Transportation System Management in Connecticut: Attitudes and Actions

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ABSTRACT

The status of transportation system management (TSM) in Connecticut is given. The attitudes and actions of 13 regional planning agencies and 9 city traffic agencies are identified as obtained from a questionnaire survey and follow-up interviews conducted from 1983 to 1985. Both types of agencies perceived TSM as mainly traffic engineering, and traffic engineering improvements dominated the list of projects implemented. These agencies took a pragmatic approach to TSM, in which selling improvements is more important than studying them, and they cited examples of application as an important need. A continuing effort to broaden the scope of TSM and to emphasize its coordinative and complementary aspects is also stressed.

Transportation System Management (TSM) is in transition today. Once considered a planning process, it is increasingly viewed as an action program. The focus is on identifying problems and finding suitable solutions. Action rather than study is the goal of many agencies (1).

Much has been written on the process-related aspects of TSM, measures of effectiveness, and methods of evaluation. But relatively little information has been made available in recent years on how specific agencies perceive TSM and, in turn, formulate and implement improvement programs.

In response to this need, Connecticut regional planning agencies (RPAs) and city traffic and transportation departments (CTDs) were queried about their TSM activities. The salient findings are described here. They are based on a questionnaire survey and follow-up interviews conducted from 1983 to 1985 with 13 regional planning agencies and 9 city traffic agencies. The attitudes and actions of these agencies are identified, and how they influence decisions concerning specific project implementation is discussed. The status of TSM in Connecticut's communities as of mid-1985 is summarized.

SURVEY DESIGN AND SCOPE

A questionnaire was distributed to 22 planning and operating agencies to obtain their attitudes, perceptions, and practices regarding the application of TSM throughout the state. Some 14 questionnaires were returned, a 64 percent response rate. The distribution by type of agency and percentage of response are as follows:

	RPAs	CTDs	Total
Questionnaires distributed	13	9	22
Questionnaires returned	9	5	14
Percentage of response	69	56	64

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The completed questionnaires covered the major population and employment centers in Connecticut (see Figure 1). They included responses from city traffic engineers in Hartford, West Hartford, New Haven, Norwalk, and Stamford.

Questionnaire Content

The questionnaire was designed to record the views of local officials about TSM actions, to identify their problems and accomplishments, and to determine their analysis needs. It was structured to permit an evaluation of the TSM programs surveyed (2).

Nine major topics were included:

- Agency's characteristics (Question 1)
- Agency's role in the TSM process (Question 2)
- Agency's perception of TSM (Question 3)
- TSM projects suggested (Question 4)
- Agency's goals related to TSM (Question 5)
- Implemented TSM projects (Questions 6 and 7)
- Unimplemented TSM projects (Question 8)
- Ways to improve TSM planning and implementation in local communities (Question 9)
- Analysis needs (Question 10)

Responsibilities and Roles

The RPAs serve as the metropolitan planning organizations (MPOs). These agencies, by mandate, develop various transportation improvement programs and are involved in coordination of transportation planning and TSM activities. The CTDs, in contrast, are line agencies with direct operating and implementation responsibilities. These responsibilities vary among specific agencies. In Stamford and New Haven they include traffic, parking, and transportation planning for the local transit district.

The responsibilities and roles reported by the 14 agencies that responded are shown in Table 1. Planning is the primary role of all RPAs in the TSM process. Besides planning, five RPAs have funding responsibilities through the transportation improvement plan (TIP) process, three have implementation duties, and two report involvement in the review

