

NATIONAL COOPERATIVE
HIGHWAY RESEARCH PROGRAM REPORT

205

**IMPLEMENTING PACKAGES OF
CONGESTION-REDUCING TECHNIQUES
STRATEGIES FOR DEALING WITH
INSTITUTIONAL PROBLEMS OF
COOPERATIVE PROGRAMS**

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**IMPLEMENTING PACKAGES OF
CONGESTION-REDUCING TECHNIQUES
STRATEGIES FOR DEALING WITH
INSTITUTIONAL PROBLEMS OF
COOPERATIVE PROGRAMS**

**R. REMAK and S. ROSENBLOOM
REMAK/ROSENBLOOM**

RESEARCH SPONSORED BY THE AMERICAN
ASSOCIATION OF STATE HIGHWAY AND
TRANSPORTATION OFFICIALS IN COOPERATION
WITH THE FEDERAL HIGHWAY ADMINISTRATION

AREAS OF INTEREST:

ADMINISTRATION
PLANNING
OPERATIONS AND TRAFFIC CONTROL
(HIGHWAY TRANSPORTATION)

**TRANSPORTATION RESEARCH BOARD
NATIONAL RESEARCH COUNCIL
WASHINGTON, D.C. JUNE 1979**

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

Systematic, well-designed research provides the most effective approach to the solution of many problems facing highway administrators and engineers. Often, highway problems are of local interest and can best be studied by highway departments individually or in cooperation with their state universities and others. However, the accelerating growth of highway transportation develops increasingly complex problems of wide interest to highway authorities. These problems are best studied through a coordinated program of cooperative research.

In recognition of these needs, the highway administrators of the American Association of State Highway and Transportation Officials initiated in 1962 an objective national highway research program employing modern scientific techniques. This program is supported on a continuing basis by funds from participating member states of the Association and it receives the full cooperation and support of the Federal Highway Administration, United States Department of Transportation.

The Transportation Research Board of the National Research Council was requested by the Association to administer the research program because of the Board's recognized objectivity and understanding of modern research practices. The Board is uniquely suited for this purpose as: it maintains an extensive committee structure from which authorities on any highway transportation subject may be drawn; it possesses avenues of communications and cooperation with federal, state, and local governmental agencies, universities, and industry; its relationship to its parent organization, the National Academy of Sciences, a private, nonprofit institution, is an insurance of objectivity; it maintains a full-time research correlation staff of specialists in highway transportation matters to bring the findings of research directly to those who are in a position to use them.

The program is developed on the basis of research needs identified by chief administrators of the highway and transportation departments and by committees of AASHTO. Each year, specific areas of research needs to be included in the program are proposed to the Academy and the Board by the American Association of State Highway and Transportation Officials. Research projects to fulfill these needs are defined by the Board, and qualified research agencies are selected from those that have submitted proposals. Administration and surveillance of research contracts are responsibilities of the Academy and its Transportation Research Board.

The needs for highway research are many, and the National Cooperative Highway Research Program can make significant contributions to the solution of highway transportation problems of mutual concern to many responsible groups. The program, however, is intended to complement rather than to substitute for or duplicate other highway research programs.

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The members of the technical committee selected to monitor this project and to review this report were chosen for recognized scholarly competence and with due consideration for the balance of disciplines appropriate to the project. The opinions and conclusions expressed or implied are those of the research agency that performed the research, and, while they have been accepted as appropriate by the technical committee, they are not necessarily those of the Transportation Research Board, the National Research Council, the National Academy of Sciences, or the program sponsors. Each report is reviewed and processed according to procedures established and monitored by the Report Review Committee of the National Academy of Sciences. Distribution of the report is approved by the President of the Academy upon satisfactory completion of the review process.

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FOREWORD

*By Staff
Transportation
Research Board*

Institutional problems have been identified as being the most serious obstacles to implementing programs to reduce traffic congestion, reduce air pollution, and conserve energy. This report, therefore, will be of special interest to transportation professionals and administrators, at all levels of government, who are attempting to implement programs to meet these goals. Institutional barriers to cooperative programs for implementing complex packages of congestion-reducing techniques are identified. Incentives and penalties are suggested to obtain essential participation of existing institutions.

Peak-period traffic congestion continues to be a widespread urban transportation problem despite the availability of technologically feasible solutions. Research reported in *NCHRP Report 169* revealed that the most effective congestion-reducing (C-R) programs were those combining several of these techniques into coordinated implementation packages. These packages, designated by the names of their primary techniques, were (1) Changes in Work Hours, (2) Pricing Techniques, (3) Restriction of Access, (4) Changes in Land Use, (5) Pre-arranged Ride Sharing, (6) Communications Substitutes for Travel, (7) Traffic Engineering, and (8) Transit Treatment. Implementing these C-R packages and similar packages to obtain compliance with the Clean Air Act Amendments of 1977 calls for the cooperation of a number of independent public agencies and private organizations. Barriers to such cooperation are vested interests, inadequate funds, legal and regulatory constraints, and failure to provide an effective organizational structure for joint implementation.

The research agency, Remak/Rosenbloom, documented experiences of 18 cities in carrying out joint-agency transportation projects. In addition, case studies in Jacksonville, Seattle, Houston, and Dallas were conducted. Institutional problems found were grouped into three categories as they relate to (1) individual techniques selected for the package, (2) needs to coordinate activities of independent agencies, and (3) site-related problems. Findings and recommendations in the form of incentives and penalties are presented in tabular form for respective techniques in category 1. For categories 2 and 3, general guidelines are presented. An example application of these results to a metropolitan planning organization is provided.

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ACKNOWLEDGMENTS

The research reported in this document was carried out under NCHRP Project 7-10(2) by Remak/Rosenbloom. Roberta Remak, Consultant, Santa Barbara, Calif., and Sandra Rosenbloom, Assistant Professor, the University of Texas at Austin, were the principal investigators.

Sandra Rosenbloom had the primary responsibility for the Phase I survey of current literature and on-going programs in 18 urban areas. She also undertook the detailed case studies of Dallas and Houston and the analysis of legal and regulatory problems. Roberta Remak had primary responsibility for the Phase II application of these findings to the future implementation of congestion-reducing packages, conclusions, and suggested research. She also carried out the case studies of Jacksonville and Seattle and the analyses of funding availability and organization for cooperative action.

Deep appreciation is extended to the more than 80 local traffic engineers, transportation planners, members of regional and metropolitan planning organizations, local elected officials, staff of federal and state transportation agencies, consultants, and community leaders for their cooperation and openness in discussing institutional problems, and their creative suggestions for strategies to deal with these problems.

IMPLEMENTING PACKAGES OF CONGESTION-REDUCING TECHNIQUES

STRATEGIES FOR DEALING WITH INSTITUTIONAL PROBLEMS OF COOPERATIVE PROGRAMS

SUMMARY

Peak-period traffic congestion continues to be a widespread urban transportation problem in spite of the availability of technologically feasible solutions. Research in NCHRP Project 7-10 revealed that the most effective congestion-reducing (C-R) programs were those combining several of these techniques into coordinated implementation packages. Implementing these C-R packages calls for the cooperation of a number of independent public agencies and private organizations. Barriers to such cooperation are vested interests, inadequate funds, legal and regulatory constraints, and failure to provide an effective organizational structure for joint implementation.

Institutional barriers to obtaining the cooperation of essential participants can be objective, in that they represent practical, external constraints; or subjective, in that they stem from personal interests and attitudes. Objective barriers are legal and regulatory restrictions, insufficient funding, or inadequacies of staff, of equipment, or of personal skill. Subjective barriers include vested interests, institutional rivalries, interpersonal conflicts, fears, and prejudices. Often, what are perceived as external constraints (legal, funding, or resource barriers) may, in fact, be internal ones stemming from conservative attitudes of those within the institution.

The general objective of Project 7-10(2) was to develop strategies for assuring that the congestion-reducing techniques and packages of techniques identified in Project 7-10 are considered rationally in today's institutional framework.

Research was undertaken through a literature search and undocumented experiences of 18 U.S. cities in attempting to carry out cooperative transportation programs. Interviews were conducted with more than 80 representatives of public agencies and private individuals involved in such programs. Four cities—Dallas, Houston, Jacksonville, and Seattle—were selected for intensive analysis by visits to these sites.

The findings of these investigations indicate that institutional problems can best be anticipated by organizers of C-R programs by recognizing that they derive from three sources. Some are inherent in the individual techniques selected. Others result from needs to coordinate activities of several essentially independent institutions. Still others derive from the character of the community in which the program is being carried out.

Source 1: Technique-Related Problems and Strategies

The 17 C-R techniques recommended in NCHRP Project 7-10 can be grouped according to common institutional problems they present and strategies that can be used to overcome them. These groups are: (1) traffic engineering techniques, (2) transit improvement techniques, (3) techniques for restricting automobile use,

(4) techniques for changing land use, and (5) techniques relying on employer initiative.

The major institutional problem in the first group (traffic engineering techniques) is in gaining public acceptance when the measures selected employ new restraints on free access of vehicles to public roadways—reserving lanes for high-occupancy vehicles, controlling entry to freeways, prohibiting through traffic, or limiting streets to one-way use. Opposition from commuter, neighborhood, or business groups can be avoided or counteracted by the following strategies:

- Consult with enforcement agencies about potential driver response and to ensure future cooperation.
- Prepare drivers for changes with on-site distribution of information.
- Include plans for dealing with traffic and access problems in adjacent areas.

Major institutional problems common to the second group (transit improvement techniques) are inconsistencies in federal-funding policies, failure to integrate areawide services, and high labor costs. Federal action is essential to the ultimate solution of the first and last problems.

Local government can assist itself in dealing with rapidly changing directions of federal assistance to community transit by these strategies:

- Establish community goals to guide it in selectively adopting or rejecting different solutions promoted by the availability of federal assistance.
- Resist implementing demonstration services that the community will not be able to support after demonstration assistance is withdrawn. If unavoidable, earmark planning funds to developing alternative operating techniques and sources of funding.
- Seek new sources of funds, and explore innovative methods of subsidizing local transit.

The long and difficult process of integrating local transit throughout the urban area can be encouraged by initiating the integration program with a relatively noncontroversial task, such as joint publication of routes and schedules. This can provide a background for undertaking more difficult cooperative tasks.

High labor costs must be dealt with as a nationwide problem, preferably by negotiating with transit unions for more flexibility of work assignments, so that drivers can do essential maintenance and other tasks during off-peak hours. No local strategies are suggested.

In the third group (techniques for restricting automobile use), the characteristic common to the techniques of road pricing, parking controls, traffic cells, and auto-free zones is that they rely on economic penalties or legal constraints to reduce traffic congestion. Although directed primarily at modifying commuter travel patterns, these penalties and constraints also fall on enforcement agencies, operators of parking facilities, business concerns, and property owners. Strategies for gaining essential cooperation are the following:

- Provide feasible alternatives to automobile commuting—transit, ride-sharing, park-and-ride, or peripheral parking within walking distance—and have operational prior to implementation of automobile restraints.
- Where certain socioeconomic groups are unequally penalized by pricing mechanisms, provide relief through selective distribution of free entry or use permits.

- Where operators of parking facilities must impose new pricing schedules, ease customer relations by media and on-site public announcements that are dictated by a community-sponsored program to reduce congestion.
- Where business and property owners are adversely affected, provide economic incentives through tax exemptions, low-interest improvement loans, and public investment in landscaping, lighting, street furniture, and other improvements. Also, provide information on economic benefits to business and property values experienced elsewhere under similar programs.

Although difficulties of obtaining local authorization for new uses of land have multiplied in recent years, the primary institutional problem in this group (techniques for changing land use) remains in securing the cooperation of the private sector. Changing existing patterns of urban land use so that needs to commute long distances are reduced appears to offer the most effective long-run solution to peak-period congestion. The techniques of new towns, planned neighborhoods, and utilization of zoning and building codes to promote mixed land use, however, rely heavily on the participation of private investors, business firms, and property owners.

At the national level, strategies recommended are the creation of a nationwide land bank and development corporation empowered to hold land until developers are ready to use it and to raise capital to finance long-term development projects. Strategies suggested for local government are:

- Gradually introduce mixed use in residential areas, beginning with those offering employment for current residents; and locate, design, landscape, and provide adequate access roads and parking so that residential values are preserved.
- Prior to large-scale land acquisition and clearance in the central city, select reuses of this land that will support community goals and locate developers who will proceed according to these plans as soon as the land becomes available.
- Where renewal requires replacement or rehabilitation of only some structures, attempt to accomplish this without federal aid by persuading property owners and local lending institutions to cooperate in expectation of increased property values and business activity; use local zoning and building codes to enforce appropriate improvements.

The common characteristic of the techniques (fifth group—techniques relying on employer initiative) of staggered work hours, ridesharing, and substituting communications for travel to work is that they depend on the active participation of employers. The major institutional barrier to their cooperation is that employers stand to benefit far less than the community and may even suffer from initial implementation problems of reduced productivity and needs to invest in project-related equipment and systems.

Strategies for obtaining the widespread cooperation of employers that is essential to achieving successful results are as follows:

- Enlist the sponsorship of prominent business and civic leaders and seek initial participation of employers most likely to cooperate—top management of firms oriented to innovative, highly technical activities whose work force is largely highly skilled and not unionized.
- Develop a promotion program based on up-to-date records of contacts with employers and statistics on program results. Use these to

publicize over-all accomplishments and contributions of individual employers.

- Arrange funding assistance to employers in purchasing vehicles or communications equipment necessary to program implementation; provide tax incentives for participants; and assist executives in identifying potential long-term economic benefits from new operating procedures.
- Form a volunteer pool of local executives from participating institutions to assist new participants with initial administrative problems.
- Promote employee cooperation through general media promotion and special presentations to employee groups.

Source 2: Joint-Implementation Problems and Strategies

Joint implementation generates certain institutional problems independent of the particular techniques involved in the C-R program. Action agencies can be reluctant to undertake unfamiliar tasks of unproven value, especially if they sense loss of independence in complying with the plans of others. Metropolitan planning organizations (MPOs) must integrate local and areawide transportation needs, resolve conflicts in plans of individual agencies, and, at the same time, ensure that federal and state program requirements are met. Special-interest groups can see their concerns threatened by some program action, while other private entities can see unwelcomed government control or disruptions in their primary activities.

These problems can be dealt with best by providing a sound organizational framework within which both public and private institutions feel secure and can make their optimum contributions to the joint effort. Principal strategies are:

- Implement programs through a central authority, organized into functional levels of policy-making, technical guidance, and professional support staff. Avoid jurisdictional or geographical divisions.
- Include in the planning process all institutions whose participation or approval will subsequently be required. Provide for flexibility to permit the addition of new agencies or organizations as their roles become apparent and for reducing intensity of participation when institutions have fulfilled their planning functions.
- Hold meetings only when they can accomplish useful tasks and limit attendance to those essential to the matter. Avoid using the policy level for technical decisions and technical personnel for policy matters. Provide agendas and pertinent data prior to meetings and ensure that the meeting place is quiet, comfortable, and adequately equipped with necessary audiovisual aids in good working order.
- Supplement meetings with a well-organized communications operation and use, instead of meetings where the primary purpose is to exchange information rather than to reach joint decisions. Provide continuity by assigning this function to the support staff, whose responsibilities must include not only distributing information to all appropriate institutions but also acknowledging responses with appropriate action. This system will work only if there is sufficient evidence of feedback to assure participants that their objections or proposals are being considered as well or better than if they had been voiced at a meeting.

Source 3: Site-Related Problems

The important institutional factors determined by the implementation site

are the unofficial power structure, special-interest organizations, and community attitudes. Because these factors will be unique in each community, only broad strategies can be suggested:

- Identify individuals in the unofficial power structure and how their special interests relate to the proposed program. Arrange to meet with them to discuss points of conflict and misunderstanding, and include them in the citizen advisory structure where they can become involved in the success of the program.
- Maintain open communications with special-interest organizations, being ready to modify the original plan by eliminating unnecessary elements of conflict or incorporating useful suggestions. Groups with long-range interests in transportation should be represented in the citizens' advisory committee.
- Community attitudes against restraints on automobile use and increased government involvement in urban transportation can be changed by initiating such action with measures that emphasize incentives rather than penalties to change commuting habits. Modest projects successfully completed can promote public acceptance of subsequent, more radical measures. Avoid surprising commuters with difficulties of initial implementation; it is less damaging to the overall program and the reputation of responsible agencies if the project is modified or abandoned during the planning phase than if it is halted after it is in operation.

