Highway Funding: It's Time To Think Seriously About Operations

A Policy Framework

A White Paper

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Introduction

For decades, highway agencies have seen their mission as the provision of transportation infrastructure for automobiles and trucks, an outlook encouraged by the generous streams of federal dollars flowing to states to support highway construction. These agencies typically identified vehicle drivers as the operators on the highway system rather than themselves as operators of the system. However, a shift in this understanding of highway agencies' mission has begun. Some highway officials have realized that providing transportation infrastructure is not enough, if the infrastructure doesn't provide a reasonable level of *service.* In short, more state officials now see their mission more as transit agencies see theirs – as the provision of both infrastructure *and* service.

Thus, it is accurate to say that enlightened highway agencies now identify themselves as service providers for the nation's highway systems, at least in part. This more expansive outlook recognizes the growing role played by these agencies in managing highway congestion and deploying Intelligent Transportation Systems (ITS) as an integral part of their management toolkit. However, it is an approach not yet supported by Federal transportation policy, which is still, despite some evolution, rooted primarily in the 20th century pattern of providing Federal-aid money for highway construction, not highway operations. For highway agencies to realize and carry out a more operations-oriented mission, a corresponding change in Federal highway funding policy and accompanying changes to supporting institutions and organizations will be necessary.

Federal Highway Funding – The Policy Framework

Public roads have been built for mail delivery since the formation of the United States; in fact, the period 1774-1804 saw a significant expansion of the young nation's post road system. During the nineteenth century, federal infrastructure spending went primarily to canals and then to railroads to open up markets in other states for goods and produce from inland areas. Land grants and the concession of certain other rights, in the case of the railroads, substituted in most cases for outright cash assistance (although monetary instruments, such as bonds and loan guarantees, were used as well). The "good roads" movement began in the closing years of the nineteenth century – spurred by the rapid growth in popularity first of bicycles and then of automobiles, and once again interested the now firmly established federal government in building roads. Systematic federal highway aid began in 1916, with assistance to States for building roads that would permit the delivery of mail even in remote parts of the country. The initial federal policy that guided funding was firmly based on the needs of interstate commerce and the federal responsibility for postal delivery. As automobile ownership became more prevalent during the early 1900s, the demand for good roads increased, and federal assistance to

States for constructing those roads grew modestly along with the demand, still with a policy grounded in the needs of Interstate commerce. The first Federal-aid highway act was passed in 1916 (the Federal-Aid Road Act); by a year following this modest legislation, every State had established agencies to coordinate highway construction programs, a system of organization that continues today. Subsequent transportation legislation has not much diminished the enthusiasm for Federal construction assistance. Throughout the 1920s, 1930s, and 1940s, the Federal-aid highway program was expanded somewhat to permit additional construction.

In the years following World War II, as spending shifted from a war-emergency basis to a consumer economy, demand for personal automobiles began to explode. With the passage in 1956 of the revolutionary Interstate Highway Act, based on a policy supporting a national defense network and farm-to-market connections, the concept of significant federal funding for highway construction was literally cast in concrete. This special, national coast-to-coast and border-to-border system would be built using 90 percent federal dollars with only 10 percent required from state matching funds. The Highway Trust Fund was established to serve as a source of funds. (Federal assistance to the states for other construction programs was set requiring a state match of 20 percent.)

The promise of generous federal funding was more than any state could resist, and the grant categories of the Federal Aid Highway Program became major drivers for state transportation decision-making. If, for example, an agency were faced with both budget constraints (which most always have) and choosing between two projects, only one of which would receive a 90 percent match, the choice almost invariably would go to the one with the higher matching federal dollars. Nonetheless, this policy grounding for federal aid to states for capital highway expenditures – primarily for construction – served the nation well, with some modifications permitting major capital expenditures for reconstruction and rehabilitation, for the next several decades. Professional and trade organizations and special interest groups proliferated, each devoted to understanding how the system worked, how to get things done, and how to increase the benefits to their members. They grew in size and influence, as they were successful in weighting funding decisions in favor of their specific cause and became (and remain) powerful perpetuators of the status quo.

Nevertheless, as the highway system criss-crossing the land was gradually completed, the newfound mobility it brought inevitably changed the population distribution across the country. Sprawling new metropolitan regions were created, especially in the west and south, and transportation demand patterns changed considerably. However, it was not until the 1970s that a national policy dialogue began about the desirability, even necessity, of making changes in the decision drivers – the federal aid categories - to address these new issues. Starting from the premise that the Interstate Highway System was soon to be completed, the dialogue focused on several facts:

- Much of the Interstate system was maturing;
- Parts of the system were in poor condition and needed repair and/or reconstruction; and
- The potential for constructing additional miles of highway had limitations.

