

Financing Low-Volume Roads and Bridges: Results from a National Survey

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Financing low-volume roads, usually the responsibility of counties, towns, or townships, recently has been a subject of interest and some concern for state and local policymakers. Low-volume roads and bridges represent the main connection between residents in unincorporated areas and essential public services, such as ambulances and fire trucks. In recent years, however, the process of financing the off-system transportation network has changed, with local resources becoming a greater share of the overall financing system. The condition of the rural transportation network is examined on the basis of a mail survey of county highway officials. Financing arrangements also are reviewed, with special attention paid to the growing reliance on local resources in the financing arrangements. Finally, options available to local highway officials for meeting their perceived needs are examined. According to survey respondents, the condition of low-volume roads and bridges needs attention and repair of deficiencies may require additional funding. Many respondents report that budgets are inadequate to provide the services that they consider necessary. Although recent population trends have rendered some of the local mileage no longer economically feasible, incentive remains small for either residents or local officials to remove road mileage from the inventory.

Low-volume roads and bridges in rural areas have been a policy issue for rural residents and policy makers for many years. Rural farm residents need access to markets for their products and, increasingly, to off-farm employment. Rural nonfarm residents require regular access to employment in nearby communities and many rural residents depend on the local transportation network for public services, such as fire protection and emergency medical care.

However, rural states face several major issues in financing roads and bridges. First, changes in agricultural methods involving heavier farm equipment have increased demands on the local transportation network. Semitrailers weighing more than 60,000 lb travel off-system roads and bridges. The changes have occurred concurrently with population declines, forcing infrastructure costs to be paid by a smaller number of residents, and resulting in increased cost per resident.

Second, the relatively poor performance of the farm economy in the early 1980s, with subsequent income declines, meant that property taxes traditionally used to finance roads and bridges increased relative to farmers' ability to pay. In some instances, pressures by the agricultural community for

property tax relief affected the ability of local governments to finance public services.

Third, federal general revenue sharing was eliminated beginning in 1987, removing a revenue source commonly used to finance roads and bridges. Other local revenues, such as sales taxes, did not perform well in many rural areas during the early and mid-1980s and, as a result, local officials have had to find alternative revenues such as user charges or local imposts.

Engineering condition data for off-system roads and bridges are not available on a national basis. However, information on the estimated condition of roads and bridges is available from a 1987 national survey of county highway superintendents conducted by the National Association of Counties (1,2). Although these estimates lack the precision of engineering analysis, many states require that county highway superintendents be engineers. They are therefore in the most informed position to evaluate the ability of roads and bridges to meet local transportation demands and determine spending patterns and revenue sources of local governments.

Recent shifts in revenue sources have placed greater burden on local revenue sources. The additional burden in rural areas facing economic declines makes the financing of roads and bridges at current levels more difficult although, as will be shown later, real spending has increased in the past decade.

Correlation analysis is used to examine relationships between conditions of roads and bridges, and financing patterns. The relationships between spending patterns, road density, budget outlook, and condition are considered.

Although specific policy recommendations are not made, local policy makers should evaluate policy alternatives. Each option has difficulties associated with its implementation, but given the trends, a long-term financing solution may require some of these alternatives. Changes in state distribution programs may be required to allow local governments to respond better to changing population and economic conditions.

Local roads and bridges include those off the federal aid highway system and because most of the mileage is in non-metropolitan areas, the terms "rural" and "low-volume" refer to the same road mileage. In 1987, there were 3,020,000 mi of off-system roads and 302,011 bridges longer than (or equal to) 20 ft (3).

Subsequent analyses use information from a 1987 national mail survey of 533 counties conducted in cooperation with the National Association of Counties (NAC) (1,2). The response rate for counties was 25.4 percent. A similar survey was conducted by the National Association of Towns and Townships,

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with a response rate of 14.8 percent of the towns or townships that have direct responsibility for roads and bridges, and these results are reported elsewhere (1,2). Financial information is obtained from FHWA's *Highway Statistics* (3) for counties and townships combined and from the 1987 Census of Governments finance data file for counties.

Every 2 years (within 6 months), state and local public officials inspect bridges of 20 ft and longer and report the ratings to the FHWA. Although the National Bridge Inventory (NBI) has been criticized, it is still a major information source on bridge conditions. No such comprehensive data source exists for roads.

LOCAL ROAD AND BRIDGE CONDITIONS

The views of local highway officials concerning road conditions are especially useful because these decision makers are responsible for financing local roads and bridges. If, in their perception, additional funding is needed, they can take appropriate action; if, on the other hand, the mileage can be reduced, they can adopt that strategy as well.

County highway officials rated the mileage under their responsibility using a 10-point scale, ranging from 0, for a road that is closed, to 9, for a road that is in new or perfect condition. This rating system is in common use and is familiar to many county highway officials. Each rating category contains a brief description of road condition to maximize reporting comparability among responses. The rating system is presented in Table 1.

On average, 1 mi in 5 on the county highway system is perceived as less than barely adequate, a rating of 4 or below (Table 1). An additional 12.7 percent of the county highway system was rated as having limited failures and barely adequate, a rating of 5, bringing the total to 35.6 percent as barely adequate or worse in the view of county highway officials. Information is not available regarding whether the mileage is considered inadequate for volumes of traffic, weight, or both.

Regions differ in reported road conditions. Counties in Pacific states reported 40.1 percent as barely adequate or below (Table 1), whereas those in the Northeast reported an average of 28.9 percent. Available information fails to indicate reasons for these differences and further work is needed to determine whether they are significant between regions.