Suggested Research

No further research is recommended on institutional barriers to specific C-R measures. However, it is suggested that two studies of broader impact on efforts to improve urban transportation could be undertaken that would result in information of value to local implementation of complex congestion-reducing programs:

1. Increase public awareness of the costs of automobile use, both in true costs to individual drivers and in social and economic costs to the community of providing roads, parking, enforcement and emergency services, loss of more productive use of land, and damage to the environment. The purpose of this research would be to provide local transportation agencies with the data and techniques to relay this information effectively to the community, so that the public could more realistically compare the personal costs of commuting alternatives and evaluate proposed transportation improvement programs.

2. Determine the long-run feasibility of centralizing urban transportation authority. Communities are encouraged by federal and state transportation policies to move toward greater centralization of local transportation authority. Coordination of the activities of formerly independent local transportation agencies is now required to qualify them for funding assistance, and the central role of the MPO in this process has been strengthened. Under a strong central authority, the various interdependent elements of the urban transportation system can be brought into balance and the local transportation improvement program can be implemented more efficiently. However, some transportation professionals believe that the needs of smaller constituencies in the urban area are better served by maintaining the independence of the several local agencies. This study also suggests that strong central authority may be difficult to maintain over the long term because of conflicts of interest between local jurisdictions. The research

proposed is an investigation of the recent histories of regional and metropolitan planning bodies and their transportation programs to determine how local transportation authority can best be structured to provide continuity of effort and a balance between efficiency and responsiveness to individual constituencies.

CHAPTER ONE

INTRODUCTION AND RESEARCH APPROACH

Peak-period traffic congestion continues to be a widespread urban transportation problem in spite of the availability of a number of technologically feasible solutions. Recent research suggests that effective congestion-reducing programs rely on the coordinated implementation of several mutually supportive techniques, but such programs require the cooperation of a number of essentially independent public agencies and private organizations. Barriers to cooperation exist in the form of vested interests, public acceptance, legal and regulatory restrictions, limitations of funds, and failures to properly identify and communicate with the institutions whose participation and support are essential to the program. This report examines the institutional problems inherent in joint congestion-reducing projects and suggests strategies for dealing with these problems.

BACKGROUND

Under the National Cooperative Highway Research Program a study (NCHRP Project 7-10) was recently undertaken to identify and evaluate a wide range of currently available techniques to improve peak-period efficiency of urban transportation systems, with emphasis on those that offered alternatives to capital-intensive solutions. Seventeen congestion-reducing techniques were judged to be both technologically and politically feasible for current application.

However, none appeared to offer more than marginal solutions when applied individually, but it was noted that many of the techniques could be implemented together, with the potential for far greater combined effectiveness than when applied singly. Carrying out several compatible techniques under one coordinated program not only could improve the benefits realized from the most promising techniques, but also could achieve significant results from techniques that individually were only minimally effective.

On the basis of the compatibility of individual techniques and the applicability of combinations of techniques to different types of congestion problems, eight packages were selected as potentially effective programs. Each focused on a central technique or combination of highly interrelated ones to which a number of supportive techniques were added.

The eight packages suggested were:

1. Changes in work hours.
2. Pricing techniques.
3. Restriction of access.
4. Changes in land use.
5. Prearranged ridesharing.
6. Communications substitutes for travel.
7. Traffic engineering.
8. Transit treatment.

Table 1 gives the basic components and supportive techniques included in each package. Although the eight C-R packages were selected as those most generally effective and applicable in a broad range of transportation settings, they do not exhaust the possibilities of other combinations of techniques. Each community presents unique conditions that may be better matched by an alternative grouping of C-R techniques, and it was recommended that local program designers modify the suggested packages to fit their particular communities' needs and resources.

Readers interested in the detailed evaluation of congestion-reducing (C-R) techniques and the packaging approach to designing more effective C-R programs may refer to *NCHRP Report 169*, "Peak-Period Traffic Congestion—Options for Current Programs" (1).

RESEARCH PROBLEM

Local implementation of packages of C-R techniques is impeded by institutional problems resulting from the need to coordinate the efforts of several independent public agencies and, often, private organizations as well. Transportation authority in urban areas is dispersed among city and county public works, traffic and enforcement agencies, transit districts, state highway or transportation departments, and federal transportation administrations. In addition, many of the C-R techniques—such as carpooling and vanpooling, staggering work hours, regulating parking, modifying land uses, and substituting communications for travel to work—cannot be carried out without the cooperation of private investors and employers. Attempts to carry out beneficial, technically feasible congestion-reducing

TABLE 1
COMPONENTS OF RECOMMENDED C-R PACKAGES

| INDIVIDUAL TECHNIQUES | PACKAGES | | | | | | | |
|---------------------------------------|--------------------|--------------------|--------------------|------------------|--------------------------|--------------------------------------|--------------------------------|--------------------|
| | WORK HOURS CHANGES | PRICING TECHNIQUES | RESTRICTING ACCESS | LAND USE CHANGES | PREARRANGED RIDE SHARING | COMMUNICATIONS SUBSTITUTE FOR TRAVEL | TRAFFIC ENGINEERING TECHNIQUES | TRANSIT TREATMENTS |
| Staggered Work Hours | * | + | | | | | + | + |
| Road Pricing | * | * | | + | * | * | | + |
| Parking Controls | * | * | + | + | * | * | + | + |
| Traffic Cells | | | * | + | | | | + |
| Auto-free Zones | | | * | + | | | | + |
| New Towns | | + | | * | | * | + | |
| Planned Neighborhoods | | + | + | * | | | + | |
| Zoning and Building Codes | | + | + | * | + | + | + | + |
| Incentives to Transit Use | * | * | + | + | | | | * |
| Carpooling and Other Ridesharing | | * | | | * | | + | |
| Communications in Lieu of Travel | + | + | | + | | + | | |
| Freeway Surveillance and Control | | | + | | | | * | |
| Maximizing Use of Existing Facilities | | | * | + | | | * | |
| Transit Circulation | + | * | * | + | + | | | * |
| Priority Transit Arterials | + | * | + | | | | | * |
| Priority Transit Expressways | + | * | + | | | | | * |
| Extended Area Transit | * | * | + | + | | | | * |

*Component of the Basic Package
+Supportive Technique

programs also may fail because of such institutional factors as political and legal constraints, funding problems, scheduling difficulties, lack of public acceptance, and the unwillingness of essential contributors to participate in the program.

OBJECTIVES AND SCOPE OF STUDY

The objectives of this study were to identify the important institutional barriers to local implementation of C-R packages and suggest strategies for organizing and promoting the cooperative action essential to the success of a C-R program.

The institutional problems of planning and implementing transportation improvements are subjects of considerable investigation and discussion at this time. It is only within recent years that one has come to recognize not only that the several components of an urban transportation system (roads, transit, parking, bikeways, and pedestrian facilities) are interdependent, but also that transportation resources themselves affect and are affected by local economic and social conditions, land-use patterns, and physical environment, as well as national energy resources. There has been increasing responsibility placed on those who provide local transportation facilities and services to consider not only the internal efficiency of their particular

operations but also their impact on the total transportation system and the community at large. Federal policies and funding programs have for some time promoted cooperative long-range transportation planning at the local level, but have recently, through the Transportation System Management (TSM) program, presented local action agencies with the task of coordinating their implementation programs. The difficulties experienced by communities in establishing workable institutional arrangements for these joint efforts have generated a number of studies.

C-R packages and TSM programs have many similarities, although the objectives of TSM are broader but more short range than those of reducing peak-period traffic congestion through these C-R techniques. Several of the studies of TSM institutional problems were sufficiently complete to be of value to this research, and some duplication of problems and strategies described in the TSM studies could not be avoided. But by focusing on the specific topic of congestion-reducing measures, this report should both avoid repetition of research already accomplished and be of practical value to local transportation agencies and TSM programs.

This research was essentially undertaken between March 1976 and April 1977. Institutional factors affecting the planning and implementation of local congestion-reducing

programs were—and still are—in the process of radical change, largely as a result of new federal policies governing local transportation assistance. Efforts were made to update information up through the preparation of the final report where possible, and some notes have been added describing developments taking place more recently. However, the local programs discussed and the conclusions and recommendations drawn from them are essentially a reflection of the situation existing at the time the major research work was carried out.

RESEARCH APPROACH

Research was accomplished in two phases. Phase I included collection and evaluation of data obtained both from recent published material and from individuals currently involved in or studying local attempts to carry out cooperative congestion-reducing measures. Phase II covered application of observed institutional barriers and potential solutions to the problem of implementing complex C-R packages and developing guidelines to assist local transportation planners and operators in carrying out joint congestion-reducing programs.

Phase I: Data Collection and Evaluation

The research tasks carried out under Phase I were:

1. Review of case histories and other reports in the existing Project 7-10 data collection and search for more recent published material for special reference to institutional problems or barriers to cooperation.
2. Identification of urban areas with recent or current experience in implementing C-R programs involving combinations of techniques or individual techniques with which U.S. cities had limited experience, as well as identification of key federal and state transportation agencies involved and conduct of interviews by phone, mail, or personal visits.
3. Identification of key locations and institutional factors as demonstrated by these experiences with C-R programs as a guide to profitable areas and topics for further investigation.
4. Detailed field investigations of four selected cities: Dallas, Houston, Jacksonville, and Seattle.
5. Analysis of the findings of the research and field investigations to reveal common institutional problems and strategies successfully employed to overcome them.

Review of Published Data

This study was designed to build on the extensive literature search and review undertaken previously in NCHRP Project 7-10. However, the study required a slightly different approach. Project 7-10 was initially envisioned as a state-of-the-art survey. Consequently, analyses were synthesized from economic models of the potential impact of some techniques, such as road pricing and parking controls; from theoretical calculations of the benefits and disbenefits of some techniques, such as communications in lieu of travel; from experiences with some techniques in total foreign contexts, such as variable work hours and auto-free

zones; as well as from data derived from operational experiences with congestion-reduction techniques.

Phase I examined only the last data source: actual U.S. experience with C-R techniques and particularly with combinations of techniques. Experiences in other countries were considered only when they might supplement one's knowledge of areas where U.S. experiences were limited.

Since the packages of C-R techniques were devised during the Project 7-10 study, no attempts to implement them were yet available for observation. Therefore, this research effort focused on actual experiences with the joint implementation of at least two C-R techniques, or at least two different variations of one technique. This approach allowed examination of the increasingly complex institutional arrangements that resulted when individual techniques were jointly implemented.

Seven major types of congestion-reduction combinations were discovered in actual implementation:

1. Work-hours rescheduling (with transit modification).
2. Ridesharing (carpooling programs with areawide matching and with individual employer matching; van-pooling programs with employer-sponsored vans and with private vans).
3. Transit service improvements (with transit incentives).
4. High-occupancy vehicle priority (with transit service improvements and with ramp-metering and traffic controls).
5. Traffic engineering (with channelization and signalization, with one-way pairs and turn prohibitions, with arterial transit priority, and with traffic deterrents and diversions).
6. Congestion and pricing disincentives (road pricing with manual tolls and high-occupancy vehicle priority).
7. Vehicle access restrictions (parking pricing programs, vehicle entry prohibitions, and freight management programs).

Interviews with Cities and Transportation Agencies

The extent of operational experiences of these seven C-R combinations varies. For example, there is only limited U.S. involvement in major vehicle-access restrictions (e.g., auto-free zones) or areawide congestion pricing, but both these concepts have gone through the planning stage in the United States and have come close to being implemented. Transit improvements and priority treatments, on the other hand, have been implemented in many U.S. cities.

An effort was made to identify a limited number of cities or metropolitan areas that were attempting more than one of these C-R combinations or had a history of implementing such combined measures. These included cities recognized as having successful TSM planning efforts and implementing strategies because of the similarity of C-R packages and TSM programs. The intent was to contact those cities which had a perspective on the institutional aspects of implementing C-R combinations because of their current experience or previous history with such techniques.

Cities or metropolitan areas with unique organizational structures or particularly noteworthy regional planning organizations which also had a history of involvement with

C-R combinations were identified. These cities were of special interest to the study team, because they provided an opportunity to analyze the impact of different structural variables on the implementation of joint programs.

Also of special interest were cities with notable or successful experiences with major federal transportation programs, such as the Urban Corridor Demonstration jointly funded by UMTA and the FHWA to test the combined implementation of highway engineering and transit operations technology, the FHWA Ridesharing Demonstrations; and major transit improvement projects sponsored by UMTA's Service and Methods Demonstration program.

Eighteen cities were tentatively identified for detailed study in Phase I, based on the selection criteria previously discussed. Table 2 summarizes the experiences and features of interest within each city. Each of these 18 cities was contacted by phone or mail during Phase I. In cities studied under Project 7-10 or whose programs were well reported in published sources, there was need only to obtain information on the most recent developments; in other cities, more effort was required to obtain the essential information.

In general, all informants were asked to identify and comment on, where appropriate, the following:

1. The range of institutions and agencies involved in the implementation of a C-R combination or technique.
2. The role or actual set of activities undertaken by each institution involved with the C-R combination.
3. The relationship between and among key agencies and institutions in the implementation of the C-R combination.
4. The factors that acted to create support and cooperation among the key agencies and institutions.
5. The factors that acted to create conflict and opposition among the key agencies and institutions.
6. The reason for support or opposition from other groups or institutions in the community.
7. The deliberate strategies used by program organizers to promote implementation; the success or failure of those strategies.

Federal and state officials who were involved or close observers of local attempts to implement C-R combinations were contacted for further insights into the critical institutional factors operating in such situations. (Informants were not equally able to answer all of the questions listed,

TABLE 2
EXPERIENCES AND EVALUATION OF 18 PHASE I CITIES

| Cities | Notable Experiences With: | | | Other Notable or Publicized C-R Attempts or Implementation | Unique or Innovative Governmental Structure | Strong Regional Planning Program | Innovative Reputation; Good TSM Reputation | Evaluation of Mixture of C-R Experience and Institutional Factors |
|------------------|---------------------------------------|---|---|--|---|----------------------------------|--|---|
| | Urban Corridor Demonstration Projects | FHWA Ridesharing Demonstration Projects | UMTA Service and Methods Demonstration Projects | | | | | |
| Baltimore | | X | | | | | | Low |
| Berkeley | | | | *Traffic Eng. | | | X | Low |
| Boston | | | | *Vehicle Access Restrictions Ridesharing | | | X | Moderate |
| Dallas | X | X | X | *Traffic Eng. High Occupancy Priority | | | | High |
| Houston | | X | X | *High Occupancy Priority | | | X | High |
| Jacksonville | | | X | | X | | X | High |
| Los Angeles | | X | X | *High Occupancy Priority *Congestion Pricing | | | | Moderate |
| Madison | | | | | X | | | Moderate |
| Miami | | | | *High Occupancy Priority | X | | | Low |
| Minneapolis | X | | | *Ridesharing | X | X | X | High |
| New York | X | | | *Work Hours Rescheduling Vehicle Access Restrictions | | X | | Moderate |
| Philadelphia | X | | X | *Work Hours Rescheduling | | X | | Moderate |
| Portland | | X | | *High Occupancy Priority | | | X | Moderate |
| San Francisco | | | X | *High Occupancy Priority Vehicle Access Restrictions | X | | | Moderate |
| Santa Barbara | | | | *Traffic Eng. | | X | X | Moderate |
| Seattle | | X | X | *Transit Service Improvements *High Occupancy Priority | | X | X | High |
| Tucson | | | | *Vehicle Access Restrictions | | | | Low |
| Washington, D.C. | X | | X | *Work Hours Rescheduling *High Occupancy Priority | X | | | Moderate |

and many asked to be assured of anonymity before discussing their observations and opinions openly. Since a partial list of contacts might serve only to point up omissions in particular cities or agencies, and to avoid anonymous comments being attributed erroneously to informants named, a policy of referencing only published material has been adopted.)

Investigation of Selected Sites and Institutional Problems

On the basis of data from published reports and information and opinions obtained from interviews, the study team selected four cities for intensive field investigation and three problem areas for special attention.

Cities were selected on the basis of the following criteria: (1) significant experiences with implementing C-R techniques or combinations of techniques, preferably offering examples of innovative solutions to institutional problems; (2) local informants willing to meet with the study team and openly discuss those experiences; (3) sufficient published data and evaluation reports that could be made available to the study team; and (4) locations not currently or recently the focus of intensive research in this subject area.

Four locations were selected that met these criteria: Dallas, Houston, Jacksonville, and Seattle. Visits of several days were made to each of these study sites, and interviews were carried out with representatives of city and county traffic, transit and transportation planning authorities, regional planning bodies, state highway and DOT agencies, regional offices of the U.S. Department of Transportation, and selected nontransportation agencies and private institutions (such as local chambers of commerce and redevelopment authorities). Documents obtained covered long-range regional transportation plans, TSM and TIP documents, organization charts and membership rosters of cooperative regional transportation bodies, maps, area statistics, and public information literature. These visits also made possible first-hand observations of local institutional relationships and their impact on transportation actions. Case histories of these cities' experiences in cooperative transportation efforts were written and are included in Appendix C of this report.

