in the procedure previously used by the Mt. Grace shared-ride service, and a number of suggestions to improve the procedures now being used in Barnstable and Pittsfield have been made.

The issues involved in the choice and implementation of cost-allocation procedures have been explored. Some or all of these issues might need to be considered by a transit system about to design and implement a cost-allocation procedure. It is hoped that the experience from these five case studies will be helpful in this design and implementation process.

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Minor Rural Roads: Finance Trends and Issues

THOMAS W. COOPER AND ANTHONY KANE

The local rural road problem is primarily one of finance. The purpose of this paper is to examine the sources and trends in local rural highway revenues and expenditures, to identify issues, and to explore solutions. Revenue for local rural roads ($3.1 billion for 1979) is generated equally by the local jurisdictions and by state and federal grants-in-aid. Local jurisdictions rely almost entirely on property taxes and general revenues for local support for highways. However, road-user charges provide a substantial portion of the local road burden via shared state user-tax revenue. Because of the role of the local rural road, some claim that this shared financial burden (user and nonuser support) is justified. Others argue that users should cover all highway costs. County roads programs are oriented toward routine maintenance of conditions. In fact, local road maintenance has increased in real dollars since 1970, whereas capital road improvements have dropped by one-fourth. Consequently, local road conditions are judged to be declining. The conclusions reached are that (a) existing local rural road revenue sources are imperiled by energy conservation and voter demands for fiscal restraint, (b) local road programs are basically maintenance operations and user charges ought to cover the cost, and (c) revenue sources are available. Specifically, local governments should expand road-user tax revenues by redefining existing taxes as user fees and dedicating them to highway use and by exploring the creation of new user revenue instruments and mechanisms such as a local gasoline tax that piggybacks the state tax. Finally, local governments need to articulate the condition of local roads and what that means in terms of costs to government, local economy, and road user.

For the most part, local rural governments are responsible for the largest block of road mileage in America--some 2.2 million miles. The higher functional classes of rural mileage serve the important interregional and interstate movements of goods and people and to a lesser degree serve trips from farm to market. Local rural roads provide primarily private and public intracommunity and intracounty movement of people (via buses or private vehicles) and accommodate the movement of trucks that are critical to rural areas (1). Local rural roads are also profoundly affected by the recent changes in rural demographics and economics. Nonmetropolitan population growth has exceeded metropolitan growth in the decade of the 1970s. This movement of people and industry to rural areas has altered the rural economic base and has placed added strain on local roads. Shippers complain about the condition of rural roads and bridges, which is dramatized by the revelation that about three-fourths of all rural bridges were constructed prior to 1935 and had a life expectancy of 50 years.

County and other rural governments control the greatest mileage of rural roads in America, 70 percent. However, these roads account for only 13 percent of all rural travel. Although our knowledge of the performance characteristics and the condition of local roads is lacking, the 1972 National Highway Needs Report stated that about one-half of the total mileage had been judged inadequate by reason of surface type and safety deficiencies, such as lane width or lack of shoulders (2). In addition, it has been estimated that 115 000 bridges off the federal-aid highway systems require replacing or rehabilitation (3).

The existence of an inferior road or bridge in rural areas could effectively isolate residents, communities, and economic activities. In some cases, school buses, service vehicles, and commercial trucks are rerouted to avoid inadequate facilities (particularly structures), which inconveniences residents, jeopardizes the security of rural communities, and adds an element of cost to goods moved over the highway network.

Because of their service nature, local rural roads are constructed to minimal design standards and for a variety of reasons have received minimal funding. While these practices may have been justified in the past, changing conditions raise the question of justification. For example, when truck travel increases rapidly, heavier loadings are permitted, larger school bus or farm equipment is

introduced, or urban growth spills over into formerly rural areas, how will these outdated local roads meet the need and how long will they hold up?

CURRENT REVENUE SOURCES

Local governments, rural and urban, obtain highway revenue from two basic sources--locally raised revenue (predominantly general revenue and property taxes) and grants-in-aid from state and federal governments.

According to the Federal Highway Administration (FHWA) publication Highway Statistics, locally raised revenue for highways (both urban and rural) totaled $8.4 billion in 1979 or 23 percent of all highway revenue generated by all units of government. Local rural governments provided $3.1 billion, slightly more than twice the amount raised in 1970. Local revenue has grown faster than federal and state sources, as shown by the fact that in 1970 local revenues only accounted for 18 percent of the total.

