

can be identified in ways similar to those used to determine the level of community interest.

The cohesiveness of the community determines the ease with which consensus can be developed on a proper course of action. If opposing interests exist in the community, conflict resolution techniques such as mediation may be needed. The level of community cohesion is less easily measured than are some of the other sociopolitical factors. It is influenced by such factors as the community's mobility, ethnicity, and range of income levels. Some of these factors can be found in statistical publications and others by talking with people in the community.

The community's expectations are important because they can determine which techniques the community will consider legitimate. Past experiences affect the community's expectations. The community's expectation of the role the public should play in the planning process can be determined by talking with community leaders or by using surveys and other information collection techniques.

The community's past experience will affect the community's opinion of planners. It may cause the community to expect certain levels of power in decision making. It may also have generated the development of certain interaction and leadership skills in the community. These factors should be considered when selecting appropriate techniques. The community's past experience can be learned from interviews with knowledgeable people in the community and in local planning organizations. Records can be found in back issues of the local newspapers and sometimes in the files of the planning agency itself.

The median educational level of a community is an important indication of the expected success of certain techniques. For example, fishbowl planning relies heavily on the reading and writing skills of the participants; it will probably fail in a community where the educational level is low. The median educational level of a community can usually be determined from census data.

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## Fiscal Planning and Highway Programming: The Pennsylvania Response to a Changing Environment

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Many states face a changed era of highway programming and administration, an era characterized by a highly uncertain and pessimistic outlook for fiscal resources, escalating costs, and mounting environmental and other operational constraints. This paper discusses this changing environment in Pennsylvania and consequent developments in the state's highway program and programming process and relates them to trends in other states. Major issues described include the forecasting of fiscal

resources, development and delineation of program alternatives, recognition and resolution of trade-offs among highway program elements (for example, capital versus maintenance efforts), and programmatic allocation and administration of capital investments.

Many state highway programs are experiencing severe

financial difficulties. National economic problems are the most immediate causes of the fiscal crises. Greatly increased gasoline prices have caused fuel-dependent revenues to level off, and construction costs are beset by tremendous rates of inflation. These recent fiscal problems are also caused by long-standing trends in highway financing and programming. Specifically, very generous federal assistance for highway construction has encouraged large-scale construction programs without adequate consideration of the maintenance requirements of these new facilities, for which federal aid has not been available. Also, the attempt to capture all available federal aid for construction has encouraged construction programs at the expense of maintenance programs. The practice of financing construction through bond issues can produce escalating debt service requirements, which eat up revenues that might otherwise be used for maintenance.

Large decreases in their real purchasing power and their inability to adequately fund operating activities have spurred several state highway and transportation agencies to immediate action. Many have adopted austerity measures that only a few years ago would have been drastic, if not unthinkable. This paper discusses the changing environment of highway financing in Pennsylvania and consequent developments in the state's highway program and programming process and relates them to trends in other states.

In this paper, we draw on our work in continuing policy analysis for the Pennsylvania Department of Transportation (PennDOT) regarding its highway program. Two projects in particular—one involving the allocation of construction funds and the other involving a broader fiscal review of the whole highway program—illustrate the recognition of this changing environment and the development of responses to it. The issues involved represent the kinds of problems that face many states at present and the constraints that must be met in what appears to be a new era in state highway programming and administration (1,2,3).

#### ALLOCATION FORMULA STUDY

Pennsylvania selects projects for inclusion in its capital program according to an allocation formula adopted by the Pennsylvania Transportation Commission. Traditionally, this formula has involved some weighted combination of factors designed to indicate needs and thereby produce an acceptable distribution of resources. However, in 1974, dissatisfaction with the prevailing formula led the commission to request that its advisory body, the State Transportation Advisory Committee, review the entire allocation procedure. The study focused on the allocation of highway funds because (a) they accounted for most of the state spending, (b) highway improvement throughout the state was urgently needed, and (c) this subject had long been in the public eye (4).