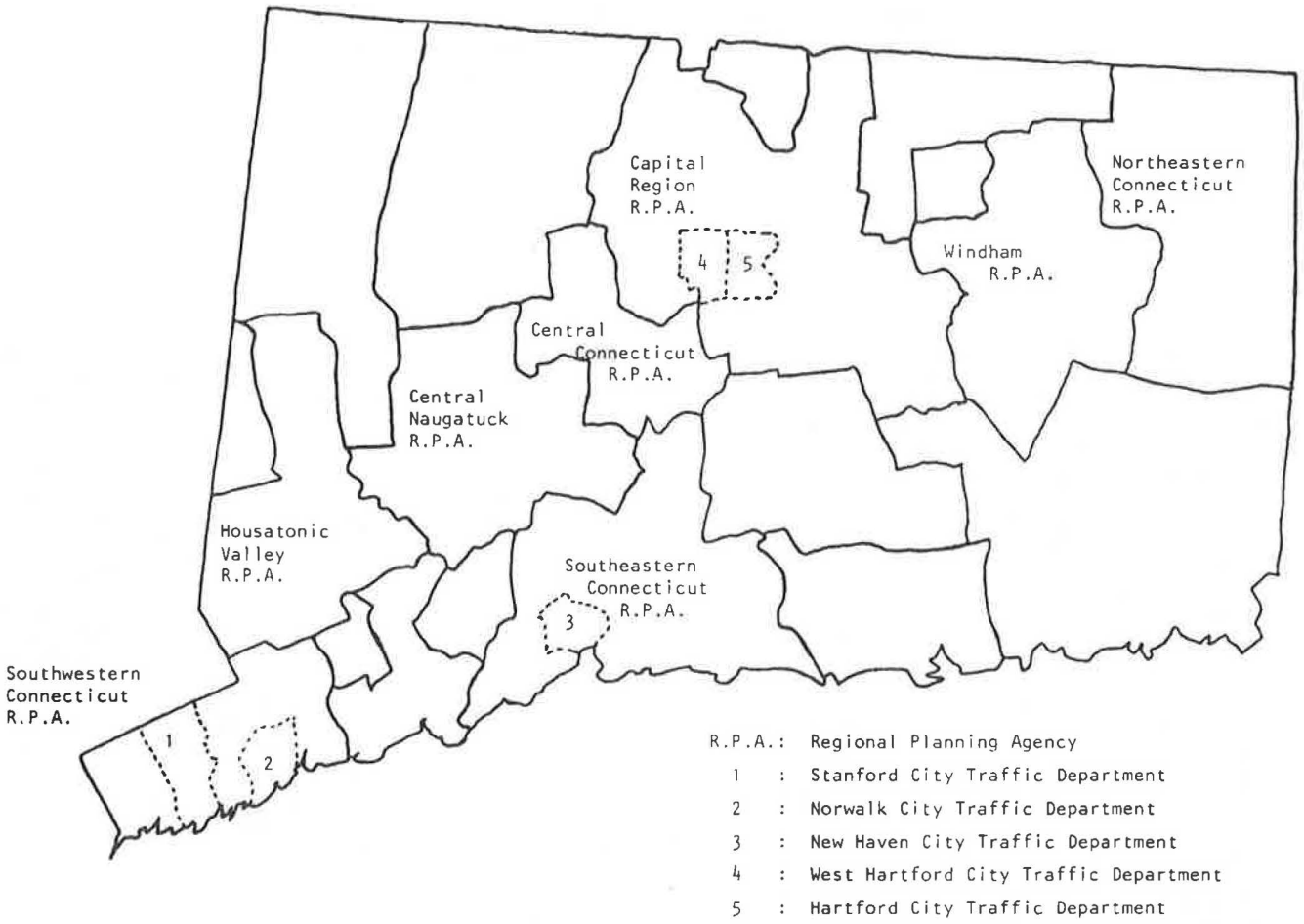

FIGURE 1 RPAs and CTDs surveyed.

TABLE 1 Responsibility and Role of Respondents (Questions 1 and 2)

	RPA Respondent No.									CTD Respondent No.					
Item	1	2	3	4	5	6	7	8	9	1	2	3	4	5	Total
Primary responsibility															
Planning	X	X	X	X	X	X	X	X	X	–	–	–	–	–	9
Operations	–	–	–	–	–	–	–	–	–	X	X	X	X	X	5
Agency's role in TSM															
Planning	X	X	X	X	X	X	X	X	X	X	X	X	X	X	14
Implementation	–	–	–	X	–	X	X	–	–	X	X	X	X	X	8
Review	X	–	–	–	–	X	–	–	–	X	–	X	–	–	4
Funding	X	X	X	–	–	X	X	–	–	X	–	X	–	–	7

Note: Total no. of agencies responding, 14; X = positive response.

process. Other roles reported by specific RPAs were as follows:

- Lobby for funding
- Trigger project implementation through TIP
- Occasional timely political intervention or advocacy

All five CTDs recognized both TSM planning and implementation as their primary roles. Two also reported funding and reviewing responsibilities.