Local governments rely less on road-user tax revenue than do the state or federal governments. The state governments have historically relied on road-user taxes and tolls to finance highway programs. Highway-user income as a percentage of total highway income, by jurisdiction (excluding bond proceeds), is given below (traffic-fine revenue is excluded for local jurisdictions; if included, the percentage would be nearly doubled):

	Highway-User Income in Total Highway Income (%)			
Year	Federal	State	Local	Total
1970	86.2	92.9	10.0	77.1
1975	74.2	90.5	8.9	69.0
1979 (est. in part)	66.9	86.3	7.9	63.8

Road-user revenue provided 86 percent of state revenue in 1979. In 1956, the federal government earmarked highway-user revenue for highways; however, the user-charge share has dropped to 67 percent due to non-Title 23 (U.S. Department of Transportation) programs. Local governments obtained only 8 percent of tax revenue directly from users, and counties reported only 5 percent from users. Local governments rely predominantly on general revenue and property tax receipts to fund highway programs. These county sources totaled $2.4 billion for 1979 ($1.1 from property taxes and $1.3 billion in general revenues) or about 80 percent of all revenue. The remaining receipts come from investment income, miscellaneous taxes, and bond proceeds.

Intergovernmental Transfers

Local governments, rural and urban, are heavily dependent on state and federal funds for financing highway programs. For 1979, counties received $2.9 billion in net intergovernmental transfers for highway purposes.

States provided most of the grants to counties, and these are principally shared road-user tax revenue. Except for the few states that assume total responsibility for county roads, all states share a portion of their motor-fuel and/or motor-vehicle revenues with their subdivisions. Counties received $2.2 billion from state road-user fees during 1979. The remainder of state grants came from such diverse revenues as sales-tax receipts, resource severance taxes, income taxes, and general fund appropriations.

Federal grants to local rural governments amounted to $588 million for 1979. These receipts consist of shared national forest timber sales, mineral leases, general revenue-sharing funds, and others.

Revenue from transfers accounts for nearly one-half of all revenue for counties, and the shared responsibility is relatively unchanged since 1965, as shown below:

	Net Intergovernmental Transfer in Total Highway Budget (%)		
Year	State	County	Municipal
1965	23.3	50.1	25.9
1970	16.7	49.6	29.1
1975	16.6	48.7	26.1
1979	18.6	49.4	26.9

In summary, financial support for local rural roads is shared equally by the local jurisdiction and by state and federal grants-in-aid. Road-user charges, although not widely employed by local governments, provide a substantial share of the local road burden (via state grants-in-aid, which are derived almost totally from user fees). The remainder comes from a mixture of revenue sources.

User/Nonuser Issue

The major revenue instruments used by local rural governments are the property tax and general fund appropriation. Some claim that this is entirely proper both from the ease of tax administration and benefits criteria. The role of the county road is to provide land access to the farms, forests, resource and recreation areas, and lesser commercial centers in rural areas. Travel on these roads can be classified as the beginning or ending of long trips, the movement of goods to market and supplies to farms, and short trips for social-welfare purposes (education, health care, etc.). It is true that road users benefit, but so do the land and the activity they support. Thus, some balance between users and nonusers seems appropriate and equitable. In the case of local rural highway finance, it has been shown that users pay for nearly half the local rural highway costs via shared state user-tax revenue. In addition, nonusers benefit and in turn must assume part of the cost of improved access.

Others argue that, in general, users should support the full costs of highways (4). Since governmental outlays have not kept pace with roadway deterioration, users should cover all governmental outlays; but even then they would be paying less than their rightful share of true governmental costs and nothing toward external and congestion costs. In addition, since benefits of highway services are fully captured by users and indirect benefits are passed through normal market processes, there are no nonmarket benefits and therefore nonusers should not contribute for highways.

Of course, general revenues would be justified to support the cost share of public vehicles such as police, fire, and mail vehicles and to partly cover common costs for which no vehicle class can be found to cause the roadway costs.

CURRENT EXPENDITURE AND ROAD-CONDITION TRENDS

Capital Versus Maintenance

More than half of all local rural road expenditures is for maintenance and operation of roads (5) (Figure 1). For 1979, $3.2 out of $5.8 billion expended by counties was for maintenance (for reference purposes, state maintenance accounted for only 20 percent of total state disbursements). Maintenance is defined here as routine roadway expenditures

(e.g., pothole repair, joint repair, sealing, blading, snow removal, grass cutting, etc.); overlays and reconstruction are included in the summaries of capital expenditures.

