Comparing Infrastructure Renewal Projects to Mobility Improvement Projects

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Procedures that provide for a quantitative calculation of system benefits derived from both infrastructure and mobility projects are described. The procedures were used by the Capital District Transportation Committee (CDTC) in Albany, New York, as part of a comprehensive project evaluation process in the development of its 1993–98 Transportation Improvement Program. The technique involves the use of CDTC's regional travel simulation model to estimate system-level impacts of transportation actions; these impacts include changes in travel time, delay, excess delay, operating costs, accident costs, and vehicular emissions. Metropolitan transportation organizations typically use such calculations to examine the value of mobility projects (highway widenings, signal system improvements, new highway or transit facilities, and other projects that add capacity), but CDTC uses similar calculations to capture the system benefit of repair or replacement of bridges, highways, and transit equipment. This method allows for head-to-head comparison of mobility improvement and infrastructure repair projects. In the CDTC process, the system value of a bridge, highway, or transit service renewal proposal is estimated by simulating system conditions both with and without the facility or service proposed for repair or replacement. The difference between system conditions with the facility (or equipment) in place and with the facility removed is then prorated to reflect the percentage of the natural life of the facility that is extended by the project. For example, if a facility's physical life is 50 years and the repair extends its life 20 years, the system benefit of the repair project is calculated at 40 percent of the calculated system value of the facility.

The Capital District Transportation Committee (CDTC) is the designated metropolitan planning organization (MPO) for the area containing the Albany-Schenectady-Troy, New York, urbanized area. During 1992 CDTC and New York State defined CDTC's metropolitan area boundary as Albany, Rensselaer, Saratoga, and Schenectady counties (with the exception of a small part of Saratoga County, which is within the Glens Falls urbanized area). The total population of CDTC's defined metropolitan area is in excess of 750,000, and the entire area is designated as a marginal nonattainment area for ozone.

CDTC's board is composed of the New York State Department of Transportation (NYSDOT), New York State Thruway Authority, Capital District Transportation Authority, and Capital District Regional Planning Commission; chief elected officials from the four counties; mayors of four central cities (Albany, Schenectady, Troy, and Saratoga Springs) and four smaller cities (Rensselaer, Cohoes, Watervliet, and Mechanicville); and rotating representatives of towns and villages. CDTC operates by consensus, defined as unanimous consent of all affected parties.

The Capital District is characterized as a collection of small cities with growing suburban areas both within a tri-city area and surrounding that area, particularly along the Interstate 87 corridor in Saratoga County. The fragmentation of municipal structures has historically allowed CDTC to avoid "big city versus suburban county" conflicts in planning and program development. MPO participants have relied on objective information and structured discussions rather than raw political clout for many years. These discussions have their origins in the 3C (comprehensive, continuing, and cooperative) process of the mid-1960s, which produced a long-range transportation plan by 1971.

Further, a strong precedent for objective comparison of competing transportation projects was established in 1977 to facilitate the selection of substitution projects for the withdrawn I-687 project in Albany County. At that time, policy and technical participants from all member agencies and units of government worked cooperatively on a multimodal project evaluation and programming structure. The structure was successful in gaining consensus on a list of state and local highway projects and public and private transit improvements totaling approximately $60 million.

CDTC continued its structured project evaluation process in the 1980s through a formal Project Information Procedure (PIP), which built on the Interstate substitution process and included both quantitative and qualitative evaluations of project merit. The procedure proved useful, but it was generally limited in application to situations in which projects from different sponsors were competing for the same categorical funds. These situations tended to be limited to urban system projects, which constituted only a small fraction of the total federally funded transportation program approved each year by CDTC. It was not applied to federal-aid primary funds, which were exclusively on projects on state highways, for example.