Gradually, as a result of this discussion, legislation of the 1970s and 1980s broadened federal-aid highway funding to include categories of maintenance and reconstruction. These categories gradually grew in size and scope with each reauthorization during those years. In fact, during the debate leading to the passage of the Intermodal Surface Transportation Efficiency Act (ISTEA) in 1991, the need for a new construction grant program to replace the Interstate program – the National Highway System, or NHS, which had been proposed and was being promoted as final connections to the interstate system – was a subject significantly more controversial than would have been the case a decade earlier. State proposals to USDOT for new highways to be built under the NHS included many parallel and duplicative routes in neighboring states – deemed unnecessary by transportation experts not dazzled by the prospect of federal matching funds. Other discussion centered on the realization that newly constructed highways were often at capacity, even congested, shortly after opening. Although building roads opened up more suburban areas to settlement, it also generated more traffic, and major metropolitan areas were becoming choked with cars. The sentiment that "we can't build our way out of congestion," became widespread.

In fact, when ISTEA was eventually enacted, it did not include the NHS program, although the program was added in a separate bill several years later. Moreover, it clearly articulated policy supporting the necessity of maintaining and repairing the existing system. In addition, through the Congestion Management and Air Quality (CMAQ) program, some funding was made available in "non-attainment" areas for transportation planning and for transportation improvements that could include some aspects of operations, although these were not spelled out. The catch for those concerned about funding for operations, however, was that the federal funding "driver" became a region's air quality – a factor over which operations improvements have relatively little influence. (The penalty for a state's inability to conform to Clean Air Act standards is severe limitation of the types of highway and transit projects that may be funded while the state remains in that status.) The Transportation Equity Act for the 21st Century (TEA-21) reiterated the importance of these policy shifts, but gave primary emphasis to altering grant allocation criteria, increasing the amount of funding returned to the States, and setting criteria to ensure that State program allocations more closely reflected each State's contributions to the Trust Fund. While TEA-21 funded ITS at healthy levels and broadened eligibility for many programs, it did not make major changes in the programmatic emphases, with the exception of clarifying a shift in ITS funding to support for technology deployment, rather than research and development. An innovative financing program was also enacted that provided Federal loans for very large capital construction programs that had a significant highway component, but could include other transportation modes.

Congestion: A New Policy Imperative

One issue that has been part of the discussions leading up to both ISTEA and TEA-21 but has never been well articulated and put into a robust policy framework is the severe congestion that has plagued every major metropolitan area in the country for at least the

past fifteen years. Consideration was given, during the development of ISTEA, to incorporating a congestion-management program into the legislation. However, it became evident that poor benchmarks were available for standards, and there were no widely accepted measuring techniques usable to determine improvement in congestion levels. The outcome was that the CMAQ program and the ITS Joint Program Office were authorized and funding was provided. Each of these initiatives was aimed at making an impact in a specific, separate area (non-attainment in air quality requirements partially related to congestion in the case of CMAQ; the potential for rapidly emerging and powerful new technologies to aid drivers and improve traffic flow in the case of ITS).

A related provision was a new requirement for each state to establish a congestion management system. However, state officials still viewed congestion as a problem in their urban areas for which they had little responsibility. They were very uncomfortable with this requirement and reluctant to spend state funds for a system that was not one they managed. They objected strongly to the requirement through their organizations and eventually succeeded in modifying it and eliminating any penalty if they chose not to implement such a system. Both CMAQ and ITS were partial efforts to insert operations funding into a fundamentally construction oriented highway grant program, according to some who participated in the debate. (Others contend that CMAQ was aimed entirely at air quality with no consideration of operations.) Although each program has had important effects, neither has been sufficient to establish solid congestion management or to bring about the efficient use of the surface transportation system that ISTEA's initiators sought.

As attention turns to reauthorizing Federal aid for highways, a compelling case can be made that it is time to address the issue of congestion, that it is recognized that the present piecemeal approach to congestion is not the answer. A policy shift to direct funding targeted at operations to reduce congestion is required – even overdue. The nation can no longer afford the economic toll taken by highway delays. Operational strategies and tactics, if implemented, can be effective, efficient ways of managing congestion and making maximum use of the transportation system's capacity. Transportation Secretary Norman Mineta recently stated that the number-one transportation problem for the U.S. today is congestion. The national press agrees:

> "If all the plans, programs and problems of the Department of Transportation could be boiled down to one word, it would be: CONGESTION. … [T]here is general consensus that it simply will not be possible to keep building new highways, particularly in the near-gridlocked areas of the East and West Coasts."
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> (*Washington Post*, May 15, 2001)

Federal Funding For Highway Operations So Far

Although federal highway aid has historically been linked to new construction, leading naturally to the emphasis on infrastructure and construction in most state highway agencies, other factors also account for the hesitance on the part of many state and local officials in looking for federal help for operations. One primary reason is that operations responsibility rests primarily on the shoulders of regional and local transportation

officials; the state role in operations, other than maintenance and ensuring that the highway is passable in all weather, is often limited. While regional and local authorities receive state money for transportation projects, dollars often go for big-ticket capital projects, rather than day-to-day operations that would have an impact on traffic management and congestion. And finally, federal funding to states for highway operations has been limited and piecemeal since its beginning. The most obvious initial funding effort was the pilot project begun in 1968 by the new Federal Highway Administration that was soon formalized in the Federal-Aid Highway Act of that year as TOPICS, the Transportation Operations Program to Improve Capacity and Safety. This experimental program authorized $200 million in federal aid for each of FY70 and FY71 (at a 50 percent Federal share); overall, it was an attempt to deal at the federal level with what even then was recognized as the growing problem of highway congestion in urban areas. However, after being reauthorized for FY72 and FY73 at $100 million each year, the brief TOPICS experiment was discontinued.

