results of the rail-oriented and suburban-focused service improvements of the 1970s suggest that service increased most where it was least used and most unprofitable (8, 17, 18). In this respect, federal subsidies were not targeted where they would have been most effective. Moreover, the overall amount of transit service (vehicle miles) increased by only 11 percent from 1970 to 1980. During the same period, transit fares in the United States increased at a rate slower than inflation so that by 1980, the average transit fare (in constant dollars) was 28 percent less than in 1970. This fare reduction, together with slight service expansion, was probably responsible for the 7 percent ridership growth during the 1970s, a sharp contrast to the 57 percent ridership loss from 1950 to 1970 (2, pp. 55, 58, 60). These trends suggest that burgeoning federal subsidies at least helped to curtail the long-term decline in transit use. Ridership would have grown more, however, if subsidies had not encouraged cost inflation and if new services had been instituted where they would have been better used.

How equitable was the old federal program? In terms of its geographic distribution, federal funding was concentrated in a few areas. For example, the 10 largest urban areas received 65 percent of the nation's cumulative federal capital subsidy (\$18.1 billion) from 1965 to 1981 (6). The same 10 urban areas received 53 percent of total federal operating assistance (14, 19). Some degree of geographic concentration, of course, is virtually inevitable for any program whose funds are restricted to transit use.

The inequities that arose from the effects of the old program on disadvantaged users appear far less defensible. As indicated by Pucher (20), those types of transit services most relied on by the poor were subsidized far less than transit services used mainly by the affluent. Inequities in capital sub-

sidies were particularly the responsibility of the federal government, as capital-intensive rail modes patronized by affluent riders were heavily favored. Moreover, the expansion of bus services in the suburbs at the expense of service reductions in the central city harmed the poor and minorities disproportionately. Although federal policies did not explicitly encourage such service shifts, neither did they protect the interests of the disadvantaged.

The old federal program offered limited flexibility to respond to changing circumstances over time. The capital program, for example, required the Secretary of Transportation to make case-by-case judgments about the appropriateness of proposed capital projects. Ideally, a transit system's grant applications as well as the Secretary's decisions should have reflected changing transit needs in each urban area, but in practice, it appears that political considerations and the overriding desire to maximize federal funding were more important in determining the distribution of grants. Moreover, such long delays arose from the grant approval process and project construction that capital subsidy responses to changing needs were quite slow (21). The operating subsidy program was even less flexible, with funds allocated on the basis of population and population density as of the latest decennial census.

Similarly, the old program appeared to be insensitive to the different transportation needs of different urban areas. Most important, no transit grants could be used for highways, and almost no federal highway funds could be used for transit. Only the small Urban Systems program permitted a choice between highway and transit expenditures. The Inter-state transfer program has offered the possibility of converting highway grants to transit grants, but approval is by no means automatic; the consent of the Secretary of Transportation is required as well as special congressional appropriations from general revenues (not the Highway Trust Fund). As discussed earlier, flexibility in the use of funds between operating and capital needs was also limited; only about one-fourth of total federal funds were permitted (Section 5, excluding bus replacement funds).

The transit program also interfered with local decision making. Not only did differential federal matching rates appear to bias decisions, but discretionary programs (such as Section 3 and Interstate transfers) required project-by-project approval from UMTA. Moreover, all federal grants required compliance with an extensive set of regulations that influenced virtually every aspect of their use as well as the cost of the services or facilities financed.

In addition, the old program was time-consuming and expensive to administer. Approval of federal transit grants was slow and cumbersome (22). A large federal staff was needed to screen applications, to evaluate proposals, to monitor ongoing projects, and to ensure compliance with federal regulations. Witnesses at congressional hearings on the transit program agreed that adequate federal oversight was almost impossible (22). Not only were there too few UMTA staff available for this purpose, but the necessary judgments were often subjective and difficult to make. The old program also required large staffs at the state and local level to apply for federal grants and to facilitate compliance with federal regulations in ongoing projects. In all respects, the administration costs of the old system were high.

#### EVALUATION OF HYPOTHETICAL ALTERNATIVES TO THE OLD FEDERAL PROGRAM

The shortcomings detected in the preceding analysis suggest that the old federal transit program needed to be improved along a number of dimensions. A wide variety of alternatives were considered before the enactment of the 1982 federal transportation act. Several of the proposed revisions in the program would have better satisfied at least some of the criteria. In the following section the advantages and disadvantages of the most promising alternatives that were proposed are evaluated.

##### Minor Variation on the Old Federal Program

One of the revisions proposed would have entailed relatively minor revisions in the structure of the current program. For example, the old system of matching rates could have been altered to encourage those types of expenditures deemed to be most needed and to discourage those types of projects with low federal priority. There appears to be a consensus that precedence should be given to expenditures for maintenance of existing infrastructure and equipment and for minor capital improvements that increase the efficiency of transit operations (11,22). Such projects would receive the maximum federal match--perhaps 80 percent or even 90 percent. Large-scale capital projects as well as nonmaintenance operating expenses, in contrast, would be funded at much less generous federal matching rates--possibly as low as 20 percent or 30 percent. Such a large rate differential would probably introduce the desired bias in local decision making.

By its design, such a subsidy allocation procedure would focus funds on maintenance and improvements for existing systems, where funding is most needed and where it would probably produce the greatest benefit per dollar spent. Moreover, the low matching rate for large-scale capital projects and operating expenses would discourage elaborate and expensive new rail systems in low-density cities. It would also remove some of the inflationary impact of federal subsidies on transit wages.

With likely reductions in the overall operating subsidy resulting from the lower federal match, fares would increase. It is unclear how the total amount of service would change, but the quality of service would probably increase (fewer breakdowns, cleaner vehicles and stations, etc.), and the distribution of services would probably improve as funds shift to more intensively used, existing systems. Of course, the extent of fare and service changes would depend on the total level of federal funding.

In terms of equity impacts, subsidy funds would be more geographically concentrated under the structure of the current program than under the old federal program--due to the reduced operating subsidy. The impact on disadvantaged users would depend on the specific types of service and fare changes made by local transit operators, and these are difficult to predict. Nevertheless, a reduction in the federal matching rate for large new rail systems would reduce benefits to the relatively affluent riders who patronize such systems. Thus, low-income groups would reap a larger proportion of the total subsidy.

Although the differential matching rate program would permit some flexibility in the use of funds, it obviously interferes with local preferences by funding less-favored categories of expenditures at less-generous matching rates. Thus it assumes that priorities are more appropriately set at the federal

level. The main administrative difficulty would be the uniform accounting for different categories of expenses, especially the identification and measurement of maintenance expenditures. Moreover, the distinction between major and minor capital projects may be debatable--as would be the issue of whether a project was aimed at improving the efficiency of an existing system. These problems do not appear insurmountable, but dealing with them would require considerable effort at both the federal and local levels to ensure uniform accounting procedures and to monitor whatever projects are undertaken. The problem of case-by-case federal approvals for capital projects would remain.

#### Transit Block Grants

The conversion of the current set of federal transit programs into a unified transit block grant would entail significantly greater structural change than would the revision discussed earlier. Perhaps most significantly, a true block grant would completely eliminate federal interference in choices among types of expenditure as well as in specific project selection. The main choice to make in establishing a block grant is how to allocate funds among cities. Three formulas for subsidy distribution appear to have the most potential: federal subsidies proportional to ridership levels, proportional to vehicle miles (or hours) of service, or proportional to state and local subsidies and fare revenues.

#### Ridership Block Grant

By tying subsidy levels directly to ridership, the federal program would provide strong incentives for local officials to use subsidies in ways that maximize ridership per dollar spent. Thus, many underused and unprofitable services would be cut. Within each city as well as among cities, funding would shift toward the most intensively patronized services. There would also be an incentive to keep fares low to increase ridership and thereby increase the federal subsidy. Indeed, there can be little doubt that this type of block grant would maximize the nation's transit ridership for any given amount of federal subsidy.

Because those types of services most used by the poor require the least subsidy per passenger (20), a ridership-based block grant might encourage increased services for disadvantaged central city residents. Conversely, because demand elasticity is inversely correlated with income, there may be a countervailing incentive to minimize fare reductions and service increases for services relied on by the poor. The net outcome is not obvious, but the former, more favorable equity impact would probably predominate; differences in unprofitability among types of services are much larger than elasticity differences among income groups (20,23).

Geographic concentration of funding under a ridership block grant would be slightly more than under the old federal program (62 percent versus 60 percent of total federal funds allocated to the 10 largest urban areas) (2,6,11,14). Ridership-based funding would be more concentrated because of higher load factors in large cities. Nevertheless, a ridership-based block grant may appear more equitable than the old system because it would provide equal federal subsidies per rider for all cities. As with any transit program, of course, per-capita subsidies would be much larger in large, transit-oriented cities.

A ridership block grant would provide flexibility

in the use of federal subsidies, and it would automatically provide additional funding to those cities experiencing an increased need for transit service--insofar as this is expressed by ridership growth. It might not be well-suited, however, to finance large capital projects or any type of service expansion aimed at inducing future ridership growth. Moreover, cities losing ridership--for whatever reason--would receive less funding, which would force service cutbacks and fare increases, which would further reduce federal funding, and so forth, in a vicious cycle. This may be an efficient solution to the problem of serving a changing regional distribution of transit riders in the country, but it would certainly compound the hardships of declining cities.

Another problem with a ridership block grant is the incomparability of ridership statistics, their questionable reliability, and the potential for deliberately overestimating ridership to maximize federal funding. Incomparability arises from different trip lengths, different transfer policies, and different ways of estimating free riders and trips made by monthly pass holders. Inaccuracy arises from the estimation of ridership from revenue figures (on many systems) instead of actual passenger counts. These two problems create the possibility of exaggerating ridership figures, and the subsidy program itself would provide a strong incentive to do so. Similarly, different trip lengths and transfer policies on different transit modes would also be a source of difficulty in administering a ridership block grant.

#### Service-Based Block Grant

Problems of administration and data validation would be greatly reduced if the transit block grant were distributed in proportion to vehicle miles or vehicle hours of service. Although it would probably be necessary to adjust the allocation formula to handle different vehicle sizes and types, there would certainly be less potential for inaccurate estimates of the necessary data for each city.

This variation on the transit block grant is not without its shortcomings. For example, it would not provide a strong incentive to eliminate underused services. It would not reward systems that achieve high ridership, and it would not penalize systems that run empty buses. Moreover, the problem of interregional inequity in the federal transit program would persist.

It is significant, however, that geographic concentration would be considerably less than with a ridership block grant. Indeed, if vehicle miles (instead of hours) were used in the distribution formula, only 50 percent of the total federal subsidy would be allocated to the 10 largest urban areas, compared to 62 percent under a ridership block grant and 60 percent under the old federal program. Small and low-density cities would be favored because bus speeds in such cities are much higher than in large, dense cities (14). In addition, per-hour and especially per-mile costs are much higher in larger cities (14). Because equal federal subsidies would be provided for each equivalent vehicle hour or mile, federal subsidies under such a block grant would cover a much higher percentage of costs in lower-density cities. Of all the alternatives examined so far, this type of grant would create the least interregional inequity.

What would its impact be on overall service levels, fares, and ridership? By its design, such a block grant would strongly encourage service expansion, regardless of whether or not additional service is well used. Although it would provide no

incentive to eliminate underused service, it would discourage the provision of high-cost service because all services would be subsidized at the same per-hour or per-mile rate. Thus, it might lead to a shift of services from peak hours to off-peak hours, when per-hour and per-mile costs are much lower (24). A vehicle-mile based formula would certainly favor a shift of services to low-density suburban areas with less congestion or to increased express routes. By contrast, a vehicle-hour based formula would avoid this bias in local route planning.

A service-based block grant might actually reduce overall ridership levels. It would probably encourage fare increases, because the same federal subsidy would be received regardless of ridership, and the necessary state and local subsidy would be reduced by increasing fare revenues. In addition, although the total amount of the nation's transit service would increase, it would increase the least (or actually decrease) where ridership per vehicle is currently the heaviest, because cost per mile and per hour are generally highest for such services. To the extent that this type of block grant encourages shifts to express routes and suburban services, poor and minority riders would be harmed. This adverse impact would be mitigated, if services also shift from peak to off-peak hours, when transit use among the disadvantaged is greatest (25).

A service-based block grant would be equally as flexible as a ridership block grant by permitting choices among types of expenditures, and it would provide local decision makers considerable independence. Moreover, a service-based block grant would be more responsive to changes in travel patterns over time. Local officials would immediately receive federal funds as new services are added; it would not be necessary to wait until sufficient ridership is generated. Large new capital projects, of course, would be difficult to incorporate in any type of formula-based grant.

#### Revenue-Based Block Grant

The problem of large capital projects also arises for the third variant of the transit block grant, which would allocate funds in proportion to state and local subsidies plus fare revenues. This alternative is of particular interest because it was recommended by a congressional transportation subcommittee in 1982 (11). One reason the congressional subcommittee backed this formulation was the hope that it would encourage cost control. It is not clear that such an objective would be achieved. Matching state and local subsidies plus fares would be equivalent to federal funding of a fixed percentage of total costs. Therefore, the higher a system's costs, the higher its federal subsidy. Of course, the higher state and local subsidy burden needed to finance the higher costs might tend to discourage cost escalation, as would increased fare burdens.

Similarly, it is not certain what impact such a block grant would have on service levels. It does not appear to introduce any strong incentives either to change overall service levels or to shift services among modes, routes, or times of day. It would probably encourage fare increases because fare revenues would be matched by federal subsidy, unlike the current arrangement. Ridership losses would be avoided only if the matching structure so increased total funds devoted to transit (all subsidies plus fare revenues) that substantially more service could be financed, or if the new distribution of services corresponded better to the distribution of potential riders.

The latter scenario appears more likely. Accord-

ing to congressional estimates, a transit block grant distributed in proportion to non-federal subsidies and fare revenues would produce the greatest geographic concentration of federal funds--with 66 percent allocated to the 10 largest urban areas (11). Because transit service in these cities is better used than elsewhere, a shift of funds would permit service expansion and ridership gains per dollar of federal subsidy, although not as much as a ridership block grant would encourage. This geographic concentration of funding limits the political feasibility of such a grant. Indeed, the congressional subcommittee recommendation failed to win approval from the full transportation committee, and was not considered by the Congress as a whole.

Another equity problem with the revenue-based block grant is its likely adverse impact on low-income and minority riders. Increased reliance on fares for transit finance would cause greater hardships for low-income riders (20). Moreover, shifts of federal funds from smaller cities would also be to their disadvantage because low-income riders constitute a much higher proportion of total transit riders in smaller cities than in large cities (25).

Perhaps the greatest advantage of this third variant is its low administration costs. It would be easy to determine the total state and local subsidy and fare revenue for each city, and the potential for inaccurate data or distorted accounting would be slight.

#### Transportation Block Grant

The most dramatic departure from the old federal transit program would have been a transportation block grant, which could be used for either highway or transit--for either capital or operating expenses. It would generate the least federal interference with local priorities. Virtually no federal biases would be introduced by such a grant--on the assumption that state and local officials know what is best for their own areas and that they are in a better position to monitor expenditures to ensure effective use of subsidy funds.

A transportation block grant would allow transit-oriented cities to devote more money to desperately needed transit improvements instead of wasting categorical federal highway funds on expensive highway projects of questionable value, simply because the federal funding for highways is available. Transit services would be increased in areas where they are most beneficial, and they would be contracted elsewhere. For example, transit may not be an effective option in fast-growing, low-density areas where highway improvements may merit top priority. A transportation block grant would not force such communities to spend money on underused transit services. In this regard, a block grant would permit a more rational allocation of total transportation resources.

Although cost control and productivity improvement within each expenditure category would become the sole responsibility of state and local officials, the structure of the federal grant would encourage increased concern for these goals. Unlike the current situation, a dollar of federal aid wasted in transit projects would be a dollar less for local officials to spend on highway projects. Similarly, a dollar of federal aid wasted in capital spending would be one dollar less for operating expenditures. Thus, the relevant opportunity costs of federal funds for local decision makers would be considerably increased.