The commission was the arbiter of the allocation procedure, and the allocation occurred only for capital expenditures on state-administered highways. At the time of the study, all federal aid and bond funds available for capital improvements were subject to allocation with one major exception: federal aid for the Interstate and Appalachian highway systems. The prevailing allocation formula for the remaining federal aid and the bond funds consisted of an equal weighting scheme for each county's share of motor vehicle registrations, kilometers of state-administered road, and daily vehicle kilometers of travel. In the budgeting process, sufficient lead time was provided for preliminary, engineering, and other studies on an ad hoc basis. Local units, therefore, often demanded increased funding so

that a sufficient backlog of projects could be maintained and used when any of the active projects ran into delays. Finally, the allocation procedure permitted contract awards on a first come, first served basis, with no ceiling on the amount expended in a county. This procedure failed to compensate those regions, particularly urban areas, that encountered difficulty in bringing projects to the contract award stage (for example, because of environmental opposition). This often resulted in large imbalances between allocations and contract awards; no accounting system existed to guarantee that all counties would ultimately get their allocations.

The foregoing characterizes the prevailing situation at the time of the advisory committee's study. The initial problem confronting the committee was one of immediately developing an allocation procedure to permit preparation of the biennial 12-year improvement program as mandated by state law. The interim measure sought, then, was one for resolving the multiple problems of

1. Intense competition for the capital improvement funds by counties in a situation that is exacerbated by inflation, cost escalations, and mounting debt service obligations;
2. Intense rivalry between urban and rural areas that is aggravated by constraints on the use of certain federal aid funds and alleged differences in the manner in which needs had been estimated between urban and rural regions; and
3. Charges that the prevailing allocation formula, which used a weighted combination of socioeconomic parameters, did not adequately reflect needs and was therefore inequitable.

In order to resolve these problems, the committee broke the allocation issue down into a number of elements and analyzed options for each separately at first, and then analyzed them together in terms of composite effects. Its short-term recommendations addressed (a) the treatment of federal aid funds, (b) the establishment of a discretionary fund and guidelines for its use, (c) allocation procedures for bond funds, (d) the relationship between the award schedule and allocation, and (e) the structure of the capital program. In what follows, the actions described are those that were recommended by the committee's study report and were then adopted by the commission (exceptions are noted).

#### Federal Aid Funds

The different way of treating federal aid funds arose because some of these funds were designated for specific uses (e.g., Interstate, Appalachian, and urban system funds), while others (e.g., primary and secondary funds) were not so constrained. The urban system funds, for example, were earmarked for urban areas that have populations of 5000 or more, and they were to be apportioned according to a formula developed by the state. However, urban areas that have populations of 200 000 or more were entitled to the funds "attributable" to them. In addition to these provisions, other complexities were introduced by (a) consideration of different federal, state, and local matching proportions; (b) ability to reallocate limited funds among eligible systems; and (c) ability to reallocate urban (but not rural) highway funds for transit.

Clearly, weaving these diverse federal fiscal policies into the state's allocation process was a complicated task. According to the committee's report, congressional intentions would be best served and equitably applied if each federal fund was separated and individ-

ually allocated according to its own appropriate criterion. Therefore, the primary, secondary, and urban extension funds were allocated to all counties on the basis of the relative proportion of kilometers of each system in each county. The urban system funds were allocated to the urban areas on the basis of relative population within these areas.

To maintain some flexibility in the allocation process, the committee recommended that the commission establish a discretionary fund to be allocated outside of the formula. This recommendation was accepted by the commission, and the fund amounted to 15 percent of the state bond revenues for highway capital improvements. The committee suggested (although the commission has not yet formally accepted) that the first call on this fund be given to emergency road and bridge improvements. Projects to rectify major system gaps would have the second call. Next, this fund could be used for contingency projects in areas that encounter difficulty in awarding contracts to start projects. Any balance remaining in the fund would revert to the counties in accordance with a formula described below.