Finally, a selection was made of three institutional problem areas that appeared to be the most common and critical factors in the success or failure of C-R programs: (1) the organizational framework for joint implementation; (2) funding the full range of essential activities; and (3) legal and regulatory restrictions on innovative action. These findings are detailed in Chapter Two.

Phase II—Application of Findings to C-R Package Implementation

Since the C-R packages identified by the NCHRP Project 7-10 study team were not yet implemented within a community, it was necessary to extrapolate the findings of the Phase I investigation into the context of full-scale C-R programs. An analysis of these findings indicated that institutional problems are derived from three aspects of C-R implementation: (1) the particular congestion-reducing techniques employed, (2) the need to coordinate

activities of several institutions, and (3) the unique characteristics of the site of the implementation attempt.

The task was to draw on observations of local experience with the less complex transportation improvement programs to anticipate the institutional problems that would probably arise in attempts to implement a C-R package. Three broad questions were posed that formed the framework for the Phase II work:

1. What institutional problems were associated with each of the 17 apparently feasible C-R techniques, and what were possible solutions?
2. What institutional problems were inherent in coordinating the activities of independent agencies and organizations within a joint program, and what were possible solutions?
3. What institutional problems were the result of community characteristics and conditions existing at specific sites, and could broadly useful strategies be suggested for dealing with them?

Emphasis was placed on devising strategies for reducing or eliminating barriers to participation or approval. First the individual techniques were examined as sources of institutional problems. Some common denominators of agency responsibility, sources of funding, and need for external approval and cooperation became apparent, which permitted a more efficient analysis. The results of this analysis, discussed in Chapter Three, make use of this characteristic to discuss the C-R techniques under five groupings, in which common problems and strategies are treated initially and those unique to the separate techniques in individual subsections.

The second analysis pointed up institutional barriers to cooperative action inherent in any type of joint program undertaken by essentially independent agencies and organizations. Strategies for overcoming these barriers were discovered to lie in establishing a workable organizational structure, a proper identification of affected institutions, and a good communications system. These strategies are also discussed in Chapter Three.

The question of site-specific institutional problems was the most difficult to treat because these are related to personalities in the local political structure, community attitudes, and unique combinations of degree of congestion problems and transportation resources available. This section in Chapter Three presents some general observations and a few specific strategies that might be employed directly under certain circumstances or, more probably, suggest to the reader others that might deal successfully with a unique local problem.

To pull together the findings on the institutional factors potentially involved in a complex C-R program, a hypothetical case-history of the implementation of a package of congestion-reducing techniques was drawn up, and set into the real background of one of the study sites: Seattle. The congestion problems, the transportation resources, the institutional framework, and the community attitudes are those observed during the field investigation. The C-R package selected and the implementation problems and solutions are hypothetical. The scenario presented at the

end of Chapter Three traces the case history from the initial package selection by one agency, the response of other institutions, the revision of the implementation plan, the attempts to gain essential support and cooperation, and the attempts to overcome legal and funding problems to the final accomplishment of a successful program.

The final task of the research was to draw over-all conclusions from the information obtained in Phase I and subsequent analysis and application in Phase II and to recommend further action. This material is presented in Chapter Four.

CHAPTER TWO

FINDINGS

In recent years several communities have experimented with programs calling for the cooperation of public agencies and private organizations in carrying out combinations of congestion-reducing (C-R) techniques. Although none of these experiments involved so many individual techniques as called for in the more complex congestion-reducing packages suggested in the Project 7-10 report, they do provide insights into the institutional problems of joint implementation. Often they provide, as well, suggestions for strategies that can be employed to gain the participation or approval of institutions whose cooperation is essential to such programs.

This chapter describes the institutional problems met and solutions sought in experiments with cooperative transportation programs in 18 U.S. cities. Initially, it presents some generalized propositions about aggregate institutional behavior. Next, it considers three institutional factors found to be critical in determining the success or failure of C-R programs: legal and regulatory restrictions, funding availability, and organization for cooperative action. Finally, it examines in detail the various incentives and disincentives that influence institutional cooperation in specific communities' attempts to implement joint transportation programs. This information is supplemented by in-depth studies of the institutional structures and experiences in cooperative programs in four selected cities—Dallas, Houston, Jacksonville, and Seattle. Complete case histories of these four cities, from which the data presented in this chapter were drawn, can be found in Appendix C.

INSTITUTIONS AND ROLES

Informants in the Phase I city survey identified a number of public and private institutions participating in the implementation of C-R techniques and combinations. However, merely identifying participating institutions is insufficient; the same agency could be found strongly supporting, strongly resisting, or having no position toward different C-R combinations within the same city. For example, city traffic departments might support traffic engineering techniques, oppose transit priority treatments,

and have no opinion about work-hours rescheduling; these were the actual positions of the Los Angeles City Traffic Department. Moreover, the set of activities required of each participating agency or institution varies from one C-R combination to another, and from one city or institutional setting to another. In Philadelphia, the Southeastern Pennsylvania Transportation Authority (SEPTA), the major transit system, was directly responsible for transit improvements funded by the Urban Corridor program; however, SEPTA only had an advisory role to the Delaware Valley Regional Planning Commission, which has direct responsibility for implementing the staggered work-hours program funded by the same demonstration program. In Dallas, the ridesharing program was the responsibility of the city traffic department; in Los Angeles, an independent nonprofit corporation was set up to handle that set of responsibilities.

It was not only insufficient to merely identify institutions involved in implementing C-R techniques or combinations, but it was also necessary to identify a bundle or grouping of institutional activities or roles that were required in the successful implementation of C-R combinations. Once such roles were identified it was possible (1) to identify the institutions that filled those roles in the actual implementation of various C-R combinations and (2) to analyze the impact of the involvement of different institutions in those roles on the actual initiation of various C-R combinations.

The Phase I informants indicated a significant amount of conformity in the type of activities or roles involved in attempting C-R strategy. Eight sets of activities or roles were found to be essential to the successful implementation of most of the C-R components, although some C-R combinations required fewer activities. Two types of activities or roles were found to arise in all C-R components directly as a result of the actual make-up of the C-R combination.

The two C-R combination specific roles are operational activities and management of operational activities. The first role consists of the activities directly related to the functioning of the C-R combination, such as running

a ridesharing matching program or operating a new express bus service. The second role consists of management or administrative duties relating to the operation of C-R combinations, such as monitoring and evaluating the impact of the ridesharing project or programming modifications for the express bus service. In some C-R combinations, such as transit service improvements, the same institution usually fills both roles. In other C-R combinations, such as work-hours rescheduling, different agencies fill these two C-R combination-specific roles.

Six additional sets of activities or roles were found to occur during the actual implementation of C-R combinations in a particular context. The six implementation-specific roles were:

1. Initiation and promotion of the actual project (rather than just the concept).
2. Funding project start-up costs.
3. Funding project continuation costs (if any).
4. Regulation and licensing of project activity, personnel, clients, or riders.
5. Formal approval of the project (apart from the approval process implied in other roles).
6. Enforcement of operational characteristics and rider or client eligibility.

Not all C-R combinations reflected all six sets of activities during their implementation. Transit service improvement combinations generally did not require any enforcement activities. Work-hour rescheduling combinations did not generally require either formal approval or enforcement activities.

Table 3 gives the key institutions and agencies identified by Phase I informants, showing the roles or activities each were generally found to pursue in the implementation of various C-R combinations. It should be noted that this table represents a synthesis of empirical data and not a compilation of all possible permutations. It is probably technically possible for all institutions to fill all roles in all C-R combinations in some specified context. Table 3 gives only the *actual* experiences of the 18 Phase I city informants and the federal and state officials contacted. It should not be implied from this table that all institutions found filling one or more of the eight essential roles were either enthusiastic or competent in the performance of these sets of activities. It should also be noted that there were cities where institutions filling essential roles did so unwillingly or under duress. Such an attitude, of course, has great bearing on how successful any given C-R combination will be.

In addition to the key institutions or agencies directly involved in the implementation of a C-R combination, other community or neighborhood associations or special-interest groups often took an active role during the implementation of some C-R combinations in some cities. The institutions that often either supported or opposed a C-R combination in a given city are given in Table 4.

The impact on the implementation of a C-R combination of the involvement of the institutions given in Table 4 varied substantially. The activity and involvement of these institutions in the community are only significant if they have or are perceived to have influence on the key

institutions involved in the eight essential implementation roles; these other institutions only have impact if they could or would influence key institutions. This usually depended on how important these other institutions were perceived to be by the key implementation agencies. For example, the Miami I-95 transit priority treatment created protests from businesses all along the route, but Dade County decided to implement the treatment anyway. In Seattle, however, when a neighborhood group protested some traffic signalization projects that were just about to be implemented, the city abandoned the project. In Los Angeles, CALTRANS weathered an even larger and fiercer protest from business and neighborhood groups, as well as from local elected leaders, and went ahead with the implementation of the Diamond Lane transit priority treatment. However, these protesters were successful in getting a federal court to say that no institution had filled one of the eight essential roles—*formal approval* of an Environmental Impact Statement (EIS) was required.

It is clear that identifying the institutions and agencies involved in a C-R combination is only the beginning of an analysis of the factors that influence its successful implementation. It is also crucial to identify:

1. The factors that induce an institution filling one or more of the eight essential roles to do so willingly and competently.
2. The factors that create support or opposition among other groups and institutions in the community.
3. The reasons why, and the conditions under which, other community institutions can and do influence the performance of one or more of the eight essential roles by key institutions.

The following discussion presents a number of generalized propositions about aggregate institutional behavior and the legal, funding, and organizational problems that more commonly act as barriers to implementation of jointly sponsored transportation programs. Then, each C-R combination is examined individually and together with the particular set of incentives and disincentives applicable to it. Both perspectives are designed to be useful to planners and policy-makers seeking to implement either one particular C-R combination (such as one of the recommended packages) or other joint institutional programs.

INSTITUTIONAL BEHAVIOR IN IMPLEMENTING JOINT PROJECTS

An examination and evaluation of the experiences of the 18 Phase I cities, and discussions with informants in those cities, generated a number of generalized observations about institutional behavior in implementing joint projects. These observations are discussed in the following.

Some of the observations were offered by respondents active in project implementation; others were derived from evaluations of their operational experiences. The derived observations were discussed with experienced respondents to gauge their validity.

Motivation to Participate

These generalized rules about institutional behavior are

TABLE 3
INSTITUTIONS COMMONLY FILLING ESSENTIAL IMPLEMENTATION ROLES

| | Work Hours Rescheduling with Transit Modifications | | | | Ridesharing | | | | Transit Service Improvements With Incentives | | | | High Occupancy Priority | | | | Traffic Engineering | | | | Congestion Pricing | | | | Vehicle Access Restrictions | | | |
|--|--|------------|------------|-------------|-------------|------------|------------|-------------|--|------------|------------|-------------|-------------------------|------------|------------|-------------|---------------------|------------|------------|-------------|--------------------|------------|------------|-------------|-----------------------------|------------|------------|-------------|
| | Initiation | Management | Operations | Enforcement | Initiation | Management | Operations | Enforcement | Initiation | Management | Operations | Enforcement | Initiation | Management | Operations | Enforcement | Initiation | Management | Operations | Enforcement | Initiation | Management | Operations | Enforcement | Initiation | Management | Operations | Enforcement |
| <u>City</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Planning Department | X | - | - | - | X | X | X | - | X | - | - | - | X | - | - | - | X | - | - | - | X | X | X | - | X | X | - | - |
| Traffic/Trans. Department | - | - | - | - | - | X | X | - | X | - | - | - | X | X | X | - | X | X | X | - | X | X | X | - | - | X | X | - |
| Police Department | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | X | - | - | - | X | - | - | - | X | - | - | - | X |
| Public Utilities Commission | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| <u>County</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Planning Department | X | - | - | - | X | X | X | - | X | X | X | - | X | X | X | - | X | X | X | - | X | X | X | - | X | X | - | - |
| Traffic/Road Department | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | X | X | - | - |
| <u>State</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Highway/Trans. Department | - | - | - | - | - | - | - | - | - | - | - | - | X | X | X | - | X | - | - | - | X | X | X | - | - | - | - | - |
| Public Utilities Commission | - | - | - | - | - | - | - | X | - | - | - | X | - | - | - | X | - | - | - | - | - | - | - | X | - | - | - | X |
| Highway Patrol/Police | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| <u>Transit Operator(s)</u> | X | - | X | - | - | - | - | - | - | X | X | - | - | X | X | - | - | X | X | - | X | X | X | - | - | - | X | - |
| <u>Council of Governments</u> or <u>Regional Planning Body</u> | - | - | - | - | - | - | - | - | - | - | - | - | X | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| <u>Independent Unit Estab.</u> | - | X | - | - | - | X | X | X | - | - | - | - | - | - | - | - | X | X | X | X | X | X | X | X | - | - | - | X |
| <u>FHWA</u> | - | - | - | - | X | - | - | - | - | - | - | - | X | - | - | - | X | - | - | - | X | - | - | - | X | - | - | - |
| <u>UMTA</u> | X | - | - | - | X | - | - | - | X | - | - | - | X | - | - | - | X | - | - | - | X | - | - | - | - | - | - | - |
| <u>EPA</u> | X | - | - | - | X | - | - | - | X | - | - | - | X | - | - | - | X | - | - | - | X | - | - | - | - | - | - | - |
| <u>FEA</u> | - | - | - | - | X | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| <u>Private Firms</u> | - | X | X | - | X | X | X | - | - | X | X | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

| | Start-up Costs | | | | Continuation Costs | | | | Regulation & Licensing | | | | Formal Approval | | | |
|--|----------------|--------------------|------------------------|-----------------|--------------------|--------------------|------------------------|-----------------|------------------------|--------------------|------------------------|-----------------|-----------------|--------------------|------------------------|-----------------|
| | Start-up Costs | Continuation Costs | Regulation & Licensing | Formal Approval | Start-up Costs | Continuation Costs | Regulation & Licensing | Formal Approval | Start-up Costs | Continuation Costs | Regulation & Licensing | Formal Approval | Start-up Costs | Continuation Costs | Regulation & Licensing | Formal Approval |
| <u>City</u> | | | | | | | | | | | | | | | | |
| Planning Department | X | X | - | - | X | X | - | - | - | - | - | - | - | - | - | - |
| Traffic/Trans. Department | - | - | - | - | - | X | - | - | - | - | - | - | - | - | - | - |
| Public Utilities Commission | - | - | - | - | - | - | X | - | - | - | - | - | - | - | - | - |
| Police Department | - | - | - | - | - | - | - | X | - | - | - | - | - | - | - | - |
| <u>County</u> | | | | | | | | | | | | | | | | |
| Planning Department | X | X | - | - | - | - | - | - | - | X | - | - | - | - | - | - |
| Traffic/Road Department | - | - | - | - | - | - | - | - | X | X | - | - | - | - | - | - |
| <u>State</u> | | | | | | | | | | | | | | | | |
| Highway/Trans. Department | - | - | - | - | X | X | - | - | X | X | - | - | X | X | - | - |
| Public Utilities Commission | - | - | - | - | - | - | - | - | X | X | - | - | X | X | - | - |
| Highway Patrol/Police | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| <u>Transit Operator(s)</u> | X | X | - | - | - | - | - | - | X | X | - | - | X | X | - | - |
| <u>Council of Governments</u> or <u>Regional Planning Body</u> | - | - | - | - | - | - | - | X | - | - | - | X | - | - | - | - |
| <u>Independent Unit Estab.</u> | X | - | - | - | - | - | X | - | - | - | - | - | X | - | - | - |
| <u>FHWA</u> | X | X | - | - | X | X | - | - | - | - | - | - | X | - | - | - |
| <u>UMTA</u> | X | X | - | - | X | X | - | - | X | X | - | - | X | - | - | - |
| <u>EPA</u> | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| <u>FEA</u> | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| <u>Private Firms</u> | X | X | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

meant to suggest appropriate incentives and disincentives for those transportation professionals attempting to develop strategy to ease the implementation of joint C-R or similar techniques.