Despite the demise of TOPICS, Federal highway assistance became somewhat more flexible in the Federal-Aid Highway Acts of 1973 and 1976, liberalizing the use of funds for purposes other than traditional new construction. This shift reflected the anti-highway sentiment that had begun to develop in the 1960s and intensified through the 1970s during the Interstate Highway Program's construction of urban expressways. Transportation System Management (TSM) activities were promoted toward the end of this period, although funding devoted to them was limited. The funding changes also represented a recognition that parts of the highway system required serious maintenance. A continuation of this policy response was visible in the Surface Transportation Assistance Acts (STAA) of 1978 and 1982, although the TSM program at the time was focused largely through the transit program. The Surface Transportation and Uniform Relocation Assistance Act (STURAA) of 1987 also continued the trend toward financing flexibility.

However, even throughout the 1980s, new construction, capital replacement, restoration, resurfacing, rehabilitation, and reconstruction were absorbing about 75 percent of annual federal highway aid. In fact, much of the newly flexible funding went to entirely non-highway-related projects – often transit (see below). As already noted, ISTEA in 1991 and TEA-21 in 1998 were the first recent pieces of legislation that specifically made funds available for operations and other operations-related activities.

Comparison – Federal Operations Funding in Other Modes

Federal funding assistance for transportation modes other than highways has frequently included aspects of operations. The federal interest in or responsibility for parts of operations has determined the degree to which operations has been the focus for federal dollars. In the case of aviation, for example, the air traffic control system for aviation operations is a federal responsibility, and has received federal dollars from the earliest days of airmail. Since 1938, the Civil Aeronautics Authority, the Civil Aviation Board, and then the Federal Aviation Administration (FAA), successively were directly involved in the operation and administration of the nation's air space. (The FAA was formed, in

fact, after several tragic airplane crashes in the 1950s convinced the public as well as the airlines that a federal agency was needed to ensure safe operations.) Until the Carter-era deregulation of airlines, the Civil Aviation Board's mission also included control of schedules and fares in a manner reminiscent of the Interstate Commerce Commission's regulation of railroads a century earlier.

Federal support during the era of railroad construction has already been discussed. Often forgotten, however, is that the Federal Government took over much of the railroad system during the World War I years, citing wartime exigencies. During this period, railroad operations came under direct federal control, which ended when the war ended, and before a supportive institutional framework was established. However, a fragment exists today, in Amtrak, the National Railroad Passenger Corporation, chartered by Congress in 1971 to operate (or, in some areas, merely to administer) the remaining bits of the nation's passenger rail system. Amtrak has received substantial operating assistance from Congress from the start, despite its initial mandate to achieve self-supporting status. The Federal Railroad Administration also continues its oversight of the safety and regulatory framework for operations on the nation's freight railroad network, but does not provide operating subsidies. The US Coast Guard has similar responsibilities for safety in recreational boating, ocean shipping - especially in US ports, and commercial fishing. The Coast Guard also provides icebreaking services in northern US rivers and lakes, and navigational aids for the nation's rivers, lakes, and coastal areas – all operations.

Federal Transit Funding

The mode that provides the most direct contrast to highways in terms of Federal operations funding, however, is transit, although Federal transit funding did not begin until the 1960s. During the years immediately after World War II, rider patronage of transit systems declined, and private transit operators began to fail. Many transit systems were taken over by local and state agencies and authorities at that time. However, federal policy was still to look on transit as a local responsibility, without interstate aspects, and federal aid remained focused on highway construction.

> At the national level, it was considered sufficient justification for federal neglect of urban mass transit to note that few transit trips crossed state lines. Federal disinterest in the decline of transit was reinforced by the general conviction that transit was a dying industry, rooted in obsolescent technologies and urban land use patterns. (Altshuler)

By the 1960s, however, the Interstate Program funding the building of urban expressways, which often replaced major transit arteries, began to meet resistance because these roads often contributed to urban sprawl and hollowing out of inner cities. Two notable defeated highway projects of the time were the Inner Belt in Boston and the Lower Manhattan Expressway in New York. Gradually, the importance of healthy, functional transit systems to urban areas became more obvious, and the attitude about federal funding for transit began to change. The obvious model at first was the highway program, with support for major capital investments. (In the case of highways, this had been construction; in the case of transit it was equipment and facilities.) "The proper role of government, it was believed at the time, should be to provide capital for needed transit

expansion and modernization, while continuing to impose the 'discipline' of self-support upon transit operations by requiring [transit agencies] to cover all *but* capital costs with farebox revenues," as Alan Altshuler, a former Massachusetts Secretary of Transportation, explains it. A Federal role having been identified, the Urban Mass Transportation Act and the Mass Transit Act were passed in 1964 to provide for capital assistance to transit agencies – equivalent legislation in many ways to the 1956 Interstate Act.