County bridges also have problems, on the basis of the NBI (4). Bridges are rated on 100 points, using a system of deficiency points. If a bridge receives a Sufficiency Rating (SR) of >80, it does not qualify for federal funding under the Highway Bridge Replacement and Rehabilitation Program (HBRRP). If rated between SR 50 and 80, a bridge qualifies for rehabilitation, but not replacement. Bridges that are to remain in use with ratings of <50 qualify for replacement or rehabilitation. The NBI, however, has been criticized for including bridges not intended for future use, thereby implying a state's bridge condition is worse than it actually is (5).

Nationwide, 22.5 percent of county-maintained bridges had SR values of >80 (Table 2). These bridges are judged adequate for expected traffic and loads. Although they do not qualify for funding through the HBRRP, they may receive state funds. Judging bridge adequacy is complicated by the

TABLE 1 CONDITIONS OF COUNTY ROADS BY REGION

Condition Description	Rating	Northeast (n=43)		Midwest (n=157)		Appalachian (n=37)		Southern (n=96)		Mountain States (n=56)		Pacific States (n=79)		U.S. Counties (n=468)	
		Pct.	Avg. Miles	Pct.	Avg. Miles	Pct.	Avg. Miles	Pct.	Avg. Miles	Pct.	Avg. Miles	Pct.	Avg. Miles	Pct.	Avg. Miles
New or Perfect Condition	9	9.5	31.2	4.4	47.2	9.9	46.9	8.9	65.8	5.0	40.6	6.4	65.3	6.6	51.6
	8	14.4	100.8	5.9	53.1	6.1	12.9	7.3	65.8	3.9	43.2	7.3	61.6	7.0	55.6
Surface adequate with normal maintenance	7	33.8	156.0	39.9	418.2	42.8	212.4	42.1	320.3	45.2	401.2	37.7	350.8	40.3	338.2
	6	13.4	85.2	13.4	120.6	11.7	75.8	6.3	63.8	9.2	118.2	8.5	83.7	10.5	94.6
Limited failures and barely adequate	5	12.9	47.0	11.3	93.1	8.9	41.2	16.5	133.9	12.0	107.5	12.9	131.2	12.7	98.7
Maintenance will be considerably higher to prevent continued deterioration	4	10.0	35.3	12.4	110.4	12.0	56.3	11.5	96.3	13.3	127.5	16.4	180.4	12.7	107.1
Considerable failures and beyond practical limits of normal maintenance	3	2.3	7.0	5.0	42.9	2.5	27.7	2.8	23.5	3.5	25.7	4.4	49.2	3.8	32.9
	2	3.4	11.4	5.5	61.0	5.0	24.8	3.3	41.2	5.8	47.7	4.6	43.0	4.7	44.0
Failure to the extent that operation of traffic is severely affected	1	.3	.8	1.9	16.4	.9	6.8	1.2	8.7	1.9	17.1	1.7	21.2	1.5	13.1
Closed, awaiting repairs	0	-	-	.3	2.8	.2	.8	.1	.7	.2	2.9	.1	1.4	.2	1.7
Totals		100.0	474.8	100.0	965.7	100.0	505.6	100.0	818.9	100.0	931.6	100.0	987.8	100.0	837.4

Dash (-) indicates not applicable.

Source: Survey of County Highway Officials, Fall 1987.

fact that bridges may be sound but, because of width, are inadequate to accommodate the heavier farm traffic of recent years. Also, there are numerous bridges less than 20 ft long, which are not on the Federal Highway System. These structures must be financed by local governments with their own resources.

On the other hand, 31.2 percent of bridges on the NBI were assigned SR values of <50. These bridges require serious attention and, overall, are cause for concern, although not necessarily at the state or federal level. If the bridges serve

local traffic only, the argument can be made for strictly local financing, as is often the case.

Bridges requiring attention are not evenly distributed among states. In Missouri, 75.9 percent of county bridges are in the poorest condition category, compared with only 13 percent in neighboring Illinois. Relatively poor states such as Alabama, Arkansas, and Mississippi reported large proportions of bridges needing repairs or replacement. At the same time, Texas and Oklahoma reported 70.1 and 68.3 percent, respectively, of county bridges in the poorest condition category.