Efficiency would be further enhanced in an even broader sense. If the transportation block grant was

distributed to areas on an equal per-capita basis, it would reward areas that manage to economize on travel and would penalize areas with extensive travel per capita. Over the long run, this might discourage suburban sprawl and encourage clustered development. Finally, such a multimodal fund would probably enhance efficiency by facilitating an integrated, multimodal approach to transportation planning. Indeed, federal officials might require each urban area to develop comprehensive transportation plans as a prerequisite to federal funding. Provided that specific project approval is not required, this would be a minor federal interference.

Effects of a transportation block grant on transit service levels, fares, and ridership would vary widely from one city to another. In cities choosing to devote a higher percentage of federal funding to transit, service would probably increase, fares would decrease (or increase less), and ridership would increase. The reverse would occur in cities deciding to shift toward greater highway emphasis. Overall, it appears likely that transit-oriented cities would become more transit-oriented, and that automobile-oriented cities would become more automobile-oriented.

The equity impacts of a transportation block grant in the United States are debatable. It would aid low-income transit riders in large cities, but it would disproportionately harm them in smaller cities, where they account for most ridership (25). Indeed, in small cities, the poor might be left without any transit at all. The interregional distribution of funds would be equitable in that per-capita subsidies would be exactly equal. Some might argue, however, that larger subsidies should be given to areas where transportation needs are greater, and that in the short-run, equal per-capita subsidies would put such areas at an unfair disadvantage.

In spite of these possible difficulties, a unified transportation block grant has considerable appeal. It would overcome the problem of channeling transit funds where they are most needed while not concentrating the funds in so few areas that congressional support cannot be obtained. The balancing off of transit funds with highway funds would reduce interregional inequities and would enhance the political feasibility of a transportation block grant.

In addition to the three major categories of program revisions analyzed previously, two supplemental grant programs might be useful as adjuncts to any of the alternatives. These adjuncts include a special bonus fund for productivity improvement and cost control and a supplemental, user-side subsidy fund for the disadvantaged.

#### Bonus Fund for Productivity and Cost Control

Under a special bonus fund for productivity it would be possible to set aside some small percentage of total federal funds (perhaps 10 percent) to reward those cities that achieve improvements in productivity, cost control, or some other appropriate indicator of performance. For example, average values of each indicator (or changes in each indicator) could be calculated for the country as a whole. Systems performing better than average on a particular indicator would receive a bonus, and the more indicators according to which a system was successful, the more bonus funding the system would receive. Alternatively, the critical performance measures might be specified as percentage increases or decreases. An incentive fund could probably be established for

highway expenditures as well, although the specific indicators would obviously be different.

Assuming that the transit performance indicators would at least include slow growth in cost per service hour (efficiency) and increases in riders per service hour (effectiveness), a bonus fund would encourage transit systems to improve their performance in both dimensions. Service levels would probably decrease because there would be an incentive to eliminate the most expensive services as well as the services that are used the least. The overall ridership losses caused by such cutbacks would be offset by fare reductions (to increase riders per hour) and by the more effective allocation of services by route and time of day.

Equity impacts of a bonus fund would be mixed. It would probably benefit low-income riders in the central city, where vehicle occupancies are the highest, and where services would tend to shift to increase systemwide occupancy rates. Similarly, the poor would benefit from fare reductions.

Interregional equity would be low. Inevitably, cities would be treated differently: inefficient systems would be penalized, and efficient systems would be rewarded. Thus, it might conceivably lead to a more unequal distribution of funds. Moreover, if rewards are based only on changes in performance, systems that are already efficient might find it difficult to improve enough to earn a bonus. Conversely, if rewards are based on absolute levels of performance, they might represent windfall gains for already efficient systems and thus create little incentive for such systems to improve. Finally performance indicators might be significantly affected by factors (such as population change, topography, and urban structure) over which transit systems have little if any control. It might appear unfair to penalize systems for the adverse impacts of these factors.

Another problem with the bonus fund would be its administrative cost. Depending on the specific performance measures chosen, it would require considerable expense and effort to monitor operations and to ensure accurate and comparable reporting of the necessary data.

#### User-Side Fund for the Disadvantaged

A special user-side subsidy fund for the disadvantaged might serve as an appropriate adjunct to any general subsidy program. There are many different ways in which such a user-side subsidy could be designed. The comprehensiveness of the subsidized group is also subject to debate. Ideally, it would include low-income persons as well as the elderly and the handicapped. Eligible persons might receive transportation vouchers that could be spent for transit, van service, taxis, or other transportation services deemed appropriate. Of course, it would be possible to restrict the program to transit, but this would greatly reduce the benefits of the user-side subsidy. Many elderly and handicapped individuals are simply unable to use conventional transit. Moreover, in small cities especially, taxis represent a far more available and convenient mode of travel.

Economists and transportation analysts are virtually unanimous in their support for user-side subsidies to help the disadvantaged (3, pp.312-313; 4, pp.250-253; 26; 27). Similarly, there is widespread agreement that redistributive objectives should primarily be the responsibility of the federal government (28). Thus, it appears appropriate for such a subsidy fund to be coordinated and financed at the federal level.



A user-side subsidy fund would be cost-effective in two respects. First, it is unquestionably the most effective way to target subsidies to the disadvantaged. Second, it would facilitate efficiency of conventional transit operations by freeing transit managers from concern about adverse equity consequences of productivity measures. For example, it would reduce the need for expensive modifications to existing transit systems to make them accessible to the elderly and the handicapped. Likewise, it would permit fare and service policy decisions to focus exclusively on improvement of efficiency.

In addition to the favorable equity impact such a user-side subsidy would have for disadvantaged groups, it would also enhance reductions in inter-regional inequities in the distribution of federal funds. The percentage of transit riders with low incomes is more than twice as large in small cities as in large cities (25). Thus, a user-side subsidy aimed at the poor would benefit a much higher percentage of transit riders in smaller cities. This would reduce the overall concentration of federal transit subsidies in the 10 largest urban areas. Because median incomes are considerably lower in smaller cities at any rate, even a multipurpose transportation voucher program would have a deconcentration effect.

There are other advantages of a user-side subsidy. By its design, it would correspond exactly with the needs of each city for special subsidies for the disadvantaged, both in the level of funds and in the use of those funds. Moreover, funding levels would automatically adjust over time to changing needs as population characteristics change.

The main drawback of a user-side subsidy program is administrative cost, including possible difficulties in ensuring eligibility and preventing fraudulent use of vouchers or discount transit passes. A number of demonstration programs sponsored by UMTA suggests that these potential problems can be successfully handled (26), but doing so would require increased staffing at both the federal and local levels. Critics might also complain that a user-side subsidy program would interfere with local prerogatives in deciding which type of traveler to subsidize. This appears to be a dubious objection, however, especially if federal funding were 100 percent. As discussed earlier, moreover, a user-side fund would facilitate reduced federal interference in other aspects of transportation policy.

#### EVALUATION OF THE NEW FEDERAL PROGRAM

In the last hours of the lame-duck session of the 97th Congress (December 1982), a new federal transportation law was finally passed: the Surface Transportation Assistance Act of 1982 (P.L. 97-424) (9). It contains modifications to the 1978 legislation that significantly change the procedure for allocating federal transit subsidies. A larger percentage of the subsidy total is now allocated by formula (63 percent versus 40 percent under the 1978 act), and the allocation formula itself has been altered. Whereas the bulk of formula funds were allocated according to population and population density under the old Section 5 formula, the new Section 9a and Section 9 formulas allocate funds primarily according to the amount of transit service supplied in each urban area (vehicle miles and route miles).

For example, 57.37 percent of the total rail transit subsidy is to be distributed in proportion to each area's vehicle miles of commuter rail and rail rapid transit service; 38.24 percent will be distributed in proportion to rail route miles; and 4.39 percent will be distributed in proportion to

rail passenger miles multiplied by the ratio of passenger miles to operating cost in each area (9). Federal subsidies for bus transit in cities with populations of 200,000 or more are to be allocated 50 percent on the basis of bus vehicle miles, 25 percent on the basis of population, and 25 percent on population times population density. Subsidies to urban areas between 50,000 and 200,000 in population will be allocated 50 percent in proportion to population and 50 percent in proportion to population times population density (9). Subsidies to nonurbanized areas will be allocated solely on the basis of population.

These formula-allocated funds comprise the so-called block grant portion of the new federal program. In several ways this terminology is inappropriate. Local officials are significantly restricted in their use of Section 9 funds. The federal matching rate for capital expenditures is 80 percent, whereas for operating expenditures it is only 50 percent. Thus, there remains a strong bias toward using federal subsidies for capital projects. Moreover, there is an absolute limit to the federal operating subsidy received by each urban area. For urban areas with populations of 1 million or more, the federal operating subsidy cannot exceed 80 percent of the federal operating subsidy in FY 1982. For urban areas with populations between 200,000 and 1 million, the limit is 90 percent of the 1982 subsidy, and for yet smaller areas, the limit is 95 percent (9). The larger the urban area the more stringent the limit on operating funds, and the less real choice there is between expenditure options.

Aside from its decreased relative importance, the main changes in the discretionary capital grant program (Section 3) are a slightly reduced federal matching rate (75 percent versus 80 percent) and its financing through the proceeds of 1 cent of the federal gasoline tax instead of from general federal revenues. The Interstate transfer program remains intact (with an 85 percent federal match), but at sharply reduced levels of funding (e.g., \$365 million in FY 1983 versus \$675 million in 1980). As was true under the 1978 legislation, both Section 3 and Interstate transfer grants are made on a case-by-case basis by the Secretary of Transportation.

To the extent that the new federal legislation maintains provisions of the old legislation, the criticisms made at the outset of this discussion still apply. For example, the continuing large differential between federal matching rates for capital and operating subsidies maintains the strong bias toward capital expenditures. Moreover, the discretionary portion of capital funding remains subject to inordinate political influence and contains no provisions to ensure cost control or effective use of funds.

The new elements introduced into the federal transit program by the Section 9 block grant raise additional concerns. Of total formula funds, 46 percent will be allocated in proportion to vehicle miles, 11 percent according to route miles, 7 percent in proportion to passenger miles times passenger miles per dollar of operating cost, and 36 percent--on the old basis--in proportion to population and population density (9). As discussed earlier, this fourth of the allocation criteria has limited relevance to the transit funding needs of each urban area, and it certainly does not encourage cost control or rational deployment of services. The first three criteria at least relate to the output of transit systems. The problem with the vehicle mile and route mile measures is that they provide no incentive to eliminate underused services. Because transit speeds are much higher in outlying areas, the temptation is to expand suburban services--even

if they are lightly used--so as to increase system mileage and federal subsidy funds at minimum cost. Likewise, because it is less expensive to build rail transit systems in low-density areas, the new allocation formula is biased in favor of suburban rail service.

Perhaps the most interesting new factor in funding allocation is the use of passenger miles weighted by passenger miles per dollar of operating cost. Theoretically, this criterion should encourage improved ridership as well as control of per-unit costs. In practice, however, it will be difficult to estimate passenger miles accurately. The room for error is great, and the subsidy formula provides the incentive to overestimate. As discussed previously with respect to the ridership-based block grant, it is difficult enough to verify simple passenger totals for each transit system. Passenger miles present the additional complication of estimating average trip length. Even small errors could significantly distort subsidy allocations (by the square of the error in estimated trip length).

Approximately 56 percent of the new formula funds will be allocated to the 10 largest urban areas. This figure exceeds the degree of concentration under the old Section 5 program (53 percent) but is lower than funding concentration under the old, discretionary capital programs (65 percent) (6,19,29). Because the overall level of funding concentration under the 1978 legislation was 60 percent, the implementation of the combined operating and capital block grant through Section 9 should lead to reduced geographic concentration--and less than would have resulted from a purely ridership-based grant (62 percent) or a revenue-based grant (66 percent) (11). This suggests somewhat greater equity on a per-capita basis but less equity on a per-rider basis. Transit riders in dense, transit-oriented areas will be discriminated against even more under the new legislation than they were under the old. Large cities are put at the additional disadvantage of having less flexibility in choosing between operating and capital expenditures as a result of the more stringent limits on total operating subsidies in large cities.

The overall impact of the new formula program on disadvantaged users is hard to predict. On the one hand, the service-based formula encourages shifts of service to the suburbs, where both operating and capital costs per mile are lower. This would probably leave a smaller proportion of service in the inner city, where the poor are concentrated. On the other hand, the reduced importance of discretionary capitals funds--which had been used primarily for rail services patronized by the affluent--may offset this negative impact.

In contrast to the old Section 5 program, the new Section 9 block grant offers somewhat greater flexibility to adjust to changing circumstances over time. Approximately 64 percent of these funds can vary according to the amount of service offered (9). Thus, systems that need to expand service can expect a commensurate increase in federal subsidy to help offset the cost. In the case of long-term capital investments, however, increased service levels--and thus supplemental funding--will significantly lag behind capital expenditures, which will cause short-term financing problems. The 36 percent of Section 9 funds that continues to be allocated in proportion to population and population density (recalculated only once every 10 years) will be unresponsive to changing transportation needs.

Likewise, the new set of federal subsidy programs may not be responsive to the different transportation needs of different types of urban areas. The possibility of using federal funds for either high-

way or transit expenditures is even more limited than under the old legislation due to sharply reduced Interstate transfer funding. The choice between capital and operating expenditures is also restricted under the new program, with a strong bias toward capital. As a result, the distortions in local transportation expenditure decisions observed under the old federal program may persist. Not only would this lead to an inefficient use of subsidy funds, but its interference with the specific preferences of states and urban areas could be viewed as a shortcoming in itself.

Finally, there is little reason to believe that the new set of federal transit programs will be less expensive or less time-consuming to administer than the old program. The discretionary Section 3 and Interstate transfer grants will still require case-by-case approval by the Secretary of Transportation. Moreover, the new Section 9 block grant formula is more complicated than the old Section 5 formula, and the data needed for the formula are more difficult to measure and verify. The calculation of passenger miles alone will require a team of experts if even roughly appropriate figures are to be obtained. In short, the 1982 federal transportation law offers little improvement over the 1978 legislation. The federal program could still benefit from improved subsidy allocation procedures that promote efficiency and equity.

#### CONCLUSION

Of all the alternative designs of the federal transportation program examined here, the combination of a multimodal transportation block grant and a special user-side fund appears to be the most promising. In many ways this combination would be an improvement over the current program. It would avoid unjustifiable biases between highway and transit expenditures as well as between operating and capital expenditures. It would greatly increase the sensitivity of the program to the different needs of different types of cities and regions of the country. It would increase the independence of local officials in choosing among transportation projects but would also force them to weigh more carefully the full costs and benefits of alternative expenditures of subsidy funds. It would reduce interregional disparities in federal funding. It would target subsidies more effectively to the mobility-disadvantaged, and its administrative costs would be lower than most alternatives.

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# An Equity Assessment of Federal Highway User Charges

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## ABSTRACT

The Surface Transportation Assistance Act of 1982 made significant changes in the structure and level of federal highway user charges. Examined in this paper is the degree to which payments under the new federal rates conform to the cost responsibility of the various highway user classes as determined by the 1982 Federal Highway Cost Allocation Study. Estimated annual payments for various representative vehicle types and assumed annual mileages are computed and compared against the cost responsibilities of these vehicles. The analysis indicates significant equity problems within the new federal user charge structure. In particular, the new rates do not remedy the problem of cross-subsidization of high-mileage vehicles by low-mileage vehicles. Based on this analysis, several recommendations are made for improving the federal highway user charge structure, including the implementation of a federal weight-distance tax. It is demonstrated that the adoption of such a tax could make a significant contribution toward improving the equity of the federal tax structure.