QUESTIONNAIRE ANALYSIS

The 14 survey questionnaires returned were analyzed separately for RPAs and CTDs. Questions involving ranking of preferences (3, 4, 5, 9, and 10) were analyzed in two steps. First, descriptive statistics (means, medians, and frequencies) were computed to identify general patterns pertaining to perceptions, practices, and preferences. Second, statistical tests were used to determine the significant differences among agencies relative to their most important choice. In addition, attitudes and actions of specific agencies were identified.

Perceptions of TSM

Six alternative perceptions of TSM were presented to participants, who were asked to rank them on a scale from 1 to 6, where 1 corresponds to the most important action or perception and 6 to the least important. Table 2 summarizes the median and mean scores of this ranking for RPAs and CTDs.

TABLE 2 Perceptions of TSM: Mean and Median Ranks (Question 3)

Perception	RPAs		CTDs		All Respondents	
	Mean	Median	Mean	Median	Mean	Median
Traffic engineering	1.6	1	1.3	1	1.5	1
Transit improvements	3.3	3	3.0	3	3.2	3
Priority bus or HOV use of streets	5.2	5.5	4.0	3.5	4.7	5.0
Parking	4.2	4.5	3.2	3.0	3.8	4.0
Limiting car use	4.0	4.0	4.5	4.5	4.2	4.5
Coordination of actions	2.4	2.5	3.8	4.0	2.8	3.0

Note: On a scale of 1 to 6, 1 was most important and 6 was least important.

Both groups of respondents perceived traffic engineering as the most important action. RPAs viewed coordination as next in importance followed by transit improvements. CTDs, however, ranked transit improvements and parking measures higher than coordination. High-occupancy-vehicle lanes and car use restraints were considered to be the least important (or least relevant) TSM actions. Activities considered part of TSM but ranked low in importance also included goods movement and incorporating traffic criteria and standards into the local zoning ordinances.

General perceptions of TSM reported by specific agencies were as follows:

- Cost-effective system improvements.
- Best use of existing facilities. Our emphasis is on streets, because of low development density and public interest.
- More efficient use of the transportation system.
- Identification of the most appropriate and lowest-cost solution.
- Mainly traffic engineering--then transit, parking, and coordination.

Projects Selected

Five general types of TSM projects were ranked by survey participants in order of importance: traffic engineering, transit, ridesharing, parking, and work schedule changes. The median and mean scores of this ranking, classified by the type of the agency, are given in Table 3.

Traffic engineering projects predominated among both RPAs and CTDs. This is consistent with the low population and employment densities throughout most parts of the state. Except for downtown Hartford, employment is less than 25,000 in other city centers.

Transit projects were ranked second by both types of agencies and parking projects third.

Project Goals

Six general categories of goals were ranked in order of importance: reduce congestion, improve air quality, conserve energy, expand mobility, reduce operating costs, and encourage development. The ranking was on a scale from 1 to 6 where 1 corresponds to the most important goal and 6 to the least important goal. The median and the mean scores of this ranking are given in Table 4.

The most important project goal of all agencies was to reduce congestion--the underlying rationale for most traffic improvements. The Southwestern Regional Planning Agency, for example, indicated relative to improving Route 7 that "of prime importance was reduced congestion and improved safety."

Expanded mobility was ranked second by both types of agencies. RPAs ranked reduced operating cost third. Goals such as improving air quality, conserving energy, and encouraging land development received the lowest ranking from both RPAs and CTDs.

There was, however, considerable variation in the rankings among agencies. This reflects (a) the site-specific nature of problems and the projects designed to alleviate them, (b) the type of operating environment, and (c) community attitudes and perceptions of need and institutional arrangements.