TABLE 2 BRIDGES BY SUFFICIENCY RATING AND HBRRP FUNDS RECEIVED

Region and State	Bridges Sufficiency Rating			County Bridges ¹	HBRRP Funds Received		
	Less than 50	50-80	Greater than 80		County	Township	State
	(Percent)						
Northeast							
Connecticut	-	-	-	0.1	-	-	100
Maine	-	-	-	-	-	25	75
Maryland	37.7	36.5	25.8	26.8	17	-	72
Massachusetts	-	-	-	7.3	-	-	100
New Hampshire	-	-	-	0.1	-	-	-
New Jersey	34.2	36.2	29.6	38.7	-	-	-
New York	50.3	37.2	12.5	35.6	54	-	46
Pennsylvania	42.6	24.0	33.4	12.8	5	3	90
Rhode Island	-	-	-	-	-	-	100
Vermont	-	-	-	-	-	24	75
Mean	41.2	33.5	25.3	11.0	6.9	4.7	59.8
Midwest							
Illinois	13.0	37.7	49.3	14.2	10	14	75
Indiana	36.0	26.4	37.6	68.2	33	-	67
Iowa	29.4	42.4	28.2	82.0	47	-	45
Kansas	40.3	37.6	22.1	80.5	23	-	55
Michigan	39.1	20.5	40.4	51.7	75	-	-
Minnesota	24.8	27.5	47.7	67.7	25	-	55
Missouri	75.9	19.8	4.3	63.2	25	-	75
Nebraska	55.1	23.8	21.1	81.6	35	-	50
North Dakota	43.9	23.0	33.1	81.8	30	22	9
Ohio	25.1	35.5	39.4	63.0	15	5	65
South Dakota	43.6	33.0	23.4	73.5	50	-	50
Wisconsin	21.0	39.5	39.5	22.5	9	28	60
Mean	37.3	30.6	32.2	62.5	31.4	5.8	50.5
Appalachian							
Kentucky	55.0	33.0	12.0	39.3	15	-	85
Tennessee	50.3	31.5	18.2	49.6	25	-	65
Mean	52.6	32.2	15.1	17.8	8	-	30
Southern							
Alabama	60.4	33.5	6.1	63.2	15	-	80
Arkansas	63.3	29.0	7.7	49.1	15	-	70
Florida	30.1	42.1	27.8	32.0	17	-	83
Georgia	53.0	33.6	13.4	52.7	10	-	84
Louisiana	55.5	32.2	12.3	43.4	15	-	85
Mississippi	60.4	21.3	18.3	72.9	-	-	0
Oklahoma	68.3	19.9	11.8	73.8	40	-	50
South Carolina	48.6	37.0	14.4	12.2	15	-	85
Texas	70.1	21.3	8.6	34.9	13	-	80
Mean	56.6	30.0	13.4	48.2	15.6	-	68.6
Mountain States							
Arizona	21.1	25.6	53.3	19.2	20	-	65
Colorado	55.8	18.0	26.2	48.2	21	-	65
Idaho	20.0	24.6	55.4	38.1	35	-	65
Montana	28.5	38.8	32.7	51.5	30	-	60
Nevada	24.3	37.9	37.8	14.3	35	-	65
New Mexico	31.5	33.0	35.5	18.1	-	-	100
Utah	33.1	31.3	35.6	25.7	45	-	30
Wyoming	45.0	34.6	20.4	30.0	35	-	65
Mean	32.4	30.5	37.1	30.6	27.6	-	64.4
Pacific States							
Alaska	-	-	-	1.8	-	-	100
California	24.2	34.3	41.5	34.3	40	-	50
Hawaii	30.2	28.3	41.5	36.0	15	-	85
Oregon	10.5	31.4	58.1	56.1	25	-	65
Washington	9.6	41.2	49.2	52.3	-	-	-
Mean	18.6	33.8	47.6	36.1	16	-	60

¹ Percent of bridges maintained by counties. Dash: not applicable.

Source: U.S. Department of Transportation, Federal Highway Administration, *National Bridge Inventory*, computer printout, 1987; and American Association of State Highway and Transportation Officials, *Local Finance Survey*, (Washington, D.C.: AASHTO, 1987).

One explanation for Texas and Oklahoma is the adverse economic conditions in the oil industry during the 1980s. State and local revenues became tighter, perhaps forcing local officials to choose between capital and current projects.

Federal bridge dollars are allocated to states on the basis of proportion of total bridge dollar deficiencies within a state. However, internally, funds are allocated by project and various other criteria (6). A federal mandate requires that between 15 and 35 percent of the bridge dollars be spent on off-system bridges. State governments also supplement or replace federal bridge dollars with state funds. Thus, the fact that county-maintained bridges in some states are in relatively poor condition is not entirely because of insufficient local resources.

States with a higher proportion of bridge dollars spent on county bridges might be expected to have a smaller proportion of bridges needing major rehabilitation and replacement. This relationship, of course, depends on the percentage of bridges under county control. Table 2 generally supports this hypothesis. In Missouri, where counties receive 25 percent of HBRRP funds, 75.9 percent of the bridges have SR values of <50 . Alabama counties receive 15 percent of the HBRRP, and 60.4 percent of the county bridges have SR values of ≤ 50 . Arkansas is similar—15 percent of HBRRP funds and 63.3 percent in the poorest category. The allocation of dollars and selection of bridges to receive attention is subject to the state decision-making process. Less state financial support for bridges is reflected in poorer bridge quality in some states.

However, the converse relationship between bridge dollars and condition is not found in all states. Illinois has one of the smallest percentages of county bridges with SR values <50 , but counties receive only 10 percent of the HBRRP funding. Illinois, however, has a state bridge program that supplements the federal dollars. Oregon also has a small percentage of bridges qualifying for rehabilitation or replacement, but counties receive 25 percent of the federal bridge support coming into the state.

It is important to make the point that states have varied in response to changing socioeconomic conditions. Fewer miles and fewer bridges are needed today than 50 years ago because of improvements in transportation methods. Closing roads or bridges is not politically popular, and as a result, local officials are tempted to spread financial resources over too many miles, given current traffic needs. Detailed information on this issue is difficult to obtain, but local officials apparently consider reduction in road mileage to be feasible in areas with population declines (7, Table 4-1).

HOW COUNTY ROADS AND BRIDGES ARE FINANCED

Nationwide, county roads and bridges are financed with a variety of revenue instruments. Real estate property taxes, as a source of local funds for county highway revenue, are common in 35 states (6). State intergovernmental assistance also is important in most states and often involves a sharing of state taxes on motor fuels. Federal intergovernmental assistance through the federal aid secondary highway program, community development block grants, and general revenue sharing is an important revenue source for local road and bridge programs. Federal general revenue sharing was

discontinued beginning in 1987, eliminating a readily available source of funding for county roads and bridges.

Revenue Structure

Local governments, depending on state statutes and constitutional restrictions, rely on several revenue sources. The per-mile revenues generated from each source and the proportion that each represents of total revenues are used in this analysis to illustrate the collections and the relative importance of each. Comparisons between 1977 and 1987, the most recent data available, show how these revenues have changed during the past decade.

Per-mile local government receipts increased 7.4 percent in constant dollars between 1977 and 1987, from an average of \$2,419 per mile at the beginning of the period to \$2,598 per mile in 1987. Two issues are especially important in this comparison: the adequacy of these revenues and their source. Spending need is nearly impossible to determine at this level of aggregation because it depends on type of service, traffic demand, and other factors for which data are not available.