The commitment to preserve county roads and to maintain service is dramatically demonstrated by the willingness of local governments to allocate resources. Expenditures for highway maintenance have more than doubled since 1970, but, more importantly, disbursements have increased sufficiently to offset inflation. As shown in Figure 2 (data from Tables HF-10 and PT-5, Highway Statistics), local rural maintenance outlays have grown in real terms, albeit marginally.

Capital outlay on local rural roads is estimated at $2236 million for 1979. Two-thirds of this will be expended by counties and the remainder is provided directly by state highway agencies. In contrast to local maintenance programs, capital improvement on local rural roads has declined by one-fourth in real dollars during the decade of the 1970s as shown in Figure 3 (from same sources as Figure 2).

Capital-Improvement Types

Data on the type of improvements made on local rural roads are not readily available. No national summary of improvement choices for these roads exists as is available for the higher functional systems, i.e., arterials and collectors. However, it seems reasonable that we might look to the improvement choices selected by state and local officials for the minor collectors for direction in determining local road improvement types (5). Minor collectors are off the federal-aid highway systems.

New construction is the lowest choice for minor collectors (6.5 percent of obligations) and the highest for principal arterials (35.4 percent) (Table 1). Reconstruction of existing highways is uniform among all rural classes (average, 27 percent); however, restoration, rehabilitation, and resurfacing account for the highest percentage on collectors.

Bridge replacement appears to be an exception. Approximately 12 percent of all rural obligations was for bridge replacement for the three-year period that ended in 1978. The percentage is larger for the lower functional classes; for minor collectors 21.5 percent was reported for bridges. This development is due to the expanded national bridge-replacement program, which is intended for facilities on and off federal-aid highway systems, and the poorer conditions of bridges on lower functional-class roads.

New construction and major widening add road capacity to the highway infrastructure. In the years 1976-1978, these improvement choices accounted for 44 percent of non-Interstate principal arterial obligations, 19 percent for minor arterials, 12 percent for major collectors, and only 8 percent for minor collectors. It is evident that when the federal interest is passive, the mileage is the greatest, and the resources are limited, maintenance of condition takes precedence over capacity expansion.

Highway Conditions

In examining the condition of low-level rural roads, it is easy to see why maintenance (in the broadest sense of the term) is emphasized. About 75 percent of rural collectors have fair or poor pavement condition, and the percentage has been increasing over time (5) (Figure 4).

Figure 1. Distribution of county highway disbursements, 1962-1979.

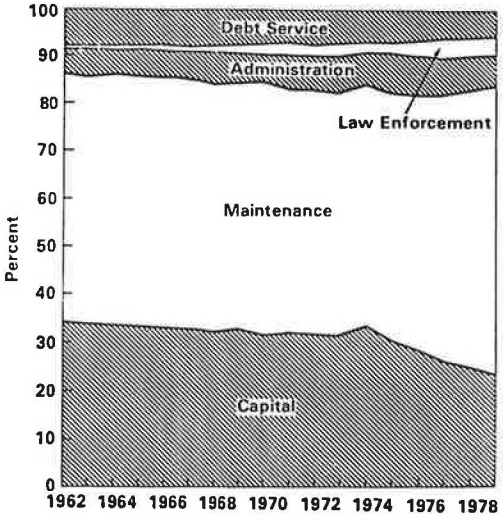


Figure 2. Local rural road maintenance expenditures, 1970-1979.

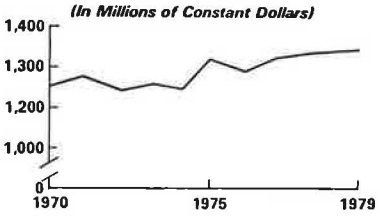
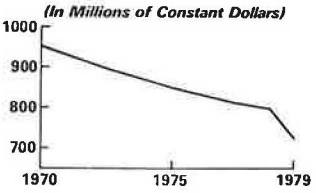


Figure 3. Local rural road capital outlay, 1970-1979.