### State Bond Funds

The interim procedure used to allocate the state bond funds weights the relative urban and rural needs in each county by a policy variable referred to as the urban-rural split. The relative urban and rural needs were estimated by performing correlation and regression analyses on selected socioeconomic variables compared with the results from the Pennsylvania portion of the 1972 National Transportation Needs Study. The urban-rural split adopted by the commission was 55-45.

If a county awards contracts in excess of its allocation over a given time period, a number of actions could be taken in the next period to restore the balance. One possibility proposed by the committee (and eventually adopted by the commission) was to use a period of 2 to 4 years as a model for awarding contracts during the next 2- to 4-year period. Another option would be to reduce the number of projects budgeted, an action that eventually affects contract awards because there will be fewer projects available to award.

During the committee's study, modification of the structure of the 12-year improvement program was suggested to give local planners greater flexibility in developing candidate projects. The inflexibility in the current program structure arises from two characteristics of our transportation scene: (a) the greater concern with environmental factors and community values, which frequently delays or halts budgeted projects, and (b) the long lead time generally required to bring projects to fruition.

For these reasons, local planners should be allowed to develop contingency plans. The structure of the improvement program has to be modified so that it will consist of three classes, each of which would possess different planning and budgeting actions. Class 1 would include projects for which corridor location studies and environmental impact statements had been completed. Class 2 would include projects 3 to 6 years away from contract award. Class 3 would include projects more than 6 years away from contract award. The first two classes would be fiscally constrained; the third would be fiscally unconstrained but would have its projects ranked in priority order. Due to constraints on its time and resources, the committee stopped short of full endorsement for this proposed alternative structure but noted that the proposal clearly merited further consideration.

### Programming Implications

Several of the recommendations have important implications for highway fund programs within the new context of scarce resources. First, the recommendation that actual contract awards be tied more directly to the dollar amounts allocated to the counties reflects a recognition of the changing environment of state highway finance. The past policy of open-ended award of contracts in a county, constrained by the total resources available statewide but not by county ceilings, facilitated the (unstated) objective of building as many kilometers of highway as possible in any single year and making use of all available federal funds. Apparently, if almost unlimited resources are available, imbalances between a county's allocation and the amount of contracts awarded are not really a problem because there will be sufficient funds for all projects that counties have under construction. When funds are limited, however, counties that lose projects on environmental or other grounds would be penalized if they could not be assured that their allocated amounts would be available for replacement projects.

Second, the proposed three-tier program structure attempts to impose fiscal restraint on the programming process while providing the flexibility for contingency planning. Although local officials may feel a need to consider alternative projects, the purpose of this proposal is to ensure that the number of projects moving into the advanced stages of the programming process are scaled down to a level that can actually be accommodated by the anticipated available financial resources.

Third and most important, the recommendation of a discretionary fund that would not be subject to the allocation formula is a significant move toward the concept of statewide allocation of highway funds. The possibility of abandoning the county allocation altogether was not seriously considered by the advisory committee, but the committee did recognize that, given a shortage of available funds, some provision was necessary to ensure that emergency improvements and projects that might have a high priority from a statewide perspective could be given special consideration apart from individual county programs.

The traditional procedure of allocating highway funds first to county areas and then to particular projects is based primarily on the concept of geographic equity; that is, every county should be assured of its fair share of projects. In the prevailing allocation formula, motor vehicle registrations and vehicle kilometers of travel might be considered as rough indicators of highway-related revenue generation and could thus serve to return funds to their geographical source. State-administered road kilometers, on the other hand, might be considered a rough surrogate for needs; the adopted urban-rural split was intended to further temper the allocation for the greater needs of urban areas.

Each proposed project is, of course, subjected to economic analysis and some benefit/cost criterion, and within counties the priority ranking of projects might be based on economic efficiency. The point is that the statewide allocation is based primarily on equity criteria and secondarily on needs criteria. Such a policy can result in discrepancies between the composite program of county projects and the priorities that would be established on the criterion of maximum benefits from a statewide perspective. If financial resources are abundant, this may have little or no practical significance but, if resources are scarce, the issue may be critical.