The distribution of the revenue sources clearly has changed, with a greater burden resting on local revenue sources, including user revenues and imposts. Property taxes remained a relatively constant funding source for roads and bridges during the past decade. In 1977, for instance, property taxes represented 18.9 percent of revenues generated by counties and townships for roads and bridges (Table 3). By 1987, the percentage had increased slightly to 19.5 percent, even though during this period many states tightened property tax limits.

A per-mile comparison of property tax collections reveals an overall increase in constant dollars between 1977 and 1987 (10.9 percent) (3). This is true even though the unit cost increases for highway maintenance and operation were 102.5 percent between 1977 and 1987. The highway unit cost index is higher than the overall price increases for state and local government purchases, as measured by the gross national product (GNP) implicit price deflator, indicating that agencies responsible for roads and bridges were more adversely affected by cost increases than other agencies (8, Table C-3).

Between 1977 and 1982, the growth in real property tax collections was limited by a major recession, high inflation, and property tax limits in many states. However, between 1982 and 1987, a 6.3 percent increase in constant dollars was reported. Thus, for the decade, property taxes increased approximately one percentage point each year and maintained their relative importance, providing approximately 1 of every 5 dollars spent by counties and towns or townships for roads and bridges.

Reliance on combined federal and state intergovernmental assistance declined from 49.1 percent in 1977 to 39.8 percent in 1987. Within the federal aid highway program, the federal aid secondary program assists counties (counties have responsibility for approximately 50 percent of the mileage). Additional federal funds spent on highways during the 1980s include general revenue sharing, community development block grants, and similar programs. Federal assistance to local governments, which provided 9.8 percent of revenues available for roads and bridges in 1977, by 1987 had declined to 5.7 percent. In current dollars per mile, federal aid went from \$238 in 1977

TABLE 3 COUNTY AND TOWN OR TOWNSHIP HIGHWAY REVENUE TRENDS

Revenue Source	1977	1982 (dollars)	1987	Pct Change 1977-87
Local Receipts per mile				
Current	1,043	1,820	2,800	168.5
Constant ¹	1,043	1,135	1,382	32.5
Property Tax per mile				
Current	457	763	1,027	124.7
Constant	457	477	507	10.9
General Fund Appropriations per mile				
Current	415	620	1,053	153.7
Constant	415	387	520	25.3
User Charges and Imposts				
Current	171	437	720	321.1
Constant	171	273	356	108.2
Federal Highway Aid per mile				
Current	238	300	301	26.5
Constant	238	187	149	-37.4
State Highway Aid per mile				
Current	948	1,314	1,783	88.1
Constant	948	821	880	-7.2
Total Receipts per mile				
Current	2,419	2,690	5,262	117.5
Constant	2,419	2,306	2,598	7.4
		(Percent)		
Reliance on Local Revenue	43.1	49.3	53.2	
Property Taxes	18.9	20.7	19.5	
General Fund Appropriations	17.1	16.8	20.0	
User Revenues and Imposts	2.5	4.3	8.0	
Miscellaneous	4.5	7.6	5.7	
Reliance on Intergovernmental Aid	49.1	44.0	39.8	
Federal	9.8	8.1	5.7	
State	39.2	35.6	33.9	
Reliance on Bonds and Notes	7.7	6.7	7.0	
Total Revenues	100.0	100.0	100.0	

¹ Constant figures are calculated using the FHWA maintenance and operation price index. (See FHWA, *Highway Statistics 1988*), Table PT-5, p. 60 (1977=100; 1982=160.04; 1987=202.53).

Source: U.S. Federal Highway Administration, *Highway Statistics 1977, 1978, 1982, 1983, 1987, 1988*, (Washington, DC: U.S. Department of Transportation, Federal Highway Administration), Tables M-1, LF-1, and HM-10.

to \$301 in 1987, but in 1977 dollars the 1987 revenues purchased only \$149, a decrease in spending power of 37.4 percent.

As a percentage of total revenues, state highway aid is more important than federal aid, and was 39.2 percent in 1977. By 1987, state assistance had decreased to 33.9 percent of the total. This decrease occurred even though many states increased motor fuel tax rates during this period. Nevertheless, state aid remains the single most important revenue source for financing off-system roads and bridges.

In per-mile current dollars, state highway aid was \$948 in 1977, and increased to \$1,783 in 1987, a growth of 88.1 percent. In purchasing power, though, the 1987 amount was \$880,

a 7.2 percent decline. In 1977, bonds and notes generated 7.7 percent of the revenues available for roads and bridges, and by 1987 had decreased slightly to 7 percent.

If property taxes remained relatively constant and federal and state support decreased during the past 10 years, where did the revenues arise to finance the roads and bridges? Based on *Highway Statistics (3)* data, local governments relied more heavily on user fees and impostos. In 1977, user fees and impostos represented 2.5 percent of revenues collected, but by 1987 they had increased to 8.0 percent.

Fees place more of the burden on road users. Recent surveys of taxpayer preferences conducted by the Advisory Commission on Intergovernmental Relations have shown a pref-

erence for such charges as a method of financing. Detailed information on local user charges and imposts is limited, but at least conceptually this source of revenue is an alternative for replacing shrinking federal and state sources.

Borrowing, another suitable alternative for financing local road and bridge construction, is less appropriate for maintenance, depending on the project. Long-term projects that benefit future generations can be financed with bonds, but short-term projects are less appropriate. The appropriate level

of financing from borrowing for roads and bridges is not clear and depends on interest rates. In the late 1980s, interest rates decreased and reduced borrowing costs. The increase in the relative importance of borrowing that occurred in the mid-1980s slowed by 1987.