LOCAL FINANCE DEVELOPMENTS

Property Taxes

The uncertainty of tax support because of measures such as California's Proposition 13 or Maryland's "TRIM" program in Prince George's County undermines investor confidence. It also may prohibit the placement of highway bonds or raise their debt-service costs and could undermine an increased level of highway support from local general fund receipts.

Shared State Revenue

State motor-fuel tax receipts have fallen below expectations in the last year or two due to more fuel-efficient automobiles in the motor vehicle fleet. Since local governments rely in part on these revenues, the national trend toward energy conservation will likely affect future county road programs.

Some Federal Actions

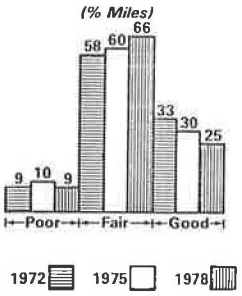
Functional Realignment

As a result of the functional classification of the

Table 1. Percentage of estimated rural highway obligations by improvement type and functional class.

Type of Improvement	Estimated Rural Highway Obligation (%)				
	Non-Interstate Principal Arterial	Minor Arterial	Major Collector	Minor Collector	Avg
New construction	35.4	14.4	9.7	6.5	19.8
Reconstruction	24.3	29.6	29.9	28.1	27.0
Major widening	8.6	5.0	2.5	1.5	5.2
Restoration, rehabilitation, and resurfacing	16.6	33.1	37.1	33.7	28.8
Bridges	7.9	11.9	15.7	21.5	12.3
Safety, other	7.2	6.0	5.1	8.7	6.9

Figure 4. Rural collector pavement condition, 1972, 1975, and 1978.



nation's highways and the realignment of federal-aid highway systems, the federal-aid secondary (FAS) system was reduced nearly by half. After July 1, 1976, the FAS system consisted of rural major collectors; this reduced the FAS system from 608 000 miles to less than 400 000 miles. For the most part, the mileage dropped is county roads. Realignment tightened the targeting of federal aid, but did not diminish the dollar level given to secondary roads.

Program Funding

Expenditures for capital improvements off the federal-aid highway systems increased throughout the 1970s. Federal funds have proved substitutive on the primary, secondary, and urban systems, which enabled states to increase other off-system improvements and to sustain their maintenance programs. The off-system capital program totaled $4.6 billion in 1979 (Table 2), an increase of 50 percent since 1970, and accounts for a larger share of total capital expenditures.

Non-Title 23 Federal Aid

A very significant factor in the growth of off-system expenditures has been the impact of non-Title 23 federal-aid programs. General revenue-sharing (GRS) and community development block grant (CDBG) funds have become important sources of local highway financing. Revenue sharing was fully under way in fiscal year 1973, and community grants were initiated in fiscal year 1975. To put these in scale, from 1974 through 1978, GRS and CDBG funds ($3.5 billion) equaled all federal-aid urban funds paid to states. In fiscal year 1979, revenue-sharing funds used for highways were estimated to exceed $700 million and most will be allocated by local governments (states are also beginning to allocate these funds to highways).

REVENUE ALTERNATIVES

Given the above overview, what can local governments do? Questions that must be addressed in the quest for more highway revenue include whether the local governments wish to place more or less reliance on highway-user charges, whether they should join the state governments to seek a combined solution, and what their real revenue needs are--what are the future maintenance requirements to either maintain or improve today's level of service?

County and municipal governments have several financial options available to them: (a) they can raise local tax revenues, (b) they can seek more state or federal aid, (c) they can prevail on others to assume the burden, (d) they can reduce the cost of the service, or (e) they can forego the service.

Local Revenue Alternatives

Despite the objections to and the shortcomings of the property tax, localities will likely continue to rely primarily on a single tax source--the property tax--and for some good reasons. First, enlightened tax administration has eliminated many of the more offensive (and regressive) aspects of the property tax, notably, the circuit-breaker feature for the poor and elderly homeowners. Second, the property tax keeps pace with inflation. Third, it is a rough measure of the ability to pay and is therefore equitable, and fourth, it is locally controlled and administered, which is not the case for most other local income.

Locally imposed road-user taxes can prove difficult, cumbersome, and expensive to administer. However, the administrative burden of a locally imposed user tax may be outweighed by the need for more revenue. To reduce administrative hurdles, localities might elect to piggyback state user-tax mechanisms. Examples of tax coordination include (a) a local penny add-on gasoline tax collected by the state from wholesalers and/or distributors in the area or (b) an add-on county motor vehicle registration or tag fee. Local governments might consider a gross receipts tax on motor fuel sales to be collected with the state sales taxes. Finally, increased use of locally imposed road and bridge tolls, parking fees, or perhaps even severance taxes could be used to target the tax burden and spare the general taxpayer.