Implemented Projects

The types of projects actually implemented covered a somewhat narrower spectrum than the projects that were suggested. Once again, traffic engineering improvements dominated. In this sense, they were compatible with the Connecticut urban and suburban environment.

Implemented traffic engineering improvements included

- Routes 58 and 35 intersection improvement, Fairfield;
- Route 7 TSM improvements, Norwalk;
- Widening of Trumbull Street exit from I-91 to provide an additional lane, New Haven;
- Rush-hour parking restrictions along arterial streets, Hartford;
- Bedford summer one-way system, Stamford;
- Traffic signal removal program, New Haven;
- Elimination of exclusive pedestrian phases, Stamford; and
- Traffic signal upgrading, West Hartford.

Parking improvements implemented include

TABLE 3 Types of Projects Suggested: Mean and Median Ranks (Question 4)

Project Type	RPAs		CTDs		All Respondents	
	Mean	Median	Mean	Median	Mean	Median
Traffic engineering	1.4	1	1.0	1	1.3	1
Transit	2.2	2	2.3	2	2.2	2
Parking	2.8	3	2.8	3	2.8	3
Ridesharing	3.0	3	4.0	4	3.2	4
Work schedule changes	4.0	5	5.0	5	4.2	5

Note: On a scale of 1 to 6, 1 was most important and 6 was least important.

TABLE 4 Agency's Goals: Mean and Median Ranks (Question 5)

Goal	RPAs		CTDs		All Respondents	
	Mean	Median	Mean	Median	Mean	Median
Reduce congestion	2.1	1.5	1.5	1.0	1.9	1.0
Improve air quality	4.3	5.0	4.3	4.0	4.3	5.0
Conserve energy	4.1	4.0	3.7	4.0	4.2	4.0
Expand mobility	2.7	2.5	1.7	2.0	2.3	2.0
Reduce operating costs	2.9	3.0	4.0	4.0	2.9	4.0
Encourage development	4.0	4.0	4.7	6.0	4.2	4.0

Note: On a scale of 1 to 6, 1 was most important and 6 was least important.

- 2,400-space Air Rights garage, New Haven;
- Union Station Transportation Center and garage, New Haven;
- 4,000-space town center garage, Stamford;
- Transportation center and garage, Stamford;
- Parking meter revenue security control system, Norwalk; and
- Route 135-15 park-and-ride lot, Stamford.

Transit improvements implemented include

- Transit marketing program, central Connecticut;
- Ridesharing brokerage, northwest Connecticut;
- Regional transit system, Windham;
- Regional ridesharing program, south central Connecticut; and
- Bus shelter programs, Hartford and West Hartford.

It is significant to note that the city traffic engineers in New Haven and Stamford viewed major road and garage construction as TSM. This contrasts with the established concept of TSM that calls for making use of existing facilities rather than building new ones.

The Route 7 TSM projects in Norwalk, according to the RPA, were implemented to correct the "intolerable conditions experienced by the general public along a corridor, and the concern of public officials and private corporations. All demanded that something be done. Support [for improvements] and lobbying led to state action to implement recommendations as well as unified action along the corridor." The problem origin of this action is apparent.

Reported obstacles encountered in implementing projects were

- Communication;
- "Lukewarm" attitude;
- Technical coordination;
- Lack of population density, making it difficult to form vanpools;
- Lack of reliable data;
- Initial town apprehensions on financial liability;
- Red tape; and
- Long design review and approval process.

The agencies did not provide any specific measures of the benefits resulting from the TSM projects implemented. About 40 percent did not judge the resulting benefits, 30 percent cited benefits in general terms only, and 15 percent gave a relative ranking of benefits (e.g., Project A had more benefits than Project B). Only 15 percent identified specific benefits of their projects.

Projects Not Implemented

Relatively little information was received on projects that were proposed but not implemented. Projects that never became a reality generally did not reflect public perceptions of problems or need, receive necessary support of merchants or transit operators, or obtain needed funding. Examples of such projects were

- A regional bicycle plan in central Connecticut (funding not obtained),
- A bus marketing program in the central Naugatuck Valley (bus company not interested), and
- One-way street system in Willimantic (opposed by merchants).