The Surface Transportation Act of 1978, Section 506 (P.L. 95-599), mandated the U.S. Department of Transportation (DOT) to conduct a new Federal Highway Cost Allocation Study (FHCAS). In addition to the cost allocation study, Section 506 requested an assessment of federal user charges and called for recommendations "on any more equitable charges." Pursuant to this charge DOT submitted the Final Report on the Federal Highway Cost Allocation Study (1) to Congress in May 1982.

In response to pressure from the White House, the second session of the 97th Congress passed the Surface Transportation Assistance Act of 1982 (STAA). The House and Senate Committees, working in close consultation with the DOT cost allocation team, finally worked out a compromise version of the tax structure recommended in Chapter VI of the study. This version, referred to as the Conference Report, raised \$12.7 billion from highway users and was hailed by Congress as a jobs bill that would give a shot in the arm to the ailing economy.

In addressing the most pressing needs of the nation's highways and mass transit systems, the President in his remarks focused on the desperate condition of the transportation infrastructure and stressed that the bill was fair and the levies should be considered as user fees rather than taxes. Even though the bill easily passed Congress, after a prolonged filibuster attempt by Senator Helms of North Carolina, all was not calm on Capitol Hill or across the country. Although most agreed to the need for additional dollars to preserve and maintain a deteriorating transportation network, many were unsettled by the particulars of the tax structure.

Despite the fact that the Conference Report's tax

structure yielded tax rates below the rates recommended by the Federal Highway Cost Allocation Study, truckers believed they would be unfairly burdened. They found their frustrations represented by the Independent Truckers of America who sponsored a nationwide truckers strike in February 1983. Although short-lived, the strike culminated in violence that spread throughout the nation and underscored the intensity of the debate. The truckers were primarily directing their dissatisfaction toward the large fee increases scheduled for heavy trucks. The current highway use tax is a flat fee of \$3 per thousand pounds of gross vehicle weight (GVW) for trucks weighing more than 26,000 lb. The 1982 STAA scheduled phase-in rates up to 850 percent above the existing rates for the largest trucks.

Apparently, these voices have not gone unheeded by certain congressmen. Six bills have been introduced in the 98th Congress to drastically restructure the Conference Report rates--primarily by eliminating or reducing the heavy vehicle use tax with partial replacement by a fuels tax surcharge. Before this flurry of bills dealing with the heavy vehicle use tax, Congress directed DOT in Section 513(g) of the 1982 STAA to conduct a study of alternatives to the heavy vehicle use tax. This pressure has moved up the study deadline substantially so that Congress could consider alternatives by the summer of 1983. A meeting soliciting public comments on the study was held at DOT on April 27, 1983, and written comments on the docket were accepted through September 30, 1983.

Thus the stage is set for a congressional overhauling of the tax structure embodied in the 1982 STAA. The extent to which the concern about the fairness (equity) of the scheduled tax structure is valid is the subject of this paper. No attempt is made to analyze the results of the Federal Highway Cost Allocation Study either in terms of its theoretical or its empirical validity, but rather the question is raised as to how well the Conference Report's tax structure captures the costs attributed to the various vehicle classes identified in the study. It is readily acknowledged that different analytical approaches can yield substantially different results from the Federal Highway Cost Allocation Study. It is also recognized that the Federal Highway Cost Allocation Study embraced equity and investment criteria but not economic efficiency criteria.

## BACKGROUND

Highways have had a long history of the "user-pays" concept and the principle now seems firmly established. As they are perceived by the public and their elected representatives, user taxes are generally accepted as fair. But there is much less of a consensus as to whether or not they are fairly levied.

Historically, the federal government and most states have predicted cost allocation studies on equity rather than on efficiency, and have employed cost allocation on the basis of cost occasioning as the guiding principle of fairness. This method holds that those vehicle groups that occasion (give rise to) traceable costs should bear the tax burden.

Thus, the approach seeks to assign costs on the basis of relationships between vehicle characteristics (primarily size and weight) and additional highway costs.

The 1982 Federal Highway Cost Allocation Study was conducted using this concept of equity. The study recognized efficiency-based allocation approaches as a valid alternative and devoted an appendix to exploring the nature and magnitude of user charges based on marginal cost pricing.

Under the equity approach a fair tax structure requires that (a) all vehicle groups pay their fair share of fully allocated costs and (b) vehicles within the same group pay approximately the same amount. The first condition is necessary to satisfy vertical equity, whereas the second satisfies horizontal equity. A cross-subsidy between road user groups exists when some vehicle classes are overpaying and others are underpaying relative to their respective responsibilities. A cross-subsidy within a group exists when vehicles of the same group, with equal circumstances, are paying unequal amounts.

To avoid both vertical and horizontal equity problems, it is essential that the tax structure be flexible enough to capture the variable costs attributable to vehicles. These are costs resulting from a vehicle's size, weight, and travel characteristics.

The flexibility of the tax structure, in turn, depends on the nature of the tax type. Some tax types are adequate to avoid vertical inequity but not horizontal inequity. As will be shown, the Conference Report's tax structure, while failing both vertical and horizontal equity tests, results in alarming horizontal inequities. It is this aspect of the current federal tax structure that requires extensive overhauling, and the repair can only be made by introducing a more flexible tax-type that can adequately account for miles traveled among the heavy-vehicle group. Before analyzing the federal tax structure, some considerations that are prerequisite to the development of a rational equity-based tax structure should be examined. Here some lessons can be learned from the Oregon philosophy of highway finance and its resulting tax structure.

#### UNDERLYING PHILOSOPHY OF THE OREGON HIGHWAY USER TAX STRUCTURE

The state of Oregon has not relied exclusively on motor vehicle ownership and fuel for its revenue base, nor has it relied on general funds. Oregon has, since the mid-1930s, been dedicated philosophically to a cost-based approach to road finance known as cost responsibility. This approach has given Oregon a source of revenue more directly related to road wear than are the traditional registration and fuel taxes.

Throughout the past 75 years, Oregon has been guided in its road user taxation by three persistent principles:

1. Road users should pay the cost of the highway system.
2. Road users should be charged according to their cost responsibility; that is, payments by road user should be in proportion to the costs for which they are responsible.
3. Road user tax revenue should be used primarily for the operation, construction, and maintenance of highways.

In 1935 Oregon conducted its first cost responsibility study. In this study, the general "user should pay" principle was extended to include the

imperative that each class of road users should be taxed in proportion to its specific responsibility for the provision and maintenance of roads.

Based on this concept of highway finance, the study called for a three-tiered structure of road user fees. The first tier or structure is the registration fee, which, in Oregon, is considered to compensate for the fixed or non-use-related costs of providing a highway system. Because these costs account for a relatively minor portion of total highway costs, the registration fee in Oregon traditionally has been low in comparison to the corresponding fees in many other states.

The second tier is the fuel tax, which provides adequately for meeting the use-related cost responsibility of automobiles and other light vehicles. This is an important part of a true user tax, as the incidence of the tax falls on road users in proportion to their use of the roads.

The key to the Oregon system is the third tier in its tax structure, the weight-mile tax, a graduated mileage tax applied to all commercial vehicles weighing more than 6,000 lb. The rationale for a weight-distance tax is quite simple. It is by now well established that building roads to accommodate truck traffic costs more than building roads for automobile and other light vehicle traffic. Roads must be wider and stronger and bridges must be wider, higher, and stronger to accommodate trucks. In addition, wear and tear on the roads increases dramatically with increases in vehicle size and weight. Heavier axle loads increase the burden on the roads in an exponential manner. For example, a conference report (2) published on the proceedings of an American Association of State Highway Officials (AASHO) design committee concluded that the conventional five-axle semi operating at 80,000 lb does approximately six times more damage than the same vehicle operating at 50,000 lb.

The weight-mile tax, in effect, takes the place of a fuel tax on heavy vehicles, as fuel consumption, although it increases with vehicle size and weight, does not increase proportionately with cost responsibility. The results of the 1980 Oregon Motor Vehicle Cost Responsibility Study (3) indicate that the per-mile responsibility of an 80,000-lb truck is about 16 times greater than the per-mile responsibility of an automobile. The 80,000-lb truck, however, uses only three to four times the fuel used by the average passenger car for a comparable amount of travel. Similarly, the 1980 study revealed that the overall per-mile responsibility of a typical 80,000-lb truck is double that of a typical 50,000-lb truck, but the 80,000-lb truck uses only about 14 percent more fuel. Thus, fuel consumption alone does not adequately reflect the cost responsibility of vehicles of different sizes and weights.

This same deficiency applies to vehicle registration fees and other road user charges, such as the federal heavy vehicle use tax, that are not related to the amount of highway use. Although a registration tax based on vehicle gross weight may be graduated in its application, it does not reflect the variation in travel by the same vehicle from year to year or the variation in mileage among different vehicles of the same type and gross weight. Thus, two vehicles that are identical except that one travels 100,000 miles a year and the other travels 20,000 miles a year pay the same registration fee, even though the total responsibility of the first vehicle is five times that of the second vehicle.

Hence, neither a fuel tax nor a vehicle registration fee adequately reflects the cost responsibility of vehicles of different sizes and weights. A weight-mile tax, a tax based on vehicle weight and distance traveled, is the only type of tax that can

equitably charge heavy vehicles for the costs for which they are responsible. A road user tax structure consisting of a balanced mix of registration, fuel, and weight-distance taxes is required to capture the cost responsibility of vehicles of different sizes and weights and to equitably charge both high- and low-mileage vehicles.

#### THE FEDERAL HIGHWAY USER TAX STRUCTURE

On January 6, 1983, the President signed into law HR 6211, the 1982 Surface Transportation Assistance Act. As noted earlier, this legislation, among other things, substantially raised road user fees paid by vehicles operating on the highways. The legislation repealed previous user taxes on tread rubber, inner tubes, lubricating oil, and truck parts. What remains of the old structure is the gasoline and diesel taxes, the tax on new tires, the tax on new trucks and tractors, and the heavy vehicle use tax. Table 1 gives details of the Conference Report rates enacted by the 1982 STAA.

The gasoline and diesel tax was raised 5 cents per gallon effective April 1, 1983, for an increase of 125 percent. The revised tax schedule on new tires became effective January 1, 1984. The new schedule eliminates the tax on small tires (under 40 lb) used by cars but graduates the tax by weight for heavier tires used by trucks.

The revised truck and trailer sales tax went into effect on April 1, 1983. Under the new law, light trucks under 33,000 lb and trailers under 26,000 lb are exempt. The heavier vehicles now pay a sales tax of 12 percent of the retail price instead of 10 percent of the wholesale price.

The heavy vehicle use tax was dramatically revised. The old rate was a flat fee of \$3 per 1,000 lb GVW for trucks larger than 26,000 lb. The revised tax is a graduated schedule starting at \$50 for a 33,000-lb truck and peaks at \$1,900 for trucks 80,000 lb and larger. The new rates will go into effect on July 1, 1984, and the rates for trucks

larger than 55,000 lb will be incrementally phased upward during the next 4 years. For example, the rate for an 80,000-lb truck, effective July 1, 1984, will be \$1,600; this changes to \$1,700 on July 1, 1986, and reaches its maximum level of \$1,900 on July 1, 1988.

As indicated in Table 1, all buses are granted a full exemption from federal fuel taxes. This exemption represents a substantial subsidy to a particular class of heavy vehicles using the nation's highways, roads, and streets.

Vehicles using gasohol pay a 4 cents per gallon fuel tax. This results in such vehicles paying only 44 percent of the per gallon fuels tax paid by vehicles using gasoline and diesel fuel. Also, as indicated in Table 1, heavy vehicles traveling less than 5,000 miles annually were exempted from paying the heavy vehicle use tax.

#### EQUITY OF THE FEDERAL HIGHWAY USER FEE STRUCTURE

As mentioned earlier, the federal highway user fee structure fails to meet both vertical and horizontal equity tests. The nature and extent of the inequities in the 1982 STAA user charge structure is examined in this section.

#### Exemptions

Without question, most exemptions are contrary to the basic purpose of equitable cost allocation, which is that each vehicle should pay for the highway costs it causes. The exemptions mentioned earlier lead to obvious cross-subsidy situations. The exemption of buses from the fuel tax means that other passenger vehicles must pick up their share of road wear and tear. The result is a vertical inequity.

The gasohol exemption will primarily benefit passenger cars and pickups. By 1985 this is likely to amount to more than \$100 million. Other passenger

TABLE 1 Federal User Fee Rates Enacted by the Surface Transportation Assistance Act of 1982

User Fee Type	Rate (\$)
Gasoline	0.09/gallon
Diesel	0.09/gallon
Gasohol	0.04/gallon
Bus fuel	Full exemption for all buses
Tires	By weight 0 to first 40 lb 0.15/lb next 30 lb 0.30/lb next 20 lb 0.50/lb balance
Truck sales	12 percent at retail for trucks more than 33,000 lb GVW, trailers more than 26,000 lb
Heavy vehicle use tax (lb GVW)	
26,000-33,000	0
33,000-55,000	50 + 25/1,000 lb more than 33,000 lb
55,000-70,000	600 + 52/1,000 lb more than 55,000 lb
70,000-80,000	1,380 + 52/1,000 lb more than 70,000 lb
80,000 lb and above	1,900
	Top rate (\$)
	1,600 on July 1, 1984
	1,700 on July 1, 1986
	1,900 on July 1, 1988
Trucks traveling less than 5,000 miles/year	Exempt

Source: Data compiled from information provided by Anthony Kane, U.S. Department of Transportation, Federal Highway Administration, 1983.

vehicles in the federal study were assigned this user tax liability, thus creating a horizontal inequity in the tax structure.

Other heavy vehicles were assigned the user tax liability that resulted from the heavy vehicle use tax exemption of vehicles traveling less than 5,000 miles. This exemption worsens the horizontal equity of the federal structure. To be sure, a heavy vehicle traveling less than 5,000 miles has the same per-mile cost responsibility for road use as does one traveling 100,000 miles (assuming similar load factors).

#### Cost Responsibility Between Vehicle Classes

A litmus test of vertical equity is to compare the cost responsibility of a vehicle class to its revenue payments. Table 2 provides such a comparison for eight major vehicle classes.

Automobiles and motorcycles are the only groups whose payments closely match their responsibility, with a 3 percent overpayment. Buses, as exempt vehicles, contribute nothing toward their cost responsibility. Interestingly, the bus underpayment of \$160.4 million is sufficient to offset the automobile and motorcycle overpayment of \$149.5 million. However, as pickups and vans are overpaying by \$282.5 million, or 13 percent, the passenger-carrying vehicles as a whole overpay by \$271.6 million. This sizable overpayment in effect represents a cross-subsidy to freight-hauling vehicles and most especially the heaviest truck classes.

Single-unit trucks (excluding pickups) are overpaying their share of costs by 18 percent and combination trucks weighing less than 70,000 lb are overpaying by an even more significant 30 percent. Together, these lightest of the freight-hauling vehicles are overpaying a whopping \$426.6 million. This overpayment results in a significant cross-subsidy to the heavier combination vehicles, 70,000 lb and more.

The 70,000 to 75,000-lb combination vehicles are underpaying their cost responsibility by 11 percent, or \$118.4 million, and the heaviest group, the more than 75,000-lb class, is substantially underpaying by 31 percent, or \$579.8 million. Together, the heaviest freight-hauling vehicles are being subsidized by almost \$700 million per year. This deficit is compensated by the overpayments made by passenger vehicles (except buses) and lighter trucks.

The data presented in Table 2 indicate that by 1985 the rates contained in the 1982 STAA will lead to a significant imbalance in vertical equity among

user groups. The failure of the legislated pricing structure to adequately reflect the cost responsibilities of vehicle groups will inevitably lead to overuse of highway facilities by the heaviest vehicle classes.

The problem of significant imbalance between cost responsibility and payments within the freight-hauling group is a direct result of an inadequate user fee structure. The tax types chosen for trucks are not flexible enough to account for variations in weight and distance traveled. This is especially true for the excise taxes and the heavy vehicle use tax. Repeal of these taxes and the introduction of a tax type more responsive to weight and distance traveled is the key to improving the vertical equity of the federal structure.