With the passage of the Intermodal Surface Transportation Efficiency Act of 1991, greater flexibility in programming set up much greater potential for competition among projects from different sponsors. During the annual update of its 5-year Transportation Improvement Program (TIP) carried out between October 1992 and March 1993, CDTC engaged in an open process to program approximately $130 million in National Highway System, Surface Transportation Program, and Congestion Mitigation and Air Quality (CMAQ) Program funds available to new projects. This situation was made possible largely by the expectation of a new state dedicated funding program that would lessen the state's demands on federal funds.

The presence of a large pot of flexible funds reinforced CDTC's long-standing commitment to objective comparisons and prompted an examination of ways in which to improve the technical evaluations.

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DEVELOPMENT OF 1993–98 TRANSPORTATION IMPROVEMENT PROGRAM

CDTC launched its annual TIP update in October 1992. In contrast to TIP updates of prior years, this effort was characterized by several new features.

1. A major municipal outreach effort was established. Each of the more than 70 municipalities in the metropolitan area was contacted to elicit project proposals. After 1 month, a second letter was sent, citing local roads with poor pavement conditions and daily traffic volumes over 5,000 and containing a request to consider proposing such facilities for repair.
2. A major public outreach effort was conducted. More than 100 community, environmental, and business groups were included in ongoing mailings of TIP material and invitations to open TIP working group meetings.
3. NYSDOT provided full disclosure of its project proposals for both federal and state fund sources early in the process and pledged to work with CDTC staff and local participants in accurately scoping project proposals and in firming up cost estimates of both state and local projects.
4. Participants reaffirmed commitment to an objective evaluation process. Through discussions, this process was defined as a screening, scoring, and programming sequence. Project proposals were screened for consistency with regional and local plans, minimum physical condition for infrastructure work, minimum level of service (LOS) for congestion relief, and other conditions. Projects passing the screen were then scored on a consistent set of criteria. Balance among project types, geographic areas, and project sponsors was struck at the programming stage.

The process continued from October 1992 through March 1993 with ample opportunities for public comment before formal CDTC action. During that period, 114 projects were considered. Of these, most were derived from either CDTC's ongoing regional system planning process or from outreach to municipalities. A minority were the traditional infrastructure repair and replacement projects on the state system, project types that had dominated CDTC's TIP for many years.

The screen, score, and program sequence differed from CDTC's traditional PIP used to evaluate candidate projects by segregating screening criteria from scoring criteria. The PIP traditionally included a weighting factor to allow travel time savings derived from addressing a LOS E intersection to be treated as more important than similar travel time savings derived from addressing a LOS D intersection. In contrast, the screening process eliminated all consideration of LOS D intersections. Similarly, infrastructure projects were screened to eliminate consideration of lower-function roads unless they were in poor condition and major arterials unless they were in fair condition.

This shift in process, along with the broad outreach and large amount of funds on the table, led to a thorough revision of the PIP.

REVISED PROJECT INFORMATION PROCEDURE

CDTC staff and TIP working group participants reviewed the existing PIP and made some significant changes to it. The changes were made to fill holes in previous techniques and to fairly articulate the merits of a wide range of project types. A conscious choice was made not to use a 100-point scale, in order to avoid limiting the effect of a single criterion on the estimation of total project merit.

As in the previous PIP, an attempt was made to provide a single "fact sheet" for each project that summarizes both quantitative and nonquantitative criteria.

Differences from the historic PIP include the following:

