Multimodal Project Evaluation: A Common Framework, Different Methods

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The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) provides unprecedented flexibility to metropolitan planning organizations (MPOs) in programming federal transportation funds for multimodal projects. With this flexibility comes the responsibility to analyze and select projects fairly within a practical process. The way in which the Capital District Transportation Committee (CDTC) in Albany, New York, approaches the programming process is examined and compared with the methodology used by the Metropolitan Transportation Commission (MTC) in the San Francisco Bay Area. The two approaches outline both screened projects for minimum requirements and then evaluate project merits. CDTC's methodology puts heavy emphasis on benefit/cost analysis but weighs qualitative factors before programming. MTC's approach negotiates merit criteria and relative weights of those criteria before evaluating individual projects. The strengths, weaknesses, similarities, and differences in project selection methodology are discussed. A common framework for multimodal project selection is offered as a starting point for other MPOs struggling to respond to the opportunities presented by ISTEA.

"How do you compare apples and oranges? By their nutritional value." (Lawrence D. Dahms, Executive Director, Metropolitan Transportation Commission.)

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) grants metropolitan regions unprecedented latitude to direct transportation investments toward mobility solutions that suit local needs and desires. This combination of funding flexibility and regional decision making will shape transportation investments for many years to come. Many metropolitan planning organizations (MPOs) are uncertain how to approach this opportunity. The literature in the area provides little insight, as it has not kept pace with the rapid changes wrought by ISTEA. The flexibility provided by the ISTEA comes with a responsibility to evaluate projects fairly, regardless of mode. This poses technical difficulties when analytic tools are unavailable, unfamiliar, or cumbersome to implement. The increased eligibility of a wide variety of projects for federal funding also raises expectations and brings a number of new players to the MPO table. This can greatly complicate matters when traditional transportation needs for rehabilitation far exceed available revenues, even at increased ISTEA authorizations.

This paper, which is not a research paper but is intended for practitioners, compares the project selection methodologies of two very different MPOs and suggests a common framework for project selection under ISTEA. It highlights the strengths and weaknesses of each methodology in order to allow other MPOs to choose methods that will work in their area.

CAPITAL DISTRICT CONTEXT

The Capital District Transportation Committee (CDTC) is the MPO for the four counties around Albany, New York. With a population of just over 775,000 people, the Capital District has three major cities (Albany, Schenectady, and Troy) and several smaller cities (Saratoga Springs, Mechanicville, Cohoes, Watervliet, and Rensselaer). Population density is lower than in many other areas of similar size, and the lack of a single dominant city center has greatly influenced transportation and development patterns. As the state capital and locus of many state government functions, the area is flavored by a focus on state governance. The Capital District is currently a marginal nonattainment area for federal ozone standards, but it is expected to be redesignated to a maintenance area later in 1994. Air quality concerns for the state as a whole are generally focused on the New York City metropolitan area, where pollution levels are high. In the Capital District, air quality concerns mirror larger national trends of increasing vehicle miles traveled, increasing vehicle ownership, and general demographic shifts. The transportation system as a whole can be accurately characterized as automobile-oriented, and, with increased suburbanization, ridership on the bus system has shown a long-term declining market share, dropping 20 percent between 1982 and 1992. Transit use represents just over 4 percent of commute trips, only 2 percent of all trips. The vast majority of trips are by way of the single-occupant vehicle.

As part of the greater Northeast United States, Capital District infrastructure is weather-worn and aging. For the past 15 years, 75 to 85 percent of all federal-aid funds have been spent on basic pavement rehabilitation and bridge replacement and rehabilitation. New York State has a history of funding non-federal-aid transportation improvements by a combination of general fund appropriations and short-term bond programs. Until 1993 there was no ongoing dedicated state fund for transportation in place. It is anticipated that the creation of the state dedicated fund will allow the state to absorb many major state highway and bridge rehabilitation needs that were previously federally funded. This was a major factor in the increased federal-aid programming capacity available to the CDTC during 1993 Transportation Improvement Program (TIP) discussions.

State-generated transportation funds, such as bonds, have historically been programmed by the New York State Department of Transportation (NYSDOT) without the direct involvement of MPOs in project selection. This is also true with the state dedicated fund, which is limited by law to the state highway system. In addition, the bonding programs have been categorical in nature.
The New York State legislature has preferred to fund specific projects rather than to establish discretionary, or flexible, programs.