Participation in the C-R combination must be seen as a legitimate function for institutional involvement regard-

less of the benefits expected or the seriousness of the problem addressed. It is essential to the implementation of a C-R combination that the proposed project be viewed by each institution as supportive of its own interests and in line with its mandates. Most of the Phase I C-R experiences illustrate that agencies that assumed that other institutions

TABLE 4

COMMUNITY INSTITUTIONS TAKING AN ACTIVE ROLE IN THE IMPLEMENTATION OF C-R COMBINATIONS

| C-R Combination | Potential Support | Potential Opposition |
|---|--|--|
| <u>WORK HOURS RESCHEDULING</u> | Civil and Political Leaders Good Government Groups Press and Media Labor Unions | Labor Unions Employees |
| <u>RIDESHARING</u> All Combinations | Civic and Political Leaders Good Government Groups Press and Media Labor Unions Transit Operator(s) | Transit Operator(s) Labor Unions Charter Bus and Limousine Operators |
| <u>TRANSIT SERVICE IMPROVEMENTS</u> | Civic and Political Leaders Senior Citizen, Handicapped and Minority Organized Groups Conservation and Environmental Groups Good Government Groups | Abutting Neighborhood Associations Taxpayers Groups |
| <u>HIGH OCCUPANCY VEHICLE PRIORITY</u> All Combinations | Conservation and Environmental Groups Civic and Political Leaders Transit Unions | Abutting Neighborhood Associations Abutting Business and Commercial Establishments |
| <u>TRAFFIC ENGINEERING</u> All Combinations | Good Government Groups Abutting Business and Commercial Establishments | Abutting Neighborhood Associations Abutting Business and Commercial Establishments |
| <u>CONGESTION PRICING</u> Road Pricing with Manual Tolls | Conservation and Environmental Groups | Lower Income Groups Social Equity Groups Auto Driver Associations Downtown Business and Commercial Establishments |
| Road Pricing with High Occupancy Vehicle Priority | Conservation and Environmental Groups Professional Planning Groups | Auto Driver Associations Press and Media Civic and Political Leaders Abutting Residential Neighborhoods |
| <u>VEHICLE ACCESS RESTRICTIONS</u> Freight Management Programs | Labor Unions Downtown Business and Commercial Establishments | Labor Unions Trucking Associations Downtown Business and Commercial Establishments |
| All Other Combinations | Civic and Political Leaders Downtown or Abutting Business and Commercial Establishments Chamber of Commerce | Downtown or Abutting Business and Commercial Establishments Abutting Residential Neighborhoods |

would share their view of a C-R combination had a very difficult time implementing that project. Many lead agencies assumed that other institutions would be willing and able to change their traditional procedures and traditional approaches to a problem simply because the C-R combination was reasonable or a "good idea." Planning agencies assumed that transit operators would be willing to incur increased costs to increase ridership; but many properties were not willing to do so because their traditional objective was to reduce costs, not increase service.

Ridesharing programs assumed employers would be willing to actively participate in carpooling programs because they were public spirited or wished to aid their employees; many firms were not willing to participate because their participation might cost them money without increasing their profits. Some planning agencies assumed that local traffic departments would be willing to implement priority restrictions on arterials on highways; this was often not the case because the traffic engineers were concerned with improving passenger and vehicle flows and not with making transit more attractive. Highway departments and city traffic departments may hesitate to become involved in transit priority treatments because such involvement has not been statutorily permitted in the past and their performance standards have always involved improving the speed of *auto* traffic flows.

Even if involvement in a C-R combination is seen as having realizable benefits at little cost, institutions may be unwilling to participate if they do not see their involvement as appropriate institutional behavior. Local police in two cities near Miami, who were paid directly for their enforcement of the I-95 transit and carpool priority treatment there, withdrew from the project after a year because they felt their primary mission was not traffic enforcement. Arterial priority lanes in Los Angeles, Chicago, and Oakland, and parking restrictions in Boston and Portland, have been jeopardized because of the unwillingness of the local police to involve themselves in enforcement activities which they do not highly regard. In Los Angeles, the highway patrol chose to give back the small amount of money it was paid to be involved in the planning of the Diamond Lane, because they did not value traffic enforcement. Experiences with each of the seven C-R combinations tell the same story; institutions will only be willing to expand resources of time and money if they benefit directly from their involvement in a project and they view such involvement in a project as an appropriate activity for their agency or firm.

As a corollary, it is possible to induce the participation of unwilling firms or institutions by legal mandate (e.g., the EPA control plans or the Oregon State or Los Angeles Air Pollution Control District requirements) or by threats

(e.g., to reduce operating subsidies or limit parking), but these techniques tend to be counterproductive in the long run and sometimes in the short run. Even when certain institutions eventually participate, their reluctant involvement may affect the C-R operations themselves. In addition, it still requires a significant amount of staff time to meet with and monitor the performance of the reluctant agencies.

Lead agencies that are forced to induce participation—through sanctions, threats, and control plans—expend significant political and administrative resources that are as finite as natural resources. In any case, such method of inducing participation is far from efficient and often creates even deeper and more lasting opposition to involvement in a C-R component. In general, respondents found that if a sanction is used to induce either public or institutional participation, it should always be accompanied by a benefit. Experiences with transit priority projects in Los Angeles and Miami suggest that the benefit—here an increased level of transit service for the public—should begin significantly before the sanction is implemented. That approach was used on Miami's Orange Streak priority treatment with positive impact; it was not used on the Diamond Lane in Los Angeles.

It cannot be overemphasized that the C-R combination must represent a practical solution to a serious problem actually perceived by the institution. The C-R combination must offer a high probability of significant realizable benefits to the institution, without at the same time offering the potential of any substantial risk. The C-R combination must offer some realizable benefits actually sought by the institution regardless of how minor the cost.

Perhaps one of the most pervasive public opinions is that people and institutions will change the undesirable aspects of their behavior if the negative impacts on society are brought to their attention. Many C-R combinations were initiated in this belief; early carpooling projects and work-hours programs are good examples. The record shows a number of problems with that approach to implementing C-R combinations, and an overwhelming number of respondents have abandoned it for more realistic approaches to behavior modification.

The foregoing observations reflect the finding that all institutions must perceive real benefits to themselves to be derived from participation in a C-R combination without incurring significant risks. This is as true of public governmental agencies as it is of private profit-making firms. The U.C. Berkeley Institute of Transportation Studies research on TSM planning concluded that TSM-type activities have been successfully implemented where they were the solution to a unique problem; successful implementation more often reflected an *ad hoc* response to local problems and pressures rather than to a pursuit of societal goals.

A significant corollary finding is that institutions are not interested in participation in C-R components with no direct benefits, even if there is no cost to them. For example, in transit priority treatments, the transit operator must perceive that the greater speed and/or operating efficiency sought is a real benefit, an assumption routinely made by highway departments and planning agencies. Unfortu-

nately, this is often far from true. In Dallas, the proposed city system of transit traffic signal preemption first claimed greater transit operating speeds as the major benefit. After the transit system (DTS) pointed out that if significant travel time savings were realized all schedules would have to be revised and extra buses put on, the city revised its calculation of benefits. The city now claims that the programs will allow the buses to keep their existing schedules by decreasing time lost to congestion; the transit system claims that the buses are not off-schedule now and the project will require buses to simply sit at stops for several minutes. As the case study described, DTS will eventually participate because other benefits to participation exist—increased city subsidy of the transit deficit, for one.

Carpooling and work-hour rescheduling projects have also routinely made naive assumptions about the conditions that would induce institutional participation. In Philadelphia's work-hour rescheduling program, the regional planning agency assumed that one of the local transit operators, SEPTA, would be glad to change its peak-period operating characteristics to make significant employee shifts possible. SEPTA claims that the changes cost them a great deal without generating enough new ridership to cover these costs. In Ottawa, however, where the transit operator sought the work-hours changes to meet its peaking problem, implementation went far more smoothly. The fact that both programs were implemented should not obscure the fact that Philadelphia's lead agency has had to spend significant political and financial resources to ensure SEPTA's cooperation.

Ridesharing programs that simply attempt to inform the public of the costs of driving alone have generally been recognized as ineffective, as are programs that attempt to convince employers of the service they will provide society by instituting pooling programs. The 3M Company, often heralded for its pioneer vanpooling effort, had already budgeted 3 million dollars for new parking garages, had terrible congestion near its facility, and had difficulty in retaining employees because of the location of the plant.

Communications Between Institutional Participants

The actual participation of any institution in an essential role in a C-R combination should never be assumed; it is more sensible to assume that in the absence of efforts to induce participation an institution will *not* actually participate. There is little relationship between institutional agreement on the merits of a C-R combination in principle and actual institutional participation in an essential role.

It was common in many C-R projects to assume that institutions would be willing to participate in the project simply because they did not indicate they would not do so. However, because ideas like energy conservation and environmental improvement are so agreed upon in theory, many institutions were unwilling to publicly express disapproval or lack of interest. In many ridesharing and alternative work-hours programs, firms contacted indicated approval of the concept and support for the project; this approval, even if sincere, did not turn into active and meaningful participation. Many institutions were sincere in their feeling that the C-R project was a good idea, but this feeling simply did not commit them to any active involvement.

The assumption that firms or institutions would participate in a beneficial program was often rooted in a belief in the efficacy of media promotions and public relations campaigns as educational devices. However, the literature of social psychology is replete with examples of induced attitudinal changes that are not accompanied by behavioral changes.

It is essential in the implementation of a C-R combination that one agency or institution act as "lead agency" with the responsibility for overseeing all institutional roles and providing continuity in communications, knowledge, and technical assistance.

It is essential that one person, or a very few, be designated as the lead person(s) within a participating institution to maintain internal and external communications and provide a continuity of technical assistance.

It is essential that the lead agency or lead person involved in implementing a C-R combination know and understand all relevant laws, regulations, requirements, and policies, and provide technical assistance in these areas to other participating institutions.

These observations address the most significant and most common implementation problem—that of securing and maintaining the involvement of required institutions which are only marginally interested in a C-R combination and will reduce their effort or drop out if given the opportunity to do so.

Almost all respondents in a wide range of C-R combinations saw the single most important institutional factor as the existence of an obvious central institution with the responsibility for pushing the C-R project along. This view reflected the difficulty of coordinating operational details between agencies not overwhelmingly committed to the C-R project or those that did not view the project as a primary concern of their institutional mandate.

Not only should such an agency provide leadership and constant prodding, but it should also take full responsibility for learning the technical, legal, and economic details involved in implementing the C-R component and then actively disseminating relevant information to relevant institutions involved in the process. Joint highway/transit projects in Miami, Dallas, and Los Angeles, almost all carpooling and vanpooling programs, and UMTA's auto-restricted zone projects in Boston and Tucson all showed the significance of the presence or absence of such a lead agency.

A corollary of the original observation is that within a given agency, a certain person should be clearly identified as having the responsibility for that institution's involvement in the C-R program. In carpooling projects it was important to have an individual clearly identified as carpool coordinator so that employees knew where to seek information and the external lead agency knew whom to contact for progress reports and to push the project further.

The existence of both stable lead institutions and stable lead personnel within institutions can do more than provide technical information and leadership; the continuing presence of committed individuals and organizations may create an expectation that difficulties will be overcome in time. Several respondents reported that the successful implementation of the Shirley Highway bus priority treatment

was due in large measure to only two people, who quietly but continuously pushed the project forward. One person in the Knoxville Transit Authority is generally given the credit for overcoming institutional barriers to subscription bus service and private vanpooling. Even if these particular assessments are highly simplistic, they reflect the belief that continual intelligent pressure from within an institution can overcome significant institutional barriers.

Lastly, all three of these observations assume that information collection is a costly activity for which most institutions do not have the time or money even if they have the inclination. Since the absence of needed information may impede C-R combination implementation, it is necessary that one agency and one person within an agency take the responsibility for collecting and disseminating relevant data, because most other institutions will not do so on their own.

The difficulty of coordinating essential institutional roles in the implementation of a C-R combination and the amount of time required to do so appears to increase in direct proportion to the number of institutions involved in those roles and not necessarily with the scope of the work, the cost of the project, or the levels of government involved.

The Berkeley study concluded that TSM-type strategies that are "exceptional" (that is, different from the ordinary business of an institution) require the commitment of a large amount of staff time to interagency liaison. The amount of staff time required to secure the participation of needed institutions not only was initially substantial but also had to be maintained at fairly high levels. This is entirely consistent with the views of this study's respondents.

Most reported that continuous contact and communication with all institutional participants were required to even maintain a tenuous hold on participants in a C-R combination. Incentives to inaction are high and many project personnel found themselves constantly having to re-argue their cases. When institutional personnel changed, the lead agency often lost all the gains it had made over months or even years.

Respondents reported that it was impossible to be sure that an institution was firmly committed to participation in a C-R combination until the project was actually underway, and then there was no way to assure either continued participation by that institution or the lack of opposition by institutions that had not protested previously. In some C-R projects this was because the start of the project brought the first realization to a number of institutions of what commitment to participation actually meant. Agreements on park-and-ride facilities throughout the United States have experienced eleventh hour reversals as shopping centers, theater owners, etc., and have suddenly decided that the risk and costs exceeded any monetary benefits or service to the public. Part of the New York-New Jersey Urban Corridor Demonstration was the development of a new park-and-ride facility in northern New Jersey; the final report of that project details the nine separate contracts with lot owners that failed at the last moment, two sites after signs were painted and brochures printed—the facility has never been inaugurated.

The Houston contraflow projects illustrate how important continuing contact between all institutions is in maintaining the momentum of a project. Many respondents noted how easy it was for a suggested project or action to simply get "lost," not because there was opposition but because there was no pressure on the institution to keep the process flowing. Any activity or action that required new decisions was likely to be put "under study" in the hopes that no decision would have to be made. One respondent's view that controversial or innovative projects would collapse on their own is astute; without constant attention to the organizational details that surface constantly during the attempt to implement a joint project, the project might well stagnate in a procedural holding pattern until forgotten.

The difficulty of achieving the successful implementation of a C-R combination will increase as the number of institutions increases, largely because the amount of staff time required to bind them all together increases almost exponentially. Any agency attempting a major C-R project is well advised to budget substantial amounts of time for establishing and maintaining primary communications networks.

Support for C-R Implementation

All levels of an institution must perceive serious concern and support for involvement in the C-R component on the part of top management and/or top level bureaucracy. All participating institutions must perceive serious interest and concern for the implementation of a C-R component on the part of both the lead agency and a significant number of the other institutions participating in essential roles.

This set of propositions follows directly from the previous observations and addresses the same institutional barriers. Strong support at high institutional levels can overcome indifference and inertia. Respondents reported that actual participation by required institutions often depended on the perceived strength of support for the C-R combination either internal or external to the organization. In carpooling projects, employees and the carpool coordinators themselves often based their behavioral commitment on their perception of management support of the program. In Boston's MASSPOOL program, a small number of firms actually discharged employees acting as carpool coordinators when business decreased; it is no accident that even prior to the "lay-offs," these firms did not have good carpooling records. In Los Angeles, the support given by the Director of CALTRANS to the Diamond Lane high-occupancy priority treatment kept lower bureaucratic levels from giving in to demands to end the project. Reluctant public transit operators were induced to participate in priority and other service changes in Dallas, Miami, Seattle, and Knoxville by the knowledge that the suggested changes were strongly sought by higher levels of management and elected officials. It should be pointed out that the perception of support must be based on solid evidence; carpool programs report little impact from after-dinner speeches and mimeographed letters from the president of the company.

The Berkeley TSM study concluded that mayoral and local legislative leadership has been extremely significant in getting multiple institutions to coordinate in TSM-type activities. Strong support from the Mayor of Houston was obviously important in achieving institutional cooperation in the Houston region. The breakdown of the Seattle regional council of governments as a strong leader in the area has created a vacuum in which little institutional cooperation has been forthcoming.

Opposition to C-R Implementation

Initial lack of protest to the implementation of a C-R combination does not guarantee that serious opposition will not arise later once the project has begun.

Institutions with the potential for opposition should be identified and brought into the C-R planning process as early as possible; compromise alternatives should be considered to meet their objections. When it is not possible to overcome the opposition of some institutional participants, efforts should be made to offset their impact on the institutions filling essential roles.

Attendees at the 1975 TSM Conference in Minneapolis (10) reported that localized public protests often surfaced at the last moment, significantly affecting the implementation of a planned C-R component. In Seattle, a series of traffic channelization techniques has been halted because of neighborhood association protest over a type of signing approved only a year previously at a public hearing in the neighborhood. In Dallas, a park-and-ride facility has been delayed for over four years because when the city actually went to break ground on the parking lot, neighborhood groups protested, even though there had been no prior protest.

Sometimes protests do not surface earlier because it is not the concept itself that is in doubt but its application. Traffic engineering techniques and transit improvements are a common example; rarely are people or community groups opposed to the idea, and so they do not attend public hearings or express public opposition. Once their street is rechannelized or a bus rerouted in front of their house, the tangible impact of the plan they approved in principle becomes apparent and they can mount impressive campaigns in opposition.