1. Safety benefits, travel time savings, and energy and user cost savings were generally estimated using CDTC's regional travel simulation model, using a common reference year of 2000.
2. Hydrocarbon emissions reductions and cost-effectiveness of emissions reductions were added as quantitative criteria. These were also calculated using year-specific, link-level emission rates applied to regional travel simulation model results.
3. Congestion relief benefits were added as quantitative criteria but not counted in the quantitative benefits. These were measured in terms of daily excess vehicle hours of delay (XVHD) saved and the cost-effectiveness of such savings. (Excess delay is defined as the amount of time spent at an intersection or highway link above and beyond the maximum allowable time at LOS D.)
4. "Life-cycle cost savings" (a more correct term may have been "extended facility value") served as a primary measure of the benefit of infrastructure projects. The new life-cycle cost savings measurement was also calculated using results from CDTC's regional travel simulation model.
5. Previous qualitative criteria measured on a scale of -2 to +2 were replaced with a comparable list of narrative criteria. The expressed intent of this switch was to recognize that any one of the nonquantifiable criteria might have sufficient importance to warrant inclusion or exclusion of a given project. For example, if elimination of traffic from a residential area were the sole purpose of a project, the narrative treatment would allow full articulation of the argument for the project. Fact sheets were given a flexible format so that the space devoted to different criteria could be adjusted to fit their importance to each project.
6. Narrative criteria included noise reduction, impact on residential traffic, community and ecological disruption, access to the public transportation system, modal integration, provision of alternative modes, system linkage, and economic development. An "other" category was provided to note characteristics of the project not cited elsewhere.

A sample project evaluation fact sheet is shown in Figure 1. Although many of the criteria are derived from the previous PIP, the differences proved significant. Use of narrative criteria in place of qualitative scores successfully allowed nontraditional projects equal consideration as traditional projects. Participants focused on narrative merit for several projects in adding them to the TIP; this would have been less likely under the previous -2 to +2 scale.

TREATMENT OF INFRASTRUCTURE RENEWAL PROJECTS

The most significant technical advancement of the revised evaluation process is the reworking of the treatment of infrastructure projects. The revised approach proved very effective in articulating the inherent value of infrastructure work.

Improvement in the approach came from asking, "Why are infrastructure projects valuable? What are we trying to achieve by reconstructing a bridge, rebuilding a road, or replacing a bus?" If this implicit value could be quantified, it could be fairly compared with the value derived from other projects, such as new transit services or intersection improvements. Literature in this area was hard to find and provided little insight. Intuitively, repairing or replacing a facility or service integral to the regional system is important because of the value of that facility or service to the transportation system. Bridges are not replaced because they are in poor condition; they are replaced because it is important to keep those links open. Buses are not replaced because they are 12 years old; they are replaced because it is important to continue operating a vital transit service.

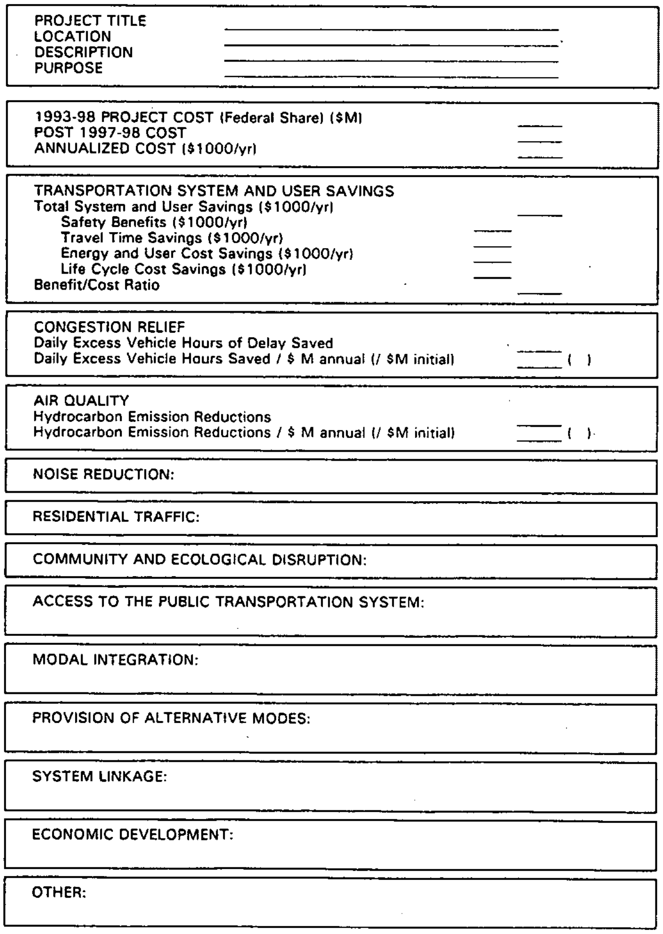
As a result, the life-cycle cost savings (or the extended facility value) of an infrastructure project was defined as

$$\text{Extended facility value} = (\text{total facility value}) \times (\%\ \text{extended life})$$

where

total facility value = safety benefits + travel time savings + energy and user cost savings (from the presence of the facility), and