#### Cost Responsibility Within Vehicle Classes

In addition to establishing equity between classes of vehicles (vertical equity), it is equally important to address the question of equity among the vehicles within each class (horizontal equity). Because of the composition of the federal tax structure under the 1982 STAA, substantial horizontal inequities exist within the heavy vehicle classes that do not appear within the light vehicle classes. This is demonstrated by the data given in Tables 3 through 7, which compare tax payments and cost responsibilities at various annual mileages for five selected vehicle classes.

The data in Table 3 indicate that regardless of miles traveled the ratio of tax paid to cost responsibility for automobiles and motorcycles remains virtually constant. Under the 1982 STAA, automobiles and motorcycles pay all of their tax liability through the fuel tax. This tax is highly related to vehicle travel and retains, on the average, a close relationship to cost responsibility.

The data in Table 4 indicate that single-unit trucks have somewhat of a horizontal equity problem. A single-unit truck that travels 100,000 miles per year pays about seven times as much as one traveling 10,000 miles per year, whereas the cost responsibility of the vehicle traveling 100,000 miles per year is ten times greater.

Tables 5 through 7, on the other hand, display data for combination vehicles that pay the new vehicle excise tax and the heavy vehicle use tax in addition to the fuel and tire taxes. As neither the new vehicle tax nor the use tax is related to mileage, the tax-payment and cost-responsibility ratio varies greatly with the amount of travel by a vehi-

TABLE 2 Comparison of Vehicle Class Responsibility to User Payments Under 1982 STAA (millions of dollars)

Vehicle Class	1982 STAA Total Revenue	FHCAS Cost Responsibility <sup>a</sup>	Overpayment or Underpayment	
			Total	Percent
Automobiles and motorcycles	5,586.0	5,436.5	+149.5	+3
Intercity buses	0.0	33.3	-33.3	
Other buses	0.0	127.1	-127.1	
Pickups and vans	2,470.7	2,188.2	+282.5	+13
Other single units	1,106.2	937.5	+168.7	+18
Combinations (lb)	3,388.5	3,828.8	-440.3	-11
Less than 70,000	(1,109.0)	(851.1)	+257.9	+30
70,000-75,000	(979.1)	(1,097.5)	-118.4	-11
More than 75,000	(1,300.4)	(1,880.2)	-579.8	-31
Total	12,551.4	12,551.4		

Source: Data compiled from information provided by Anthony Kane, U.S. Department of Transportation, Federal Highway Administration, 1983.

<sup>a</sup>The cost responsibility numbers given here are 2 percent lower than the numbers given in the 1982 FHCAS. They were adjusted downward to reflect the vertical inequity problem for a given program level.

**TABLE 3 Comparison of 1985 Tax Payments and Responsibility at Various Annual Mileages Under 1982 STAA—Automobiles and Motorcycles**

Annual VMT	Use Tax	Excise Taxes	Fuel Tax <sup>d</sup>	Total Taxes	Cost Responsibility <sup>b</sup>	Ratio
9,940 (avg)	0	0	50	50	47	1.06
10,000	0	0	50	50	47	1.06
25,000	0	0	125	125	118	1.06
50,000	0	0	250	250	236	1.06
75,000	0	0	375	375	354	1.06
100,000	0	0	500	500	472	1.06

<sup>a</sup>Based on standard sized automobile with average mile per gallon (MPG) of 18.0.

<sup>b</sup>Responsibility of \$0.00472 per mile based on a \$12.6 billion program. Derived from data in Final Report on the Federal Highway Cost Allocation Study, Appendix C and the Congressional Conference Report (1).

**TABLE 4 Comparison of 1985 Tax Payments and Responsibility at Various Annual Mileages Under 1982 STAA—Single Unit Trucks**

Annual VMT	Use Tax <sup>a</sup>	Excise Taxes <sup>b</sup>	Fuel Tax <sup>c</sup>	Total Taxes	Cost Responsibility <sup>d</sup>	Ratio
10,000	66	6	130	202	162	1.25
12,920 (avg)	66	8	169	243	209	1.16
25,000	66	15	326	407	405	1.00
50,000	66	30	652	748	810	0.92
75,000	66	45	978	1,089	1,215	0.90
100,000	66	60	1,304	1,430	1,620	0.88

<sup>a</sup>Assumes typical vehicle with two axles at 33,500 lb GVW.

<sup>b</sup>Includes tire excise tax only.

<sup>c</sup>Based on average MPG of 6.9.

<sup>d</sup>Responsibility of \$0.0162 per mile based on a \$12.6 billion program. Derived from data in Final Report on the Federal Highway Cost Allocation Study, Appendix C and the Congressional Conference Report (1).

**TABLE 5 Comparison of 1985 Tax Payments and Responsibility at Various Annual Mileages Under 1982 STAA—Combinations Less Than 70,000 lb**

Annual VMT	Use Tax <sup>a</sup>	Excise Taxes <sup>b</sup>	Fuel Tax <sup>c</sup>	Total Taxes	Cost Responsibility <sup>d</sup>	Ratio
10,000	600	450	155	1,205	345	3.49
25,000	600	463	388	1,451	862	1.68
36,560 (avg)	600	473	567	1,640	1,261	1.30
50,000	600	485	776	1,861	1,725	1.08
75,000	600	507	1,164	2,271	2,588	0.88
100,000	600	528	1,552	2,680	3,450	0.78

<sup>a</sup>Assumes typical vehicle at 55,000 lb GVW.

<sup>b</sup>Includes tire and truck sales excise tax. Retail \$43,000 amortized over 12 years.

<sup>c</sup>Based on average MPG of 5.8.

<sup>d</sup>Responsibility of \$0.0345 per mile based on a \$12.6 billion program. Derived from data in Final Report on the Federal Highway Cost Allocation Study, Appendix C and the Congressional Conference Report (1).

**TABLE 6 Comparison of 1985 Tax Payments and Responsibility at Various Annual Mileages Under 1982 STAA—Combinations 70,000 to 75,000 lb**

Annual VMT	Use Tax <sup>a</sup>	Excise Taxes <sup>b</sup>	Fuel Tax <sup>c</sup>	Total Taxes	Cost Responsibility <sup>d</sup>	Ratio
10,000	1,280	688	158	2,126	547	3.89
25,000	1,280	720	395	2,395	1,368	1.75
50,000	1,280	771	789	2,840	2,737	1.04
62,810 (avg)	1,280	798	992	3,070	3,438	0.89
75,000	1,280	823	1,184	3,287	4,106	0.80
100,000	1,280	875	1,579	3,734	5,474	0.68

<sup>a</sup>Assumes typical vehicle at 72,000 lb GVW.

<sup>b</sup>Includes tire and truck sales excise taxes. Retail \$66,569 amortized over 12 years.

<sup>c</sup>Based on average MPG of 5.7.

<sup>d</sup>Responsibility of \$0.05474 per mile based on a \$12.6 billion program. Derived from data in Final Report on the Federal Highway Cost Allocation Study, Appendix C and the Congressional Conference Report (1).



**TABLE 7 Comparison of 1985 Tax Payments and Responsibility at Various Annual Mileages Under 1982 STAA—Combinations More Than 75,000 lb**

Annual VMT	Use Tax <sup>a</sup>	Excise Taxes <sup>b</sup>	Fuel Tax <sup>c</sup>	Total Taxes	Cost Responsibility <sup>d</sup>	Ratio
10,000	1,520	725	158	2,403	734	3.27
25,000	1,520	757	395	2,672	1,834	1.46
50,000	1,520	809	789	3,118	3,668	0.85
67,960 (avg)	1,520	847	1,073	3,440	4,985	0.69
75,000	1,520	861	1,184	3,565	5,501	0.65
100,000	1,520	914	1,579	4,013	7,335	0.55

<sup>a</sup>Assumes typical vehicle at 78,000 lb GVW.

<sup>b</sup>Includes tire and truck sales excise taxes. Retail \$69,320 amortized over 12 years.

<sup>c</sup>Based on average MPG of 5.7.

<sup>d</sup>Responsibility of \$0.07335 per mile based on a \$12.6 billion program. Derived from data in Final Report on the Federal Highway Cost Allocation Study, Appendix C and the Congressional Conference Report (1).

cle. For combination vehicles less than 70,000 lb (Table 5); for example, a vehicle traveling 10,000 miles per year pays 3.49 times its cost responsibility whereas one traveling 100,000 miles per year pays only 0.78 of its cost responsibility. Similar situations exist for combinations of 70,000 to 75,000 lb (Table 6) and combinations more than 75,000 lb (Table 7). The data in these tables clearly indicate the inequity created by flat rate annual taxes. The vehicle that spends the most time on the road and uses the largest share of road services pays the lowest tax rate per mile, thus encouraging overuse of the nation's highways. An illustration of this may be derived from Table 5. A vehicle traveling 10,000 miles per year pays a per-mile rate of 12.1 cents (\$1,205 ÷ 10,000 miles), while the same vehicle traveling 100,000 miles would pay only 2.7 cents per mile (\$2,680 ÷ 100,000 miles).

The largest horizontal equity problem that results from the federal user fee structure occurs within the heaviest trucks class, combination vehicles weighing more than 75,000 lb. It is not unusual for vehicles in this class to travel more than 100,000 miles per year. Thus, these higher mileage vehicles are meeting less than 55 percent of their cost responsibility under the federal fee structure. This is the major problem with the current federal highway user fee structure.

As with the solution to the vertical equity problem, much of the horizontal imbalance would be rectified by repealing the new vehicle excise and heavy vehicle use taxes and replacing them with a tax that considers both weight and distance traveled by a heavy vehicle. This type of tax, in conjunction with a fuel tax, would bring tax payments more closely in line with cost responsibility, improving both horizontal and vertical equity.

#### An Equity Alternative

The 1982 STAA has built into it both horizontal and vertical inequities, as indicated in Tables 2 through 7. A solution to both equity problems can be found by simplifying the federal tax package enacted in the 1982 STAA. This package was a simplification of the earlier law, reducing the previous eight separate taxes to a total of four. A further reduction is proposed here by eliminating the excise taxes on new tires (more than 40 lb), the truck sales tax, and the heavy vehicle use tax, and replacing these with a graduated weight-distance tax.

The proposed tax structure would contain a 9 cent per gallon tax on all fuel and a graduated weight-

mile tax. The proposed equity-based tax structure is given in Table 8.

As under the 1982 STAA, all vehicles would pay a 9 cent per gallon fuel tax. Only automobiles, pickups, and vans would be exempt from the weight-mile tax. However, if single-unit trucks were exempt from the weight-mile tax it would only create a 9 percent underpayment by this group. The total dollar amount is less than \$100 million or about 2 percent of total truck cost responsibility.

The weight-mile tax rates listed are averages for broad weight groups. In the actual construction of tax tables, much greater delineation between weight groups is necessary. For example, whereas the average cost responsibility weight-mile tax rate for the more than 75,000 lb group is 5.7 cents per mile, the rate for the heaviest, most damage-causing configuration in the group may be 10 cents or more per mile. The lightest vehicle in this same group may have a weight-mile cost responsibility as low as 4 cents per mile.

The last column in Table 8 reflects each vehicle group's average total payment per mile for the combined fuel and weight-mile tax payments. If the total rates per mile are appropriately established, then payments by each vehicle class will approximate its cost responsibility.

Table 9 gives the total payments by each vehicle class under the proposed equity-based tax structure and Table 10 compares these payments with the cost responsibility of each class as determined by the Federal Highway Cost Allocation Study. The equity-based tax structure raises approximately the same amount of money as the FHCAS structure.

As can be seen from comparing Table 10 to Table 2, the equity-based tax structure greatly improves the vertical equity between the major vehicle classes. Although under the equity-based structure automobiles, pickups, and vans are still overpaying, the weight-mile tax, because of its flexibility, adjusts all other classes to their cost responsibility. Thus, the equity-based tax structure virtually eliminates cross-subsidization between broad vehicle classes.

#### CONCLUSIONS

Highway cost-responsibility studies are unquestionably important. The federal government as well as many states are investing heavily in resources to conduct such studies. It makes little sense, however, to conduct cost-responsibility studies unless there is the commensurate desire to implement a tax

TABLE 8 An Equity-Based Tax Structure by Vehicle Class

	Fuels Tax <sup>a</sup> Cents per Gallon	Weight-Mile Tax Cents per Mile	Total Average Payments per Vehicle Mile Cents per Mile
Automobile	9	Exempt <sup>b</sup>	0.5
Bus	9	1.1	2.6
Pickups and vans	9	Exempt <sup>b</sup>	0.6
Single unit trucks	9	0.3	1.6
Combination trucks (lb)			
Less than 70,000	9	1.8	3.4
70,000-75,000	9	3.9	5.5
More than 75,000	9	5.7	7.3
Average	9	2.2	0.7

<sup>a</sup>Includes gasoline, diesel, and gasohol and other liquid or non-liquid fuels convertible to cents per gallon.

<sup>b</sup>Exempt except for vehicles powered by electricity and other energy sources not convertible to cents per gallon.

TABLE 9 Total Payments by Vehicle Class Under an Equity-Based Tax Structure (millions of dollars)

Tax	Automobile	Bus	Pickups and Vans	Single Unit Trucks	Combination Trucks (000 lb)			Total
					<70	70-75	>75	
Fuel	5,586.0	88.1	2,470.7	853.6	350.9	282.9	363.4	9,995.6
Weight-mile	- <sup>a</sup>	72.3	- <sup>a</sup>	83.9	500.2	814.6	1,516.8	2,987.8
Total	5,586.0	160.4	2,470.7	937.5	851.1	1,097.5	1,880.2	12,983.4

<sup>a</sup>Not applicable.

TABLE 10 Payments Under Equity-Based Tax Structure Compared to FHCAS Cost Responsibility—By Vehicle Class (millions of dollars)

Vehicle Class	FHCAS Cost Responsibility	Equity Tax Structure Alternate	More Than/Less Than FHCAS	
			Amount	Percent
Automobile	5,436.6	5,586.0	149.5	2.7
Bus	160.4	160.4	0	0
Pickups and vans	2,188.2	2,470.7	282.5	12.9
Other single units	937.5	937.5	0	0
Combination trucks (lb)	3,828.8	3,828.8	0	0
Less than 70,000	(851.1)	(851.1)	0	0
70,000-75,000	(1,097.5)	(1,097.5)	0	0
More than 75,000	(1,880.2)	(1,880.2)	0	0
Total	12,551.4	12,983.4	432.0	3.4

structure flexible enough to capture the costs identified (either singularly or collectively).

Congress appears to be sensitive to this point in calling for a new study of alternatives to the heavy vehicle use tax. The target date for completion of this study has been moved up by a full year.

There has been substantial controversy concerning the new rates proposed in the 1982 STAA. Many truckers feel heavily burdened by the new rates. Some of their concerns are valid as was demonstrated by the discussion in this paper of the horizontal inequity in the STAA rates (low-mileage vehicles are seriously overpaying to the benefit of higher mileage vehicles). On the average, however, truckers do not have a justifiable complaint. If the results of the Federal Highway Cost Allocation Study are accepted, the two heaviest classes of trucks are underpaying by \$700 million.

Exemptions add significantly to both vertical and horizontal inequity. The gasohol exemption must be eliminated in order to treat other passenger vehicles fairly. Buses are making no contribution toward their road user cost responsibility.

Congress evidently deems the bus exemption to be justifiable when consideration is given to other social objectives, such as assisting low-income people who ride buses; however, it should not be forgotten that other road users must assume more

than \$160.4 million in cross-subsidy payments. Exempting heavy vehicles that travel less than 5,000 miles per year from the heavy vehicle use tax may improve the relative equity with other large vehicles under the cumbersome federal user fee structure, but it makes no sense in terms of cost responsibility.

Only by adopting a national weight-distance tax can the inequities addressed in this paper be corrected. Weight-distance taxes are practical, proven, and can be efficiently administered (Oregon has found that collection and administration costs are less than 5 percent of revenue).