Ways To Improve TSM

Most agencies believed that the TSM process would be improved if better ways of selling and implementing projects were available. Better analysis tools, although desirable, were given the lowest priority by most agencies.

A more detailed ranking of the various ways to improve TSM is summarized in Table 5. RPAs identified a strong need for better interagency cooperation and better funding mechanisms. CTDs desired better examples of successful applications.

Some specific responses were as follows:

- [Obtain] "clear directions from elected officials and administrators to 'do something.'"

TABLE 5 Ways To Improve TSM: Mean and Median Ranks (Question 9b)

Detailed Ranking	RPAs		CTDs		All Respondents	
	Mean	Median	Mean	Median	Mean	Median
Better interagency cooperation	1.9	2.0	3.0	3.0	2.3	2.0
Better funding mechanisms and additional funding	2.2	1.5	3.0	3.0	2.5	2.0
Greater community participation	3.8	3.0	3.3	3.0	3.6	3.0
Better examples of successful applications	3.0	3.0	2.3	1.0	2.8	2.5
Better analysis methods for assessing feasibility and impacts	3.7	4.0	2.3	2.0	3.2	3.0

Note: On a scale of 1 to 6, 1 was most important and 6 was least important.

• [Provide] "attractive easy-to-read summaries for use by political leaders." [There is a need] "to follow through from report to implementation [of] how [best] to deal with Conn. DOT first, then the legislature." Benefit analysis, per se, is not crucial.

• "Bring together parties involved to address a perceived problem. The problem has to be perceived by many to get action. Meetings need to involve public and private officials, then the general public and the press."

• "Consolidation of, or more interchangeability among categorical funding programs."

• "Selling projects is the key."

In sum, agencies were found to be looking for better ways to sell and implement projects. Examples of successful applications elsewhere were viewed as the means by which specific projects might be sold to top officials and the general public.

Primary Analysis Needs

Five "analysis need" items were ranked: examples of application, examples of benefits and costs, case studies of successes and failures elsewhere, "look-up" tables and charts, and improved models. The mean and median scores of the ranking are given in Table 6.

All agencies considered examples of application as the most important tool. Next in order of importance were examples of benefits and costs, for the RPAs, and case studies of successes and failures elsewhere, for the CTDs. Improved models were considered to be the least important analysis need by both planning and operating agencies.

One RPA indicated a need for microcomputer software to facilitate analysis of capacity and signal timing. In general, however, agencies took a pragmatic approach to TSM analysis requirements.

General Remarks

The agency interviews and questionnaires provided important guidelines regarding making TSM a reality. The ingredients needed to accomplish TSM projects, according to one agency, were (a) a problem perceived by many; (b) a call to action by many, including the general public and public officials; (c) development of a plan of action, feasible projects that will provide relief; (d) acceptance of the plan by all parties involved; (e) lobbying support to obtain funding; and (f) pressure on the "implementors" to prevent slippage from the plan of action.

In a related sense, another agency stated that lack of accomplishments reflects (a) absence of clear, continuing, and concerted directions from elected officials and high-level administrators and (b) an inability to define both relevant actors and to jointly gain a consensus and a commitment to followup actions.

Statistical Analysis

A nonparametric test, the Friedman test, was used to determine the statistical significance of the "first choice" ranking for both the RPAs and CTDs. The null hypothesis tested was that there are no significant differences among agencies in their ranking. Where differences are statistically significant (say, at the .05 level), it is clear that agencies agree (or are consistent) in their view of the most important items.

In this test, the responding officials are asked to rank k objects (the alternative TSM choices such as actions, goals, and projects) in order of preference. The objective is to find if the n judges agree with respect to their order of preference and if there are any significant differences among them.

The test statistic Q is computed by the following formula:

$$Q = [12/nk(k + 1)] \ (R_1^2 + R_2^2 + \ldots + R_k^2) \ 3n(k + 1)$$

where

k = number of alternatives included in the question,
n = number of agencies surveyed, and
R = sum of the ranks of the proposed alternatives.