However, capital projects undertaken in partnership with the new Urban Mass Transportation Administration (now the Federal Transit Administration or FTA) failed to achieve the federal policy goal of creating healthy, functional transit systems in the nation's major metropolitan areas. Federal operating dollars for transit agencies, it appeared, would also be required to assure flourishing inner cities. Unlike for highways, where states played a minimal role in daily operations, "operations" was relatively easy to define in a transit context – the day-to-day running of a transit system, or, more broadly, everything *not* defined as a capital project. As Altshuler explained, by 1977 "Public acceptance of the need for transit operating as well as capital subsidies ha[d] become general. Large-scale federal operating assistance for mass transit was authorized in 1974, *though highway assistance is still confined to capital investment purposes"* (emphasis added). In 1974, in other words, the Federal role in transit funding began to differ from its equivalent in highway funding.

Ironically, because transit operating support was tied to highway legislation, the federal role in transit operating assistance was secured, even though most beneficiary transit systems in the 1970s were in very heavily urban geographic areas representing but a tiny fraction of congressional districts. Since then, however, the FTA's mandate has grown to cover much more of the country, and more attention has been paid to providing operating funding to rural transit agencies. Indeed, in the 1990s, operating assistance for the largest transit agencies, those in big cities, was eliminated after prolonged debate. However, TEA-21 provided a revival of sorts for the concept of operating assistance for these larger systems, with the addition of preventive maintenance as an eligible activity for federal transit dollars available to agencies of all sizes. Also, the linking of transit funds to highway legislation means that "…highway advocates, traditionally contemptuous of transit, have found advocacy of increased transit spending to be an effective means of protecting their own vital interests…" (Altshuler); this is particularly important given the increased public interest in transit – owing to energy, environmental, and livability concerns – since the 1970s.

Thus the policy rationale for the compelling federal interest in transportation operations had extended far beyond a direct federal role in operations by the end of the twentieth century. It now includes interstate commerce, the environment, the economic health and well being of cities, access to transportation services, and the safety of the transportation system. Better management of road and highway congestion fits all these requirements. Since more funding for operations is the primary way to ensure better management, the policy direction is clear. However, for a full fledged grant program for operations to succeed, no matter how firmly grounded in good policy it may be, a variety of issues will

need to be addressed and a start made on consensus building and institutional arrangements to support it.

Funding Partnerships for Highways and Transit

In delivering funding assistance to the national transportation system, the U.S. Department of Transportation forms partnerships with non-federal agencies to administer aid and to ensure that transportation projects and programs are carried out. For highway programs, the federal partners are the fifty state DOTs, which generally do not view their primary role as "highway operations," although they have major mission responsibility for Maintenance and Operations (M&O). In sharp contrast, for transit programs the federal partner is typically a regional or local transit agency, whose principal job *is* the operation of transit systems as well as providing the rolling stock. This difference highlights one of the institutional issues that must be addressed if there is a shift to more federal assistance for highway operations.

Perhaps more importantly, this difference speaks to the dissimilarity in how highway and transit agencies form operations partnerships. The nation's approximately 600 transit agencies typically work directly with the FTA in setting the parameters for their projects. Their greater numbers pose a challenge for FTA, but a manageable one, according to a FTA Deputy Regional Administrator. However, close to 40,000 regional and local (city, town, and township) agencies have some responsibility for operating roads and highways. These work more closely with state DOT regional offices and state DOT headquarters, consultants, universities, organizations such as the American Association of State Highway and Transportation Officials (AASHTO) – and only rarely with the Federal Highway Administration (FHWA), as their fifty state counterparts more often do. Even when they do exist, partnerships between local and federal highway agencies are likely to be with an FHWA division office, not FHWA headquarters.

Also, programs that would use federal dollars for highway operations often must compete with capital funding needs, because the governing legislation has created somewhat flexible funding categories that can be used for either, rather than separate and well-defined funding categories for each. By contrast, federal transit funds are, for the most part, clearly separated and designated into capital and operations categories. There is also the fact that transit agencies are responsible for both capital and operations projects, whereas capital and operations responsibilities for highways tend to be divided between various agencies – state DOTs, local agencies, and others. These organizations sometimes vie for the same funds for their own purposes. Especially because the definition and boundaries of responsibility for highway operations are seldom clear, it is relatively rare that agencies aggressively seek funding specifically for operations.

Defining Eligibility for Federal Operations Funding

Federal funding for projects even remotely connected to highway operations is a relatively recent phenomenon, begun (excepting TOPICS) with support for restoration, resurfacing, and rehabilitation ("3R") in the 1970s. Although these were fundamentally

infrastructure programs, the projects funded by them, once completed, did improve operations. Eligibility was expanded to include reconstruction ("4R") in the 1980s. With their specificity about federal highway operations funding, ISTEA in 1991 and TEA-21 in 1998 defined and confirmed the trend. However, no line item in legislation specifically allocates funding to "operations," complicating any efforts to build a constituency. Various provisions may be interpreted to cover different facets of operations, depending on what definition of that term is used. Indeed, ISTEA and TEA-21 include numerous provisions relating – usually indirectly – to highway operations, both in specific line items and in specific redefinitions of earlier key elements, again, depending on the sense in which the term "operations" is used. For instance, STAA (1982) and STURAA made it possible to use funds that otherwise would have gone to capital construction for highway "maintenance," which, under certain circumstances, can be classified as "operations" if the activity affects traffic flow. In ISTEA, this principle was formally established through the Interstate System/Interstate Maintenance program; TEA-21 expanded its application. So-called "4R" projects (restoration, resurfacing, rehabilitation, and reconstruction) may also be considered "operations" if they result in "operational improvements" to a highway.