MPOs in New York State are an outgrowth of the 3C (comprehensive, continuing, and cooperative) planning processes established by the state in the mid-1960s. In many metropolitan areas of the state, including New York City, the MPO staff are NYSDOT employees. In other areas, the transit authority or county serves as legal employers of the MPO staff. MPOs in New York State operate by a “consensus of the affected parties”; that is, on a regionwide program such as the TIP, by unanimous consensus of the voting members. The primary source of funding for MPO operations is federal planning funds. Some MPOs, like the CDTC, also have cultivated local funding sources. Other than in-kind services (which are significant), New York State provides no direct funding for regional transportation planning performed by the MPOs.

In the Capital District, the CDTC includes the Capital District Transportation Authority—the regional public transit operator—as a voting member. NYSDOT is also a voting member of the CDTC. With the advent of the ISTEA, the New York State Thruway Authority was added to the traditional membership of 21 county, city, town, village, and other state agency officials that make up the policy board. Federal agencies are ex officio members. The Thruway Authority’s mission was broadened by recent state legislation to include the barge canal system and economic development activities, and provisions of ISTEA for the use of toll credits have made the Thruway Authority a large player in transportation decisions statewide.

Over the past 10 years or so, MPOs in New York State have searched for their niche in transportation planning. CDTC has a strong history of state-of-the-practice traffic modeling, corridor and subarea studies, the development of pavement management systems for local roads, and traffic count data gathering. CDTC’s reputation for sound technical analysis and fair negotiation has led local government to request a number of traffic impact assessment and other subregional planning studies. There is a strong link between CDTC’s long-range planning efforts, particularly as regards strategic mobility concerns, and the development of the TIP. This provides a solid basis for CDTC and its participants to act on the opportunities presented by ISTEA.

CDTC Project Selection Methodology

In March 1993 the CDTC adopted the 1993–98 TIP (1). This 5-year program of federally funded capital and transit operating projects represents a major achievement in advancing the project selection techniques used in the Capital District. Major program changes, the creation of the state dedicated fund for many large state highway and bridge projects, and increased monetary authorizations included in the ISTEA resulted in significant programming capacity for new projects ($150 million over 5 years) and a corresponding increase in the number and variety of project proposals. This compares with programming capacities of $20 million to $40 million in federal-aid urban funds in previous TIP cycles.

Together with the Federal Clean Air Act Amendments of 1990 and Americans with Disabilities Act (ADA) requirements, the ISTEA requirements to address intermodal issues, base project selection on performance-based standards, and fairly consider a wider array of eligible projects caused CDTC to modify its project selection approach significantly. However, a history of the use of evaluation techniques based on benefit/cost (B/C) analyses and substantial modeling efforts put CDTC in a strong position to develop a set of criteria to meet the challenges and take advantage of the opportunities presented by this programming exercise.

Basic Approach

CDTC established a working group of transportation and environmental protection interests to develop the project evaluation criteria, review staff project merit evaluations, and develop the program. This working group, with a mailing list of over 200, was regularly attended by 25 to 30 people. CDTC has a staff of 10 people, 4 of whom focused on TIP development activities. The following approach was used in developing the 1993–98 TIP in the Capital District:

1. Minimum requirements were established for each project. These were basic “screening” criteria that ensured that every project considered for programming was consistent with the long-range transportation plan and local land use plans, had reasonable cost estimates and a funding plan, and was justified on the basis of need.

2. The merits of every project that met the minimum requirements were fairly evaluated. Following ISTEA mandates, life-cycle costs and the use of performance-based standards were an integral part of the merit evaluation. The merit evaluation procedure used the best available information from CDTC’s models, corridor studies, and the project sponsor (1). A traffic simulation model run for every highway and bridge project (114 projects) compared the system benefits of the project with baseline system performance in the reference year 2000. For rehabilitation projects, infrastructure benefits were quantified by using the model to determine the mobility benefits of keeping the facility open and evaluating the current pavement or bridge condition and suitability of the proposed project scope (see the paper by Poorman and Posca in this Record). Wherever possible, measures that cut across modes, such as relative cost effectiveness, were used. A B/C ratio was then calculated for virtually every project. The exceptions were some of the more nontraditional projects, such as an intermodal transfer facility proposed for the Port of Albany. The qualitative benefits of projects—such as environmental impacts, systemwide significance, and intermodal links—were directly incorporated into this merit evaluation procedure. Every project’s quantitative and qualitative benefits were summarized on a standardized one-page form, which is shown in Figure 1. This merit evaluation emphasized the intended project benefits [e.g., emissions reductions for Congestion Mitigation and Air Quality (CMAQ) Improvement projects], although the same criteria were used for different project types.