Given the current congressional interest in improving the equity of the federal user fee structure the time is ripe for federal enactment of a weight-distance tax. In the words of the 1982 Final Report on the Federal Highway Cost Allocation Study (1), the adoption of such a tax "...could contribute significantly to a fairer and more efficient tax structure."

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## Transit and the California Legislature: A Practitioner's Perspective

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### ABSTRACT

Transit services in the state of California are discussed with emphasis on the role of the state legislature. Not unexpectedly, the efforts of the legislature have been significant in financing and developing an institutional framework. Initial efforts centered on providing financing mechanisms and later efforts moved toward accountability and performance measures as transit dollars became more scarce and subject to competition from other governmental programs. Recent activities also have addressed the structure and process of targeting and delivering transit dollars where potentially most effective, encouraging local and private support, and establishing incentives for better management and greater operating efficiency. An array of secondary efforts conceived to enhance public transit in the state are outlined by the transit industry followed by a discussion of efforts to present its case in political arenas in response to financial scarcity and calls for accountability. Despite the activist role of the legislature in transit services inherent limitations exist. The legislature has been a facilitator and architect and can continue to frame certain policies and procedures; still it remains the task of transit operators and managers to actually provide the services, the accountability, and the performance. Failing to do so will set the stage for erosion of political and financial support and increase the prospect of decline and deterioration in the state's transit industry.

When discussion turns to transporting people by public transit, probably the most common locations that come to mind are those in the eastern United

States. This is almost predictable given the long-established and extensive transit systems in existence in the eastern United States. Because of its long history in the region, transit is a service with which the populace grew up, uses and expects, and relies on.

Conversely, when discussion turns to the transportation of people by automobiles, the association is more likely to be with western portions of the United States. The populace in these areas grew up with the private automobile, after long being wedded to their horses (another mode of private transportation), and have extensive--some would argue excessive--freeway and road systems dedicated to serving the automobile's needs. Nevertheless, close examination reveals that considerable transit activities, services, and support are being provided in those western areas, particularly California, that appear to be dominated by the private automobile.

### TRANSIT AND THE CALIFORNIA LEGISLATURE

Public transit in California, although not now and probably never to be the dominant transportation mode, has made slow but steady progress from the spartan days when it inherited the transit functions abandoned by private industry.

One of the most significant influences and factors in the progress of transit has been the financial and institutional support provided by the California Legislature. Through a long series of actions, the California Legislature has put in place mechanisms that ensure a relatively predictable base of support for all local transit systems as well as establish those provisions necessary for the effective operation of individual systems. In addition, the legislature has developed and refined an equitable process for providing capital assistance for major projects of regional and statewide interest.

Despite the legislature's many accomplishments in transit development, one should not assume that transit is without significant hurdles nor that the gains and resources realized to date are permanent

and can be taken for granted. There exist several significant sources of legislative and other jeopardy that threaten the past gains and future plans of transit. First, there are relatively few legislative champions of the transit cause. Transit in California is not as popular or attractive as education, health, and many other broad-based state programs. Some legislators have flatly stated that they would prefer to see transit abolished. This relative lack of glamour and affection has been a factor in keeping small the ranks of legislators promoting transit.

A second, persistent jeopardy vis-à-vis the legislature is the continuing competition for funds from other state programs. Funds provided to transit systems have long been eyed, and occasionally raided, by competing programmatic and special interests. This situation is made possible because most transit funds, unlike state highway funds, are not constitutionally dedicated. Transit funds may be redirected to other programs by simple statutory change or by the insertion of language in the state's annual budget. Thus, in the case of state funds allocated to transit, it appears that there are never enough.

As discussed earlier, transit also faces a more general threat in California's long-standing interest in the automobile. Regardless of the reasons for this interest, it presents a serious and continuing problem for the expansion of transit services.

The role of the legislature in making transit a viable concern has been a piecemeal process. Legislative involvement has developed over a long period of time and in increments rather than through a few comprehensive, integrated actions. It is possible to segregate these legislative efforts and developments into three general groupings: (a) fiscal-based, (b) performance- and productivity-oriented, and (c) structural and procedural.

#### FISCAL MEASURES

The legislature has ensured that transit receives substantial financial support on an annual basis. This is significant and perhaps the legislature's greatest contribution. Transit not only enjoys a fixed percentage of general sales tax revenues in the state, but also receives a formula-based share of gasoline sales tax revenues and also a portion of the revenues generated by the excise (per-gallon) tax on motor vehicle fuels. In some areas of the state, an additional sales tax increment dedicated to transit has either been legislatively mandated or made permissive on a county-by-county basis, subject to local voter approval.

The major pieces in the fiscal structure are discussed in the sections that follow:

#### Transportation Development Act (TDA)

Approved in 1971 (effective 1972), the TDA was part of a legislative package that extended the state sales tax to gasoline purchases, reduced the state percentage share of the sales tax, and allowed for an increase in the local government share of the sales tax for transit (equivalent to the state's reduction).

#### One-Fourth Percent Sales Tax

The TDA provisions resulted in the dedication of the state's then 5 percent sales tax as follows: (a) 3-3/4 percent to the state, (b) 1 percent to cities

and counties, and (c) 1/4 percent to local mass transit. In rural counties with no unmet transit needs, the 1/4 percent funds were authorized for streets and highways. Extension of the sales tax to gasoline sales in 1972 was equivalent to an additional 1/4 percent sales tax on all taxable sales. Thus, the legislature's expansion of the sales tax base kept total state sales tax revenues at their existing level, protecting existing programs, while creating a dedicated funding source for local transit.

The 1/4 percent sales tax has become a critical funding source for local transit operations. It is currently estimated that this revenue source will raise approximately \$425 million in 1983 and grow to approximately \$479 million in 1984. Despite the dedication of this funding source to transit, it is a somewhat unstable mechanism because of its dependence on general taxable sales levels and the relative health of California's economy. A recent example of this variability is that TDA revenues for 1982 originally were estimated at a total of \$408 million, but proved to be closer to \$395 million as a result of depressed retail sales during the latest economic recession. Notwithstanding the volatility of this revenue mechanism, however, the 1/4 percent sales tax is again generating increased revenues and soon will be producing more than \$500 million annually for local transit. Moreover, it most surely will be a growing source of revenue for transit in coming years.

#### Spillover Formula

The TDA also included a second transit funding mechanism through the so-called spillover formula. The formula provided that if revenues from the new 3-3/4 percent sales tax rate on all taxable sales, including gasoline, produced more revenue than that from the old 1 percent rate on all taxable sales, excluding gasoline, then the difference (spillover) would accrue to the transportation planning and research account (later renamed the transportation planning and development account). Viewed another way, this provision stipulated that when sales of gasoline increased faster than sales of other taxable items, then the additional sales tax revenue from gasoline would be spent for transit activities rather than for general state activities.

The revenue potential of the spillover mechanism was not fully realized for several years, however, because of the interaction of the TDA and separate legislation which increased the state's sales tax by 1 percent. The two bills were signed in such a sequence that the spillover formula, based on the prior sales tax structure, generated less revenue than its potential under the pending higher sales tax rate. The general consensus on these signatory actions was that they were deliberate and designed to maximize the benefit to the state's General Fund rather than transit development. Thus, for several years the spillover mechanism produced only modest amounts of additional transit funds.

#### Senate Bill 620

In 1979 the spillover formula finally was adjusted to reflect the total 6 percent sales tax rate. This and related changes were effected through Senate Bill (SB) 620, part of the legislature's effort to allocate burgeoning gasoline sales tax revenues generated by skyrocketing gasoline prices.

SB 620 provided that \$110 million annually in spillover revenues, adjusted for increases in popu-

lation and consumer prices, would be deposited in the transportation planning and development (TP&D) account for transit activities. This spillover "cap" was included to minimize the fiscal impact on the state's general fund. This mechanism assured that both the general fund and the TP&D account would share the revenue increases.

Once deposited, the spillover funds were available for expenditure for state mass transportation responsibilities, local public transportation assistance, and a statewide public mass transit guideway program. The bill also appropriated funds for intermodal transportation facilities, intercity bus services, commuter and intercity passenger rail services, rail capital improvements, and other one-time transit expenditures.

#### State Transit Assistance (STA)

The funds in SB 620 for local public transportation assistance formed the basis of the new state transit assistance (STA) program. After deductions for specific transit and state department of transportation activities specified in the legislation, one-half the total TP&D account revenues went to the STA program. STA funds were appropriated to local transportation planning agencies and commissions on a per capita (50 percent) basis and an urbanized population (50 percent) basis. Transit systems and cities or counties were eligible for these funds only if they were receiving the maximum TDA revenues permitted by law. This requirement was intended to maximize the commitment of available local transit funds so that the state's assistance would increase overall funding rather than becoming merely a substitute funding source. Further, the legislature declared its intent that the STA funds be used to enhance existing transit services before meeting other transit needs.

#### Transit Capital Improvements

Also significant in SB 620 was the establishment of a transit guideway and capital improvements program. Funds not otherwise committed in the bill (approximately \$68 million out of the bill's \$364 million) were made available for guideway construction, purchase of rolling stock, bus rehabilitation, grade separation construction, and acquisition of abandoned railroad rights-of-way. To receive a portion of these guideway funds, local agencies were required to provide a 5 percent funding match. This match requirement provided some measure, though admittedly small, of financial commitment by local agencies and was intended to encourage the submission of viable project applications rather than open-ended requests for state monies. In addition, projects were to be judged in view of their statewide significance and potential for maximization of other available state and federal guideway funds.

Thus, SB 620 ushered in a greatly expanded commitment to transit services, operations, and facilities. But unlike TDA revenue-funded activities which were controlled locally, the myriad of SB 620 programs were designed for control by the state, especially through the legislature. Retention of this control guaranteed at least some measure of leverage in promoting the effective commitment of the new resources to transit services and capital projects favored by the state.

#### Proposition 5

Although not exclusively a legislative act, a con-

stitutional amendment known as Proposition 5 was placed on the statewide ballot by the legislature to determine whether a portion of state gasoline excise taxes could be used for transit guideway construction. This amendment was approved by state voters in 1974. As provided by Proposition 5, this alternate use was allowed only in those counties also approving a subsequent local referendum on the question. Currently, 9 of the state's 58 counties have approved the guideway use of gasoline tax revenues. These counties are the most urbanized in the state and contain the vast majority of the population.

Subsequent legislation specified that up to 25 percent of a county's gasoline tax funds from Proposition 5 could be used for transit guideways. Intended as a cap on the guideway option, the 25 percent figure instead encouraged the set-aside of highway funds which often remained unspent and which inflation eroded in value. The legislature repealed the 25 percent reference in 1982, leaving the guideway use figure to be determined through budgetary action on specific project proposals.

#### Senate Bill 1335 and Assembly Bill 2551

Enacted in 1982, Senate Bill (SB) 1335 and its companion measure, Assembly Bill (AB) 2551, extended indefinitely the 3-year STA program that was about to expire. The new legislation also revised the split of TP&D account revenues, increasing the local share at the expense of the state's share.

By 1982-1983 TP&D account revenues had grown to the point where the STA program's 50 percent share would have funded the program at approximately \$75 million. SB 1335, however, reconstituted the 50 percent STA (local)/50 percent state revenue split as a 60 percent STA/40 percent state split. Therefore, the STA appropriation grew to \$90 million, an increase of \$15 million or 20 percent. Similarly, the 1983-1984 appropriation was increased to \$103 million, or \$17 million more than would have been provided under the old 50-50 formula.

In revising the STA formula, the intent of the legislature was to redirect resources from some of the state's marginal mass transit activities to local agencies for the preservation of their existing transit operations. At that time local agencies faced significant funding reductions because of federal proposals to eliminate transit operating assistance. Legislative proponents of the state formula change believed that, dollar-for-dollar, more people could be moved by transit through local services than could be moved through the state's own transit activities.

#### State Budget

Any discussion of the legislature's fiscal support of transit must also reference the annual state budget. For several of the established transit programs (e.g., transit capital and rail operations), the additional action of an annual budget appropriation is required to actually free funds for expenditure. In other instances, the budget has been used to amend a transit appropriation previously established in separate legislation (STA, for example). The budget, technically a 1-year statute, can be and has been used to temporarily modify an expenditure provision but cannot be used to permanently rewrite substantive law.

Currently, the state budget process determines the actual expenditure authorization for transit capital projects (funded by both TP&D account and state highway account), passenger rail operating

subsidies, intermodal transfer facilities, transit research, ridesharing programs, and other related transit activities.

#### Fiscal Resources Summary

In summary, the combination of fiscal provisions contained in the TDA, SB 620, SB 1335/AB 2551, Proposition 5, and the annual state budget will provide approximately \$715 million in transit funds in 1983-1984. Although this total is large, it reflects only those resources that the legislature was directly involved in providing. It does not include additional hundreds of millions of dollars available through legislatively authorized or mandated local transit sales taxes. When the local transit sales tax revenues are included, the available transit resources total approximately \$1.25 billion annually.

#### PERFORMANCE AND PRODUCTIVITY MEASURES

Although the legislature has been active in establishing a financial base for transit, it also has demanded some accountability for the manner in which transit funds are spent. A number of requirements have been established over the years to encourage the effective use of transit dollars and the provision of efficient transit services. The emphasis on productivity and performance, however, has been more noticeable recently as transit funds, and all public dollars, have become more scarce.

#### Farebox Ratios

The most visible productivity standard established by the legislature exists in the form of farebox-revenue-to-operating-cost ratios. The legislature has placed in law minimum farebox recovery ratios for a variety of transit services. Although these ratios have not and will not eliminate the heavy public subsidization of transit, they tend to act as governors on operating costs.

The Transportation Development Act has long required minimum farebox ratios or local support, although these requirements have undergone numerous revisions and have had major exceptions added. Originally, the TDA limited many transit systems' (those operating before 1975) use of TDA revenues to no more than 50 percent of their systems' costs (after deducting federal funds). The other 50 percent was required to come from the farebox and other sources of local support.

In 1979 SB 620 amended the 50 percent requirement to make it one alternative criterion for the pre-1975 systems. Alongside it--really in place of it--were established several minimum farebox recovery ratios, including a 20 percent ratio for systems in urbanized areas. If an urban operator actually had a higher ratio in 1978-1979, however, then the minimum ratio was fixed at the higher percentage. Operators serving nonurbanized areas were bound to a 10 percent recovery ratio whereas transit services for the elderly and the handicapped were given a 10 percent ratio or their actual ratio at the time, whichever was higher.

For state-subsidized intercity rail services, the legislature imposed a farebox ratio of 55 percent beginning in the fourth year and continuing in subsequent years of any such services. For commuter rail, a 40 percent ratio is specified for the same time frame.

The legislature also has created penalties for operators that fail to meet minimum ratios. Failure

by a transit operator to meet the specified ratio activates a higher ratio requirement. This higher ratio requires the operator to make up for the previous year's shortfall, albeit under somewhat generous and indefinite terms.

Taken together, the various ratios for different operators, regions, and services today present a jumble of conditions and requirements rather than one simple set of standards. Although it is easy to see that the legislature has set these minimum ratios, it is difficult to generalize about them given their number and conditions of application. And although the establishment of these standards is a favorable development, it is difficult to conclude that all are strictly enforced or consistently applied. For example, notwithstanding the general farebox ratios (20 percent) and the farebox ratios for the elderly and the handicapped (10 percent), some operators in the San Francisco Bay Area must meet a 33 percent standard. Geographically contiguous services may have different ratio requirements as a result of their inauguration date or ratio realized in 1978-1979. Community transit services for the elderly and the handicapped actually may adhere to one of a number of ratios, including those established by local transportation planning agencies. Again, rail service farebox ratios may be waived for up to 3 years. Therefore, although these standards have been established, they have proven to be relatively permeable and flexible and, in certain cases, elective.