% extended life = (years of facility life added by project)/(normal facility life)



PROJECT TITLE
LOCATION
DESCRIPTION
PURPOSE

1993-98 PROJECT COST (Federal Share) ($M)
POST 1997-98 COST
ANNUALIZED COST ($1000/yr)

TRANSPORTATION SYSTEM AND USER SAVINGS
Total System and User Savings ($1000/yr)
  Safety Benefits ($1000/yr)
  Travel Time Savings ($1000/yr)
  Energy and User Cost Savings ($1000/yr)
  Life Cycle Cost Savings ($1000/yr)
Benefit/Cost Ratio

CONGESTION RELIEF
Daily Excess Vehicle Hours of Delay Saved
Daily Excess Vehicle Hours Saved / $ M annual (/ $M initial) ( )

AIR QUALITY
Hydrocarbon Emission Reductions
Hydrocarbon Emission Reductions / $ M annual (/ $M initial) ( )

NOISE REDUCTION:

RESIDENTIAL TRAFFIC:

COMMUNITY AND ECOLOGICAL DISRUPTION:

ACCESS TO THE PUBLIC TRANSPORTATION SYSTEM:

MODAL INTEGRATION:

PROVISION OF ALTERNATIVE MODES:

SYSTEM LINKAGE:

ECONOMIC DEVELOPMENT:

OTHER:

FIGURE 1 Sample project evaluation fact sheet.

Safety benefits, travel time savings, and energy and user cost savings attributable to the facility or service are calculated using CDTC's regional travel simulation model. Specific safety improvements are treated separately using accepted NYSDOT accident reduction factors, applied against accident experience at the site. If specific safety calculations are performed, the safety benefits derived from the calculations are used in place of the regional model's estimates of safety benefits.

The model is run once with the facility or service in place, then a second time with the facility or service removed. The difference in regional system measures between the two model runs is assumed to represent the total value of the facility or service.

For bridges, the facility is removed for purposes of running the simulation model by eliminating the bridge link entirely from the highway network. For highways, the facility is considered removed by reducing the travel speed to 8 km/hr (5 mph). This speed effectively eliminates the facility's through function while allowing the simulation model to maintain access to any traffic analysis zone loading links that might be located along the facility.

For transit service, the service is eliminated by restoring passenger travel as vehicular travel to the highways that the transit service is effectively serving. One key transit replacement project evaluated by CDTC for use of federal "highway" funds was the replacement of a private carrier's express buses along I-87. These buses remove approximately 500 vehicles from the peak direction in the peak hour of a facility that is operating at LOS E in the peak hour. The system value of this transit service is significant.

From this perspective, the value of a bridge repair project can be viewed as gaining 10 or 20 more years of safety, travel time, and energy and user cost savings—compared with allowing the bridge to close at the end of its normal life. Normal facility life was defined as the total span of years from construction to the point of closure (for a bridge), closure to all but local access traffic (for highways) or retirement (for transit vehicles), when only ordinary but not extraordinary maintenance is provided.