## PENNDOT FISCAL REVIEW

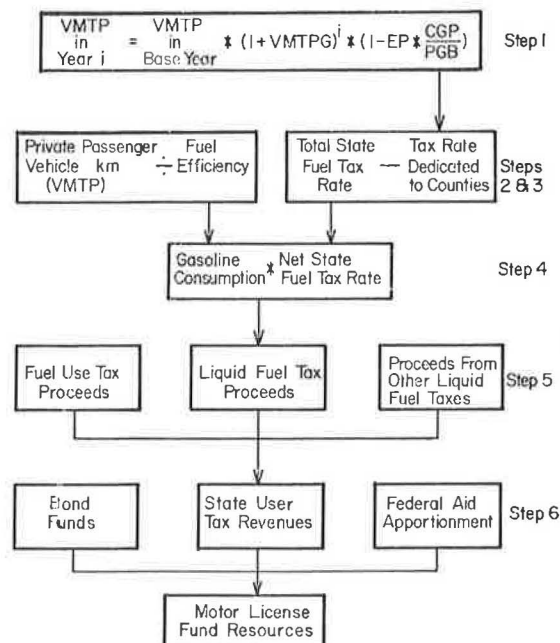
In response to a number of developments in the highway program (including difficulties in implementing the construction program, increasing deficiencies in the maintenance program, and tremendously increasing costs in both areas), the Pennsylvania Secretary of Transportation and the transportation commission established a top-level task force to look into PennDOT's financial problems. The task force's work clearly demonstrated the connection between fiscal planning, systems planning, and programming, and it is instructive for the analytical approach employed.

Because the highway program accounts for about 90 percent of the department's budget, the fiscal review task force concentrated on the broad policy issues involved in the funding, allocation, development, and implementation of highway programs; particular attention was paid to the fiscal management process. It evaluated the problem in dollar terms, identified the critical factors contributing to the problem and the control points for dealing with it, analyzed the implications of alternative program strategies, and made recommendations regarding financial, programmatic, and managerial policies (5,6).

The task force's approach was to compare forecasts of the revenues available to the department based on varying assumptions with projections of resource requirements based on alternative program strategies. A systems approach was used to highlight the constraints imposed on program size and content by revenues and other factors, as well as the interactions among certain program decisions.

Much of the analytical work concerned the development of adequate forecasts of revenues, based on the functional relations modeled in Figure 1 (6,7). Briefly, the motor license fund is credited with revenues from three sources: state user tax revenues, federal aid

Figure 1. Flow chart for computing liquid fuel tax proceeds.



VMTPG = Annual growth in private passenger-vehicle kilometer of travel (VMTP)

EP = Elasticity of demand for VMTP with respect to fuel price

CPG = Change in price of gasoline from base year

PGB = Price of gasoline in base year (fiscal year 1974-1975)

apportionments, and new bond issues. The state user tax revenues include those generated by fuel taxes, whose proceeds are determined by tax rates and fuel consumption, which is itself determined by such factors as vehicle kilometers, fuel efficiency, fuel prices, and the elasticity of travel demand with respect to fuel price. Federal aid apportionments are determined by the same factors and, in addition, by the interest rate for highway trust fund income and the apportionment factor for Pennsylvania (sequence not shown). Bond funds were not forecast as such because they are set exogenously rather than being determined endogenously.

Sensitivity analysis was conducted using this model to develop separate forecasts of motor license fund revenues for the next several years based on differing assumptions about the values of the input parameters. These assumptions regarding factors such as growth in vehicle kilometers traveled and fuel price were varied to represent alternative income scenarios, including a null case that reflected existing trends, as well as more optimistic and pessimistic scenarios. The optimistic scenario included provision for a 0.5 cent/L (2 cents/gal) tax increase in the liquid fuels tax—from 2.4 to 2.9 cents/L (9 to 11 cents/gal). Taken together, the resulting set of forecasts represented the likely range of revenues for the next several years.