#### Performance Audits

A relatively recent addition to transit performance criteria is the triennial performance audit. The legislature required that, beginning in 1980 and every 3 years thereafter, operator and transportation planning agency performance evaluations must be submitted that review the efficiency, effectiveness, and economy of operation of the operator or transportation planning agency being audited. In the case of operators, audits must include verification of (a) operating cost per passenger, (b) cost per vehicle service hour, (c) passengers per vehicle service hour, (d) passengers per vehicle service mile, and (e) vehicle service hours per employee. Failure to provide the audit renders an operating agency ineligible for an allocation of funds under the TDA.

Despite the specific audit provisions and the requirement that the reports be available for review, performance audits have not yet had a significant impact. This is primarily because various operator's services are not judged relative to one another nor is a single entity responsible for reviewing the audits and making performance comparisons. Also, the relatively lengthy cycle of the performance audit has not yet produced a significant enough collection of data, nor data that is fresh enough, for conclusive analyses.

#### Local Support

Transit productivity also has been sought through requirements for local support. Sources of this local support may include local matching funds for state capital funds, farebox revenues and local general fund contributions, property taxes and bridge tolls, or other creative local efforts. More recently, monies raised locally through the private sector also have been promoted. Regardless of the type of local funds, the existing premise is that some local contribution is necessary as a show of local interest and commitment as an incentive to improved performance and to limit the state's costs.

In 1982 the legislature approved SB 1335 and AB 2551, which required a 10 percent local match for transit capital projects funded from the state's share of TP&D account revenues. Through the same legislation the distribution formula for the local share of TP&D account revenues (STA funds) also was revised. Rather than continue to provide the local TP&D account funds strictly on a population basis, the legislature specified that 30 percent of the local 60 percent share, or 18 percent of total TP&D account revenues, be divided based on local support and fare revenues. For example, if an operator's fare revenues and other local support amounted to 10 percent of the statewide total for these revenue categories, then that operator would receive 10 percent of the 30 percent funds being distributed on the local support basis. One result of adding the local support factor was to create an inter-operator and inter-regional competition for the STA funds while generally encouraging increased local support.

The legislature's basic reason for introducing the local support mechanism was to inject some measure of private market forces into the public transit service sector. Operators who increased fares to match or exceed increased operating costs or who provided services supported (financially) locally were to be rewarded with increased shares of the state's transit funds. This policy change was a significant break from the old, but more politically favorable, population-based method of disbursing state transit funds.

#### Other Efforts

In discussing legislated productivity measures, several labor and private sector provisions should be mentioned briefly. First, the legislature has stipulated that TP&D account revenues provided to local agencies shall not be available to any operator that is precluded by contract from employing part-time drivers or contracting with common carriers. The legislature's purpose in establishing these conditions was to enhance the operators' ability to meet peak-hour service demands without having to hire additional full-time drivers (who then might sit idle during off-peak periods).

For transit capital improvements, the legislature and the governor recently approved legislation authorizing the creation of benefit assessment districts for areas around the proposed Metro Rail project in Los Angeles. Under this legislation the Southern California Rapid Transit District (SCRTD) would be permitted to levy assessments on real property within the districts that would benefit. These assessments would be used for the financing of capital facilities within the districts and for matching federal funds. Not unexpectedly, the premise underlying this effort is that those private commercial entities that will reap financial rewards from their proximity to transit stations should assist in financing those stations. San Francisco has attempted to implement its own transit development fees but has encountered significant political obstacles and opposition from commercial interests.

Private sector and local agency contributions also have been made components and criteria of the California Transportation Commission's evaluation and approval of applications for state transit capital funds. The legislature, which created the independent commission, also charged it with responsibility for allocating state transportation funds. The commission, in turn, has adopted an allocation policy that requires local financial support for transit guideways and capital projects from both private and public sources as a condition for re-

ceipt of state discretionary capital funds. Specifically, the policy mandates the enactment of a local sales tax from which revenues are available to transit or the demonstration of some other local revenue base capable of maintaining existing and planned transit services. In addition an adequate private sector financing program must be implemented. Meeting these two conditions permits competition for the discretionary funds but does not ensure their receipt.

#### Performance and Productivity Summary

Highlighted in the foregoing sections are several of the efforts by the legislature to encourage more productive transit services and to make them less dependent on annual state subventions. Although several significant milestones have been achieved, efforts to date remain embryonic. These performance-oriented actions reflect more the start of a new way of doing business and shift in orientation than the culmination of a sweeping reform effort or broad programmatic initiatives. Nevertheless, the move to put transit on a more business-like basis is a significant policy initiative. Recognition by transit of this attention to performance and productivity can only make it more sensitive to its operating environment which in turn will increase its chances for survival and continued growth.

#### PROCEDURAL FRAMEWORK

The legislature's establishment of transit funding sources and performance and productivity measures has been accompanied by the development of a procedural framework to channel and regulate the former. Acting as the fiscal and policy overseer, the legislature has chosen to delegate considerable responsibility for management of individual program details and project selection. A brief description of this framework and its key components may be helpful in understanding the interaction of provisions discussed in the first two sections of this paper.

#### Structure

The legislature has not acted alone in nurturing the development of transit. Instead, it has created state and local agencies that help allocate available state funding, choose capital projects, review operator budgets, and keep a watchful eye on system operations and management. At the state level, the California Transportation Commission makes the decisions as to which transit capital projects receive the state funds appropriated by the legislature. The commission also is responsible for evaluating project applications for the various funding categories with the assistance of the California Department of Transportation. The commission has further responsibility for annually estimating the amount of state and federal funds available for these projects. Thus, the commission evaluates individual projects, selects those to be funded, and matches total costs to estimated available revenues.

At the regional and local levels the legislature has provided for transportation planning agencies and transportation commissions. These agencies oversee performance audits; help allocate STA and other transportation tax funds in their respective areas; perform operator budget analyses; and help coordinate transit services, fares, and operations among different operators. Their focus is much more the normal, daily transit operations and regional ser-

VICES than the state commission focus, which is more attentive to statewide priorities and project trade-offs.

### Processes

As discussed earlier, considerable financial support for transit flows through well-established allocation procedures and formulas, including the TDA revenues and STA funds. Still, it is the legislature that annually determines, through the state budget, the total amount of transit capital funds to be appropriated, although it does not determine individual project expenditures. This is the same process as that used for highway project appropriations in which the legislature appropriates lump sum capital funds but does not budget individual projects. This process is designed to avoid legislative logrolling or pork-barrelling.

Under normal or stable economic conditions, the appropriation of transit capital funds is followed by a legislatively mandated allocation process administered by the transportation commission. This process was created through SB 1331 in 1982, which also repealed a host of individual county-oriented capital allocation requirements, including statutory allocations, fund revenues, and debts to the state for prior advances. Under this legislation the commission must subvene one-half of each year's transit capital funds to the state's nine guideway (Proposition 5) counties. This is done on a population basis subject to submission of a viable local financial plan and commission approval. The other one-half of the capital funds is considered discretionary and is allocated by the commission to projects of the greatest statewide interest and benefit and on the basis of local and private support for candidate projects.

Even when the legislature finds it necessary to amend, reduce, or temporarily suspend the allocation procedures and formulas, as was done in 1982-1983 and 1983-1984, this does not alter the basic arrangement (*vis-à-vis* state-controlled activities) that has been developed: the legislature establishes the basic policy guidelines and formulas and appropriates lump sum amounts in various program categories; statutorily created agencies, both state and local, administer the programs and allocate resources on a project-specific basis as required by the formulas or evaluation criteria.

### PITFALLS AND POSSIBILITIES

Let the reader draw the premature--and erroneous--conclusion that the California Legislature has guaranteed transit a secure future, it is necessary here to acknowledge major obstacles that must be overcome if transit is to flourish in the state. If it is true that success is fleeting, then it is probably also true that California transit's current good health could prove transitory unless carefully attended.

### Environment

As noted in the first section of this paper, transit faces an often hostile environment, even within the legislature which has cultivated it. It has also been an environment of scarcity and one that will continue to exhibit scarcity and instability for some time to come.

The state's recent economic drought not only shrank transit's sales tax revenues while also

crimping the state's overall revenue stream, but also encouraged efforts by other program constituencies and governmental entities to raid or divert each other's revenues. Transit has been a frequent target of these restructuring efforts. For example, to help cover 2 years of \$1 to \$2 billion deficits in the state's general fund, the legislature reduced STA program appropriations of \$90 million and \$103 million by \$20 million and \$15 million in 1982-1983 and 1983-1984, respectively. Although these reductions constituted a substantial percentage of the program's resources, they are small compared to the \$28 million (27 percent) reduction originally proposed by the governor and the \$60 million (58 percent) slash recommended by the legislature's own fiscal analyst in the 1983-1984 budget. In each case, the reductions were aimed at freeing revenues for the general fund and the education, health, and other major programs supported by that fund.

Another example of the raiding efforts occurred during the writing of this paper. An unsuccessful attempt was made to approve legislation that would have provided a fuel tax exemption to producers of gasohol at the expense of transit revenues. Approval of the measure would have reduced TP&D account revenues by \$20 to \$30 million annually. The 1984-1985 governor's budget, unfortunately, again proposes a gasohol tax credit at the expense of transit revenues.

### Challenges

Despite an environment of scarcity, transit overall has recently fared better than many education, energy, coastal preservation, health, and other programs in that its losses have been relatively less severe. Because damage to transit from recent fiscal woes and attempted raids has been tempered or deflected, however, does not mean transit is an especially cherished public program. Rather, it reflects the vigorous defense played by key legislators and transit advocates during the budget battles. Transit has, for the time being, weathered the storm. But it is not enough merely to depend on a small number of transit defenders in the legislature to keep transit a viable public service. The recent battles have again highlighted the need for transit supporters to take the initiative, improve services, and build transit-supportive constituencies.

### Constituency Building

Beginning with the Reagan Administration's proposals to eliminate federal operating support and continuing through the state's economic storms, the transit sector has become painfully aware that in the long run it is less well suited to succeed in legislative circles than many competing programmatic interests. These other interests are well-organized, articulate their needs to the legislature, and react vociferously when their well-being is threatened; these are conditions and actions that have been lacking among transit interests until recently.

One of the major challenges facing transit in California is educating the public in general and the legislature in particular on the value of transit services and the consequences of not having these services. Similarly, the public must be made aware of the potential benefits of improved public transit. Transit also needs to improve its organizational capabilities and to speak with one voice whenever possible. No individual operator can hope to succeed in the political arena without the strong



support of its brethren, consistent policies and positions, and also some measure of public backing.

#### Achievement

If education, organization, and coordination are musts, then too is the need for operators to provide efficient, dependable service. Efforts at education and persuasion must be accompanied by performance and productivity in the provision of services. If transit advocates cannot bolster their requests with a public record of improvement and accomplishment, the available resources will be redirected elsewhere where it is perceived the public is being better served.

The legislature can, and has, established some minimum performance requirements. But the uniqueness of the dozens of service providers severely restricts the ability to legislatively decree fair and workable standards or common achievement levels. Productivity cannot be legislated, although it can be encouraged and rewarded. Likewise, performance must come from the service providers; it cannot come from the legislature.

#### SUMMARY

Transit is alive and growing in California, even with the prevailing affection for the private automobile. Actually, transit is poised on the brink of a modal renaissance with nearly every major urban

area of the state about to launch, complete, or extend some type of rail transit system. Once fully in place, these fixed systems can serve as the trunks of expanded multimodal services. For this scenario to work, however, operators need to tend and maintain the systems now operating in addition to finding the resources to operate the larger integrated systems.

As discussed in this paper, transit has been provided many significant tools to do its job. The legislature has provided significant financing, allocation processes, and basic performance criteria. Still, much of the legislature remains a skeptical provider or disinterested overseer willing to pull back from its commitments should transit fail its public responsibilities.

Certainly the legislature could do more for transit. However, the fundamental situation of finite resources and infinite wants and needs weighs heavily on any efforts toward further legislative endowment. The legislature has been a facilitator and architect and can continue to frame certain policies and procedures; still it is the task of transit operators and managers to actually provide the services, accountability, and performance. The legislature has created the opportunity for success; it is the transit industry that must achieve that success.

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## Maximizing the Use of Private Credit Markets for Transit Investments

JEFFREY A. PARKER

#### ABSTRACT

The opportunities created by the 1982 Surface Transportation Assistance Act are examined to increase the role of private capital markets in financing transit investments. These opportunities include: the potential for more extensive grant anticipation financing using the Section 9 block grant as a credit source, the potential impact of contract authority flowing from Highway Trust Fund dollars on financing options available to grantees under the Section 3 discretionary program, and the potential impact of federal funding under the 1982 Surface Transportation Assistance Act on the terms and availability of credit for the non-federal portions of transit capital budgets. The impact of these opportunities on future applications of existing financing tools to

transit capital projects is examined. Existing credit instruments, such as dedicated tax revenue bonds, transit revenue bonds, service contract bonds, general obligation debt, toll revenue bonds, and grant anticipation notes are described and examples are cited. The conclusions reached indicate that the 1982 Surface Transportation Assistance Act will permit opportunities for longer-term grant anticipation financing and should favorably influence the terms and availability of credit for the non-federal portions of transit capital budgets. Realization of these opportunities can be expected to reduce overall project costs by allowing construction schedules to be optimized and interest costs to be lowered.

Grantees under the 1982 Surface Transportation Assistance Act (STAA) have new opportunities to blend

federal funding commitments and non-federal sources of capital in making transit investments. Program changes will facilitate the assembly of financing packages for major investments and have the potential to reduce project costs. Block grant apportionments under Section 9 and the use of trust fund financing in the Section 3 discretionary program will allow the achievement of these objectives by improving the security of future federal funding commitments.

Greater confidence in federal commitments can lower project costs in the Section 3 program by:

- Using new forms of advance construction financing to optimize contracting and acquisition schedules,
- Reducing interest costs on the non-federal portion of project financing packages due to greater assurance that the project will be completed, and by
- Increasing competition among bidders for potentially larger or more certain contracts.

The private credit markets may also be needed to facilitate the transition to block grant capital programming. The historic reliance of transit agencies on discretionary grants may require development of mechanisms to adjust annualized funding flows to finance investments that require apportionment for more than a single year.

The federal and non-federal components of transit capital financing packages exert strong influences on one another. Through better understanding of this interaction and conscious efforts to affect it positively, transit and federal officials can increase the impact of existing funding levels in meeting capital investment needs.

#### PRIVATE CREDIT SOURCES IN TRANSIT FINANCE

The credit instruments described in this section demonstrate the independent capacity transit agencies have to undertake capital investments. These mechanisms have undergone modest evolution in recent years, primarily as a result of innovation by the New York Metropolitan Transportation Authority (MTA) in long-term bonding. Legislative changes, such as safe harbor leasing, have also influenced the range of financing tools available to undertake major capital projects.

In addition, recent studies point to a trend toward incorporating dedicated taxes into transit finance, with 30 positive actions (new taxes, renewals, local options, and other favorable votes) at the local level and 15 at the state level between January 1981 and April 1983, compared with 11 negative actions at the local level and 5 at the state level during the same time period (1).

Nonetheless, federal grants remain an essential component of most financing packages. States and localities do not have large enough tax bases to support an adequate level of transit investment without federal assistance.

For example, the New York MTA and San Francisco's Bay Area Rapid Transit (BART) both have been active issuers of long-term debt for transit improvements, yet the MTA's \$8.5-billion, 5-year capital program is based on a federal contribution of roughly 35 percent, and the \$279 million BART plan to expand service in the San Francisco Bay Area will require a considerable portion of its funding from federal grants.

The examples cited in this section therefore are viewed as potential elements of an overall financing strategy for large capital investment projects.

Other financing devices such as tax benefit transfers, joint development, special benefit assessments, and so forth, also must be considered, but are not discussed directly.

#### Dedicated Tax Revenue Bonds

An example of this model is the \$45 million bond issue by the Regional Transportation District of Colorado (RTD) in October 1977 (2). The stream of revenues securing the bonds is derived from a regional sales tax. The maximum annual principal and interest payment is about \$4 million and the bonds have a maximum 25-year life.