Normal facility life was estimated for highways using historic pavement deterioration rates derived from the pavement scoring efforts of the NYSDOT and CDTC. The NYSDOT condition ratings are on a pictorial scale of 1 to 10. The break points on the scale are based on engineering judgment (*1*). These annual deterioration rates vary with the type of facility and the starting condition. Thus, it is possible to estimate the number of years required to take a new facility to the point of being considered passable only to local traffic. This span was estimated at approximately 39 to 47 years for non-state, federal-aid highways and 29 to 42 years for state highways, depending on pavement type. State highways have a shorter projected life because of higher deterioration rates attributable to greater traffic volumes, particularly greater volumes of heavy truck traffic. Because the deterioration rates are developed from a data base of highways that excludes only those roads that have received improvements sufficient to increase the pavement score by two points or more, the rates represent natural background deterioration that assumes routine maintenance. (Routine maintenance includes all improvements that do not improve the pavement condition by more than one point, such as pothole filling and crack sealing.)

In practice, the percentage extended life was determined from tables that relate current pavement condition with percentage extended life. All repairs are assumed to restore highways to a condition of 10 and bridges to a 7. A sample table is presented in Table 1.

Similarly, the normal facility life for bridges was related to NYSDOT bridge condition ratings. The condition rating is a single number that is the weighted average of a broad cross section of elements taken from current inspection reports. The 13 element ratings, composing the broad cross section, range from a structurally insignificant curb element to a primary member element, which is perhaps the most structurally significant rating of the entire inspection report. This number is intended to represent an idea of the overall condition of a bridge (*2*). A bridge score of 2.5 on a scale of 1 to 7 was used as the approximate point at which the bridge would be closed to traffic. Bridge data have not been examined as rigorously as have pavement data to determine condition-specific deterioration rates. Table 2 relates percentage extended life to current bridge condition scores.

For transit vehicles, 12 years is the typical minimum age for replacement. Vehicles are certainly functional at higher ages than 12 years, although greater-than-average maintenance and repair can be anticipated. For transit vehicles, a span of 20 years is assumed to represent the normal life, assuming ordinary but not extraordinary maintenance over the 20-year period. Another table (not shown here) was prepared with percentage extended life related to vehicle age.

The total facility value is prorated because extending the life of a facility involves some overlap between the remaining life of the facility without repair and the service life of the improvement. Unless a repair is made at the exact time that the facility is to become nonfunctional (see Figure 2), the overlap means that a portion of the service life of the improvement is redundant with life that remained before the improvement.

At an absurd extreme, assume a bridge is built with a life expectancy of 60 years. Assume that it is rebuilt 1 year later, again with a life expectancy of 60 years. In this case, the rebuilt bridge has added only 1 year's worth of mobility function to the system, not 60 year's worth. In this case, it would be appropriate to reduce the total facility value by a factor of 59/60 in order to fairly estimate the true incremental value of the rebuilding project (see Figure 3).

Real-world projects are not as absurd, but they each involve some degree of inefficiency. Reconstructing a road in "fair" condition may provide a new life span of 40 years for a road that previously had 15 years of function left. In this case, the procedure would credit the project with only 25/40 of the total annual facility value.

APPLICATION

In the 1993–98 TIP development process, CDTC entertained 114 candidate projects for National Highway System, Surface Transportation Program and (CMAQ) funds. All were subjected to the identical screen, score, and program sequence.

Project proposals that were primarily intended to address mobility issues (intersection channelization, signal coordination, new commuter transit services, demand management, highway widenings, arterial management, and expressway management) and those intended to rehabilitate or replace existing infrastructure (bridge rehabilitation or replacement and pavement reconstruction) were evaluated primarily on the basis of cost-effectiveness. Programming decisions "off the top" regarding projects whose benefits are not easily quantified were made first. Projects competing for CMAQ funds, including several transit mobility projects, were evaluated using the method presented here. Funds were sufficient to fund all CMAQ projects. Transit infrastructure projects did not compete against highway infrastructure projects, since the federal money for transit infrastructure projects was sufficient. The remaining projects (including all mobility and infrastructure renewal projects) were considered equally, on the basis of cost-effectiveness. The travel time savings, user cost savings, and accident reduction benefits anticipated from a highway widening, for example, were considered to be equivalent to the travel time, user cost, and safety benefits contained in the life-cycle cost value of infrastructure renewal projects.