#### Program Alternatives

In order to evaluate the implications of the revenue forecasts for PennDOT's highway programs, various levels of construction programs were specified in dollar terms and the costs were determined for alternative levels of maintenance activities. The levels of construction programs were defined as C1—those with only enough new bond issues to meet past commitments for contract awards, C2—new project starts made possible by \$100 million in annual bond issues, and C3—new project starts permitted by \$200 million in annual bond issues. Average bond issues for highway construction from fiscal year 1970 to fiscal year 1976 were more than \$200 million annually.

Five levels of maintenance activities were described and their costs determined; they ranged from a complete and highly desirable maintenance program (M1) through a no-frills program (M2) to a minimal, largely unacceptable program (M5).

M1—Maintain all roads, shoulders, bridges, guardrails, and so on at normal recommended standards. Do catch-up work at a rate that would eliminate backlogs on resurfacing, bridge upgrading, and widening narrow roads in 12 years. Replace substandard guardrail over 25 years. Keep all roadways generally free of ice and snow 95 percent of the time and have limited-access roads bare within 2 h after a storm. Maintain sign and line painting and vegetation control at normal standards.

M2—Maintain roads, bridges, and the like at M1 level on limited-access and primary highways, but reduce maintenance on secondary and rural roads. Eliminate work that affects aesthetics only. Do catch-up work to eliminate backlog of resurfacing, bridge upgrading, guardrail replacement, and road widening over 25 years. Permit snow accumulations of 7.6 cm (3 in) on secondary roads and 12.7 cm (5 in) on rural roads. Remove half of picnic tables from roadside rest areas. Do cleanup services only for safety reasons.

M3—Do only 3200 km (2000 miles) of resurfacing and surface treatment. This will increase backlog by 800 km/year (500 miles/year). Otherwise keep maintenance at M2 level. Do catch-up work in guardrail replacement and road widening on 30-year schedule. Reduce

snow removal during nonpeak hours from 9:00 p.m. to 4:00 a.m. Reduce grading, restabilization, and dust control work on unpaved roads by 10 percent and on shoulders by 25 percent. Do only 50 percent of required public service facility work.

M4—Keep highways in M3 condition, but permit deterioration that will significantly affect capital investment. Put major emphasis on roadway maintenance and little or none on shoulders, service facilities, and so on. Reduce preventive maintenance by 85 percent. Upgrade serious bridge deficiencies on 50-year schedule. Do not replace guardrails. Eliminate snow removal from 9:00 p.m. to 4:00 a.m. Discontinue maintenance of route markers and other signs, and do only 80 percent of required line painting. Reduce mechanized patching by 50 percent. Clean drainages only when completely clogged.

M5—Keep highways open but in a very poor state. Deficiencies will affect highway safety. Patch and surface-treat roads only on priority basis with emphasis on alleviating structural damage. Do 25 percent of required bridge maintenance, and repair structural damage to bridges. Put up no snow fences, and do all snow removal with department forces. Paint center line only on Interstate, primary, and secondary roads; paint no rural roads. Do not maintain warning signs and regulatory signs for night visibility. Do cleanup and vegetation control work only for safety. Replace guardrail only in hazardous situations.

In addition to basic differences in the level of preventive maintenance these programs would provide, they differ substantially in how they deal with the backlog of deficiencies, which are estimated to represent a total cost of \$860 million. The M1 program would complete this catch-up effort in 12 years, while M2 would do so in 25 years; the 3 lower levels would never completely eliminate these deficiencies.

Trade-offs between the construction and maintenance components of the highway program were analyzed by examining the linkage from bond issues to future debt service and maintenance funds. Since bond revenues and federal funds can be used only for construction, maintenance must be funded solely out of the state user tax revenues. The maintenance function actually has last call on these funds after fixed obligations to counties and municipalities have been covered, mandated payments to other departments such as the state police have been made, debt service has been paid, and such PennDOT activities as general administration and safety and licensing have been accounted for. Thus, given an amount of state user tax revenues and the amounts set aside for fixed obligations, mandated payments, and general administration, the use of funds for debt service and maintenance is unlikely.