A more detailed comparison of revenue sources used in financing off-system roads and bridges by region shows widely divergent patterns of financing (Table 4). The Northeast region depends most heavily on property taxes, either earmarked

TABLE 4 RECEIPTS OF COUNTIES AND TOWNSHIPS FOR HIGHWAYS, BY REGION, 1987

Region and State	Local Revenue			Intergovernmental		Bonds	Total Receipts
	Property	General	Misc. Local	State	Federal		
				(Percent)			
Northeast							
Connecticut	-	70.2	1.6	23.9	-	4.3	100.0
Maine	-	72.5	-	23.6	3.7	0.3	100.0
Maryland	3.8	41.4	3.3	39.3	1.8	10.5	100.0
Massachusetts	60.6	-	0.7	32.6	1.6	4.0	100.0
New Hampshire	-	39.2	44.9	15.4	0.5	-	100.0
New Jersey	-	56.6	9.9	3.4	3.0	27.0	100.0
New York	16.2	62.7	2.8	16.0	2.4	-	100.0
Pennsylvania	11.8	38.6	10.8	29.1	9.8	-	100.0
Rhode Island	-	73.8	-	4.0	22.2	-	100.0
Vermont	57.2	2.3	-	31.0	4.6	4.8	100.0
Mean¹	13.6	51.2	5.6	22.2	3.7	3.7	100.0
Midwest							
Illinois	39.0	7.8	21.1	31.1	1.0	-	100.0
Indiana	11.5	0.4	9.3	76.5	2.1	0.3	100.0
Iowa	40.4	0.9	0.6	55.3	2.8	-	100.0
Kansas	50.3	16.6	8.0	21.2	1.4	2.5	100.0
Michigan	1.6	35.4	9.6	49.5	3.8	-	100.0
Minnesota	32.8	7.2	3.6	49.1	6.6	0.8	100.0
Missouri	29.7	5.1	27.6	21.5	7.2	5.8	100.0
Nebraska	43.0	4.9	2.8	32.1	17.1	0.1	100.0
North Dakota	32.0	11.7	2.5	45.7	7.4	0.5	100.0
Ohio	14.3	11.4	5.4	63.7	2.0	2.8	100.0
South Dakota	22.5	36.5	2.8	34.7	3.6	-	100.0
Wisconsin	44.5	24.9	0.2	24.9	0.3	5.3	100.0
Mean	27.4	14.7	8.9	43.7	3.7	1.5	100.0
Appalachian							
Kentucky	1.2	12.9	1.4	73.9	8.3	2.3	100.0
Tennessee	16.9	-	6.7	73.4	0.3	2.6	100.0
Virginia	0.1	47.1	40.0	6.5	0.2	6.0	100.0
Mean	6.5	22.0	18.9	46.6	2.1	3.9	100.0
Southern							
Alabama	19.3	1.7	5.6	68.7	0.6	4.1	100.0
Arkansas	6.1	15.8	8.3	59.3	10.5	-	100.0
Florida	19.4	15.3	36.5	26.4	0.7	1.7	100.0
Georgia	3.1	50.7	37.0	2.8	0.9	5.4	100.0
Louisiana	22.7	1.1	35.7	30.8	8.6	1.1	100.0
Mississippi	23.1	-	3.1	44.0	19.9	9.8	100.0
Oklahoma	0.4	14.5	2.7	77.9	3.4	0.4	100.0
South Carolina	55.3	-	-	33.4	11.3	-	100.0
Texas	30.6	5.2	13.2	7.1	0.5	43.3	100.0
Mean	20.8	13.7	20.8	24.3	2.7	17.7	100.0
Mountain States							
Arizona	2.7	3.2	45.8	46.7	1.6	-	100.0
Colorado	37.7	6.1	6.1	45.2	3.6	1.1	100.0
Idaho	32.3	11.3	5.0	42.9	8.4	-	100.0
Montana	-	-	81.7	11.9	6.4	-	100.0
Nevada	4.3	5.9	16.7	7.7	0.2	56.0	100.0
New Mexico	0.9	10.5	5.7	57.4	2.6	22.8	100.0
Utah	-	47.8	2.8	42.6	6.1	-	100.0
Wyoming	26.2	-	38.2	27.4	8.2	-	100.0
Mean	14.3	7.7	25.6	36.6	3.4	10.7	100.0
Pacific States							
Alaska	61.7	18.5	2.1	17.5	0.1	-	100.0
California	1.9	11.4	19.4	44.8	22.5	-	100.0
Hawaii	-	2.0	27.3	60.1	10.6	-	100.0
Oregon	8.0	-	4.7	31.2	46.9	9.1	100.0
Washington	40.2	5.2	4.3	35.8	12.4	2.2	100.0
Mean	12.4	8.5	14.0	40.8	22.7	1.7	100.0

¹ Dividing by total number of states in region. Dash (-) indicates not applicable.

Source: U.S. Federal Highway Administration, *Highway Statistics 1988*, (Washington, DC: U.S. Department of Transportation, Federal Highway Administration), Table LF-1.

for transportation or from general appropriations, with 64.8 percent of revenues derived from this source in 1987. The Midwest region was second at 42.1 percent.

The Midwest region and Appalachian states rely most heavily on intergovernmental aid, a revenue source that represents 47.4 and 48.7 percent, respectively, to support road expenditures. Therefore, shifts in federal or state financing of local roads and bridges can be assumed to affect these regions most.

Substantial variations are evident within each group of states. Alaska, Massachusetts, and Vermont, for instance, rely heavily on property taxes earmarked for roads and bridges. More than three-fourths of the revenues is obtained from state assistance in Indiana (76.5 percent) and in Oklahoma (77.9 percent). Federal aid is especially important in Oregon (46.9 percent), California (22.5 percent), and Rhode Island (22.2 percent).