3. A “balanced” TIP that will contribute to a staged regional plan for maintenance of essential facilities and services, demand management, and capacity improvements was then produced. A set of principles to guide the programming was developed that addressed modal, geographic, and functional equity; the ability of the project to be funded through other sources; and project readiness (ability to obligate funds in year of programming). Because project merit was evaluated with different emphasis by project type, the balance of project types was achieved at the programming stage. This approach made the modal, geographic, and functional trade-offs after the merit evaluation was completed and clearly maintained the link with the goals set in the long-range plan.
The TIP as a whole must, according to federal law, conform with the Federal Clean Air Act, be financially "reasonable," be consistent with the long-range plan, and address 15 factors spelled out in ISTEA Section 134(f). Conformity with the Federal Clean Air Act was found, in cooperation with NYSDOT, using a methodology developed cooperatively by NYSDOT and the Environmental Protection Agency. Financial reasonability was determined both at the project level in the screening criteria and for the program as a whole. Consistency with the long-range plan was determined on a project level at the time projects were screened for inclusion in the TIP, and the implementation of Regional Transportation Plan goals and objectives was one of the primary programming considerations. Analyses of how the programming methodology addressed the 15 ISTEA factors and how the TIP and the long-range plan are related were included in the TIP document.

Capital District project submissions for the 1993-98 TIP were primarily pavement and bridge rehabilitations and strategic mobility improvements, although innovative projects such as a travel demand management program, a corridor management initiative, and a comprehensive advanced traffic management system were proposed and ultimately programmed. Several enhancement-type proposals were deferred, pending the surface transportation set-aside program administered by NYSDOT.

**BAY AREA CONTEXT**

The Metropolitan Transportation Commission (MTC) is the MPO for the nine-county San Francisco Bay Area. With 100 cities, including San Francisco, Oakland, and San Jose, more than 6.2 million people live within MTC's jurisdictional boundaries.

Unique geography and the demands of a burgeoning population have helped to create a diverse transportation network that includes 1,400 mi of state highways, 17,700 mi of local streets and roads, electric trolley buses, a huge fleet of diesel buses, two light rail systems, two commuter rail services, a regional rail system (BART), ferries, and the famous cable cars. The multitude of transportation agencies-ranging from county-level congestion management agencies to more than 40 transit operators—creates an environment of pronounced institutional and political complexity.

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**FIGURE 1** CDTC project merit evaluation criteria.
MTC was uniquely positioned to take early advantage of the opportunities presented by ISTEA (see the paper by Younger and Murray in this Record). California, in passing a gas tax increase in 1990, created county-level congestion management agencies and a category of state funding with some spending flexibility across modes. Regional transportation planning agencies, like MTC, have historically had a strong role in the state transportation programming process. California’s dedicated state highway account was created in the early 1970s.

Traffic congestion and stringent federal and state clean air standards have put intense pressure on MTC to fund alternatives to the single-occupant vehicle. As a nonattainment area for both ozone and carbon monoxide, MTC was sued under the Federal Clean Air Act by the Sierra Club and Citizens for a Better Environment in 1989. Over 3 years, that litigation significantly modified MTC’s conformity procedures for the TIP and brought air quality issues to the forefront.

In addition, the Bay Area has massive maintenance needs. The BART system is getting older, many bridges and other structures require major strengthening to better withstand earthquakes, and, in tight fiscal times, pavements have generally not been rehabilitated at an optimal rate.

MTC is the state-designated regional transportation planning agency, in addition to being the MPO. The state of California supports regional transportation planning with sales tax revenues. MTC has a broad funding base for its activities, including a portion of regional bridge tolls, specific grants, and other local sources.