The critical issue, caused by a shortage of funds, then, is the trade-off between present expenditures on construction and future maintenance budgets. The most important aspect of this relation is that, if bonds are issued to finance construction projects, a greater share of the state user tax revenues will be required in future years for debt service; thus, less money will be available for maintenance. Furthermore, within the constraint of the allocated federal apportionment, the amount of federal aid actually used by PennDOT is determined by the amount of matching funds made available through bond issues. Thus, the decision to use, postpone, or forfeit federal funds directly affects the resources available for maintenance. In addition, a ceiling imposed on the proportion of state revenue that can be used for debt service can constrain the amount of new bonds that are issued.

Assuming that the costs of general administration will continue to consume roughly 30 percent of the state-generated revenues made available to PennDOT, the trade-off between construction and maintenance can be shown by the following equation:

$$M = Z - W - Y^* - Y^1/1.43 \quad (1)$$

where

M = maintenance expenditures in a given year,  
 Z = total state-generated revenue,  
 W = fixed obligations and mandated payments,  
 Y\* = debt service on past bonds, and  
 Y<sup>1</sup> = debt service on new bonds.

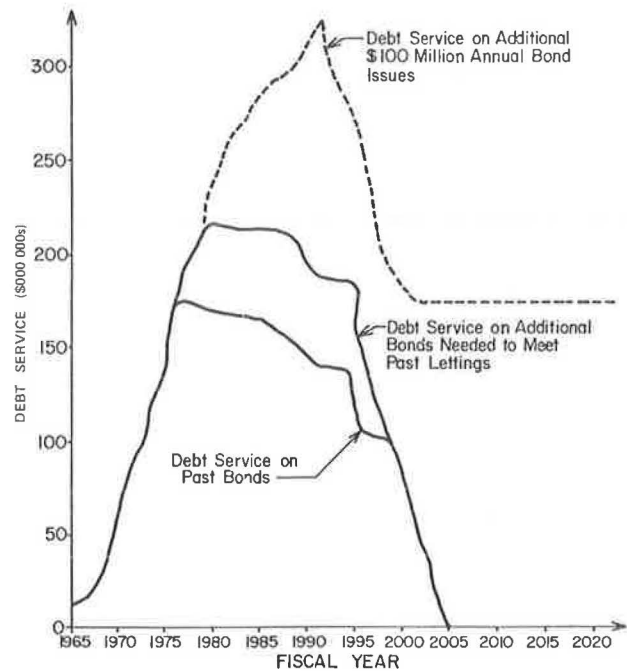
This relation would be expected to hold as long as the policy of financing construction projects with revenue bonds continues (6).

### Findings

Revenue forecasts using the three scenarios showed substantial variation by fiscal year 1980-1981. The scenario based on continuation of past trends yielded a forecast of \$819 million for fiscal year 1977 in state user tax revenues, the pessimistic scenario yielded \$790 million, and the optimistic scenario yielded \$940 million. By fiscal year 1981 this spread will widen to roughly \$900 million for the null scenario, \$760 million for the pessimistic scenario, and \$1123 million for the optimistic scenario. Comparisons between estimated program costs and projected revenues were based on the null scenario forecasts as the best point estimates of revenues, given no change in tax rates.

Debt service has escalated rapidly in the past decade from roughly \$12 million in fiscal year 1965 to \$179 million in fiscal year 1976-1977, as shown in Figure 2. The debt service on bonds that were issued in the past and on those additional bonds that will be issued to meet past contract commitments will peak in fiscal year 1980

Figure 2. Estimated debt service on past bonds and additional bond issues.



at roughly \$210 million. This amounts to 31 percent of the forecast state-generated revenue that will be available to PennDOT. If additional bonds are issued at a level of \$100 million annually (the C2 construction program), the debt service would peak in fiscal year 1995 at more than \$325 million. After fiscal year 2005 it would level off at roughly \$176 million/year.