In the past some planners have recognized this phenomenon and attempted to deal with it by reducing even further the visibility of a plan that might generate localized opposition. This strategy was designed to prevent opposing institutions from having sufficient time to marshal their resources.

Currently, respondents consider it best to bring as many potential institutions into the planning and implementation process as possible; protests may not be avoided, but they will be brought to a head far earlier and this would allow alternative courses of action to be developed. Seattle is using this approach in planning traffic engineering projects, while the MBTA in Boston is using this type of process to plan and implement transit service changes.

Lead institutions are beginning to believe that it is better to deal with opposition in the initial stages of a C-R project rather than just as implementation begins. "Early warn-

ing" serves another purpose; should a lead agency determine that opposition is unfounded, the agency can attempt to prove that to the institutions filling essential roles. In Miami, business groups along I-95 protested the high-occupancy priority treatment planned there. The Dade County Transportation Department commissioned the Miami Chamber of Commerce to take a survey of affected businesses and the Chamber found no evidence of business loss. The transportation professionals were able to present these findings to the county-elected officials who then discounted the business groups' protest.

SPECIAL PROBLEMS

Legal and Regulatory Issues

Each of the C-R combinations has experienced some legal and regulatory problems; in general, these issues are related to aspects of the individual techniques that compose the combinations and not their joint implementation. Legal and regulatory problems may vary from state to state and even from one region of the state to another as regulatory structures and state and municipal statutes vary. The ownership and structure of the transit service can also have significant impact on the regulations facing the implementation of C-R combinations.

There are some conditions and restrictions that appear to apply to all seven of the C-R combinations if they utilize federal money: the mandate of the National Environmental Protection Act of 1969 (NEPA), which requires an Environmental Impact Statement for most projects, prohibitions against discrimination on the basis of race, creed, ethnic background, sex, or handicap; and the mandate of the National Rehabilitation Act of 1973, which requires all public facilities to be equally accessible to all citizens, including the mentally and physically handicapped.

In addition most, although not all, C-R combinations receiving federal assistance must be subject to the A-95 regional review and comment process and must be a result of or consistent with the region's comprehensive transportation planning process. UMTA and FHWA regulations further require public hearings for most projects and the involvement of the elderly and handicapped in most planning efforts.

It should be noted that in addition to actual legal or regulatory constraints, institutions implementing C-R combinations often face organized interest or affected business or commercial interests that feel they have been or will be adversely affected by the implementation of a C-R combination or individual C-R technique. These protests often create political problems, of course, for the institutions involved with the C-R combination, but they are not in themselves legal problems, unless the disaffected group or groups go to court. This is a contingency that is very real, but difficult to predict. As previous sections have detailed, the possibility of adverse legal or regulatory reaction may create more disincentives to the implementation of C-R combination than the actual existence of such prohibitive sanctions.

The regulatory and legal problems commonly found to arise in each of the C-R combinations investigated is dis-

cussed in the following. This discussion cannot be comprehensive, because it is not an inventory of all relevant laws in all relevant jurisdictions throughout the United States. Rather, the purpose of this analysis is to highlight the kinds of issues that created problems during the implementation of various techniques or combinations and to alert engineering professionals and transportation planners to the possibility that the same issues may pose problems in their communities. Where possible, reference will be made to studies that have cataloged or inventoried regulatory or legal problems with a particular C-R technique or combination in a number of cities or jurisdictions.

Work-Hours Rescheduling with Transit Modification

Work-hours modifications may pose the least number of legal or regulatory problems of all of the C-R combinations studied. Difficulties can arise if participating institutions are required to maintain a minimum level of service or particular hours of service (e.g., the Post Office). Difficulties can also arise if union or employee contracts call for specified work hours at either a particular work site or on the transit system. However, none of the work-hours projects studied has actually experienced these problems.

The major legal obstacle to flexi-time or floating hours work changes appears to be the Fair Labor Standards Act of 1936, which defines overtime for most classes of workers paid hourly as those hours worked over 8 hours per day or 40 hours per week. States and municipalities often have laws patterned after the federal statute. Employers are understandably worried about adopting a flexible hours system which would allow an employee to work over 8 hours on any given day (in order to make an overall 40-hour week), but which might require the employer to pay overtime wages for all work in excess of the daily statutory maximum of 8 hours. (Transit operators who are subject to provisions of the FLS Act have grappled with this problem for decades.)

Attempts are now underway to change the provisions of the federal act to allow for alternative work schedules. Should the federal act be amended, however, localities interested in flexible hour schemes would still have to consider any remaining state and local legislation.

Ridesharing

Many aspects of ridesharing have faced and continue to face significant legal and regulatory problems (2). The most common problems confronting carpooling programs are insurance restrictions and state or local prohibitions against payment-in-cash instead of payment in kind (i.e., sharing driving) for carpool memberships. Both sets of restrictions effectively limit or prevent the formation of carpools with any nondrivers as members or situations where a private individual might provide transportation for one or more passengers in order to make a profit. Although most auto insurance companies have been relatively flexible in extending coverage to all passengers in a car when all riders share driving duties, many companies have been far less accommodating when the driver takes

money, whether the individual makes a profit or not. Drivers concerned about losing their car insurance or paying higher premiums are likely to be dissuaded from engaging in such practices. The auto insurance industry itself has this issue under study.

In many states accepting payment for "carriage" in a private car is forbidden or is subject to regulation by the municipal or state public utilities commission, or in some cases, is subject to regulation by the regional transit authority. Although it is obvious that many people must be engaging in these practices in violation of (and perhaps in ignorance of) these regulations, they do act as a barrier to the expansion of carpooling programs.

Vanpooling programs also face a host of insurance and regulatory problems. Vanpooling as a mode has been held in many states to be subject to both public utilities commission regulation and constrained by any local or regional franchise rights granted to the transit operator. Although California and several other states have passed legislation making small vanpool operations exempt from public utilities requirements, most states continue to prohibit profit-making vanpooling. Just as significantly, most states and municipalities have been unwilling to allow any kind of vanpooling operations to even marginally compete with existing transit operations (3).

Where vanpools are required to operate under public utilities commission regulations, they are often forbidden to expand service or, just as importantly, to cease service without specific PUC approval. Fear of being unable to stop an unprofitable operation is often as big a disincentive to individuals and firms as the initial fear of getting involved.

The extent of insurance coverage and state workmen's compensation laws also affects the willingness of private employers to involve themselves in sponsoring vanpools for their employees. In some states, workmen's compensation laws effectively limit an employer's liability for accidents not caused by the employer's gross negligence.

In the absence of such limits on their liability, many employers are worried about both high insurance premiums and high potential court settlements if a vanpool of employees is involved in an accident. A third-party limited liability corporation has been suggested as the answer to this problem; Los Angeles Commuter Computer is a non-profit corporation with significant support from large employers but whose liabilities will be limited to the value of the vans it owns.

Certain large employers, most notably certain agencies of the Federal Government, are statutorily forbidden to own vehicles that transport employees to work (Sec. 638, U.S. Code). Certain states have the same restrictions.

There is also some confusion over the requirements of the Fair Labor Standards Act. The U.S. Department of Labor recently ruled that the act does not require that employees driving commuter vans must be compensated for driving time.

Another legal problem with vanpooling is on the financing side; even though the Federal Aid Highway Act of 1973 (as supported by the Federal Aid Highway Act of 1976) clearly makes vanpooling a legitimate item on which to expend highway funds, many states are unclear whether

those funds can actually be used to buy vans. At least one U.S. Senator feels that all federal funds used to buy vans must be repaid; other sources are not as clear on this point. Independent of federal law, some state laws and even state constitutions forbid the expenditure of public monies for the purchase of vehicles or equipment that will be given to nonpublic institutions. For example, Texas and Louisiana kept title to vehicles purchased under Section 16(b)2 of the UMTA Act and Section 147 of the 1973 Highway Act because of such state restrictions. Not all states that forbid these expenditures, however, will be willing or able to keep the title to the vans. Even if the states are able to keep the title, that fact alone will usually cause significant increases in vehicle insurance.

Transit Service Improvements with Incentives

Most transit improvement combinations attempted in the United States have not faced major legal or regulatory problems. Perhaps the most significant problems facing all transit improvement projects are the labor protection clause, 13 C, of the Urban Mass Transportation Act of 1964 (as amended) and Section 16 of the act (and the UMTA regulations pursuant to that section) regarding accessibility for the elderly and handicapped.

The 13 C labor protection clause has been held to mean that, once a transit property utilizing UMTA funds has initiated a service with new employees, it may not terminate those employees or any others if the service is not continued. Some union agreements also prevent transit management from significantly altering the existing work schedules of current employees in order to provide a new transit service. These labor issues are very real concerns facing transit properties when they consider implementing express bus, downtown circulation, park-and-ride, or subscription bus services.

The issue of providing mobility and accessibility to the elderly and handicapped can also pose problems for a transit property considering a new service. Section 16 and the UMTA elderly and handicapped regulations are providing the basis for a number of lawsuits against transit properties attempting to purchase new vehicles, build park-and-ride facilities, or construct other types of terminal facilities that might not be fully accessible to these groups. Both the lawsuits themselves and any property's decision to purchase buses with accessibility features, such as wheelchair lifts, may significantly delay the implementation of a transit combination.

High-Occupancy Priority

The transit elements of this C-R combination face the same legal and regulatory problems previously discussed under "Transit Service Improvements"; they will not be repeated here. The major differences between the problems encountered by these combinations have to do with the preemption of auto lanes for exclusive bus and carpool use.

The Highway Act of 1973 made it clear that federally aided highways could have lanes or ramps that gave priority to buses and carpools; cities must still have federal approval if they wish to do so. Arterial priority treatments

were not always eligible for federal assistance even when the street or highway in question was itself eligible. This was changed by the Federal Aid Highway Act of 1968, which established the TOPICS program.

TOPICS projects as part of a discrete funding program were abolished by the 1973 Federal Aid Highway Act, but that act authorized the expenditure of urban systems funds for TOPICS-type projects, provided they were included in the region's transportation improvement program (TIP).

Priority treatments on most arterials and signalization priority schemes are generally subject to state and local regulations. However, many cities have been active in creating arterial transit priority treatments, and there have not been significant legal or regulatory bars to these activities. The potential inclusion of carpools in these lanes is not expected to create additional legal difficulties. If the priority treatment removes an existing parking lane, it is possible that affected businesses along the route will feel that they have been adversely affected.

Traffic Engineering

The majority of traffic engineering techniques have a long operations history and usually do not require any legal or regulatory changes. Originally, a federal statutory change was required to allow federal highway funds to be spent on such improvements; the 1968 legislation creating the TOPICS program authorized such expenditures under specified conditions. Most states and localities, however, have traditionally allowed expenditures for traffic engineering improvements.

In addition to the federal funding question, areas considering traffic improvements, such as ramp-metering and surveillance systems on federally aided highway and freeway systems, must have the approval of the Federal Highway Administration (FHWA). Many more such improvements are now eligible under urban systems funding than under the former TOPICS program.

Traffic engineering techniques that create one-way street pairs, or remove a lane of parking, or remove the prohibition on right turns on red lights may create significant opposition from merchants and business establishments along the route. Such interests may feel that the C-R techniques interfere with freight delivery or that the lack of convenient parking reduces business. These situations do not usually require any changes in local or state ordinances. Removing the prohibition on right turns may, however, require changing state or local statutes (4).

Congestion and Pricing Disincentives

Congestion and pricing techniques pose a variety of legal and regulatory problems. Pricing techniques that are based on the imposition of monetary tolls often require changes in state and municipal ordinances; more importantly, it is currently illegal to impose tolls on federally funded highway facilities. (The 2,200 miles of toll roads in the Interstate System predated the establishment of the system.) Under an old statute, the Federal Government also has authority over tolls or bridges over navigable water; these tolls must be "reasonable." In most states,

state-enabling legislation would be required to establish a toll system even in situations where federal prohibitions do not apply (5).

The legality of imposing tolls as a means to regulate use of the highway system rather than as a revenue source is also open to question. Generally, cities and states have the authority to impose taxes or user charges in order to raise money or in exchange for services provided; state and local statutes that have attempted to use this power to manipulate prices in order to actually regulate consumption (e.g., of alcohol) have been struck down by courts in some states. There is no consistent legal ruling on this topic; some bridge and road authorities that have paid off their revenue bonds have been forced to drop their tolls; others have been allowed to continue to impose charges.

Most U.S. experience with the imposition of tolls has involved the establishment of independent units of government. Generally, this is because the actual construction and operation of a transportation facility were involved. If such independent authorities are used in a C-R strategy, they are usually subject to a number of state laws about their organizational characteristics and financial arrangements. Pricing strategies that involve differential licensing schemes have not been attempted in the United States, but it appears that they too would require statutory changes at the state and local levels. Strategies that rely on the pre-emption of with-flow lanes of auto traffic for the exclusive use of transit or high-occupancy vehicles to impose additional congestion as a disincentive, such as the Los Angeles Diamond Lane, probably do not require any more legal or regulatory changes than those required for the transit techniques in the two transit-related C-R combinations (discussed previously). Although such strategies may be extremely controversial, they are generally subject only to the basic requirements facing most C-R combinations: in most cases, they must have an Environmental Impact Statement (EIS), they must be part of the regional comprehensive plan, and they must receive FHWA approval if they are on federally aided highways. The Los Angeles project was halted because, although CALTRANS had determined that it was not necessary to file an EIS, the courts felt otherwise. The important point to note is that it was the existence of an EIS and not its findings that were important; an EIS that finds that a project will harm the environment *does not* mandate the cancellation of the project. An EIS is only advisory to planners and the public.

Restricting Vehicle Access

There are few operational experiences in the United States with projects significantly limiting vehicle access in congested areas; the most notable ones involve parking control strategies, freight management programs, and exclusive transit or pedestrian streets. Each of these C-R strategies has different legal and regulatory implications.

Parking control strategies that attempt to reduce or eliminate parking space often involve changes in municipal building codes, which usually require a minimum number of spaces per office, apartment, or cubic unit of space. Less frequently, such control plans require exemptions or changes in municipal zoning ordinances concerning per-

missible land uses. If a city is firmly behind the implementation of permanent parking restrictions, it is well within its power to make these necessary changes. Parking control strategies that temporarily limit on-street or off-street parking by time of day or season of the year or by some characteristic of the traveler (i.e., differential licensing schemes) usually face no legal restrictions, although this may vary by urban area and by the method used to restrict parking (e.g., increasing and varying charges, completely banning parking during certain hours, or allocating different licenses to different functional groups of travelers).

Some secondary legal impacts may arise from the implementation of parking controls if businesses or residences in the affected area pursue claims that the parking strategy adversely affects their businesses or property values. Differential licensing schemes by nature discriminate against certain users who may claim such distinctions are unfair. The Greater London Council, which was required by statute to repay any such damages created by the London parking control plan, has never put the plan into effect because of inability to develop a method to determine, measure, and compensate such losses. Although the London experience indicates the problems that could arise in judicial settings in the United States, no U.S. parking plan has faced major legal difficulty from such claims. (The political problems created by such claims are, of course, very real.)

Freight or urban goods management programs usually attempt to restrict access and travel in certain areas of the city in order to rationalize goods movement. Cities usually have it within their legal power to restrict passenger vehicle travel, but problems arise with restrictions on truck movements. Most urban freight movement is highly regulated by the Interstate Commerce Commission (ICC); the Motor Carrier Act of 1935 does exempt interstate freight carriers from regulation within the "commercial zones" (CZs) or the economic boundaries of cities. The intent by Congress was to defer to state and local regulating agencies in matters concerning local trucking. However, the defined CZs of most urban areas have not grown since they were designated in the 1930s, and this situation has created a number of regulatory problems at the local level. There is growing pressure in Congress and the ICC to change or expand the CZ concept in line with the development of modern cities. Because of the complexity of the situation, major urban goods programs like the Manhattan garment center project have concentrated on banning passenger vehicles only and using traffic engineering techniques to reduce traffic interference problems.

Exclusive transit streets or pedestrian malls face many of the same difficulties that parking control strategies face. Any permanent change in street configuration usually requires changes in municipal zoning ordinances and building codes. However, as with parking control strategies, if the city is firmly behind the implementation of the project, such changes could be effected. As with parking control schemes, the possibility of lawsuits from disgruntled property owners claiming financial loss is a very real legal threat.