Complicating matters for determining eligibility for operations is an emphasis on multimodalism and intermodalism in ISTEA and TEA-21, which include specific language on those issues. Improvements for highway operations are often an integral part of multimodal and intermodal capital projects, sometimes blurring the line between "capital" and "operations." For purposes of this paper the term "operations" includes traffic control and enforcement (including the operation of traffic control centers), incident and emergency management, ice and snow removal, and ITS activities such as advanced traveler information systems (ATIS). Table 1 (next page) summarizes the evolution of eligibility for federal assistance for highway operations.

Federal funds for many types of operations have obviously been available for some years. In fact, two programs in TEA-21, ITS (which is discussed separately below) and the CMAQ program were intended to focus on operations. The amount of funding available under the CMAQ program – a category, or share, of aggregate funding for each state – is specified in the legislation. In a change from ISTEA, however, TEA-21 expanded CMAQ funding eligibility, from non-attainment areas only to include areas where continued efforts would be necessary to maintain conformity with air quality requirements. Over its six-year span, 1998-2003, TEA-21 provided a 40% increase over the highway funding authorized in ISTEA from 1992-1997 ($218 billion compared to $155 billion). TEA-21 authorizes a total of $23.8 billion for the Interstate Maintenance program, $33.3 billion for the Surface Transportation Program, and $8.1 billion for CMAQ – all funds that could potentially be used for operations – along with other things.

Despite this, recent research shows that this availability is poorly understood. For example, all of the local transportation officials consulted for the study believe that traffic has a significant or at least moderate impact on their jurisdictions. Moreover, almost 60 percent think their jurisdictions should be doing more in transportation operations. But many of them had little idea that federal funds were available for this purpose and while

Table 1: Evolution of Federal Highway Operations Funding Eligibility

Year	Legislation	Operations (Non-Capital) Eligibility
1916 through 1956	Initial Federal-aid highway programs	None; capital only (although Federal-aid Highway Act of 1944 allows rail-crossing hazard elimination)
1956	Interstate Highway Act	None; capital only
1968	Traffic Operations Program to Improve Capacity and Safety (TOPICS), as part of Federal-Aid Highway Act	Formerly an FHWA pilot project; first overall Federal-level involvement in highway operations ($600 million in Federal spending from FY70-FY73)
1973	Federal-Aid Highway Act	TOPICS reauthorizations end; merges with Urban System
1976	Federal-Aid Highway Act	3R work authorized for Interstates
1978	Surface Transportation Assistance Act (STAA)	3R work authorized for Primary and Secondary highway programs; traffic signalization and TSM programs eligible for funding
1981	Federal-Aid Highway Act	4R work authorized for Interstates
1982	Surface Transportation Assistance Act (STAA)	4R work authorized for Primary and Secondary highway programs and Urban System program; pavement markings and commuter carpools/ vanpools eligible for funding
1987	Surface Transportation and Uniform Relocation Assistance Act (STURAA)	Expansion of 4R program; inclusion of bridges; eligibility expanded to include additional safety improvements
1991	Intermodal Surface Transportation Efficiency Act (ISTEA)	Primary, Secondary, and Urban System designations eliminated; NHS created (legislation enacted 1995); Interstate Maintenance program established; Surface Transportation Program (STP), CMAQ and ITS programs introduced; safety program streamlined; some planning eligible
1998	Transportation Equity Act for the 21st Century (TEA-21)	CMAQ and ITS programs extended; liberalization of STP funds; preventive maintenance for transit added

41 percent thought the federal government should be doing more to help, many were unsure that doing the required paperwork for the federal funds would be worthwhile. Virtually all of those responding to the questions thought the state assistance that would be most useful would be in the form of funding. (PTI, ref.) Because eligible activities have not been clearly spelled out in terms leading to a common understanding of "operations," legislative language intended to create flexibility has created ambiguity about what can and cannot be classified as "maintenance" and/or operations. The lack of clarity is reinforced by the difficulties of changing long established and familiar patterns of ways to undertake and successfully complete highway projects. Conversely, no such difficulties or ambiguities characterize construction, where the phases of highway projects have long been familiar. Indeed, clear descriptions of construction activities and project definitions have been embedded in the eligibility requirements for the federal aid categories throughout much of the lifetime of the federal aid program. Thus, the highway communities know what federal dollars are available and entire state programs have grown up around these categories of construction. However, there is no similar clarity about the definition of the term *operations*, which encompasses a variety of transportation activities, ranging from traffic management and control, to ice and snow removal, to roadway repair, resurfacing and rehabilitation.