The estimated costs for the five levels of maintenance programs for fiscal year 1976-1977 ranged from \$447 million for M1 down to \$252 million for M5. These estimates were then projected for subsequent years by assuming a 5 percent inflation factor. Table 1 shows a comparison of these projected costs and the revenues expected to be available for maintenance, assuming that state user tax revenues in the future are those forecast under scenario 1, the null case, and assuming that the only additional bonds to be issued will be those required to meet past contract commitments (C1).

Given the impact of past bond issues, not to mention future bonds, on the current maintenance program, we decided to examine the revenue deficiencies for the minimum adequate maintenance program, M2, along with various levels of construction financed on a pay-as-you-go basis. The results are shown in Table 2. For maintenance only, the deficiencies would require tax increase of 0.5 cent/L (2 cents/gal), while still more funds would be required to undertake additional construction projects. A modest construction program (\$50 million state share) would require only marginally increased funds in the first year due to the lag time in implementation, but the full \$50 million would be required annually by fiscal year 1979-1980.

## RECOMMENDATIONS AND CONCLUSIONS

The fiscal review produced several recommendations.

Table 1. Effect of bond program C1 on maintenance in scenario 1.

Item	Costs (\$000 000s) for Fiscal Year				
	1976-1977	1977-1978	1978-1979	1979-1980	1980-1981
State revenue	819.2	838.4	858.3	879.0	900.5
Expenditures					
Payments to municipalities	85.3	86.9	88.5	90.1	91.9
Payments to other departments	108.4	113.8	118.2	123.3	128.5
Debt service (program C1)	179.5	192.9	206.6	211.6	209.3
Nonmaintenance activities <sup>a</sup>	133.8	133.4	133.5	136.2	141.2
Total	507.0	527.0	546.8	561.2	570.9
State revenues available for maintenance	312.2	311.4	311.5	317.8	329.6
Cost of maintenance programs <sup>b</sup>					
M1	447.4	469.8	493.3	518.0	543.8
M2	388.3	407.7	428.1	449.5	472.0
M3	346.0	363.3	381.5	400.6	420.6
M4	293.9	308.6	324.0	340.2	357.2
M5	252.5	265.1	278.4	292.3	306.9

<sup>a</sup>Taken as 30 percent of the three preceding items subtracted from state revenue.

<sup>b</sup>Using an inflation factor of 5 percent.

The table shows that maintenance resources will increase in fiscal year 1979-1980 and fiscal year 1980-1981, but they will not increase as fast as maintenance costs will. The results of these comparisons are quite stark: Given revenues that are expected on the basis of past trends, no increase in state user tax rates, and no new construction beyond projects whose contracts have already been awarded, the only maintenance levels that can be afforded are M4 through fiscal year 1978 and M5 after that. This is clearly inadequate. Thus, if there are no new funds, PennDOT cannot afford to maintain its present highway system, even if the construction program is halted altogether. A similar analysis was made assuming that PennDOT continues a large-scale construction program that requires \$200 million in bond issues annually (C3). The results showed that, because of the interrelationships among the highway programs, the resources available for maintenance would decrease substantially; by fiscal year 1980-1981 the budget would not even support the M5 level of maintenance.

If implemented, they would make dramatic changes in the programming and financing of PennDOT's highway activities. First, the task force recognized that the present balance between construction and maintenance is untenable and urged that priorities be reversed to ensure that maintenance needs are met before new construction projects are authorized. It recommended that top priority be placed on the M2 maintenance program—the no-frills preventive maintenance effort and the reduction of deficiencies over the next 25 years. A fuel tax increase of 0.5 cent/L (2 cents/gal) was recommended to finance the maintenance effort.