The widest differences in revenue patterns are in reliance on bonds. Nevada receives 56 percent of road and bridge revenues from this source, followed by 43.3 percent in Texas, and 27 percent in New Jersey. However, differences in reli-

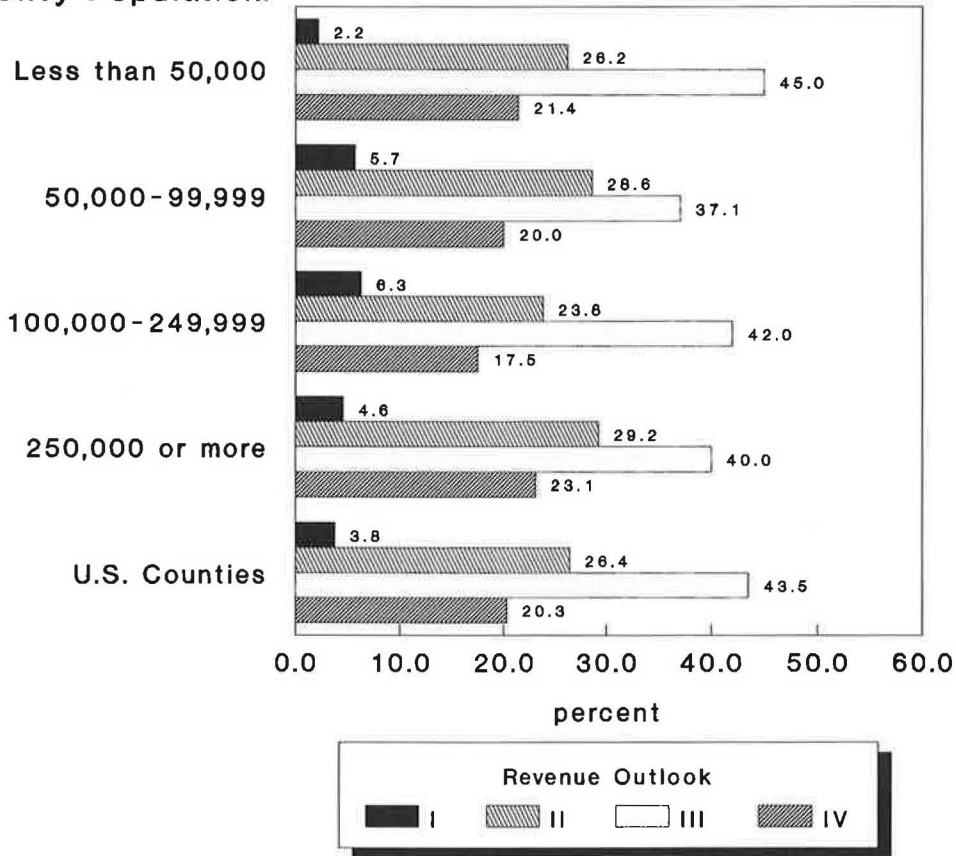
ance on bonds most likely reflect large construction programs within these states, so the percentages may not reflect long-term patterns.

Nationwide, local user charges and imposts provide a growing share of the local support for roads and bridges. Florida and Georgia clearly lead the nation in user charge or local impost usage at the local levels; and, in states such as Arizona, California, Louisiana, Missouri, and Montana, these revenues exceed or at least rival property taxes in relative support of local roads and bridges.

Revenue Outlook

County highway officials reported concern over the revenue outlook, in light of the shifting emphasis toward greater reliance on local revenues to finance roads and bridges (Figure 1). Nationwide, 63.8 percent of county respondents reported inadequate funds, with 43.5 percent reporting that although funds were inadequate for county needs, services were not

County Population:



- I. More than adequate revenue, no foreseeable problems
- II. Adequate revenue but no room for service improvements
- III. Inadequate funds but not cutting services yet
- IV. Inadequate funds and services have been reduced from last year

FIGURE 1 County revenue outlook for roads and bridges. (Source: NAC survey of county highway officials, 1987).

TABLE 5 COUNTY AND TOWN OR TOWNSHIP HIGHWAY EXPENDITURE TRENDS

Expenditures	1977	1982	1987	Pct Change 1977-87
	(dollars)			
Capital Outlay per mile				
Current	586	945	1,434	144.7
Constant ¹	586	590	708	20.8
Construction per mile				
Current	516	834	1,255	143.2
Constant	516	521	620	20.2
Maintenance per mile				
Current	1,177	1,918	2,406	104.4
Constant	1,177	1,198	1,188	.9
Roads and Bridges per mile				
Current	1,079	1,766	2,244	108.0
Constant	1,079	1,103	1,108	2.6
Total Expenditure per mile				
Current	2,071	3,802	5,263	154.1
Constant	2,071	2,251	2,599	25.5
	(Percent)			
Capital Outlay	28.3	26.2	27.2	
Maintenance				
Roads & Bridges	56.9	53.3	45.7	
Miscellaneous ²	14.8	20.5	27.1	
Total Expenditures	100.0	100.0	100.0	

¹ Constant figures are calculated using the FHWA maintenance and operation price index (1977=100, 1982=160.04, 1987=202.53). See FHWA, *Highway Statistics 1988*, Table PT-5, p. 60.

² Includes traffic police, administration, interest payment, retirement, and transfer payments.

Source: U.S. Federal Highway Administration, *Highway Statistics 1977, 1978, 1982, 1983, 1987, 1988*, (Washington, D.C.: U.S. Department of Transportation, Federal Highway Administration), Tables LF-21, LF-2, HM-10.

reduced. Of counties responding, 20.3 percent reported inadequate funds and a reduction in services from the previous year. Even allowing for an incentive to overstate financing needs, the response indicates a potential concern. This finding compares with approximately one-quarter (26.4 percent) reporting adequate revenues, but with no room for service improvements.