Availability of Funding

When a local agency adopts a plan for a congestion-reduction program tailored to the community's particular

needs, one of the most critical problems it faces is to obtain the funds necessary to implement it. The major institutional barriers to this, as evidenced by the experience of the cities studied, are:

1. Dispersion of funding authority.
2. Inconsistency in funding policies.
3. Restrictions on the use of funds.
4. Delays in approval and receipt of funds.
5. Excessive needs for documentation.
6. Local conflicts on the use of funding sources.

Since the major source of funding assistance for congestion-reducing measures is the Federal Government, in particular, the U.S. Department of Transportation, most of the criticisms brought up by those interviewed concerned federal programs. Problems with obtaining state assistance were rarely mentioned and only those that appear to have nationwide application will be considered here. A few local problems of similar broad applicability will also be discussed.

Dispersion of Funding Authority

Sources of funds to carry out congestion-reducing programs at the federal level include matching grants and loans for transportation improvement from FHWA and UMTA within the U.S. Department of Transportation; planning and community development loans and grants from the U.S. Department of Housing and Urban Development; grants for local public works from the Economic Development Administration; special transportation aid to low-income, elderly, and handicapped under programs of the U.S. Department of Health, Education and Welfare; rural transportation assistance from the U.S. Department of Agriculture; and General Revenue Sharing under Public Law 92-512. States commonly assist communities in meeting part of the local share of federal matching grants, and may provide technical assistance and sponsor demonstrations, with funds obtained through general or gasoline tax revenues. States also may create special taxing authorities, (such as transit districts), authorize special sales tax assessments within a designated transportation region, or approve the issuance of bonds to finance major transportation improvements.

The more diverse the community's congestion-reducing program, the more complex the funding problem. Considerable experience and skill are required of the promoting agency to determine the optimum method of funding the particular program the community needs. Appendixes A and B include a discussion of two documents detailing the funding programs of FHWA and UMTA.

Inconsistency in Funding Policy

Acceptance of public responsibility in meeting local transportation needs is still recent, and there is still a great deal of uncertainty as to how this responsibility can best be met. Federal and state assistance is being carried out by newly created agencies or as new programs of established agencies. These agencies tend toward short-lived enthusiasms for particular solutions. Funds are concentrated in these areas, and local governments are encouraged by the

availability of funding assistance to adopt these measures rather than others that might be more suited to the community's particular needs. Meanwhile, the agency, having expected too much in too short a time, becomes disenchanted with the solution and allocates its resources elsewhere, leaving the community with an unacceptable plan or a half-completed project that the funding agency is no longer particularly interested in.

Restrictions on the Use of Funds

Broadly conceived congestion-reducing programs often call for activities that are not compatible with the restrictions on the uses of funds obtained. One common complaint is that no provision is made for the increased workload of local enforcement agencies in maintaining new parking restrictions, reserved lanes, and preferential access for high-occupancy vehicles; and dealing with congestion problems created by new control systems. Incentives to obtain the cooperation of private institutions are also generally ineligible under transportation improvement assistance programs.

Difficulties are also encountered in expanding existing programs of agencies supported by special tax assessments or bond issues. Where voters have approved a tax to support mass transit, the agency can be restricted from experimenting with innovative modes of paratransit or becoming involved with parking controls or ridesharing. Where bonds are issued to finance the construction of transportation facilities such as bridges, tolls or other user fees cannot be manipulated for congestion-reducing purposes if this will interfere with the scheduled retirement of the bonds.

Delays in Approval and Receipt of Funds

Both federal and state transportation assistance programs have come under criticism by local agencies for the lapse of time between submittal of applications and the receipt of funds. There appear to be particular difficulties when communities apply for assistance under new programs that include innovative approaches or activities not formerly eligible under the funding agency's program. Review personnel appear to be reluctant to risk approving activities for which the agency has no established formulas for justifying that approval. Some local respondents feel that this creates a significant discrepancy between agency policy as expressed to communities and performance.

Another specific criticism of FHWA and UMTA processing of documents is that, if there is some minor deficiency in the application, such as too few copies of a page or a missing signature, the entire application is set aside until the local agency is notified and can respond by supplying the missing piece. If another problem turns up, it will again be withdrawn from the review process until the local agency provides the solution. It has been suggested that review be completed on the first submittal and approved conditionally on receipt of the required material. Thus, when it is received, no more time will elapse before the local program can receive the funds to begin implementation.

Excessive Needs for Documentation

Without endangering the essential controls over the expenditure of public money that is the responsibility of the funding agency, it is generally agreed that existing requirements for documentation exceed the need. It is common practice among local applicants for federal assistance to xerox material from previous applications on community characteristics, assurance of civil rights, legal authority, public participation, and the like in order to fill 50 to 80 percent of the pages of the new application. Some documents supplied by the federal agency as guides, such as nondiscrimination statements, are simply reproduced by the local agency and submitted as a part of the application.

Recent efforts of UMTA and FHWA to substitute systemwide programming for individual project submissions are eliminating some of these problems. Continuing assurances, agreements, and plans now need to be submitted only once and updated only when changing circumstances warrant it. However, the problem of duplicate submission where both FHWA and UMTA assistance is being applied for still remains. Requirements of these agencies differ somewhat, necessitating the preparation of two separate sets of documents containing essentially the same information.

Progress reporting also places heavy burdens on project administrators. It has been suggested that adequate supervision of expenditures of project funds could be maintained effectively and paperwork reduced by requiring only quarterly rather than monthly progress statements.

Local Conflicts on the Use of Funding Sources

Where project activities involve more than one local agency there have been instances of conflict over which agency's sources of funds should be used for implementation. One example concerned the construction of recessed bus loading areas, in which the city traffic engineer thought that UMTA funds should be used, while the transit authority reasoned that benefits were largely to traffic flow and that FHWA funds were more appropriate. This type of situation is the result of two factors: (1) overlapping areas of funding authority among federal agencies, and (2) the bulk of transportation assistance available to communities that is fixed on the basis of population rather than program needs. It was generally believed that federal programs maintained a reasonable balance between apportioned and discretionary funds, but that the situation could be improved by combining the assistance programs of the separate agencies into a single source of funds for systemwide transportation activities.

Organization for Cooperative Action

All cities investigated had experienced some difficulties with the organizational aspects of cooperative transportation programs. Not only is the traditional structure of local government ill suited to dealing with urbanwide transportation deficiencies, but the difficulties of the situation are compounded by the involvement of federal and state agen-

cies and nongovernment organizations within the community.

Local Institutional Framework

Transportation authority within urban areas is dispersed not only among separate functional agencies of one unit of government but also between several independent units of government. Most trips to work originate in unincorporated suburbs or small satellite towns and end within the central city. Any major attempt to modify the mode, timing, or routing of these trips requires the cooperation of the various city, town, and county governments.

In recognition of the need to coordinate the activities of local governments in dealing with urbanwide problems, regional planning authorities were created, largely in the early 1960s. Their members were either the principal elected officials of the several local governments or persons appointed by these officials. Participation by local governments was voluntary, and not infrequently representation was not complete because some refused to join and others would withdraw over conflicts with decisions reached by the group.

The primary purposes of these regional bodies were to develop long-range plans for land use and public services such as water, waste disposal, and transportation; eliminate incompatibilities between local development programs; and approve applications of local governments for federal assistance in the role of the A-95 clearinghouse. Their effectiveness in carrying out these functions varied greatly not only from one locality to another but also over time. In the particular area of transportation some agencies developed excellent long-range programs that strongly influenced the direction of the urban transportation system; others remained entangled in interjurisdictional rivalries and had no real impact on transportation developments.

Both federal and state policies and programs worked counter to the regional organizations' effectiveness in providing solutions to urban transportation problems. Planning and implementation were virtually independent of each other; planning funds were given to the regional body, and implementation funds were given directly to the local operating agencies. The regional body's authority to approve or disapprove local action programs was perhaps unclear in that most of the transportation improvements were undertaken totally within the boundaries of individual local jurisdictions. Nevertheless, transportation improvements were implemented by local agencies with federal support that bore no relationship to the over-all regional long-range transportation plan.

In an effort to bring systemwide improvements to urban transportation, FHWA and UMTA established new joint policies requiring urban areas requesting assistance under either agency's programs to have a metropolitan planning organization (MPO) whose members were to be the principal elected officials of local governments within the planning area and which would be responsible for developing and submitting areawide over-all transportation plans, improvement programs, and budgets. No applications of operating agencies for federal transportation assistance would be considered unless they were included in these documents and thus had the specific approval of the MPO.

Since the governors of the several states were to designate MPOs for each urbanized area or group of contiguous urbanized areas, many of the existing state-designated regional planning bodies qualified as MPOs and were assigned these functions. However, in other cases, new transportation authorities had to be created. There has been some tendency for new MPOs to be more restricted in geographical area than were the regional planning bodies, which appears to reflect a trend away from centralized planning for larger areas to more localized control. In the short time that the joint FHWA-UMTA regulations have been in effect, most of the transportation improvements proposed by communities have originated in the action agencies, and the MPO has limited its activities to collating these proposals into the documents required for submittal. Very few communities have as yet actually evaluated alternative strategies or attempted to predict the combined effects of the interaction of the several discrete proposed programs.

Common Organizational Problems

The current institutional framework for cooperative transportation action previously described has given rise to a number of common organizational problems:

1. Separation of planning and implementation.
2. Lack of commitment by participating governments.
3. Failure to anticipate public response.
4. Overexpectation of results.
5. Rivalries between participants.
6. Pressures from federal and state levels.
7. Discrepancy between official and actual local power structure.

Separation of Planning and Implementation. Although the recent joint FHWA-UMTA regulations are a move toward integrated transportation action, there is still in most communities a separation of planning and implementation functions. The most common deficiency is the failure on the part of program designers to identify all of the agencies and organizations that will be called on to participate in the proposed program and to consult with them while the plan is being developed. Enforcement agencies were most frequently omitted from the planning process and when subsequently called on were unable or unwilling to perform their essential roles.

Lack of Commitment by Participating Governments. Not all local governments participating in the design of cooperative transportation programs remained committed as the program was implemented. When projects met with opposition from local business interests or citizen groups, or their roles were unexpectedly difficult or costly to perform, some cities simply declined to meet their commitments. In one priority-lane project, for example, involving three cities and a county, all three cities one-by-one withdrew their provision of enforcement personnel and the county was forced to employ off-duty city police at its additional expense in order to continue the project.

Failure to Anticipate Public Response. Cooperative projects were frequently carried out by special-purpose associations of action agencies or by interagency agree-

ments in which there were no provisions made for citizen input. Many action agencies were found to avoid public participation in the preimplementation phase, because it required too much staff time and they wished to avoid having projects halted by public opposition. As a result, projects were occasionally put into operation and subsequently had to be abandoned when this opposition made itself heard.

Overexpectation of Results. Conversely, some attempts to obtain the support of the public and elected officials for proposed transportation improvements led program promoters to anticipate benefits that were not realized when the program was implemented. In other cases, project personnel were realistic about what the program could be expected to accomplish but were unable to control the initial enthusiasm and subsequent disappointment of others. More than one respondent spoke of the difficulties experienced in obtaining local support for continuing projects that were successful but not to the impossible degree anticipated by those outside the implementing agencies.

Rivalries Between Participants. Probably the greatest problem experienced by organizers of cooperative transportation programs was dealing with the competition between participating agencies and local governments. These concerns usually centered around maintaining their independence of action and having access to federal and state sources of funding. In many urban areas the dominance of the central city was challenged by the county and smaller communities. In Seattle, for example, the regional planning body had to be reorganized to provide autonomy for subregions, while within the King County subregion there were difficulties in allocating new transportation resources between the city and county.

Directors of local agencies saw opportunities in new federal and state programs to expand their staffs, budgets, and areas of authority. Transit and road agencies competed for the leading role in joint projects, such as priority systems. Planning and action agencies came into conflicts over the roles each should play under the new joint FHWA-UMTA regulations.

Pressures from Federal and State Levels. Some of these rivalries were intensified by conflicts at the federal level between FHWA and UMTA themselves. There were disagreements as to which federal funding programs should be used for different program elements. In some instances each agency insisted on expansion of the original local program by such things as fly-over ramps and express buses. In some cases communities were encouraged to select certain solutions currently being promoted by federal programs rather than those that the community felt it needed. In other cases both cities and states were directed toward capital-intensive solutions because of more favorable funding.

States still tend to be more supportive of road improvements rather than transit development. Local governments occasionally found it difficult to balance their transportation programs because of strong state support for improving automobile travel and little commitment to transit. These interests, in turn, gave more power to road-oriented agencies at the local level.

Discrepancy between Official and Actual Local Power Structure. The official governmental hierarchy of a community does not necessarily correspond to its effective power structure. One of the problems encountered by project organizers working within action agencies is to identify individuals who do not hold public office but exert influence over community development. Some respondents found that without the support of these individuals for the project it was difficult to obtain essential governmental support and, more particularly, the public approval necessary to carry out the program.

INCENTIVES AND DISINCENTIVES

The following discussion is intended to give transportation planners and engineers an idea of the issues, facts, and situations that affected institutional behavior in the actual projects studied in Phase I. It is not intended to discuss all possible incentives or disincentives to institutional participation but rather to highlight those factors that were actually found to have significant impact on key institutions in operational experiences with C-R combinations in the United States.

Table 5 gives the issues and factors that affected the institutions filling the eight essential roles in the implementation of C-R combinations in the Phase I survey of 18 cities and in the literature. Also given in this table are the conditions that affected the involvement of other groups or institutions in the community during the implementation of a C-R combination. The incentives and disincentives were often based on an institution's perception of the facts or the likely outcomes of a C-R strategy. Different institutions involved in the same C-R project could, and did/have different perceptions of the same "facts." These varying perceptions motivated agencies in different ways, and it is important to note how such differences affected the actual participation of a key institution in a C-R combination.

Table 5 presents the situations or conditions that were found to influence both actual institutional participation and the intensity of commitment. These underlying conditions are listed in the order of their strength or impact; situations listed at the top of a column were generally found to be more influential than conditions at the bottom of the column. These listings do not imply that a given number of conditions must apply before an institution will participate in a specified role or that some number of conditions must be combined before participation will occur. The conditions listed at or near the top were found to be the most significant issues for institutions considering participation; those variables near the bottom were less important. One or two conditions at or near the top of a column were sometimes found to be sufficient to induce participation for certain institutions (mandatory Environmental Protection Agency (EPA) control plans are an example). In situations where such compelling conditions did not exist, it was generally found that a far greater number of conditions had to exist to induce participation.

The table presents the consensus found in interviewing participants in Phase I. The few disputed issues are given at the bottom of the relevant columns. Agreement on the

ranking of the conditions was generally only possible for situations with legal mandates like state energy control plans or EPA transportation control plans.

The degree to which underlying conditions directly create incentives or disincentives to desired institutional participation in any C-R combination varies. If a certain situation creates an incentive to participation, the opposite of that situation does not necessarily create a disincentive. Arterial transit priority schemes may create opposition if merchants perceive disruption of goods delivery; lack of disruption would not by itself create any inducement to merchants to actively support the project. Work-hour changes, for example, may be consistent with the operational changes desired by a transit operation; this consistency may only keep opposition from arising and not create any desire on the part of the transit operator to participate.

Since only findings from actual projects are given in Table 5, the entries of those C-R combinations with little U.S. operational experience, such as major vehicle access restrictions, are based on a very small number of real observations and more data at some later date may render these judgments obsolete.

Table 5 does not imply that all the listed incentives and disincentives had equal and appropriate impact on the institutions involved. For example, most of the C-R combinations have more incentives than disincentives listed. This does not mean that the incentives either singly or in combination outweighed the disincentives. The actual impact of an incentive or disincentive (or their combination) on any institution varied from case to case and depended on the actual environment in which the C-R implementation took place.

The lack of disincentives does not indicate the easy implementation of any C-R combination. Inertia and the lack of any strong incentives to action often make institutions unwilling to participate in even a noncontroversial C-R project (the best examples are carpooling and alternative work hours). Many traffic engineers and planners reported the inherent conservatism of most transportation agencies and noted that institutions tend to act and react in traditional ways unless forced to do otherwise. It is clear that the lack of strong incentives to institutional participation in fact creates disincentives to action: "Why should we change now if there is no reason to change?"

Work-Hours Rescheduling with Transit Modification

Work-hours rescheduling is a low-cost option that requires the full and contained participation of a large number of individual private firms. In many cases, a successful plan also requires the participation and support of the transit system. Above all, the implementation of such a project requires a public or nonprofit agency with professional staff that can provide both technical and managerial assistance to the other participants. The incentives affecting the participation of each of these three groups of institutions will be discussed next as well as those affecting other community institutions.