Holder of the securities are completely insulated from the fiscal affairs of RTD. The bondholder's only concern is the ability of RTD to collect sufficient sales tax revenues to repay principal and interest and the security of their claim to the receipts before the funds are used for other purposes. Denver's rapid growth and increasing population offer a high level of confidence that adequate revenues will be generated, while the statutes and covenants surrounding the bonds provide:

- A first lien on sales tax receipts,
- Limitations on additional sales tax bonds that can be issued and the allowable level of amortization payments that can be assumed in relation to the revenues (debt service coverage),
- The assignment of RTD's rights to receive the tax receipts to a trustee who will satisfy the bonding requirements before disbursing the remaining funds to the transit agency, and
- A pledge to continue to levy the sales tax until the bonds are retired.

In October 1982 San Francisco's BART issued \$65 million in sales tax revenue bonds to pay for a portion of the costs of 150 rail transit cars (3). Between 1970 and 1971 BART issued \$150 million in sales tax revenue bonds to cover initial construction costs; all of these bonds have now been retired. Sales tax revenue bonds were also used to finance the trolley system in San Diego and to provide a large portion of the project costs for the Metropolitan Atlanta Rapid Transit Authority (MARTA) heavy rail system in Atlanta.

Future rail systems in Denver, Santa Clara, Dallas, Houston, Los Angeles, and other new start cities, as well as downtown transit improvements in Seattle, are all candidates for sales tax-backed bonds.

#### Transit Revenue Bonds

New York's MTA has financed a portion of its capital improvement program with a \$250 million bond issue in October 1982, which pledged future revenues of the transit system and all state, city, and other non-federal operating subsidies as security (4).

The MTA's ability to issue long-term revenue bonds, notwithstanding that fares and direct income cover 58 percent of its operating and maintenance costs, reflects the unique level of transit dependency in New York City. The bondholders are secured by a rate covenant that requires MTA to automatically raise its fares if a shortfall is projected in meeting operating, maintenance, and debt service costs.

The prospectus includes a study that demonstrates that even if all state and city operating subsidies were eliminated (federal operating subsidies are assumed to be zero as well) and fares were forced to

increase from the current level of 75 cents to \$1.38 and then to \$3.04 by 1992, sufficient ridership would be retained to satisfy the bonds and pay for the system's operating and maintenance costs.

This level of transit dependency creates a situation analogous to that of a water or sewer system revenue bond, where the security of the future revenue stream is based largely on the monopoly position enjoyed by the issuing agency and the total dependence of the population on the service provided. However, few transit systems in the nation enjoy such dependency. In almost any other city, a substantial fare increase would lead to a decline in ridership large enough to threaten continued operations.

#### Toll Revenue Bonds

In 1965 the San Francisco Bay Toll Bridge Authority issued \$100 million in revenue bonds to pay for a major part of BART's Transbay Tube. All of these bonds have been retired with revenues from tolls imposed on vehicles crossing three San Francisco Bay bridges. A similar plan is being considered in the San Francisco Bay Area. Under this plan, an increase in bridge tolls would be dedicated to debt service on a new issue of bonds for further transit capital improvements.

In August 1982 the New York Triborough Bridge and Tunnel Authority (TBTA) issued \$205 million in revenue bonds backed by surplus toll revenues from the authority's bridge and tunnel facilities to be used for MTA capital improvement projects. The 30-year bonds will require a maximum annual debt service of \$24.6 million and are secured by the virtual monopoly enjoyed by the TBTA in providing highway mobility in New York City (5).

#### Service Contract Bonds

In December 1982 the New York MTA became the first transit agency to issue service contract bonds. To date MTA has issued \$535.275 million in service contract bonds and currently has \$388 million in outstanding obligations that require an annual debt service of \$39 million.

Under the New York State Transportation Systems Assistance and Financing Act of 1981, the State Director of the Budget is authorized, on behalf of the state, to enter into service contracts with the MTA for up to 35 years in an aggregate annual amount not to exceed \$80 million for the undertaking of mass transportation projects on behalf of the people of New York (6).

MTA is paid a fixed sum of money each year by the state to provide transit services for New York residents. The commitment is expressed in the form of a service contract. Funds paid under the service contract can be dedicated to debt service or can be used to pay for capital project costs directly.

The bondholder's security is tied to the state's annual payments. The state is obligated to honor the contract as long as the MTA continues to fulfill its responsibility to undertake transit projects on behalf of New York residents, subject to the following executory clause quoted from the Official Statement (6,p.2):

The obligations of the State or the Director of the Budget to fund or to pay the amounts provided for by the Transit Service Contract and the Commuter Service Contract are subject to and dependent upon annual appropri-

tions being made by the State legislature for such purposes, shall not constitute a debt of the State within the meaning of any Constitutional or statutory provision and shall be deemed executory only to the extent of moneys available to the State therefor, and no liability shall be incurred by the State beyond the moneys made available for the purposes thereof. The State legislature is not obligated to make appropriations to satisfy its obligations under the service contracts and there can be no assurance that the State legislature will make any such appropriations.

Although the preceding paragraph might give pause to many investors, the bonds received an AA rating, which is the same as the TBTA toll revenue bonds and close to the ratings given obligations bearing the full faith and credit of the state of New York. The securities are viewed as moral obligations of the state and failure to meet service contract payments would result in its exclusion from the debt markets.

Therefore, the payment stream is secured by the state's economy (its ability to raise sufficient tax revenues to meet its obligations) and the threat that it would be denied access to the credit markets by failing to meet its commitments--even though they are not a state liability.

Because the service contracts are technically not a debt of the state, no referendum was required. Although currently unique in the transit field, service contract-backed bonds are being considered as part of a proposal for a state infrastructure bank in New Jersey and have a relatively long history in housing and electrical power, where guarantees of future funds for debt service payments have been used as credit for capital investments.

#### General Obligation Bonds

In some instances states and localities may issue long-term debt bearing the full faith and credit of the jurisdiction in order to provide funds for transit capital investments. General obligation bond issues often are required by state constitutions to be approved by referendum.

For example, in 1973 Allegheny County, Pennsylvania, issued \$62 million in 30-year, general obligation bonds to pay for the acquisition and initial capital investments of Port Authority Transit (PAT), the Pittsburgh area's transit system. Payments on this debt are made by county taxpayers from general fund revenues. PAT's credit and revenues are not involved, and the debt service is a further subsidy provided by Allegheny County. Bondholders are isolated from PAT's finances and are secured completely by county tax revenues.

Many states have issued general obligation transportation bonds over the years, with the proceeds going to highway and transit improvements. For example, New Jersey Transit is undertaking a \$1.2 billion capital improvement program, which includes the proceeds of a \$150 million general obligation bond issue. New York state voters approved a \$1.25 billion general obligation bond issue in November 1983 for infrastructure improvements. Several hundred million dollars from this bond issue will likely be used for transit projects.

In addition, some transit agencies have independent taxing powers and can issue general obligation debt of their own. For example, between 1963 and 1969 voters authorized the San Francisco Bay Area Rapid Transit District to issue \$792 million in general obligation bonds for construction of the

heavy rail system. The bonds are repaid from ad valorem taxes required to be levied on all properties subject to taxation by the district. In addition, in 1966 the district issued \$12 million in general obligation debt for capital improvements in Berkeley, California. These bonds are repaid from ad valorem taxes levied on properties subject to taxation by BART within a special service district.

#### Grant Anticipation and Advance Construction Notes

Most cities and states have experience using short-term financing to match the flow of income and expenditures. Transit agencies, such as St. Louis' Bi-State Development Agency (7), Los Angeles' Southern California Regional Transportation District, and Philadelphia's Southeast Pennsylvania Transit Authority (8), recently have issued grant anticipation notes to advance funds for projects approved for state or federal assistance. These issues generally have lives of less than 1 year and have been associated primarily with operating costs and revenues.

A similar technique has been used to finance longer-term highway capital improvements. Advance construction notes have been issued to initiate major capital projects in advance of anticipated federal highway funding. Two examples are the state of Utah's \$40 million, 24-month Federal Highway Reimbursement Anticipation Notes issued in April 1983 (9) and the state of Alabama's \$64 million, 30-month Federal Reimbursement Anticipation Bonds issued in July 1981 (10).

The significance of grant anticipation and advance construction financing in transit capital investments has not been great; however, this concept is described because of its future applications under the Surface Transportation Assistance Act of 1982.

### THE NEW FEDERAL FINANCING ENVIRONMENT

#### Section 3 Dedicated Tax Revenues

The sources of private credit for transit investments just described involve long-term commitments of funds. Local revenues often are pledged for 30 years or more to provide the capital for current investments. The long-term commitment is justified by the extended life of the project and because it will continue to generate public benefits for many decades once it is completed.

From the federal standpoint, UMTA has lacked the capacity to make multi-year contractual commitments to its grantees. The federal transit program has been subject to annual appropriations and has lacked a stable funding source. Its authorization often has expired in the midst of funding commitments. Despite these limitations, UMTA has succeeded in helping to build major transit systems in Washington, D.C., Atlanta, Baltimore, Pittsburgh, Buffalo, and Miami and has succeeded in refurbishing several others. Letters of intent, full funding contracts, letters of no prejudice, memoranda of understanding, letters of commitment, and so forth, are used to express multi-year federal commitments.

These instruments are similar to moral obligation debt issued by states. Neither is considered a debt or legal obligation of the governmental body and both are subject to annual appropriations by the legislative branch. The executory clause of the New York MTA service contract bonds quoted earlier is a

close analogy to the types of commitments UMTA has made over the years.

The security of multi-year, moral obligation commitments for future funding under UMTA discretionary grants has been enhanced through dedication of 1 cent of the federal gasoline tax to the Section 3 program. In addition to providing a stable source of dedicated revenues, paying for discretionary grants from the Highway Trust Fund using contract authority means that funds for Section 3 do not have to be appropriated, but are available for obligation in the year authorized. Although execution of letters of intent and full funding contracts are still subject to controls through the imposition of obligation ceilings, Section 3 grants now share the security traditionally associated with the federal highway program.

The challenge of financing a major rail modernization program or new start is to combine, into a comprehensive package, one or more of the credit instruments previously described with federal aid, joint development, vendor financing, tax benefit transfers, and other revenue sources.

Under the Section 3 program in the STAA of 1982, the process of blending federal and non-federal sources of capital for transit is made easier and can result in lower project costs. Specific examples of these new benefits follow.

#### Lower Interest Costs

One of the greatest risks borne by lenders when large investments are undertaken is that the project will not be completed and will fail to generate the benefits expected. The default of the Washington Public Power Supply System is a critical example.

If federal funds are essential to completion of a project and the commitment is perceived to be weak, the non-federal elements of a financing package may become more costly or impossible to arrange. Lenders may seek higher coverage ratios (the level of revenues in excess of debt service), credit enhancements (loan guarantees), or higher interest rates as compensation for the risks of uncertainty. As a result, a stream of dedicated tax revenues or other, non-federal flow of funds will yield a reduced level of investment capital and final project costs will be pushed higher as a result of greater interest expenses.

The increased assurance of future Section 3 funding and the use of contract authority will reduce these risk premiums by strengthening the commitments made in letters of intent and full funding contracts.

#### Improved Timing

The improved security of Section 3 grant commitments will allow the application of advance construction financing to transit projects. Borrowing to advance federal funds anticipated in future years under letters of intent and full funding agreements offers the flexibility to assemble major financing packages on the best possible terms.

For example, federal funding may be spread over so many years that construction schedules become extended and result in inefficiency and inflation-driven cost overruns. Advance construction financing could overcome this problem and lower project costs by allowing contracts to be bid on an optimal schedule. Similarly, if prevailing market conditions are

unfavorable and financial advisors seek to delay issuing long-term bonds, temporary borrowing using future federal grants as collateral could provide sufficient cash until interest rates become more favorable. In cases where joint development proceeds are expected to provide a large share of project revenues but will not be realized until after the funds are needed for construction, federal dollars anticipated in future years may be advanced to provide temporary cash flow.

#### Better Terms from Vendors

With greater assurance of federal commitments under Section 3, transit agencies may be able to increase their order sizes for project elements. Bigger orders for buses, rail cars, or other equipment could help to reduce costs through economies of scale in the manufacturing process. In addition, previous year-to-year funding commitments may have resulted in fixed facility projects being bid in smaller segments, inhibiting a contractor's ability to invest in productivity-enhancing capital equipment and potentially resulting in higher costs.

Because contracts previously let under the discretionary program were subject to annual appropriations, second- and third-tier subcontractors may have had to pay higher interest rates, or may have been unable to obtain trade credit from their banks and bonding companies. Small businesses and minority contractors therefore may have been unable to bid on certain transit projects, thereby reducing competition and potentially raising costs.

#### New Section 9 Financing Requirements

A major shift of transit capital funds from the discretionary grant program to a new block grant has occurred under the STAA of 1982. Although still subject to annual appropriations, the formula under which the Section 9 funds are apportioned is defined in the law and allows for projections of future capital grants over the authorization period.

According to a budget analysis by the U.S. Conference of Mayors (11), the split between discretionary and formula programs was roughly 55 percent discretionary and 45 percent formula between fiscal years (FY) 1980-1982. This split was reversed in FY 1983, and will grow to almost a two-thirds block grant, one-third discretionary mix in FY 1984. Based on authorized funding levels in the STAA of 1982, the formula portion of the capital program will expand to 75 percent by FY 1986.

Although the tilt toward block grant funding may provide transit agencies with sufficient funds to provide for cyclical capital requirements, the stream of revenues will need to be aggregated to pay for projects whose cost exceeds a single year's apportionment.

For example, a transit agency may need to purchase a large number of buses in the first year of the program and none in the next 2 years. Another locality may plan to rebuild a bus maintenance facility that requires a large amount of funds in the third year of the program. In the past these projects were funded with a single grant under the discretionary portion of the program.

Under the new block grant arrangement, the transit operator purchasing buses may have to arrange to borrow a portion of the second and third year block grants, through bank loans or grant anticipation notes, in order to obtain the funding needed to

purchase buses in the initial year of the program. The transit agency needing a bus maintenance facility can accumulate its Section 9 apportionment for 2 or 3 years in order to provide sufficient funds for the project in the later stages of the program cycle.

Under current law, states can assist in this balancing process by performing a clearinghouse role. Governors can channel block grant funds being accumulated by one property to another jurisdiction within the same state to smooth the flow of capital dollars.

#### CONCLUSION

Better recognition of the influences being exerted by federal commitments on locally supported debt and overall project costs is needed to maximize the impact of the limited dollars available for transit capital investment.

The amendments to transit legislation made under the Surface Transportation Assistance Act of 1982 have increased the strength of existing forms of multi-year commitments, and the potential of these changes to reduce project costs and facilitate the assembly of financing packages remains to be explored.

With transit capital requirements for modernization and expansion projects at extraordinary levels in relation to available resources, stretching every dollar as far as it will go is vital. A stable federal funding environment could help achieve this objective without increasing spending levels. Given current deficits, the limits of federal resources may be visible. Perhaps, as a result, new areas of compromise, involving more or less assurance of funding, should be analyzed in addition to traditional concerns over absolute appropriation levels.

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# Alternative Public Financing for Improvement of the Industrial Canal Lock in New Orleans

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## ABSTRACT

Continued federal leadership in financing the development of the nation's public waterway system is uncertain. If proposed federal cutbacks are approved, and federal cost-recovery and cost-sharing programs are implemented, additional pressure will be placed on state and local governments when selecting a financing structure to provide required front-end funds for public waterway improvements. A method of evaluating available local financing alternatives--to predict expected performance and select best possible options--is necessary if state and local governments are to successfully fulfill their financial obligations with opportunistic financial planning. Such fundamental changes may require unique and innovative organizational arrangements. In any instance, the initiative and organization for such changes should occur at the federal level.