As the second priority, the task force recommended a limited construction program to enhance the maintenance, but only if new funds are made available. Perhaps most significantly, it urged that all future construction projects be financed by current revenues and federal aid to avoid increasing debt-service obligations. The task force advocated a further increase in revenue to pay the state's share of a limited construction pro-

Table 2. Estimated new revenue requirements for maintenance and for pay-as-you-go alternative construction programs.

Item	Costs (\$000 000s) for Fiscal Year					Five-Year Total (\$000 000s)
	1976-1977	1977-1978	1978-1979	1979-1980	1980-1981	
Maintenance only for program M2	76	96	117	132	142	563
Maintenance plus \$50 million in state-supported annual project starts	101	134	164	182	192	773
Maintenance plus \$100 million in state-supported annual project starts	127	173	210	232	242	984
Maintenance plus \$200 million in state-supported annual project starts	177	250	304	332	342	1405



gram and recommended that a moratorium be placed on all new construction until funds are available to finance construction on a pay-as-you-go basis without infringing on the M2 maintenance program.

The recommendations of the task force also had significant implications for the development of PennDOT's capital program. The first recommendation was that the formula allocation of construction funds on a county-by-county basis be replaced by a statewide allocation to ensure that the limited resources available are used to address the most pressing problems. From this statewide perspective, then, development of a construction program based on the following three criteria was recommended: (a) make safety improvements, (b) correct structural deficiencies, and (c) develop a complete, modern core system of vital highways. A further recommendation, in keeping with the policy of programming from a statewide perspective, was that PennDOT seriously consider reducing the state network by returning roads whose function is only of local significance to local jurisdictions (8).

PennDOT has not adopted all of the recommendations. An abrupt and complete shutdown of the construction program, for example, would have a severe impact on the state's construction and related industries (an estimated 18 000 jobs) and is therefore not politically feasible. Nonetheless, the fiscal review and its recommendations have set an agenda for coming to grips with the changing environment in Pennsylvania, and PennDOT is moving in many of the directions suggested by the study. Additional studies are now being undertaken to more fully develop the core system concept for Pennsylvania and to develop implementation procedures for reducing the state network.

Many states are now or will soon need to redefine their highway policies in the face of changing fiscal constraints. The difficulties states have encountered in funding highway programs in recent years reflect a major long-term change in the fiscal environment of these programs rather than short-term problems. This is shown by the following probable trends:

1. Inflation will continue.
2. Fuel prices will rise, reducing earlier anticipated growth rates in distance traveled and liters of fuel consumed; this will subsequently reduce the anticipated growth in fuel tax revenues.
3. Motor vehicles will become more fuel efficient, which will cut gasoline consumption still further.
4. Competition for tax dollars for nontransportation sections will increase.
5. Nonhighway options for transportation will increase.

The states will respond in various ways to this changing environment, depending on their needs, past and present policies, and particular financial circumstances (9,10,11). However, many states will face the common problem of continuing their highway programs within a context of reduced resources and therefore may find the following kinds of policy directions necessary or appropriate.

1. Reverse the traditional priorities to put maintenance of existing systems ahead of new construction.
2. Decrease the reliance on bond issues to finance the state's share of construction programs.
3. Reduce the size of state highway networks to include only roads of greater than local significance.
4. Consider more carefully priorities and alternative service levels for different types of highways within the state network, for both maintenance and construction,

by using either existing functional classifications or the core system approach.

5. Allocate funds statewide, rather than by region or county, primarily on the basis of efficiency criteria; some alternative allocation strategies are described by Pecknold and others (12).

Finally, given a changing environment for highway programs, many state departments of transportation and highway departments will have to improve their fiscal planning and programming capabilities. They will need to develop more sensitive forecasting procedures for both short-term and long-term revenues and ways of adjusting programs to conform with realistic revenue estimates. Methods should also be developed for predicting the consequences of current decisions, particularly the effect of construction programs on future maintenance needs and resources. In addition, state transportation agencies should develop more sophisticated performance-monitoring systems to measure the efficiency of operations and impacts in terms of service levels, both for purposes of internal management uses and for the articulation of product to state legislatures and the public.

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