Some projects contained a mix of infrastructure repair and mobility improvement. Several highway widenings were linked with replacement of deteriorated bridges, others with reconstruction of poor pavement. Benefits for these projects were defined as the sum of the life-cycle cost value of the renewal of existing facilities and the mobility value of the expanded capacity or other improvements.

The process reserved programming discretion to ensure balance: there was an expressed commitment to producing a balanced program by project type and geographic area and no intention to use the benefit/cost ratios in a deterministic fashion. However, the technical products required very little supplemental effort to produce a balanced program. Mobility and infrastructure projects from various geographic areas were intermingled in the list of projects ordered by descending benefit/cost ratio. After review, the rank order was treated by the TIP participants as intuitively reasonable and understandable and no bias for or against a certain project type was detected.

Important facilities generally produced high benefit/cost values for both mobility and renewal projects except for cases in which the needs were marginal and the improvement costs high. Projects on lower-volume facilities ranked high if costs were proportion-

TABLE 1 Percentage Extended Life By Pavement Type for Non-State Federal-Aid Roads

Condition Rating	Rigid	Overlay	Flexible
1	100	100	100
2	100	100	100
3	93	91	92
4	75	74	75
5	56	58	60
6	37	43	43
7	20	27	27
8	11	15	16
9	6	6	7
10	2	2	2

TABLE 2 Relationship Between Extended Life of a Bridge and Its Rating

Bridge Rating	% Extended Life
7	0
6	22.2
5	44.4
4	66.6
3	88.9
2.5	100.0
2.0	100.0
1.0	100.0

ately low; high-cost repairs or improvements on low-volume roads ranked low on the list, as expected.

As a result, the technical process for comparing infrastructure renewal with mobility improvement projects proved to be very successful. A total of 53 projects (including 3 transit projects) from the 114 candidates were added to the area's 5-year TIP by unanimous consensus of the CDTC board in March 1993. The total project cost for these projects is approximately $230 million: $130 million for project phases over the next 5 years and the rest related to phases to be completed in the following 5 years. Of the 53 projects, 15 were mobility projects (including 3 transit projects), 17 were pavement renewal projects, 6 were bridge renewal projects, 6 were combined mobility and pavement projects, 2 were combined mobility and bridge projects, and 1 was a safety project. The remaining projects included an enhancement project, a planning study, and a truck bypass intended to separate truck traffic from an historic hamlet. (These were projects programmed without primary concern for quantitative benefits.)

INDICATIONS FOR FURTHER DEVELOPMENT

Speed at Which a Road Is Effectively Closed

As presented earlier in this paper, the value of repairing a road is gauged by testing one traffic simulation scenario with the road functioning normally and a second with the road at a functional speed of 8 km/hr (5 mph). The difference between the two scenarios is the effect of keeping the road open. The speed 8 km/hr was chosen to simulate two conditions on the road: effective closure to through traffic and use by local traffic at a speed likely to occur with a badly deteriorated road.

Although using a speed of 8 km/hr in the model will keep through traffic off the road, it may not be the optimum speed for the analysis. For certain facilities, such as an Interstate highway (as well as some other 55-mph roads), even a 25-km/hr (15-mph) free-flow speed might effectively eliminate through traffic. Therefore, it may be possible that using a higher speed in the analysis could effectively represent closure of the road to through traffic without requiring the assumption of unrealistically low local travel speeds. Use of a refined speed estimate would lead to a refined estimate of the mobility function of a facility proposed for repair.

Pavement and Bridge Condition Thresholds

The process assumes that a highway has reached the end of its service life when the pavement condition reaches a 3 on the scale of 1 to 10. A bridge is assumed to reach the end of its service life when the bridge condition reaches 2.5 on a scale of 1 to 7. The percentage extended life is related to these thresholds.