Local highway and public works agencies generally think of Operations and Maintenance (O&M) as everything that is *not* capital. This means that while regular funding is made available for O&M, it is based on traditional, long-standing concepts of what is needed (as one local official put it, "If I don't maintain my culvert, I'll have an operations problem when it rains"). Because there is no common understanding of "operations," transportation officials at state and local road and highway agencies are uncertain about which of their activities might be eligible for federal funding. And, it is difficult to track spending on operations or to compare spending or budgets between different transportation agencies to make meaningful comparisons. Moreover, many officials at the state and local levels simply do not fully appreciate the concept of system management, even as part of operations, and how it might help them address congestion and other problems. To them, the term "management" generally means administration, labor-related issues, or management systems, rather than an activity related to operations (DeBlasio, ref.). "Pavement management" is a construction-related concept easily understood; "congestion management" is not as familiar a term.

Highway Operations: A Variety of Important Players

Most highway operations activities are carried out by both State and local agencies, on the highways and roads that fall under their respective responsibilities (Rossetti, ref.). However, operations on all roads and highways are affected by a variety of disparate actors. Public-safety agencies, as one example, perform services related to accidents and safety that are vital to the smooth operation of transportation systems. Emergency response teams also are critical when an incident occurs, stopping traffic in all directions. These separate players each report to different entities and each has its own federal, state, and/or local funding source that is usually different than any made through transportation legislative and funding decisions. They are consequently difficult to coordinate, even if

one group decided that it was important to do so. For instance, state highway patrols are not typically included in the transportation planning, funding, and administrative decisions usually spearheaded by state DOTs. And local police and emergency-response communities are usually not included in decisions about public-works operations.

For federal highway operations funding, Congress and the Federal Highway Administration determine Highway Trust Fund reimbursements, matching funds, and apportionment formulas, all of which are spelled out in legislation. In addition, a number of other parties make decisions about how to expend funds once they are allocated, including metropolitan planning organizations (MPOs), local governments, transit agencies, and advocacy groups. At times, the funding and allocation processes can be prolonged and/or overwhelmed by the extensive consultations required.

As a result of this variety of players and differing responsibilities, it is extremely difficult to determine how a transportation agency allocates percentages of its budget to operations and capital activities according to research for a study being conducted by Volpe Center staff. One reason, especially true for municipalities and transit agencies, is that the amount of funding set aside for capital activities fluctuates considerably from year to year. Another reason applicable at the state district level is that the percentage spent on either operations or capital needs depends on the responsibilities of the district -- some have both capital and operations responsibilities while others have primarily operations and maintenance responsibilities. Furthermore, transportation agencies may have differing definitions of operations; some agencies include various aspects of maintenance in their operations budget line item. And finally, agencies use differing thresholds to determine what projects are considered capital projects. Therefore, at any transportation agency within a region (but not statewide), operations costs could be as low as 14 percent or as high as 100 percent of the transportation budget. In contrast, for areas with high capital costs, the capital costs alone could reach a high of 86%. The review also found that in general, capital dollars fluctuate considerably from year to year, regardless of location. While areas experiencing significant growth had the larges changes from year to year, almost all the agencies interviewed experienced great variability in their capital budgets. (DeBlasio, ref.)

Despite this analytic confusion, it is probably accurate to say, however, that because more funding has been made available generally, more has been spent on operations. In fact, a report completed for the FHWA contends that state and local spending on highway operations roughly doubled between 1985 and 1997, regardless of how "operations" is defined (Rossetti, ref.). Bureau of Transportation Statistics data indicate that combined federal, state and local disbursements on "maintenance and traffic services" and "highway law enforcement and safety" – these are the two "non-capital" categories in the BTS data – rose from $21.83 billion in 1985 to $32.43 billion in 1995. (ITS spending, however, is likely included in BTS's "capital outlays" category.)

Data since 1997, reflecting the increased federal support of highway operations, would likely show a continued increase in that spending. Again, it is difficult to precisely estimate federal spending on operations because there *is* no "operations" category at the

federal level. What we can observe, as previously noted, is that the IM and STP programs, among others, have become more flexible in terms of funding, and TEA-21 increased CMAQ funding substantially over ISTEA; these are all potential sources of funding for operations. Still, there remains confusion at the state and local level regarding the availability and eligibility of federal operations funding.

Funding for highway and for transit operations originates and is supported by numerous and varied programs from different government levels. A comparison of funding sources is illustrative, as shown in Table 2, which shows clearly that transit agencies have more options for using federal funds than do highway agencies. Data in Table 2 also show that both highway and transit agencies can use CMAQ and ITS funds – which means that their needs will compete.

In part, the reason for the greater access to federal assistance programs for transit is that the total dollars available for transit from any single source are nowhere near as large as those available for highways from the Highway Trust Fund. In addition, aid for transit operations represents the federal response to the disastrous "deferred maintenance" programs instituted by many large transit agencies in the 1970s, when funds available for O&M were severely limited. Symbolic of the issues of that time was the situation in the New York City subway system, which was unable to reverse dramatic deterioration in both its infrastructure and rolling stock because of insufficient funds. TEA-21 now stipulates, however, that all transit maintenance is defined as "preventive maintenance," and has increased O&M funding to ensure that deferred maintenance disasters do not recur.