State Aid

Local governments might seek a greater share of state user taxes or aid the state in expanding the scope of user-tax revenues. For the most part, states share a portion of state motor fuel taxes and/or motor vehicle fees with their subdivisions. Typically, states allocate a penny of the state motor fuel tax or a percentage of combined state highway funds to local governments. In addition to the typical user tax, there exists a gray area of motor vehicle taxation in which the user-charge concept is less clear. Here the statutory classification and disposition of revenue are clouded but

Table 2. Off-federal-aid system versus total highway system capital outlays.

Year	Capital Outlay ($000 000 000s)			Off-System Percentage of Total
	Total	Federal-Aid System	Off-Federal-Aid System	
1980	15.094	10.418	4.676	31.0
1975	14.378	10.117	4.261	29.6
1970	11.568	8.632	2.936	25.4

may prove fruitful to the states and localities for expanding legitimate income for highways.

Many states levy personal property taxes, titling taxes, or sales taxes on motor vehicle and/or motor fuel sales and the receipts go to areas other than highways. Some may be considered an actual user charge and many may be considered a quasi-user charge. A local personal property tax that is applied only to automobiles should be clearly designated a user charge. These taxes are based on the value of the commodity (an ad valorem tax), which automatically adjusts for inflation. Until now, revenue from these taxes has not generally been earmarked for highways, but with the combined efforts of the state and local governments, they might be defined as user charges and earmarked for highways.

In most states, property taxes on motor vehicles are not linked to highway use, and the revenue is not available for highways. They are, however, closely associated with registration fees in application and in the cost of operating motor vehicles. Moreover, they make up a large portion of the total taxes paid on motor vehicles in some states; hence their inclusion as a possible alternative revenue source is justified on equity grounds.

Personal property taxes exceed registration fees in some states. They are ad valorem in nature and many piggyback the state motor vehicle tax (6). In 1973, about one-half of all states levied a personal property tax on motor vehicles that ranged from $23 (medium-weight passenger car) to $112 and averaged $28/vehicle. The average registration fee was $18.

In two states (California and Washington), the personal property tax has been replaced by an "in lieu" tax, which is collected at the state level rather than at the local level. This tax has the same characteristics as property taxes except that the levy and distribution of proceeds are not related to the jurisdiction in which they are collected and are considered a statewide road-user impost.

Federal-Aid Highway Program

The federal-aid highway program has also evolved as a source of local financing. Areas of federal interest include the secondary program, the bridge program, and the off-system program.

Evidence suggests that secondary funds substitute for state funds. Substitution may not necessarily have negative effects if freed monies are expended elsewhere on highways. Capital expenditures on off-system roads have increased (Table 4), and highway maintenance outlays have a positive trend. It is apparent that freed state and local monies add to their off-system fiscal capability.

The federal bridge rehabilitation and replacement program has local benefits since the funds may be used for bridges on and off the federal-aid highway systems. The bridge program departs from the systems orientation of the other major programs since 15-35 percent of authorized funds must be used for off-system bridges.

The current estimate to replace or rehabilitate all deficient bridges in the country is $33 billion, and about $15 billion of these needs are off federal systems and $30 billion of the $33 billion are in rural areas (3).

The Federal-Aid Highway Act of 1978 provided $200 million a year (FY 1979 through 1982) for highways off the federal-aid highway systems. Perceived as a highway safety program (50 percent must be expended in safety improvement), the funds are intended for construction and restoration, rehabilitation, and resurfacing of off-system highways.

To summarize the federal actions, existing federal-aid programs will continue to aid off-system roads, either directly or indirectly. Direct assistance comes from the off-system and bridge replacement programs, and indirect assistance comes from freed state monies brought about by the higher authorizations for the primary and secondary systems and the higher federal share. Additional federal aid has occurred from non-Title 23 programs. The application of these funds is left to the local officials, and as road and street needs become a higher priority, it is likely that highways will garner a significant share of these monies. Non-Title 23 federal funds have become a prominent feature in some local programs, and since these monies generally carry fewer programmatic requirements and restrictions, local authorities will likely continue to allocate them for highway purposes in the future.