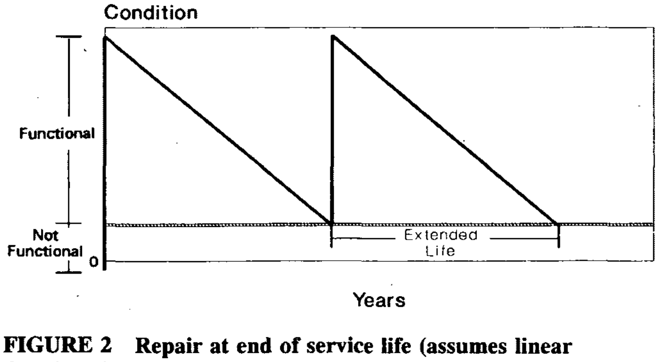


FIGURE 2 Repair at end of service life (assumes linear deterioration).

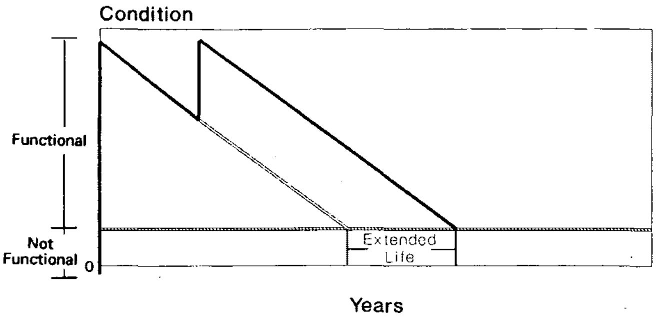


FIGURE 3 Repair early in service life (assumes linear deterioration).

These conditions may reasonably represent thresholds at which further deterioration is not easily predicted. However, they may not truly represent the end of the facility's service life. Many more years may expire between the time a facility reaches the threshold and the time at which the facility is closed or passable only by local traffic.

Further consideration needs to be given to the thresholds selected. Choosing lower thresholds, such as a pavement condition of 1 would greatly increase the theoretical service life of a facility and lower the percent extended life of most improvements, resulting in lower benefit/cost ratios for infrastructure projects. Since deterioration rates are not reliable for roads in such poor condition, it would be difficult to determine the service life of a road below the current threshold.

Difference Between Design Life and Percentage Extended Life

Values for the life of a facility are used both in annualizing the cost of construction and in calculating the benefits of repairing it. In calculating the benefits of repairing a road, the service life is the number of years that it takes to deteriorate from a condition 10 to a condition 3, which could be from 29 to 47 years, depending on the type of road. However, when calculating the annualized cost of the road, the length of the expected life is derived from standard values produced by NYSDOT ranging from 10 to 30 years, depending on the type of repair.

The apparent conflict between design life (for annualizing costs) and service life (for calculating benefits) needs further thought. It would appear desirable to use identical values for the design life of the project and the extended life due to the project. However, the NYSDOT table lists the expected life for more than a dozen different facilities, not just pavement. It would not be desirable to ruin any internal consistency in these numbers; otherwise, the annualized costs of some types of projects might be misrepresented in relation to the others and have an unfair advantage. Possibly the reliability of both sets of numbers warrants examination.

Also, further study is needed to determine if the expected life of a road should be assumed to be the same after a resurfacing as it is after a reconstruction, as they currently are treated in the benefits calculation. Intuitively it would appear that a resurfaced road might deteriorate faster than a reconstructed road, but CDTC has no data to support this.

Calculation of Emissions and XVHD Savings

For projects in which mobility improvements are made, emissions reductions and XVHD savings are calculated relative to conditions in the reference year 2000. They are displayed on the project fact sheet for information purposes but do not contribute to the benefit/cost ratio. In CDTC's 1993–98 TIP process, the contribution of infrastructure renewal projects toward extending the life of facilities' emissions and XVHD benefits was not calculated.