Probably because of greater strength and unity in the stakeholder partnerships (FHWA, interest groups, state DOTs, and governors), there have been no equally dramatic widespread highway failures, even given accelerated deterioration in the highway system as usage grew much more rapidly than anticipated. Nonetheless, spectacular single highway and bridge failures have occurred, and one general trend invites comparison to transit in the 1970s. Extensive statistics on highway and bridge deterioration are available in "National Transportation Statistics 2000," prepared by the Bureau of Transportation Statistics. As one example, the portion of the Interstate system in "very good" condition fell, in 1998, to 11% in urban areas and 19% in rural areas – from some 59% in both areas only eight years before. Increasing federal highway funding targeted directly for operations may be one way to ensure uninterrupted highway service, permitting funds needed for rehabilitation and reconstruction projects to be used specifically for those purposes, rather than used flexibly to support operations.

ITS Funding

As federal funding for operations expanded gradually, one specific technology area helped to focus more attention on the need to fund operations activities. The Intelligent Vehicle Highway Systems (IVHS) Act of 1991, which was a part of ISTEA, opened the door to funding new solutions to the safety and congestion problems on our roadway

Table 2: Differing Sources of Operations Funding, By Mode
(Federal sources are identified in bold italics.)

Highway

Local highway agencies:

- General revenue funds
- Some state funds (bonds, gas tax, license/registration fees, lottery)
- Development fees
- Dedicated sales tax

State DOTs:

- General revenue funds
- Bonds
- Gas tax
- License/registration fees
- Lottery
- ***CMAQ funds***
- ***ITS funds***

Turnpike authorities:

- Toll revenues
- Bonds (but usually capital)

Transit

Rural and small urban areas:

- ***Nonurbanized Area Formula Program (TEA-21 Section 5311)***
- ***Elderly and Persons with Disabilities funding (Section 5310)***
- ***CMAQ funds***
- General revenue funds
- ***Social service agencies (such as the Health and Human Services Department),*** including State and local agencies
- ***Job-access funding (e.g., 'welfare-to-work'***

Urbanized areas:

- ***Urbanized Area Formula Program (Section 5307)***
- Member assessments
- Contracts with municipalities
- Farebox revenue
- ***CMAQ funds***
- Sales tax

system.. Originally, Federal support for IVHS activities focused on preparing an approach to implement the Act, investigating the feasibility of an automated highway system, providing technical assistance and planning grants, and funding operational testing of advanced technologies. As these tests proved that advanced technologies were feasible and aided highway and transit practitioners, those practitioners implemented advanced technologies in a growing number of metropolitan and rural areas and for commercial vehicle applications. Although transportation managers understood the capital cost of deploying these technologies, many failed to take into account the cost to continually run the products and services that these technologies help to provide.

Federal funding for IVHS and ITS activities since 1992 has ranged from $143 million to $233 million, with a large percentage of funding going to research and development, operational tests, and corridor programs. Funding for deployment incentives, started in Fiscal Year 1998, now provides the largest category of funds within the ITS Program, ranging from $90 million to $103 million annually. It is difficult, however, to determine the true amount of Federal, State, and local expenditures on ITS activities that are not directly funded by the ITS Program. State and local governments often do not classify projects as ITS. This fact is also true for projects listed in transportation improvement programs in metropolitan areas. In some cases, projects listed as construction may contain an ITS component. In other cases, the implementation of ITS products and services are not listed explicitly as ITS projects.

TEA-21 explicitly states that operating costs for traffic monitoring, management, and control systems are eligible for federal reimbursement from NHS and STP funding. Also, CMAQ funds can be used, under specific conditions, to pay for similar projects in air quality non-attainment and maintenance areas for a three-year period. Projects that deploy integrated traffic control systems, incident management systems, and traffic control centers were given as examples of eligible activities. Within these projects, labor costs, administrative costs, costs of utilities and rent, and the cost of operational improvements are eligible for reimbursement.

The amount of funds expended for the operations of ITS products and services, however, is just as difficult to obtain as the amount of overall funding for ITS activities. ITS operating costs may be hidden in other categories within a State or local operations and maintenance (O&M) budget, such as utilities and labor. Similarly, ITS operating costs may not be explicitly called out in transportation improvement programs. Only limited data have been collected, from three States with relatively robust ITS programs, and estimates for their ITS spending range from 5 percent to 22 percent of total highway O&M expenditures. These are the only figures currently available (Staples, ref.).

Getting to Yes on Operations Funding

Research for this paper indicates that a number of issue areas pose particular challenges for efforts to achieve consensus supporting a policy shift to direct funding support for

highway operations. Considerable work will be necessary in advance of any legislative or possible legislative approaches to make an impact in each of these areas.

- *Stakeholder Issues.* The variety of institutional players that affect operations in a given urban area must be brought together to determine common interests and ways to work together on operational issues and make joint decisions. A first step would be convening state highway maintenance personnel, emergency responders, safety officials, mass transit officials, and including others, such as local railroad representatives to discuss priorities and share views. All of these stakeholders make decisions daily that affect traffic movement in a metropolitan area and often have different funding sources that serve as a focus and organizational base. However, to date no forum or cause has brought them together in the way that will be needed to support and successfully implement operations funding. The requirement for a regional ITS architecture framework provides one initial building block, but ITS is one part of the operations – the technology enabler. Activities related to ITS do not necessarily draw in all those who should be at the table to discuss operations. In addition, requirements for transportation planning and the processes essential for funding eligibility also must be revisited. Current requirements are formulated around long-standing infrastructure construction activities, and probably will need to be recast to include operations and traffic management if they are to be effective in addressing congestion issues. Related issues, such as environmental and equity concerns, must also be discussed, if transportation operations are to be placed in their proper context.