In competing for business, a public waterway improvement project must finance facilities, services, or both, to attract and maintain business. The success of a specific capital improvement program depends on its ability to anticipate and respond to change in the economic cycle and to adapt to the needs of industry and rapidly changing technology in a manner that will meet the demands of potential users at competitive rates.

Current federal cost-recovery and cost-sharing proposals on public waterway development require a unique combination of local public service utility and private enterprise to achieve this goal. State and local governments will have to overcome many obstacles. Many of these obstacles historically have been avoided because of the inherent advantages of

traditional funding arrangements based on a system of federal allocation. These issues will assume new meaning when presented to state and local governments, and they can be expected to influence the direction and success of actions to accommodate future growth of this nation's public waterway system.

Proposed capital improvement of the industrial canal lock in New Orleans offers an excellent opportunity to examine an existing situation in which the issues and concerns regarding these non-federal cost-sharing programs are currently being addressed. Because these programs are expected to typically influence similar public waterway improvement projects, it appeared advantageous to incorporate the Industrial Canal Lock project as the focal point of this research on alternative methods of funding local public waterway improvement projects.

## THE INDUSTRIAL CANAL LOCK: A NEED FOR CAPITAL IMPROVEMENTS

The existing industrial canal lock facility, which serves the Port of New Orleans Industrial Canal, Tidewater Port Area, the Mississippi River-Gulf Outlet, and the Gulf Intracoastal Waterway, is in urgent need of capital improvement. The Industrial Canal Lock is the only locking facility connecting the lower Mississippi River with these navigable waterways to the east. It is the only existing locally owned and financed facility of its kind on a federally owned and maintained navigable waterway. Capital improvement of this facility is of national importance--it is ranked as the second most important navigation project by the U.S. Army Corps of Engineers' priority listing of required national waterway improvement works as established by the National Waterways Study.

Completed in 1923, this lock is presently overused, too small, and has limited life remaining without considerable renovation or replacement. It is also the critical link between the Port of New

Orleans' traditional riverfront facilities and modern, deep-draft terminal development taking place in the Tidewater port area. Capital improvements are needed before waterborne traffic relying on this locking facility is forced to travel greater distances on alternative routes, or cargo is diverted to different modes of transportation. In either case, the cost of moving commerce will increase, and the overall efficiency of the present system will decrease.

The economic justification for a new lock has been thoroughly documented and generally accepted. Since 1970 approximately 64,000 vessels pass through the lock annually carrying an average of 25 million tons of cargo--2 million tons more than the facility's designed capacity. Actual tonnage has decreased from a high of 29,469,277 tons in 1977 to 21,743,392 tons in 1981 because of the economic recession and because of costly delays experienced at the lock. The U.S. Army Corps of Engineers projects tonnage to increase to 29 million tons by 1995, to 30 million tons by the year 2000, and to 32 million tons by 2010. The majority of traffic carries bulk commodities of low value such as grain, coal, marine shell, petroleum products, and industrial chemicals. Eighty percent of all traffic moving through the lock neither originates nor terminates in Louisiana. An estimated annual economic impact of \$500 million is realized from public and private industries directly served, which supports approximately 11,000 jobs. Excessive demand has resulted in an average of more than 14,000 lockages a year--causing costly delays, restricted movement of marginally profitable and low-value commodities, and has brought to question, in light of future uncertainties, both local and regionally related industrial growth that requires this facility's services.

Local public meetings to determine a new lock site and to develop facility objectives began in 1960 and continued unsuccessfully until 1975 when the U.S. Army Corps of Engineers completed a detailed site-plan selection study. This analysis, which evaluated 28 major points of socioeconomic-environmental concerns, concluded on the superiority of a site-plan downriver of the existing facility in adjacent St. Bernard Parish. Opposition expressed by local residents and various interest groups curtailed implementation of the project.

In 1977 the Carter Administration conducted a review of all water resource-related projects. As a result of that review, President Carter requested the elimination of the U.S. Army Corps of Engineers, site plan proposal for environmental reasons. He further requested that the U.S. Army Corps of Engineers' study the possibility of construction occurring at the existing lock site--with a specific mandate to avoid "severe residential and industrial dislocations in the area."

That study was completed by the U.S. Army Corps of Engineers in 1982 and is currently undergoing review. The cost of the resulting 6-year delay is astronomical, and it increases each year. The project's estimated cost of more than \$600 million concluded in the current Corps proposal, of which more than \$200 million has been projected by using traditional cost-sharing policies to become a local responsibility, has approximately doubled 1975 estimates. Such delays are not only costly but have also jeopardized the current economic feasibility of the project.

Under the current Administration's proposed cost-sharing policies for shallow- and deep-draft navigation projects, all costs would be borne by non-federal interests and recovered through the application of user fees. According to this proposed arrangement, the annual payments of \$60.5 million that

result from amortizing the total estimated project cost of \$600 million at 10 percent annual interest over a 50-year period (approximate designed life expectancy of the new lock) would ultimately be passed on to the users of the improved locking facility. Dividing the annual cost of improvements (\$60.5 million) by the average annual tonnage using the existing facility (25 million tons) indicates that a user fee of approximately \$2.40 per ton would be required. This additional transportation cost could divert marginally profitable bulk commodities, which encompass a majority of traffic currently using the lock, from the waterway system.

Furthermore, if such cost-sharing policies were to be enacted, a non-federal interest capable of funding a capital-intensive improvement project of this type would have to be located. In 1983 the Port of New Orleans invested \$28,845,747 of its working capital into the construction of facilities, the retirement of long-term debts, and the purchase of land, equipment, and improvements necessary to support the Port's 10-year, \$360 million capital improvement program. Total working capital available in 1983 was \$29,544,919, of which the state of Louisiana was the primary source providing \$18,827,572. The net increase in working capital available to undertake the proposed new lock project in 1983 after existing obligations have been met was \$699,192--far below the estimated annual amortized cost of the project (60.5 million) if all costs were to be borne by non-federal interests. The Port of New Orleans' limited operating margin, and the project's inability to cover its total costs through the use of project-operated revenues demonstrates a need for a creative local financing package and a high level of funding participation from outside sources--most likely from the state and federal levels.

#### EVALUATING A LOCALLY FINANCED PUBLIC WATERWAY CAPITAL IMPROVEMENT PROGRAM

Determining the expected performance of locally financed public waterway improvement programs depends on the ability of the local agency to analyze and implement the most desirable program for its specific situation. Careful and opportunistic local financial planning within individual public agencies will be essential to meet the future needs of the nation's demand for waterborne transportation.

The ability of state and local governments to provide the front-end funds required by proposed federal cost-recovery and cost-sharing programs will ultimately depend on (a) the availability of adequate funding; (b) the cost of borrowed capital; and (c) the discounting element, or lead-time required before project revenues can begin to cover costs. The degree of freedom a state or local government experiences in financing required capital improvements will also depend largely on the specific agencies' (a) political make-up and structure, (b) degree of freedom allowed in raising and using capital, (c) financial position in terms of assets and investments, and (d) support from the local community.

When assessing a locally financed public waterway project, four steps should be incorporated into the evaluative process.

Step 1: Develop a working knowledge of current proposals for federal cost-recovery and cost-sharing--explore their theory and application.

Step 2: Identify methods of generating local front-end resources--analyze the requirements and implications.

Step 3: Establish an historical perspective of related public waterway improvements--determine the specific parameters and constraints of the proposed project.

Step 4: Determine the expected performance of a locally financed public waterway project--in the light of results concluded in steps 1, 2, and 3.

In step 4 of this proposed evaluative model, determination of expected project performance, administrative resources, and implementation procedures; selection of appropriate local front-end financing techniques; and the projection of expected financial performance must be examined in detail.

A standardized method of evaluating potential public waterway capital improvement programs such as presented here must be relatively simple to apply. This is necessary to accommodate a wide variety of political and institutional structures, data availability, and specific policies and external conditions. The evaluative process must be objective and flexible for use by responsible state and local planners and officials when comparing alternative strategies. For this reason the following concerns, or design specifications, should be considered by such an evaluative model: direct useability, flexibility, sensitivity to judgment, data requirements, staff requirements, and computational requirements.

#### RESULTS OF INDUSTRIAL CANAL LOCK IMPROVEMENT EVALUATION

Evaluation of the industrial canal lock case study yielded important and conclusive results. Although a relatively basic application of the proposed model was conducted to facilitate the academic nature of the research, specific issues and concerns were identified that can be expected to influence the future actions and directions of this project.

To assist in the evaluative process and to simplify the complex relationships involved, a number of assumptions had to be made. Critical problems were avoided through the formulation of these assumptions. The realization that these variables or assumptions exist, and the potential impact each represents, is an important by-product of such an evaluation.

For the Industrial Canal Lock proposal, it was assumed that 100 percent of local front-end financing, or the worse case, would be required and that a \$320 million capital improvement program with a 10-year construction-lead time would accomplish necessary improvements. This was based on the U.S. Army Corps of Engineers' original 1975 proposals, which have since increased to about \$600 million according to the Corps' 1982 study. It was also assumed that the Board of Commissioners of the Port of New Orleans must initiate, administer, and fund proposed works--assuming that the complex political, environmental, and socioeconomic issues surrounding this situation have been resolved and an actual plan finalized. Using these tentative assumptions the evaluative process produced the following results.

First, the Board of Commissioners of the Port of New Orleans possesses the administrative structure, available financing resources, and technical capabilities to facilitate the complex tasks of planning, programming, and controlling a major public waterway capital improvement project of this nature; however, the Port has only limited resources for funding capital improvement projects.

Second, future capital improvement projects could feasibly be based on traditional local financing arrangements--if the issues of long-term financial security, recent national trends away from tradi-

tional local front-end financing arrangements, and the Port's continued bonding capacity are satisfactorily addressed. If these issues cannot be resolved, alternative financing options must be examined.

Third, modifications to the Port's current 10-year, \$360 million capital improvement program, which is required to include the Industrial Canal Lock capital improvement project, would jeopardize the Port of New Orleans' expected long-term financial performance and severely compromise future capital improvement projects recommended for development according to the Port's comprehensive master plan. Without increased funding, new capital improvement priorities would have to be established and reevaluation of investment timing and sensitivity analysis should occur.

Because of this final point, as well as uncertainties regarding basic assumptions made, the outcome of cost-recovery and cost-sharing legislation, and expected long-term performance of creative financing alternatives, it must be concluded that this capital-intensive project should not be initiated at the local level because it is beyond the Port's financial capabilities. It is recommended that the state review and consider the project's possible implementation. Because the proposed improvements are of national importance, serving mainly waterborne traffic passing through the state, improvements could be justifiably questioned. Although the capital improvement of this facility is urgently needed, such a decision would have to be based on the state's economic priorities. It must therefore be recommended, because of the national importance of this lock facility, that a special governors task force or legislative task force be established to further investigate this topic and recommend appropriate action.

#### CONCLUSIONS AND RECOMMENDATIONS

The evaluative approach taken here attempts to provide a general tool for the evaluation and analysis of alternative methods of locally financing public waterway improvements in the United States. These findings will be of value if existing federally based financing arrangements are modified according to currently proposed federal cost-recovery and cost-sharing legislation. The broad scope of subjects critical to determining future non-federal funding arrangements for the operation, capital investment, and rehabilitation of this nation's public waterway system have been only briefly identified in this paper.

The subject discussed here has provided new insights into alternative financing of public waterway improvement projects. This discussion has been presented from a planner's point of view--it was intended to identify problem areas and should not be considered a final statement. The complex problems that would result from this conceptually unique reorganization of financial responsibilities has received little attention, and where attention has been given, it has been given in a fragmented manner. After having extensively researched available information on alternative financing methods capable of satisfying proposed local front-end obligations, much remains to be done.

The need exists for a similar level of in-depth analysis encompassing the broad spectrum of issues that such fundamental changes represent; such an analysis must become an ongoing process. Successful initiation of this requirement depends, in part, on the recognition by state and local governments that their ability to respond to future demand will de-



pend on their ability to project their future physical needs and financial capacity. It also depends on the role the federal government adopts in leading or accommodating this necessary research.

The case study examined here offers insight into the nature of the problems that must ultimately be addressed. Currently, there appears to be no clear-cut traditional financing alternative available to provide the local front-end funds necessary for the capital-intensive reconstruction of this facility without adversely affecting the Port of New Orleans' long-term financial status. Although this conclusion is based primarily on the expected financial performance of the project, uncertainties regarding the actual implementation of non-federal responsibilities must also be considered. Until such concerns as (a) the local application and collection of user fees, (b) economically feasible local financing mechanisms, and (c) administrative resources and implementation procedures are available and standardized, there will be little incentive for state and local governments to commit to a capital improvement project of this magnitude.

Although it is significant to realize the current inability of the New Orleans community to enter into this local financial obligation, a community that possesses significantly greater economic resources and related past history from which to draw on than most communities, there are other concerns that must be addressed. Although these concerns apply to the New Orleans case, they can typically exist, or reoccur, in similar future situations.

1. The question of equity, or the distribution of cost and benefits. Is it equitable to assume that only the initiating public agency should bear the economic and political cost of improvements during the construction period and thereafter until returns began to be realized? What are the boundaries of the hinterland that benefits? Can specific interest groups that benefit be defined?

2. The comprehensive nature of improvements must be addressed. How will proposed improvements affect existing and future development both regionally and nationally? Are these improvements fulfilling the goals and objectives of the nation's public waterway program?

3. What responsibility does the local public sector have to motivate such comprehensive improvements? Can the different factors that influence public development (provision of services) and private development (profit motive) be integrated or compromised? Can either interest be expected to successfully realize long-term benefits without short-term returns?

4. Finally, are state and local governments actively included in the decision making process? Can greater intergovernmental and interdisciplinary coordination be enhanced by more effective legislation and funding from the federal level? Are incentives available to all levels of government?

When approaching these questions, important problems must be reevaluated in light of past successes. Two European examples, the Compagnie Nationale Du Rhone and the Rhine-Main-Danube Commission, have

each adopted comprehensive regional development of public waterway systems to meet national objectives as the ultimate goal of their programs. In the United States the Tennessee Valley Authority (TVA) was created with similar objectives, and it has been a model for comprehensive regional development of public waterway systems in other countries--but not in the United States. The foregoing examples served to enhance the multifunctional development of energy, navigation, flood control, agriculture, and socioeconomic welfare. These functions, which are typically organized and performed at the federal level, were created and administered at the regional level. This approach brought government closer to the people and their specific problems, reduced duplication of functions and facilities, and increased the opportunity to realize the comprehensive development of an entire region.

Each of these three examples have focused on the provision of inexpensive energy in the form of hydroelectric power as the basic element with which to stimulate future benefits. In each case, front-end financing of initial improvements, and continued funding to minimize the impact of related user fees, has come from the national level of government. The question should then be asked: "Can navigational improvements serve as this focal point, or as a catalyst, if hydroelectric power capabilities do not exist or are not required?" Can cheap transportation costs perform the same function as cheap energy costs have in past public waterway development schemes?

Much has yet to be learned on the subject of alternative methods of financing public waterway improvement projects before any progress can be made. It has typically been the U.S. Army Corps of Engineers' philosophy not to promote or actively pursue public waterway development projects but to respond to requests initiated at the local level or actions mandated by federal legislation. As observed with the New Orleans Industrial Canal Lock example, this may not now be an adequate approach to projects of national interest or concern. The potential long-term impacts of current federal cost-recovery and cost-sharing legislative proposals, and the degree of complexity of the problems that must still be evaluated, warrant further investigation. It is essential that the initiative and organization of relevant actions are begun at the federal level.

Continued federal funding is necessary, and the creation of a single agency, or authority, whose sole purpose is the coordination of this proposed local, state, federal, and private-interest partnership is mandatory if the benefits this nation's vast waterway system has to offer are to continue to be realized. In the case of the industrial canal lock, the New Orleans Port Commission will soon recommend that the U.S. Army Corps of Engineer examine this project in the light of the recommendations made in this paper.

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