This is a significant item. The absence of emissions and XVHD values of infrastructure renewal projects may not significantly affect programming decisions. However, articulation of these benefits could allow quantitative representation of the importance of infrastructure repair in the region's congestion management program and air quality implementation program. Consideration will be given to articulating these benefits in future applications.

Conflict Between Reference Year and Benefit Year

The analytical process used in CDTC's 1993–98 TIP development used traffic conditions in the reference year 2000 as a base. However, the benefits attributed to an infrastructure repair project are long term, most likely not seen in the reference year. For example, if a road would have lasted another 15 years (in very poor condition) but is repaired now to a life expectancy of 40 years, then the equivalent of 25 years of benefits are attributed to the project, but they represent improved conditions 15 and more years into the future. This indicates that travel time, user cost, accident reduction, emissions benefits, and congestion mitigation (XVHD) benefits attributed to infrastructure renewal projects should be represented relative to traffic volumes and emissions rates that pertain to an appropriate future year rather than the single reference year.

CDTC will investigate the feasibility of such a refinement to the process. The investigation should include consideration of net present value, discount rates, and use of traffic volumes and emissions rates from the first year of benefit. Its incremental contribution to the decision-making process may be negligible and may not justify the additional effort.

Transit Benefits

The question here is this: What are the benefits of replacement of an inner-city bus when the purpose of the bus service is related more to transportation access than it is to congestion relief or travel time savings? CDTC has applied the approach documented in this paper to a transit bus replacement project, yet that particular project related to replacing buses used in express service on a congested expressway. Travel time, user cost, and accident reduction benefits attributable to the service provided a high benefit/cost ratio for that project.

However, much of the urban transit system is not designed with congestion relief as its primary objective. Further investigation is required to articulate that portion of the value of transit service that is related either to provision of transportation to people without access to an automobile or to other purposes. The benefits of transit for these purposes could be economical or social in nature. The value of these benefits must be well articulated before attempting wholesale application of CDTC's approach to comparisons between highway repair and transit bus replacement. Another option would be to include providing transit to the carless as a qualitative benefit.

Treatment of Infrastructure Renewal Projects on Low-Volume Facilities

The procedure used by CDTC effectively ranks projects by importance of the facility and cost of the work. Use of the traffic simulation model provides for greater benefits to be attributed to the reconstruction of a bridge carrying 15,000 vehicles a day than to the reconstruction of a bridge carrying 5,000 vehicles a day. Because the model reflects detour penalties, the procedure also effectively attributes greater benefits to the reconstruction of a bridge carrying 15,000 vehicles a day that has no nearby alternative river crossings than to the reconstruction of a bridge with the same volume that does have nearby alternatives.

However, the procedure will invariably produce a low benefit/cost ratio for expensive reconstruction work on low-volume facilities. In CDTC's 1993–98 TIP process, this did not constitute a major concern for some projects. Lack of priority in the TIP process merely pointed the project sponsor away from federal sources and toward the use of local funds for a more modest project scope.

For other projects, the low priority led to considerable discussion. Particularly for rural highways, the low benefit/cost ratio attributable to major reconstruction and geometric upgrades has led to the consideration of revised design standards for low-volume state and county roads. The benefit/cost calculations have called into question the appropriateness of rural project designs at $1 million/lane-mi for locations with volumes of fewer than 1,500 vehicles a day and limited accident experience. A pilot project on a Rensselaer County highway has been identified by CDTC and NYSDOT to explore new design treatments.

In addition, further thought is required regarding whether infrastructure renewal projects on some low-volume, high-functional-class facilities deserve special consideration. An argument can be made that a rural principal arterial carrying 1,500 vehicles per day should be held to a less-demanding benefit/cost standard than that for an urban minor arterial with 10 times the volume. The argument assumes that there is a qualitative difference between the requirements for facility design and condition of one functional class and another. The current CDTC procedure treats all facilities alike, considering rural and urban travel times as equivalent, rural and urban user costs as equivalent, and rural and urban accident cost reductions as equivalent. Further consideration of this issue is warranted.

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