It is not clear what future federal legislative action will bring. Lower system-rural-road funding could come in the form of block grants, and federal-aid highway system designation could be dropped. Also, in the period of limited financial resources and federal disinvolvement from local issues, federal funds could be targeted to Interstate and primary facilities at the expense of local rural roads.

Cost Reduction

In addition to the above revenue-raising options, local governments can attempt to increase road building and maintenance productivity through better contracting procedures (e.g., competitive bidding, rejection of bids if costs are too high, and the readvertisement of those projects); pavement management systems to optimize life-cycle outlays; and the restriction of use by heavy vehicles to minimize roadway deterioration.

SUMMARY AND CONCLUSIONS

The major findings and conclusions reached are as follows:

1. Local government revenue sources are imperiled by emerging energy conservation interests and voter demands for fiscal restraint;
2. Local road programs are essentially maintenance operations, and it makes sense that, since it is users who bring about maintenance costs, user charges ought to be strongly considered to cover these costs;
3. Overall local road conditions are judged poor and probably declining;
4. Local governments have managed to maintain the level of maintenance efforts throughout the 1970s, but the outlook for the 1980s is not encouraging;
5. Revenue sources are available, but they must, however, be fully explored; fiscal and cost-allocation studies should be conducted in collaboration with state governments to arrive at a sound and equitable revenue structure for the future;

6. Innovative user sources are encouraged; these include both redefining certain existing taxes as user fees and dedicating them to highway use and the creation of new and expanded user charges;
7. Piggybacking onto state revenue instruments should be looked at carefully; and
8. Public relations work is sorely needed; local areas need to articulate the deterioration and condition of local roads and what that means in terms of both future governmental costs and road-user operating costs; these deficiencies must be shown to be sufficiently important to gain the support of the public and lawmakers.

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Principles of Highway Finance

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During its 60-year history, state highway funding has been guided by a set of principles. These are set forth for use by the general public, business, and industry in the evaluation of proposals to change highway funding plans. Also, because many state highway tax proposals include indexing schemes to keep tax revenues in pace with inflation, the eight indexed tax plans signed into law between 1977 and 1980 are examined for adherence to the principles of highway finance.

Many elements of society have encountered severe problems in meeting financial obligations. State highway agencies are no exception. Highway costs have risen sharply. Reduced travel and increased motor vehicle fuel efficiency have cut deeply into fuel-tax revenues. Governors and state legislatures have responded with tax increases, new taxes, and shifts in tax resources.

Highway users frequently are called on to supply highway finance proposals, some of which depart from long-standing practices. In order to develop and evaluate these proposals, it is helpful to remember seven basic principles of highway finance that have stood the test of time. A sound highway finance measure should

1. Assess highway needs clearly;
2. Incorporate funding levels that are adequate and affordable;
3. Involve the public (including business and the highway-user industry) in defining needs, funding levels, and taxes;
4. Provide funding levels that are predictable;
5. Provide for legislative review;
6. Maintain or establish an equitable tax structure; and
7. Be simple to administer and easy to understand.

Adherence to these principles will lead to highway programs that meet transportation needs of the general public, business, and industry. The principles have been followed successfully for 60 years, and they are as valid today as ever.

An indexed highway tax is one of the measures enacted in recent years to keep highway programs in step with inflation. In the final section of this paper, indexed highway taxes are evaluated for adherence to the finance principles. Some faults are found, the most important of which is that automatic changes in taxes caused by indexing may not be related to specific documented highway program needs.

BASIC PRINCIPLES

Assess Highway Needs Clearly

State highway funding plans must be based on up-to-date information and technically accurate evaluations of need.

Capital Program

The capital program--including rehabilitation of the existing highway system and construction of new highways to accommodate growth in population, motor vehicles, and travel--is the most expensive element of the highway program. It is therefore essential to develop this element of a program on a sound base. This calls for an engineering-needs analysis that identifies current and future deficiencies and estimates the cost to eliminate them. An engineering needs analysis should

1. Prepare and evaluate a statewide highway classification plan that is based on highway use and land development within the program period;
2. Apply accepted engineering design and performance standards to each highway class;
3. Assess highway and bridge conditions, characteristics, and performance;
4. Identify deficiencies and analyze improvement options; and
5. Determine improvement costs and priorities.

If state funds are to be provided for local road