The hypothesis (H_0 that there are no differences among the proposed k alternatives) is rejected if the calculated value of Q exceeds the tabulated value of chi-square (χ^2) with k - 1 degrees of freedom at a chosen significance level. Tables 7 and 8 summarize the results of the Friedman test for the RPAs and CTDs, respectively. The key findings are as follows:

• Both RPAs and CTDs perceive traffic engineering as the most important component of TSM. Similarly, traffic engineering emerges as the most important type of TSM project suggested.

• Both types of agencies perceive examples of application as their primary analysis need.

• Both types of agencies show more variation regarding their improvement goals and the best way to improve TSM. The variabilities reflect, in part, the physical and political environments in which the various agencies operate.

Although the average rankings of the individual items vary between planning and operating departments, the general perceptions of important items appear similar.

TABLE 6 Primary Analysis Needs: Mean and Median Ranks (Question 10)

	RPAs		CTDs		All Respondents	
Primary Analysis Need	Mean	Median	Mean	Median	Mean	Median
Examples of application	2.0	1.5	1.0	1.0	1.7	1.0
Examples of benefits and costs	2.0	2.0	2.7	3.0	2.2	2.0
Case studies of successes and failures elsewhere	3.5	3.0	2.3	2.0	2.8	2.5
"Look-up" tables and charts	3.6	4.0	4.0	4.0	3.1	4.0
Improved models	4.0	5.0	5.0	5.0	3.3	5.0

Note: On a scale of 1 to 5, 1 was most important and 5 was least important.

TABLE 7 Friedman's Test Summary for RPAs Surveyed

Question	Question Title	Q-score	Tabulated $\chi^2_{df,a}$	H_0^a	Most Important Alternative
3	Perceptions of TSM	14.52	$\chi^2_{5,.05} = 11.10$	Rejected	Traffic engineering
4	TSM projects suggested	11.84	$\chi^2_{4,.05} = 9.99$	Rejected	Traffic engineering
5	Agency's goals	6.76	$\chi^2_{5,.05} = 11.10$	Accepted	All statistically equally ranked
9	Ways to improve TSM	7.60	$\chi^2_{4,.05} = 9.49$	Accepted	All statistically equally ranked
10	Primary analysis needs	10.43	$\chi^2_{4,.05} = 9.49$	Rejected	Examples of application

Note: Where Q is greater than the tabulated χ^2-score, the differences are significant and the null hypothesis is rejected; df = degrees of freedom; a = level of significance.

[a]Null hypothesis: There are no significant differences among the proposed alternatives.

TABLE 8 Friedman's Test Summary for CTDs Surveyed

Question	Question Title	Q-score	Tabulated $\chi^2_{df,a}$	H_0^a	Most Important Alternative
3	Perceptions of TSM	10.57	$\chi^2_{5,.10} = 9.24$	Rejected	Traffic engineering
4	TSM projects suggested	37.90	$\chi^2_{4,.05} = 9.49$	Rejected	Traffic engineering
5	Agency's goals	6.14	$\chi^2_{5,.05} = 11.1$	Accepted	All statistically equally ranked
9	Ways to improve TSM	1.87	$\chi^2_{4,.05} = 9.49$	Accepted	All statistically equally ranked
10	Primary analysis needs	11.46	$\chi^2_{4,.05} = 9.49$	Rejected	Examples of application

Note: Where Q is greater than the tabulated χ^2-score, the differences are significant and the null hypothesis is rejected.

[a]Null hypothesis: There are no significant differences among the proposed alternatives.

CONCLUSIONS AND DIRECTIONS

The attitudes and actions of local and regional transportation agencies in Connecticut provide a basis for expanded TSM activities throughout the state, although Connecticut Department of Transportation personnel might have given somewhat differing responses. They also provide guidelines for TSM activities in other urban areas. Key findings and implications follow.