MTC’s unique enabling legislation gives it specific project review powers and establishes the governing board membership. The governing board is composed of locally elected officials from the nine counties and five urbanized areas and representatives from the Association of Bay Area Governments and the San Francisco Bay Conservation and Development Commission. The California Department of Transportation (Caltrans) and federal agencies are ex officio members—they do not vote. Transit agencies do not sit on the policy board, although a legislatively mandated Transit Operators Coordinating Council advises the MTC directly. MTC operates by majority vote.

MTC has carved its niche in the Bay Area transportation community as a broker and a consensus builder. This history of coalition-building and advocacy was advanced by aggressive lobbying efforts during the formation of ISTEA. It has been formalized into the Bay Area Partnership, consisting of the major modal, state, and federal agencies involved in transportation planning, programming, and project implementation. A Blue Ribbon Advisory Committee brings in the perspectives of advocacy groups, the private sector, and other constituencies. MTC’s ability to mobilize quickly in response to the ISTEA was largely a result of this history and a commitment to a philosophy of mutually beneficial cooperation.

MTC’s basic approach to project selection was established with strong participation by transportation and environmental protection interests. An ad hoc committee of 35 people representing these interests was formed to create the process and criteria by which projects are selected; it has since been institutionalized under the Bay Area Partnership. Face-to-face meetings of participants forced participants to be less parochial and to focus on reaching regional consensus. MTC staff provided the structure and schedule for the discussions and initial proposals, but the final proposals were ultimately the result of the agreement of the assembled group.

Heavy emphasis is placed on process. As a result, the actual formation of the program is a functional application of the previously agreed-on criteria. Although establishing the program is not purely a mechanical exercise (politics does intervene), debate tends to center on the application of the criteria, not the criteria themselves.

The criteria for project selection fall into three basic types: screening, scoring, and programming principles. As in the Capital District, every project is required to meet certain minimum requirements for consistency, fiscal reasonableness, and project readiness before being allowed to progress further. The scoring criteria make up an elaborate matrix that assigns points on a 0-to-100 scale, which is summarized in Table 1. The criteria are multimodal and performance-based wherever possible. Imbedded in the scoring matrix are weights agreed on by the participants for maintaining the existing system, improving its efficiency and effectiveness, expanding the system, and considering the external impacts of project implementation. The scoring procedure gives extra emphasis to a network of transportation facilities identified in the long-range plan as the Metropolitan Transportation System: those streets and roads, highways, mass transit routes, bikeways, transfer points, airports, and seaports considered essential to regional travel.

Programming principles were established to ensure that the overall program of projects would increase mobility, clean the air, leverage the most state and federal resources, and be equitable. Much of the initial discussion in establishing the principles, and annually in formulating the actual program, centers on issues of equity: across modes, geography, and functional classifications. As in the Capital District, the first programming principle enumerated is that project merit is the most important criterion for project selection.

MTC staff screens and scores the projects. MTC has a total staff of 85, about 25 of whom were actively involved in project evaluation during the peak period. Adjustments in project scores are made as project sponsors provide additional information and the proposed program undergoes public review. For the first cycle, more than 500 projects were evaluated for $210 million in available federal funds. Project sponsors in the Bay Area submitted a wide variety of projects for consideration, ranging from a day care center at a transit station to bicycle facilities and repaving jobs. The limits of ISTEA flexibility were put to the test.

COMPARISONS

The two project selection methodologies just outlined have similarities, differences, strengths, and weaknesses.

Similarities

• Both CDTC and MTC used a framework that (a) screens projects for minimum requirements, (b) evaluates project merits fairly
across modes, and then (c) establishes an equitable, balanced, cost-effective program that is based on predetermined principles.

- A participation process using working groups of major interested parties was used effectively in both cases.
- A program with broad-based support was formulated in both cases.
- Project merit was the principal project selection criterion in both cases.
- The period for development of the criteria and the program was approximately 6 months in both cases.
- “Regional” projects were forwarded by both MPOs.