Private Firms

Although alternative work scheduling is generally not a controversial idea in theory, it has been difficult to involve a large number of institutions. The New York and Philadelphia projects are expending considerable resources to meet with private employers on an individual basis to convince them of the merits of the idea. The San Francisco attempt to institute staggered and flexible work hours failed badly because it depended on a media and public relations campaign to convince employers to participate. While some Phase I respondents and some published reports indicate that alerting employers to the environmental and energy implications of alternative work schedules will create support, most respondents disagreed.

Experienced project staff reported that employers with severe congestion problems were the most likely to become involved. Yet, most of these firms initially perceived a large number of conditions that would prevent their involvement. Many firms were concerned about disrupting communications with their customers and suppliers, particularly those in different time zones. Employers were also concerned about creating difficulties with goods deliveries and about creating carpooling conflicts for some of their employees. Some firms were unwilling to become involved because they were afraid that any change in existing work schedules would open them to union or labor demands for other scheduling changes. Some firms interested in flexible hour plans were concerned that federal labor standards might require them to pay employees overtime for work over 8 hours per day, although they only worked 40 hours in a week.

The larger more successful projects have met many of these employer objections by carefully working with management to check their validity. Project staff have been able to show key employers that, if implemented properly, suggested alternative work schedules can avoid most, if not all, of these problems. Project staff have persuaded some reluctant employers to participate by carefully analyzing their entire operation and developing complete work-hours rescheduling plans—staggered or flexible—for the individual firm. Such activity requires a great deal of project staff time and expertise and often many meetings with management.

Transit Systems

The more successful staggered work-hours programs have developed from, or in close coordination with, the transit system; in Ottawa, transit system personnel devised the downtown staggered work-hours program. Where the transit system perceives its problem to be one of congestion rather than capacity and can see how alternative work schedules will impact the problem in a positive way, the property will become an active and interested participant in the project. The Philadelphia staggered work-hours program, a part of the regional planning agency, devised its program first, using federal grant money and then asked SEPTA, the local transit operator, to change its schedules accordingly. SEPTA was extremely uncoopera-

TABLE 5

INCENTIVES AND DISINCENTIVES AFFECTING INSTITUTIONAL PARTICIPATION OR APPROVAL

| C-R Combinations | Institutions Involved in Eight Essential Roles | | Other Groups | |
|---|--|--|--|---|
| | Incentives | Disincentives | Incentives | Disincentives |
| Work Hours Rescheduling with Transit Improvements | <p>Reduction in peak-period load on transit system sought</p> <p>Existing high levels of traffic or transit congestion</p> <p>Improvement in employee morale and productivity sought</p> <p>Concern with negative public image</p> <p>Severe congestion near facility</p> <p>Required by federal or state energy or pollution standards or control plans</p> <p>Federal or state funds available</p> <p>Active assistance of public agency in surveying patterns and modifying routines</p> <p><u>Disputed</u> Concern with environmental and energy consumption</p> <p>Concern with positive progressive image</p> | <p>Seen as interfering with customer relations or trans-continental communication</p> <p>Seen as interfering with goods and supply deliveries</p> <p>Seen as interfering with existing ridesharing or parking arrangements</p> <p>High percentage of professional or non-hourly people</p> <p>Not consistent with transit system operation</p> <p>Seen as requiring open discussions with unions or union contract renegotiation</p> <p>Disapproval or disinterest from employees</p> <p>Seen as violating federal and state hourly pay regulations or requiring overtime for regular work</p> | <p>High levels of traffic or transit congestion especially site specific</p> <p>Concern with environmental pollution or energy consumption</p> <p>General approval of assistance to transit</p> <p>Seen as low cost potentially effective measure</p> | <p>Disruption of personal patterns</p> <p>Interference with existing ridesharing or parking arrangements</p> <p>Seen as involving unfair labor practices</p> |
| Ridesharing Combinations | <p>Severe employer parking problem</p> <p>Severe traffic congestion near employer facility</p> <p>Curtailment of needed highway improvements near employer facility</p> <p>Concern with negative public image</p> <p>Required by federal and/or state mandated energy or pollution control plans</p> <p>High employee tardiness and absenteeism</p> <p>Security problems near employer facility</p> <p>Employer problems in attracting or retaining employees</p> <p>Lack of sufficient transit service to employer facility</p> <p>Active assistance of public agency staff in forming pools and learning of and meeting legal and insurance requirements</p> | <p>Requires new administrative structure or activity</p> <p>Requires state enabling legislation</p> <p>Conflicts with transit system operation</p> <p>Fear of irreversible or unrecoverable investments</p> <p>Administration and maintenance costs seen as high or cumbersome</p> <p>Fear of employee lawsuits or high liability judgments</p> <p>Governmental jurisdictional conflicts require resolution by state legislative or administrative action</p> | <p>Concern with environmental pollution and energy consumption</p> <p>Interest in innovative concept being actively prompted nationally</p> <p>Seen as response to some employee transportation needs</p> <p>Interest in free-market provision of transportation</p> <p>Concern with transportation needs of certain societal groups</p> <p>Raised consciousness due to media and informational campaign</p> | <p>Conflicts with transit promotion schemes</p> <p>Competition with transit system</p> <p>Questions of propriety of spending governmental funds to assist private employees</p> <p>Questions of propriety of disproportionate employee assistance</p> <p>Seen as competing with charter, inter-city and limousine operations</p> <p>Seen as too new and uncertain</p> <p>Questions of propriety of government guarantees to private providers</p> |

TABLE 5 (Continued)

| C-R Combinations | Institutions Involved in Eight Essential Roles | | Other Groups | |
|---------------------------------|--|---|--|--|
| | Incentives | Disincentives | Incentives | Disincentives |
| Congestion Pricing Combinations | <p>Severe congestion creating strong support for extensive capital expenditures</p> <p>Heavy peak-period congestion along routes with limited options or bridges</p> <p>Congested central area with limited number of access routes</p> <p>Legal authority to impose tolls available</p> <p>Seen as contributing to transit attractiveness and efficiency</p> <p>Little cost involved in implementing deterrents</p> <p>Implementation time seen as short</p> <p>Funds available for needed roadway changes</p> <p>Funds available for increased transit system expenses</p> <p>Required as a condition of continuing local transit assistance</p> | <p>Legal authority not available</p> <p>Perceive strong opposition from public to restraint of traffic</p> <p>Activity not viewed as consistent with organizational mission</p> <p>Ability to control violations in doubt</p> <p>Not seen as consistent with current transit operations or capabilities</p> <p>Needed funds not available</p> <p>Perceive new administrative structure required</p> <p>Monitoring and data collection seen as difficult</p> <p>Impact on downtown businesses in doubt</p> | <p>Concern with environmental pollution and energy</p> <p>Desire for auto disincentives</p> <p>General approval of assistance to transit</p> <p>High levels of traffic or transit congestion</p> | <p>Disruption of normal travel patterns</p> <p>Auto travel times and delays increased</p> <p>Seen as disruption of residential communities adjacent to and along parallel routes</p> <p>High violation rates seen as discouraging diversion to high occupancy vehicles</p> <p>Seen as decreasing downtown commercial and business activity</p> <p>Seen as regressive tax on low income groups</p> <p>Disapproval of auto disincentives</p> |
| Vehicle Access Restriction | <p>Controls mandated by state or federal energy or pollution plans or standards</p> <p>Severe shortage of parking facilities</p> <p>Significant interference with freight movement and goods delivery</p> <p>Desire to renovate or renew downtown</p> <p>Downtown businesses and commercial support for measure expressed</p> <p>Public support for measure expected</p> <p>Innovative concept being promoted nationally</p> <p>Availability of funds to test concept</p> <p>Seen as more easily administered road-pricing technique</p> <p>Legal authority to impose restrictions clearly available</p> | <p>Regressive impact seen on low income groups</p> <p>Ability to control violations in doubt</p> <p>Fear of relatively untried concept</p> <p>Activity seen as inconsistent with organizational mission</p> <p>Opposition from truckers industry and unions seen</p> | <p>High levels of traffic or transit congestion</p> <p>Concern with environmental pollution or energy consumption</p> <p>General approval of assistance to transit</p> <p>Innovative concept being promoted nationally</p> <p>Approval of auto disincentives</p> <p>Interested in area redevelopment</p> | <p>Possible adverse impact on freight and urban goods movement seen</p> <p>Disapproval of auto disincentives</p> |

tive, because it saw little advantage in the program, although it eventually complied.

Other Institutions

Staggered or flexible hours programs that are not a part of a regional transit operation have usually developed

as a response to local recognition of the need for low-capital transportation alternatives or the need to develop a TSM element. Many cities reported in their TSM element that they had a staggered work-hours program (3), largely because it was one of the suggested TSM options in the 1975 Joint Regulations. Dallas and Houston, like several other cities, reported the existence of such

TABLE 5 (Continued)

| C-R Combinations | Institutions Involved in Eight Essential Roles | | Other Groups | |
|--|---|--|--|---|
| | Incentives | Disincentives | Incentives | Disincentives |
| Transit Service Improvement with Incentives Combinations | <p>Required as a condition of continued state or local financial assistance to transit</p> <p>Required as a condition of continuing federal assistance</p> <p>Availability of funds for service and incentive programs</p> <p>Concern with transportation needs of certain societal groups</p> <p>Required or consistent with federal, state or local energy or pollution control plans</p> <p>Perception of increased public support for transit expenditures</p> | <p>Perception of lack of public support for increased transit deficient</p> <p>Seen as increasing transit operating deficient</p> | <p>General approval of assistance to transit</p> <p>Concern with transportation needs of certain groups</p> <p>Concern with environmental pollution and energy consumption</p> | <p>Disapproval of increasing public subsidies to transit</p> <p>Service seen as disruption of adjacent residential neighborhoods</p> |
| High Occupancy Vehicle Priority Combinations | <p>Required as a condition of continued state or local financial assistance to transit</p> <p>Required or consistent with federal or state energy or pollution control plans</p> <p>Availability of funds for transit service changes</p> <p>Availability of funds for needed highway changes</p> <p>Fear of adverse public reaction or impact for non-participation</p> <p>Strong pressure from other levels of government</p> <p>Federal or state funds</p> <p>Perception of increased public support for transit</p> <p>Existence of current transit service along treated route</p> | <p>Seen as requiring significant changes in transit operations</p> <p>Carpools seen as interfering with transit or requiring expensive treatment modifications</p> <p>Seen as financially infeasible or risky</p> <p>Activity not seen as consistent with organizational mission</p> <p>Fear of public opposition to priority treatment</p> <p>Perception of lack of public support for increased transit deficient</p> <p>Seen as having unfavorable or disruptive impact on adjacent businesses, commercial activities or residential neighborhoods</p> <p>Technology seen as impractical or unavailable</p> <p>Seen as making irreversible financial commitments</p> <p>Competition for available federal and state funds</p> | <p>General approval of assistance to transit</p> <p>Approval of use of highway money to assist transit</p> <p>Concern with environmental pollution and energy consumption</p> <p>Interest in technological concepts</p> <p>Concern with environmental pollution and energy consumption</p> | <p>Fear of business losses along treated highway</p> <p>Seen as interfering with business or commercial operations along treated highway</p> <p>Disapproval of increasing public subsidies to transit</p> <p>Seen as disruption of nearby residential neighborhoods</p> <p>Disruption of normal travel patterns</p> |

programs, but the programs appear to be little more than paper descriptions of firms already involved in alternative work schedules for their own reasons. Unless DOT or the local political forces in an area act to make this C-R option more important, it appears that such programs will remain paper programs.

Work-hour programs rarely create strong support or opposition in the community at large. Opposition has on occasion come from labor groups or individual employees, but such opposition has not generally been long lasting.

Support for this concept in the abstract can come from many good government or environmental groups, but this support usually does not extend beyond the public relations part of a program.

Ridesharing Combinations

The U.S. experiences with ridesharing generally involved four major kinds of projects: carpooling with area-wide matching and/or employer matching, employer-

TABLE 5 (Continued)

| C-R Combinations | Institutions Involved in Eight Essential Roles | | Other Groups | |
|---------------------|--|---|---|---|
| | Incentives | Disincentives | Incentives | Disincentives |
| Traffic Engineering | <p>Extreme traffic congestion or high accident rate in treated area</p> <p>Public or business request for public action</p> <p>Bus operations interfere with traffic flows</p> <p>Traffic severely interferes with buses maintaining schedules</p> <p>Significant bus-auto accident rates in affected area</p> <p>Traffic congestion interferes with downtown business and commercial establishments</p> <p>Needed to complement expressway priority treatments</p> <p>Availability of funds for needed technical changes</p> <p>On major treatments, majority of costs available from other sources</p> <p>Projected as part of overall redevelopment of renewal plan</p> <p>Required or consistent with federal or state energy or pollution control plans</p> <p>Interest in technical or engineering solutions because of organizational experiences</p> | <p>Expenditures not seen as legitimate or available from current sources</p> <p>Activity seen as inconsistent with organizational mission</p> <p>Ability to control violation in doubt</p> <p>Technology is not seen as practical or available</p> <p>Available data is inadequate</p> <p>Construction time and delays are seen as significant</p> <p>Interference with transit operations and schedules seen as unavoidable</p> <p>Seen as decreasing transit schedule adherence</p> <p>Interference with freight and goods delivery seen as unavoidable</p> <p>Activity seen as one of low public interest</p> <p>Protest from businesses or commercial enterprises expected</p> <p>Seen as creating delays for auto travelers</p> <p>Seen as refocusing travel to redevelop central city</p> | <p>Interest in technical or engineering concepts</p> <p>Seen as helping the buses run on time</p> <p>Approval of use of highway money to assist transit</p> <p>Refocusing travel on central city sought</p> <p>Seen as decreasing congestion and resulting delays</p> | <p>Seen as interference with transit operations</p> <p>Seen as interference with freight and goods delivery</p> <p>Perceived as causing delay for auto drivers</p> <p>Seen as interfering with pedestrian travel</p> <p>Perceived disruption during construction</p> <p>Seen as interfering with existing business or commercial operations</p> <p>Reduction in parking capacity seen as causing business losses</p> <p>Delay to auto drivers seen as causing business losses</p> |

sponsored vanpooling, and entrepreneur van-pooling. Similar incentives and disincentives affect the key institutions involved in the implementation of all four types of projects.

Private Firms

Most Phase I respondents reported that a significant number of incentives was required to induce the involvement of most firms in straight carpooling programs and that a significant, but slightly different, number of incentives was required for involvement in vanpooling programs. Ridesharing projects generally required the active involvement of a significant number of individual firms and employers. Project staff reported that, although it was often easy to get firms and public agencies to agree to the need for energy conservation or the value of the carpool concept, it was extremely difficult to get them to be actively involved in promoting ridesharing among their employees. Project staff found that a large number of incentives, as well as active and continued assistance from the project staff, was required to get most firms to participate in a ridesharing program in a meaningful way.

Respondents found that extremely difficult traffic and personnel problems must exist before firms would be willing to go beyond the polite agreement stage.

The most important variables inducing the active participation of private firms were extreme traffic congestion near the plant or employment site, severe shortages of parking and the likelihood of expense for the provision of new parking spaces, and transportation difficulties that significantly interfered with personnel attendance or morale. Other important factors were the inability to attract or keep labor because of the location of the plant if, for example, it were in an outlying community or in the residential location of certain employees (e.g., inner city residents).

Project staff found that traffic and personnel difficulties must be seen as immediate, pressing, and important problems or they would not motivate institutional participation. For example, convincing employers of the "real" cost to them of providing a parking space was found to be ineffective if parking supplies were abundant or the employer had already expended the funds. Price considerations were extremely important, however, when the firm was seriously

contemplating significant expenditures on new parking facilities, as in the case of the 3M Company in Minneapolis or American Express in Tucson. In the absence of strong personnel problems, discussing with a firm the positive impact of ridesharing programs on employee morale was not only found to be ineffective but counterproductive. Employers questioned why they should unilaterally increase what they perceived only as an employee benefit; both the Dallas and Houston projects encountered such situations.

There is some dispute among the respondents over the impact of media campaigns and consciousness-raising activities on the participation of major employers. Most respondents agreed that the active involvement of certain firms in ridesharing programs, such as ARCO in Los Angeles and Conoco in Houston, was the result of their need to dispel unfavorable public opinion. However, far fewer projects found that firms without unfavorable publicity were willing to participate merely to make their image look better. Even fewer firms were persuaded to participate in ridesharing programs because of a new awareness of ecological or energy problems. There were exceptions of course; the Grumman Company on Long Island had no personnel or traffic problems and no concern with poor publicity, but they became actively involved in carpooling and vanpooling programs. The Institute for Transportation at Berkeley has suggested that firms known to be very dynamic or aggressive in their own field or product line might be more willing to engage in ridesharing activities perceived to be progressive or innovative. If so, this explains why the few firms without the kind of problems usually associated with participation are interested in vanpooling, the more innovative concept.