A careful examination of financial outlook showed relatively small differences in fiscal condition among counties, by size. Counties smaller than 50,000 in population seemed most adversely affected, with 66.4 percent reporting inadequate funds, compared with an average of 63.1 percent for counties of population 250,000 and larger. Nevertheless, the differences are not large and this issue warrants further examination.

The poorest revenue outlook is found in the Pacific states, where 75 percent of counties responding reported that funds are inadequate. The Pacific region also reported roads in the poorest condition. The Midwest followed closely with 73.1

percent in this category. Appalachian and Northeast counties reported the best fiscal position, with 43.4 and 42.9 percent, respectively, reporting adequate revenues.

Expenditure Patterns

Current and constant spending for local roads and bridges in 1977, 1982, and 1987 are compared in Table 5. Special attention is paid to current and capital spending to determine how infrastructure maintenance and upkeep changed during the recession in the early 1980s.

Previously, a majority of local expenditures were for maintenance, but in recent years, they have shifted to capital expenditures. Nationwide, in 1977 local governments spent an average of 56.9 percent on maintenance, but the spending decreased to 45.7 percent in 1987. Capital spending was relatively stable, decreasing slightly from 28.3 percent in 1977 to 27.2 percent in 1987. The dependence on maintenance and

capital spending between 1977 and 1982 shifted to miscellaneous spending. In constant dollars, capital and maintenance spending both increased slightly during that period. Between 1982 and 1987, capital outlays increased slightly in proportion, whereas maintenance declined substantially. The miscellaneous category, including traffic police, administration, interest, debt, retirement, and transfer payments, increased from 14.8 to 27.1 percent between 1977 and 1987. This increase probably was caused partially by increases in interest rates.

An overall increase in real per-mile capital expenditures for roads and bridges occurred between 1977 and 1987 (Table 5). Local governments spent an average of \$586 in 1977, and by 1987 had increased to \$708 per mile for capital outlays. Between 1977 and 1982, the growth was negligible, whereas a substantial increase occurred between 1982 and 1987. Construction expenditures increased from an average of \$516 per mile in 1977 to \$620 per mile a decade later.

When the maintenance and operating unit cost index is used to depict price changes, maintenance expenditures between 1977 and 1987 are flat, actually declining slightly in constant dollars between 1982 and 1987. This finding is interesting. A likely scenario is that the high inflation and economic recession in the early 1980s limited expenditures for roads and bridges and the constant dollar increases were small. Demand created during this period may have pressured local officials to catch up on construction projects at the cost of maintenance expenditures.

With the available data, determining factors associated either with the condition of roads and bridges or with the ability to finance them, however defined, is difficult. However, several variables were collected as part of the NAC national survey that can shed some light on perceptions of local highway officials about budgets, conditions, and related issues.

CORRELATES OF ROAD CONDITION

Simple correlations were run between road condition (percentage of roads rated inadequate in the county), whether a county faced property tax limitations (1 is no; 2 is yes), mileage per capita in a county, per capita expenditures, dependence on property taxes, whether a county is metropolitan area or rural, budget outlook (Table 4), and per capita income. The correlations are presented in Table 6.

Two variables are related to perceived road condition: whether a county faces property tax limitations and budget outlook. Counties with effective limitations also are those in which road conditions were rated lower ($r = -0.1609$). This finding may indicate that counties with poorer quality of roads have had to levy relatively higher property taxes to make improvements and therefore are approaching property tax limits ($r = -0.1927$). However, the condition and proportion of general revenue coming from property taxes are not correlated ($r = 0.0958$).

A statistically significant correlation exists between spending per mile and property tax limits ($r = -0.1705$). Thus, counties without property tax limits spend more on average. The quality measure, it must be remembered, is a rating by local highway officials based on perceived needs, not an arbitrary standard based on projected traffic demand.

Equally interesting is the funding that road condition is not significantly related to per-mile expenditures ($r = 0.1024$) or number of miles per capital under county responsibility ($r = 0.0693$). This finding suggests that local officials in counties in which spending is higher do not necessarily view the road conditions as better. Counties with higher spending may have demands for greater traffic or better quality of roads. However, counties with higher per-mile spending had significantly

TABLE 6 CORRELATION MATRIX

	Road Condition	Property Tax Limit	Miles per Capita	Highway Exp per Mile	Property Tax/General Revenue	Metro/Nonmetro	Budget Outlook	Per Capita Income
Road Condition	1.000							
Property Tax Limit (1 = no; 2 = yes)	-.1690 ¹	1.000						
Miles per Capita	.0693	.0527	1.000					
Highway Expenditure per Mile	.1024	-.1705 ¹	-.2591 ²	1.000				
Property Tax/General Revenue	.0958	-.1927 ¹	.2485 ²	-.1052	1.000			
Metro/Nonmetro	.0245	-.0218	-.3391 ²	.3995 ²	-.0773	1.000		
Budget Outlook	-.3885 ²	.2582 ²	.0129	-.1202	.0033	.0439	1.000	
Per Capita Income	.0873	-.0067	-.2260 ²	.7126 ²	-.0807	.5420 ²	.0521	1.000

¹ Significant at 1 percent. ² Significant at .1 percent.

Source: Survey of County Highway Officials, Fall 1987.

higher per capita incomes ($r = 0.7126$). Higher per-mile spending also is associated with fewer miles per capita ($r = -0.2591$).

Counties in which roads were rated in poorer condition also reported a bleaker budget outlook ($r = -0.3885$). These are counties (budget outlook) with property tax rate limits ($r = 0.2582$), suggesting that local officials may feel pressed for additional revenue sources. State-imposed property rate tax limits could be raised, if deemed necessary, to alleviate the budget outlook problem.