- *Eligibility Issues.* If the policy goal is to use improvements in operations as a primary tool for affecting congestion in major urban areas, then a common understanding of the components of operations for grant eligibility is essential. Defining "operations" is critical to deciding where, how, and in what form to fund its component activities. Moreover, some consensus must be achieved on what constitutes a level of congestion that warrants federal attention. According to a paper prepared for FHWA's Operations Core Business Unit, (Lomax and Turner, ref.) concern about congestion is relative to expectations and perceptions of what is normal. These expectations and perceptions naturally differ from place to place. Thus, an intolerable level of congestion in Fargo, North Dakota, where traffic customarily flows relatively freely, would be completely different than an intolerable level in Los Angeles, Seattle, or Washington, DC, which are among the most congested in the country. Reaching national agreement on a definition of the level of performance required to meet criteria for eligibility for funding for operations will require extensive outreach, information and idea sharing, and consensus building. As a follow-up, informational and professional capacity-building initiatives will be required.

- *Partnerships and Legacy Interests.* Increased operations funding, and expanded operations categories, will alter the nature of existing partnerships. The weight of the institutional structure that currently supports Federal funding is

overwhelmingly on the side of construction. Because of the funding streams, construction programs and capital projects have political appeal, and highway related interest groups have naturally organized with biases that support them. New partnerships will emerge with a different funding focus. It may be that local and State highway agencies, MPOs, and DOTs will develop a partnership with FHWA that resembles those of transit agencies with the FTA in support of both capital projects and operations and service. However, the large numbers of such agencies may make this impractical. Another option is to provides strong incentives for state DOTS to form partnerships with the agencies in their states. Inclusion in state transportation plans could be the federal accountability mechanism to ensure attention to operations. Such new partnerships will take time to evolve and will need outreach and discussion as well as incentives to make the new partnership attractive. Such an evolution would affect relationships with all stakeholders and would alter the roles and responsibilities of involved parties – a major institutional challenge, but not an insurmountable one.

- *Competition for Resources*. Inherent in a need for change in long-established partnership arrangements, is the fact that in many cases, agencies could find themselves competing with their new partners for the same categories of federal resources. The issue of competition for resources already exists for STP and CMAQ funding, and has proven to be challenging, but manageable. A new programmatic category for operations funding would need to be crafted in a manner sensitive to the potential for competition among partners and ensure that a range of assistance is made available.

- *Procedural Change.* Regardless of how federal operations funding is incorporated into national transportation legislation, a great deal of preparatory work will be necessary. Stakeholder interests, new partnership requirements and legacy interests, and legislative and regulatory processes must all be taken into account. Eligibility issues are also crucial – for instance, depending on how operations is defined, expanding existing TEA-21 "operations" line items might be a more feasible approach then attempting to insert new eligibility items and new line items. Using lessons learned, and best practices identified until this point will be helpful; studies such as Rossetti's and DeBlasio's are particularly useful in this regard. Finding the "right" amount of operations funding, balancing operations with construction funding, and creating suitable funding categories for both earmarked and discretionary projects will be major challenges. Additional experiments or exemplary projects may be appropriate. One innovative highway program that could have an operations analogue is the Transportation and Community and System Preservation Pilot Program (TCSP). The TCSP is a broad program that provides Federal resources to States and localities to collaborate in planning and carrying out transportation projects.

The original Interstate compact brought enormous benefits and change to the country, but it is time to move ahead. It provided for federal capital highway funding for projects, but left highway operations to State and local agencies, and our nation has yet to successfully

do battle with growing congestion. Addressing this crucial problem, which exacts a huge economic toll on interstate and intrastate commerce as well as personal travel, is in the public and national interest, and this paper contends that federal policy options should explored to do so. An expanded federal highway operations policy that focused funding on congestion could bring significant benefits. Realizing these benefits would be businesses and citizens in large urban areas, which often serve as important ports of commerce and intermodal transportation hubs. Rural areas, which with increased operations resources could better manage ongoing highway reconstruction and rehabilitation projects; and border regions, crucial conduits for international trade, would also benefit greatly.

The papers prepared for this initiative outline a range of issues and strategies related to funding for operations. These range from the establishment of an entirely new "operations" program category, to enhancements of existing TEA-21 provisions, to new partnership proposals (including public-private partnerships), to new pilot programs, to new requirements that transportation projects incorporate operations (especially ITS) elements. The challenge for FHWA and its stakeholders will be to develop from them a coherent and persuasive case for a change in policy toward funding specifically aimed at operations that can make a start at managing congestion, increasing freight and traveler throughput, and making every transportation user more satisfied, across the country. This goal has so far eluded every attempt to reach it. It is worth trying again.

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