Differences

- CDTC set the balance of priorities at the programming stage. MTC built (or hid, depending on your perspective) much of this aspect into the weights using in the scoring matrix as well as into the programming principles. Therefore, significant public influence of the overall program balance occurs much earlier (when the criteria weights are set) following the MTC method.
- CDTC’s traffic model was run for every project considered, and quantification of project benefits to the system were able to be produced consistently. Allowance was built into the criteria for those benefits that are not readily quantifiable by using the standard format for evaluation shown in Figure 1. MTC’s traffic model was not an available tool for project merit evaluation, because of the number of project proposals, other priorities for the modeling staff’s time, including air quality conformity of the overall TIP, and the inclusion of many projects that are not easily modeled. Qualitative project benefits were incorporated into the scoring matrix (summarized in Table 1) in the “External Impacts” category.

Strengths

- Focusing on process and criteria led to a technically and politically defensible program.
• Flexibility was used to develop a program that met regional needs in both cases.
• Adding new players—such as freight providers—to the mix of people developing the program led to more diversified projects and programs.
• Both methodologies are very good at distinguishing the clearly beneficial projects from the “dogs.”
• Preserving the existing transportation system is an important policy concern of the ISTEA, and one of the 15 factors that MPOs are required to consider in developing plans and programs. CDTC’s methodology captures the mobility benefits of maintaining the existing transportation infrastructure as part of the B/C calculation. MTC’s methodology, by emphasizing projects that accomplish multiple objectives, similarly has forced project sponsors to articulate a project’s overall system benefits. For example, a pavement rehabilitation project may benefit the buses and bicycles that travel over it, and savvy project sponsors have learned to emphasize these multimodal aspects to enhance project scores.

Weaknesses

• A merit-based project selection process is highly data dependent—on data that are not always readily available. In the Capital District, the CDTC was blessed with a cooperative regional office of the NYSDOT and a history of data collection on pavement conditions and traffic volumes on local facilities. MTC had a similarly rich history of data collection and cooperation from Caltrans and transit operators. Without such resources, implementation of fair merit evaluations is problematic.
• Both systems of project evaluation tend to be deterministic. They give an illusion of precision of measurement when in fact the difference between a project with a B/C ratio of 2.9 and one of 3.3 (or in the MTC system, a score of 78 versus 85) is not significant. Yet the place where the funding line is drawn often depends on marginal differences in “score.”
• The MTC scoring approach prescribes relative weights and maximum scores in different categories, which leads to a program in which projects with multiple objectives rise to the top. Partly this is a policy choice to foster multimodal projects, but it can leave single objective projects, such as bicycle paths, unplanned.
• CDTC’s approach relies on the ability of the planning committee members to balance program needs—something that works only with a cooperative group of people with an ability to act “regionally” in light of parochial interest in project advancement. In reality, the focus during programming is drawn to the B/C ratio, which was not intended to be the overwhelming criterion, but functionally was. This minimized the effectiveness of having multiple criteria. CDTC addressed this weakness by deciding yes or no on projects where “the numbers don’t tell the whole story” before priority ranking other projects according to B/C ratio.
• A key piece of data that is required is reliable cost estimates. These are often difficult to obtain at the programming stage. Improvements in cost estimation techniques, as well as increased communication and “partnering” between project designers and MPO planners, is essential. Otherwise, further refinements in multimodal project selection techniques are less meaningful.

LESSONS FOR OTHER MPOs

Some lessons from the two MPO experiences can be offered.

1. It can be done. It is possible to establish a process and criteria that will lead to a multimodal program of capital improvements with broad-based support.

2. The process and criteria must be based on local experience, expertise, and, above all, participation. Regional context and historical development patterns cannot be ignored. On the other hand, a host of new players need to be included in the programming process. The two systems of evaluating project merit across modes presented here are useful examples but are probably not appropriate for wholesale adoption in other areas. The processes by which the criteria were developed are by far their most important aspect.

3. A common framework for multimodal project evaluation and selection worked in two very different regions.Screening projects for minimum requirements, evaluating their merits using the best available tools, and then formulating a program based on predetermined principles does work. Details appropriately vary from region to region and even from programming cycle to programming cycle: the framework has wide applicability.

ISTEA gives MPOs the opportunity to set programming priorities that meet regional needs and reflect regional consensus. Clearly, a new day has dawned in transportation decision making in America. MPOs representing very distinct metropolitan areas, including the two referenced in this paper, are using the flexibility of ISTEA and its wide-ranging project eligibility to fund innovative approaches to solving transportation problems. Seize the day!

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