These findings suggest that there are counties in which local officials perceive road conditions are not sufficient for local needs, but they already rely on property taxes for financing. Although these counties have not spent significantly less or more than other counties, they perceive that the budget outlook is not particularly bright. The perceived budget outlook is not related to per capita income (a measure of wealth) or whether the county is metropolitan or rural.

OPTIONS AVAILABLE TO LOCAL GOVERNMENTS

This analysis is not intended to make policy recommendations, but local governments have had to respond to real declines in federal and state support of local roads and bridges. Depending on statutory and constitutional authority, local governments can respond in several ways. Not all of the following options are equally suitable in each state but most are feasible and local policy makers should at least consider them.

Increased Property Taxes

Low-volume roads and bridges, especially in rural areas, predominantly serve local constituencies and therefore by necessity are financing primarily with local resources. In rural areas, this financing can present a major difficulty because of sparse populations and the relatively high costs per resident of financing roads. A broad industrial base to shoulder the property tax burden often does not exist. In the late 1970s and early 1980s, with the poor farm economy, differential property tax assessment programs were instituted in many states. The differential assessment limited property tax revenues available for roads and other local services. Increasing property taxes may involve raising state statutory limits.

Reduced Public Road Mileage

Existing road networks were created under a much slower transportation system. Changes in agricultural marketing methods and transportation improvements have reduced the road mileage in some cases so much that a road is no longer feasible. This point is generally recognized and has been documented in previous studies (7). Although reducing road mileage makes sense conceptually, politically this policy is difficult to implement because adjoining landowners lose access to roads but gain little in property tax savings. In addition, state motor fuel tax reimbursement programs sometimes use per mile as a base. Reducing mileage means less revenue, even

though infrequently traveled roads may not receive a proportionate expenditure.

The access limitation issue can be partly solved by converting the road to private use, and there is a clear indication that this has happened. Residents can maintain the road as they see fit or can convert it to agricultural use. In either event, the local government no longer has responsibility, but it may lose the state aid associated with this mileage.

Population declines, especially in rural counties, are a fact of life, and services, including roads and bridges, are affected. When traffic volume reaches a point that the mileage is no longer financially feasible, provisions must be made to reduce the mileage. This option, although not popular, will be increasingly necessary in rural states.

Limited-Maintenance Roads

As a compromise to closing roads, some efforts have been mounted to stipulate that certain low-volume mileage will receive limited maintenance. When the mileage is clearly marked so that travelers bear the risk, local governments no longer have legal liability for accidents. Local governments may receive the same state funding but can allocate their budgets to higher-volume mileage. Over time, residents may change their travel patterns so that the mileage will eventually be closed.

User Charges and Imposts

Instituting user charges may require state authorizing legislation. User charges also may be difficult to implement in rural areas with low-volume roads, because there are relatively few travelers to charge. Imposing costs on developers or heavy users can discourage economic development. An example in which user charges and other financing arrangements have been effective is extractive industries such as coal mines. Agreements with mine owners to rebuild local roads or to pay for a permit to use the roads have been effective in some areas. Even though user charges and imposts have gained popularity during the past decade, they remain at less than 10 percent of the revenues available and are concentrated in relatively few states, such as Arizona, California, and Florida. Certainly, other states could review, and possibly learn from, these experiences.

Reorganized Local Road Network

Local and state policy makers could benefit from rethinking the local highway networks. Considering certain mileage as consisting of high-quality access roads and relegating other mileage to other uses can reduce the overall costs. Pennsylvania has found this approach to be effective; other states could possibly examine Pennsylvania's experiences.

CONCLUSIONS

Low-volume roads and bridges are financed mainly by counties, towns, or townships. These governments, especially in

rural areas, experienced economic setbacks during the 1980s from declines or slow growth in tax revenues, as well as from loss of federal general revenue sharing. Although spending on local roads and bridges has increased, the role of local resources also has increased.

During the late 1970s and 1980s, counties and townships underwent two distinct trends. Between 1977 and 1982, they reduced capital projects in favor of current operations. After the recession, local governments spent relatively more on capital projects, presumably to make up for earlier delays.

The condition of the low-volume roads and bridges, as perceived by local public officials, is viewed with some concern. More than 1 mi in 5 (22.9 percent) of the county-maintained roads are considered inadequate for traffic, and 35.6 percent are rated as only barely adequate or worse. A similar situation exists with county-maintained bridges of 20 ft or longer. In states such as Missouri, more than three-fourths of the county bridges are in poor condition.

What also must be recognized is that population declines in rural counties may mean that some mileage is no longer economically feasible. Local officials must realize this fact and take action to bring the road mileage in line, not only with the ability to finance, but also with traffic volumes. These adjustments will not be made as long as state distribution systems are based on road mileage that is maintained.

The revenue outlook for counties, in the minds of responding highway officials, is not bright. Nationwide, about two-thirds of county highway superintendents responding to a mail survey said that existing funds were inadequate, and 20.3 percent reported service cutbacks. Little on the horizon suggests that conditions will become much better.

Local infrastructure is essential to the future development of rural areas. Rural residents rely on roads and bridges for essential public services as well as for gainful employment. Declining populations will make the financing of low-volume roads and bridges more difficult in rural counties. Yet without continued attention, the transportation system may deteriorate further.

Addressing the rural transportation financing issue will not be easy. A host of societal issues from basic services to water quality and waste management face local governments. Roads

and bridges are but one of the issues that must be addressed. Local officials must evaluate the need for low-volume roads and bridges and, if they seek continued federal support, must make the case that rural roads are of critical importance to the national highway system. State governments must evaluate policies that may prevent effective local responses to change. The federal government must determine the role it will play in financing off-system roads and bridges. Each ultimately plays a part in the overall solution.

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