1. RPAs and CTDs perceive TSM mainly as traffic engineering. Some operating agencies do not differentiate between TSM and major new construction.
2. Coordination of complementary actions--a major aspect of TSM--is given relatively little attention, and better "traffic management of land development" is not clearly identified.
3. None of the agencies report an integrated program of TSM actions. "Program packages" of improvements are not indicated. Most projects proposed and implemented were keyed to a specific type of action.
4. Traffic engineering actions are considered the most important type of project, followed by transit and parking improvements. Probably because the state operates the major transit systems and an extensive park-and-ride program, transit route and service changes, carpools, and fringe parking receive comparatively little attention.
5. Projects proposed and implemented reflect the objectives specified by the various agencies. However, specific project goals vary.
6. Projects implemented reflect actual or perceived need. The clearest example is the Route 7 TSM improvement in Norwalk.
7. Benefits of implemented projects are not clearly quantified or assessed. Because of this, cost-effectiveness comparisons of proposals are not possible.
8. Planning and operating agencies have taken a pragmatic approach to TSM. They appear more concerned with selling than studying, with results rather than theory, and with examples of application rather than analytic models. Most agencies clearly indicate that examples of successful applications elsewhere, including benefits and costs, will help them deal with their local officials. This approach is consistent with experiences elsewhere and is a step in the right direction.

These findings suggest a continuing effort to broaden the scope of TSM and to emphasize its coordinative and complementary aspects. Toward these objectives, two actions appear appropriate:

1. A statewide TSM coordinating committee should be established in Connecticut. This committee should meet quarterly to exchange information; improve state, local, and regional coordination; and formulate programs.
2. A fact book on TSM experiences in Connecticut, updated on an annual basis, should be prepared. Such a fact book would provide a logical complement to similar activities on the national level.

These Connecticut-specific guidelines may have transferability to other states. However, in developing statewide TSM program guidance, care must be exercised to reflect the state's size, geography, and urbanization.

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Developing Transport Management Improvements for the Tri-State Region: An Overview

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ABSTRACT

A framework for transportation system management (TSM) in the Tri-State Region of New York City is developed. TSM strategies are classified, it is shown how they relate to various parts of the region, their effectiveness is quantified, and guidelines for emphasizing TSM as an early-action program are suggested. Conditions of applicability are defined for principal types of strategies: each type of improvement is allowed to be used in a reasonable way and a means of screening inappropriate activities is provided. These conditions vary by specified action; employment and population density, dependence on public transport, and many action-specific factors are considered. Measures that involve restraining or reducing motor vehicle use are limited mainly to the Manhattan business district. Measures that involve priorities for buses are applicable in radial corridors within New York City, with selective application in outlying business centers. Ridesharing programs, in contrast, apply best in inner and outer suburbs. Traffic engineering improvements are appropriate throughout the study area. The anticipated effectiveness of selected TSM actions provides a useful planning guide. Although many actions have major impacts over a localized area, making it hard to derive areawide impacts from their application, site-specific impacts can be readily quantified. In TSM emphasis should be placed on immediate action improvements in a multimodal context; TSM should be viewed as an action program rather than a planning process. Improvements should be viewed from a far broader perspective than merely the reduction of VMT, especially when the localized nature of many actions and the conjectural aspects associated with anticipating areawide VMT changes are considered.

Modest growth expectations, limited financial and natural resources, and increased environmental concerns have shifted the focus of regional transportation improvements during the last decade. Transportation system management (TSM) emerged as a means of improving the efficiency of the existing transport system. TSM actions are low-capital operational improvements that emphasize management rather than expansion.

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A planning framework for TSM in the Tri-State Region of New York City is developed. Actions are identified and classified and it is shown how they relate to various parts of the region. Definitions of measures of effectiveness are given and the anticipated effectiveness of various actions in achieving goals such as improved accessibility, greater safety, fuel conservation, and cleaner air is quantified. Finally, general guidelines for developing and assessing TSM programs are set forth.

This paper is based on a study of TSM conducted in the New York State part of the Tri-State New York City metropolitan area in 1980 (1). At the time of the study most TSM activities involved making shop-