Ridesharing personnel also reported a number of factors that acted as significant disincentives to institutional participation. Most firms were unwilling to allocate staff time to organizing and promoting ridesharing. Firms that could be persuaded to participate, at least marginally, often appointed carpool coordinators who had many other personnel duties and who could not really expend time on the development of company carpools. The MASSPOOL staff found that companies forced into complying with the MASSPOOL program often appointed lower level personnel to be carpool coordinators; ten firms in Boston laid off their carpool coordinators when business got bad. Most project staff report that even firms that began participation with enthusiasm in a ridesharing program often lost momentum because over time the firm began to redirect the duties of coordinators toward more company-related functions, leaving coordinators with less and less time to promote company ridesharing.

The vanpooling concept is more attractive to a number of those experienced in ridesharing, because it requires less continuing administrative input and institutional resources than conventional carpooling programs. Project staff reported that, although vanpooling might be more difficult to "sell" to management initially, it was far easier to keep going once implemented because it was self-supporting. The entire 3M Company vanpooling program, for example, requires the time of only 1½ staff people.

There are a number of significant disincentives to vanpooling. Respondents reported that many firms were un-

willing to become involved in a new concept, no matter how much it promised. Some firms were concerned about legal liability if a company-sponsored vanpool were to be involved in an accident. Many firms were concerned about making irreversible capital purchases or service promises to employees. Some employers were concerned about potentially restrictive state legislation or regulation by state or local public utilities commissions. Other firms were unable or unwilling to get necessary insurance. In most Phase I cities the disincentives far outweighed the incentives for all but the most innovative and/or troubled firms.

Transit Systems

In addition to private and public employers, most ridesharing programs interfaced to some extent with the local or regional transit system. Although most transit systems did not oppose carpooling projects and a few supported them, many did oppose vanpooling projects. A few transit systems, like that in Seattle, have been interested in working with ridesharing projects to provide service in low density outlying areas. In Atlanta, Sacramento, and Knoxville, however, vanpooling operations were forced to make important concessions to the public transit operator about pick-up and service areas. The literature and a number of Phase I respondents reported the general opposition of many transit operators to vanpooling because of the over-all threat created by the concept itself. The Knoxville "brokerage" structure shows that, if properly managed, transit and ridesharing need not be in conflict, but other evidence indicates that the fear of the transit operator can be justified. In Boston, for example, the area-wide carpool matching program that preceded the mandatory MASSPOOL received approximately 10,000 responses in one year; more than half were from current transit riders.

Transit operations are, of course, most fearful of the private or entrepreneurial vanpool; Alton McDonald of CITRAN, the Fort Worth transit property and a leader in the industry, has likened such private operations to the jitneys of the 1930s that decimated trolley operations. Transit operators often hold that their municipal franchise protects them from such competition. Both local transit properties and industry groups have and will continue to work against most vanpooling programs, but the impact of the opposition of the transit operator on the implementation of a vanpooling project varies by community.

Other Institutions

Key institutions in a community were usually supportive of carpooling programs because they seemed a sensible idea and federal funds were often available to implement them. The coercive elements of certain programs, like those originally mandated by the Environmental Protection Agency (EPA) transportation control plans, however, did create opposition and resentment.

Some key decision-makers did withhold support from suggested vanpooling programs out of a desire to protect the transit industry. At the same time, state legislators and public utilities commissions have been willing to exempt

certain vanpooling operations from PUC regulation or restrictive legislation because of general support for the potential of the vanpool concept.

Ridesharing programs do not generally create either strong public support or opposition. Citizen's groups often supported such measures, because they appeared to promise reductions in energy consumption and environmental pollution. The general public support for such concepts has strengthened the positive attitude of key local decision-makers.

Perhaps, the only issue that has created public uneasiness, if not opposition, is the question of the propriety of spending government funds in such a way that they effectively assist a private employer or a particular set of individual employees. This issue has been raised in several vanpool implementations and was discussed in the congressional debate over key highway bills, but it has not yet proved a barrier to the implementation of a vanpool (or carpool) project.

Transit Service Improvements with Incentives

Most transit service improvements and marketing techniques are fairly noncontroversial; the significant institutions involved in their implementation are the transit system, the political body(ies) funding deficits, and the regional planning body. The important point to note about this C-R combination is that the transit property itself does not always initiate the service improvement or marketing technique; as in Dallas, the City Council may decide that the municipal transit operator should or could undertake a certain service.

Transit Systems

In many of the cases studied, the transit operator was a reluctant and unwilling participant in such service modifications. If the transit system was unwilling to participate, it was usually because proposed services, such as express buses, would significantly increase operating costs even if ridership also increased. Many transit systems are still in the position of defending their rising annual deficit to local decision-makers and feel such services to be detrimental to their own interests.

City and regional planners usually argue that transit properties are not service- or user-oriented and must be forced to take a new perspective on the transit services provided to the community. Some systems already receive assured public subsidies and have begun to reorder their priorities. Although increasing state and federal operating subsidies may reduce the reliance of other local transit properties on local resources and so make them less defensive, their current position must be taken into account. Local transit systems have been forced to undertake many transit improvements because of their dependence on local subsidy. If they are unwilling participants in the implementation of a C-R strategy, they may not implement such a strategy with competence and enthusiasm.

Transit properties are particularly concerned about being forced to continue certain services once started even if everyone agrees the service is not successful; Los Angeles, Miami, Nashville, and Dallas have had such

problems. Several respondents noted that, although the transit system was often strongly pressured into starting a service, once the service failed, the transit operator got all the blame.

Other Institutions

Certain neighborhood and community groups have been successful in pressuring either the transit system itself or the local decision-making body to extend or create new services in their community. The Knoxville example illustrates that such demands can be a true reflection of travel needs previously ignored by the transit system. However, in all four field studies, some routes demanded by community groups are extremely poorly utilized and the transit system has or would like to drop them. In Dallas, the Dial-a-Ride System, which was so unsuccessful, was initiated in response to demands of both community groups and the City Council.

Although transit improvements themselves usually do not create public opposition, there are exceptions. Park-and-ride facilities that might affect the character of a neighborhood have been opposed by community groups in several cities. Groups demanding a new transit route always expect the 39-passenger diesel bus to run nearby their home but not in front of it; when it does, they protest about the noise and fumes.

High Occupancy Vehicle Priority

The issues underlying participation in this C-R combination closely resemble those of the transit improvement combination because most of these experiences often contain significant transit options. In many cases the same institutions and institutional incentives were involved.

Although all transit priority treatments were considered together in the original NCHRP Project 7-10 study, two actual priority experiences—the Diamond Lane in Los Angeles and the “zones-and-collars” program in Nottingham, England—attempted to deliberately use the increased congestion caused by that priority treatment as disincentive to low-occupancy vehicle use. Therefore, these two priority experiences are included in the section on “Congestion and Pricing Disincentives” rather than here with other experiences in high-occupancy priority programs.

Transit Systems

It is commonly assumed that transit operators are very interested in priority treatments for transit, but this issue is not always clear-cut. Most transit systems are not enthusiastic about such treatments unless they have existing routes along or parallel to the highway to be treated, and the priority treatment promises significant increases in ridership. In both Houston and Dallas, transit system officials are not particularly interested in implementing the contraflow lanes suggested by city officials because neither of those conditions applies.

Priority treatment of transit vehicles on the highway or on exit or entrance ramps can remove inconvenience and can speed up transit operations, but they do not usually contribute to significantly lowering transit operating ex-

penses. When transit operators are required to initiate a new service on the prioritized highway, costs have increased significantly; in many cities—including Los Angeles, Washington, and Miami—transit vehicles on major prioritized highways are required to either deadhead out or back from suburban terminals. In many cases, it was not possible to cover these increased operating costs from increased ridership revenues even when vehicles operated at or near full capacity.

Public officials have argued that costs are not, or should not be, the only consideration of local transit systems when they examine the need for priority treatments. Transit system management has not generally shared this philosophy; they have been concerned both about increasing deficits and about how some proposed systems will look to the public if they do not carry enough riders.

Transit systems have generally been opposed to the inclusion of carpools in highway priority lanes; in Houston and Los Angeles, the transit systems argued that including carpools in the priority lane would lower the incentives to drivers to switch to transit and would interfere with transit vehicle operation. The Washington Metropolitan Area Transit Authority (WMATA) also opposed the inclusion of carpools on the Shirley Highway priority lane, and some federal officials report that this caused a significant delay in the eventual implementation of that priority treatment.

State and Local Traffic/Transportation Departments

Traffic and transportation engineers have been trained to see their job as maximizing traffic flows and vehicle throughput. Because of this, traffic and transportation departments have had different approaches to highway priority treatments and to arterial priority treatments (discussed in the "Traffic Engineering" section). Local engineers could often see that transit operations on arterials significantly interfered with over-all traffic flows and contributed to accidents; they felt justified in reserving lanes of traffic, at least temporarily, for transit vehicles in order to reduce transit-auto interaction. Transit vehicles, however, create a relatively small part of the congestion on most freeways, and traffic engineers are less willing to preempt auto lanes for transit vehicles, unless there is surplus capacity on the facility. Traffic engineers in Seattle and Dallas argued that the existing freeways were not designed for ramp metering and that the treatment was not appropriate.

Local traffic departments in several Phase I cities took a very narrow view of the priority issue. They were concerned with the need for a minimum number of passengers aboard a given number of buses to justify the conversion of an auto lane to transit use. The state transportation departments in California, Washington, and Florida took a similar view but with a longer range perspective; they felt that over time transit ridership would increase to some acceptable level because of the attractiveness of the service offered on the priority facility.

The longer range perspective of state highway or transportation departments also made them more amenable to experimenting with priority treatments, particularly if

federal funds were available and the improvements were not irreversible. Dade County (Miami) officials reported that the Florida Highway Department went along with the I-95 priority treatment because they were sure it would fail and the lane could easily be reconverted to auto traffic. The Banfield Freeway in Portland was redesigned for a priority treatment by eliminating the median strip; although this created both a safety and an enforcement problem, Portland officials report state officials were adamant about the configuration because it would be easy to revert to a regular traffic lane. Support from the Virginia Highway Department for the Shirley Highway priority treatment was also based on the fact that the commitment to high-occupancy vehicles on the facility was not irreversible. In all cases, far higher levels of federal money were available to implement the priority treatment than would have been available to simply redesign or add lanes to the existing facility.

The need to justify the preemption of an auto lane in order to create a priority lane generated incentives to include carpools. This increased the effective utilization of the lane to a point where traffic engineers felt the treatment was justified. However, the inclusion of carpools created other problems for traffic engineers, particularly in ramp metering and in handling traffic at either terminus of a priority lane.

In general, traffic and transportation engineers were fairly comfortable with priority treatments that required extensive new construction—for example, the El Monte Busway and the Shirley Highway—because these treatments did not interfere with freeway traffic. Moreover, the construction-oriented treatment was more in line with the traditional perspective of state and local highway departments. Traffic engineering departments were also fairly comfortable with techniques, like Seattle's Blue Streak project, which only required ramp modifications.

In communities like New York, where temporary contraflow lanes preempted underutilized lanes from the reverse direction, and transit utilization of the lanes was high, traffic engineers were supportive of such treatments and became proficient at implementing them. In situations, however, where excess capacity was not clearly available and the flow of transit vehicles was not high, traffic engineering departments were not supportive of priority treatments because they were not seen as justified. The deliberate preemption of an auto lane in order to create additional traffic congestion to in turn act as a pricing mechanism is discussed under "Congestion and Pricing Disincentives"; it should be clear from the foregoing discussion that such an approach was totally alien to the thinking of many traffic and transportation departments.

State and Local Police

Most priority treatments, particularly those that include carpools, are very sensitive to the level of enforcement. Many of the early priority treatments had particularly bad experiences because local and state police did not enforce restrictions, particularly on temporary facilities. Some cities attempted to rectify this situation by involving the

police in the planning and implementation effort. The I-95 project in Miami, for example, paid three municipalities along the route for the increased personnel required to police that transit priority treatment. Basically, however, the police do not like traffic enforcement duties and they do not like the "rent-a-cop" approach; at first, the three cities in the Miami area would not use regular on-duty officers to provide the enforcement function. Later, two of the three cities simply returned the money and refused to provide enforcement at all. In Portland, the state police were also consulted about the Banfield Freeway priority treatment; they declared that the use of the median strip for the priority lane made that lane unenforceable. The state went ahead with the treatment anyway; the state police generally do not enforce the restrictions and the violation rate in the lane is estimated at 30 percent. In Dallas, the contraflow concept was finally abandoned because the police stated they could not (or would not) enforce the necessary restrictions.

Other Institutions

Ramping and metering techniques may create traffic-flow problems for residential neighborhoods or businesses on the access road near a treated facility; such situations created opposition from business along I-95 in New York, in Black communities near downtown Dallas, and in residential neighborhoods along treated access roads in Los Angeles. When the transit priority treatment was added to I-95 in Miami, turn restrictions were also instituted because I-95 was not a fully limited-access highway; businesses along the route protested to Dade County representatives.

Taxi and private bus operators are generally prohibited from using most priority lanes, and this has been a source of some conflict. Some cities have promised to consider studying the feasibility of allowing them access to the lane(s) at some future date.

Although highway priority techniques have not generated a great deal of community or public opposition, there has been some. In cities where the volume of transit traffic in a lane is not high enough to either make it look "full" or make it self-enforcing, the relative empty lane creates some public unrest; violators in the lane who are not stopped create further public unrest. The actual techniques used to move transit (and carpool vehicles) into and out of the treatment lane, particularly when superimposed on an existing freeway, may create bottlenecks or safety hazards, and these situations also create public anger and frustration.

Traffic Engineering

The major institutions involved in implementing traffic engineering projects are usually the local traffic or transportation departments, the transit system and businesses, and residential neighborhoods along or parallel to treated areas. Each of these institutions has a different set of values that bears on their participation in the implementation of these types of projects.

State and Local Traffic/Transportation Departments

Most traffic departments consider technical engineering-type C-R techniques to be the appropriate solution to a number of different congestion and traffic problems. The use of such techniques is a traditional response to severe but localized traffic congestion and to auto-transit interference. The state of the art is highly developed, and many traffic engineers feel extremely comfortable in utilizing such approaches. Several respondents reported amusement and even resentment at the sudden "discovery" of low-cost traffic engineering approaches on the part of local and regional planning agencies as a response to the joint TSM regulations.

Although such approaches are traditional for traffic engineers, they are not necessarily the initial response of more construction-oriented highway departments. For example, the involvement of the Texas Department of Highways and Transportation in TOPICS (Transportation Operations Program to Increase Capacity and Safety) programs grew extremely slowly; even today the responsibility for such actions is located with a small group of engineers in the traffic division of the department. The Berkeley study postulated that, while most highway professionals see traffic techniques as appropriate supportive or auxiliary devices to the construction of new facilities, they do not see them as a substitute for that construction. Although many local traffic engineers do see the possibility that such techniques can reduce or even eliminate the need for new construction, most traffic engineers see such activities as separate from and supportive of the construction function. The desire to replace construction with traffic management techniques does not generally come from within the traffic engineering community itself.

Traditionally, traffic engineering techniques have been viewed as low visibility nonpolitical actions. Respondents reported that one of the virtues of most of these techniques was that they could be implemented quickly without public hearings or political turmoil. This situation has been changing rapidly, and in some cases it has caused traffic professionals to refuse to implement a proposed technique because they do not have the skills, the volition, or the mandate to deal with public protests.

Traffic engineering techniques have been losing their nonpolitical character for several reasons, and these reasons also bear on the response of traffic professionals. First, traffic departments are increasingly being asked to use techniques in ways that might slow down over-all traffic flows (as, for example, when giving transit vehicles arterial or signal priority). Although some traffic professionals have been willing to do this, others have not; they see that their entire training and professional responsibility calls for them to increase traffic flows or remove impediments to auto travel. This was the response of the Los Angeles Traffic Engineer to that city's contraflow transit priority lanes on downtown arterials; his strong opposition to such techniques predated the Diamond Lane experience by several years (and should have been a warning to California Department of Transportation (CALTRANS) officials). When traffic engineers are called on to under-

take techniques, the stated purpose of which is to reduce traffic flows (as with the road bumps instituted in Berkeley), they can be even less cooperative. Just as significantly, traffic departments are not set up to handle the public protest that such treatments can create; in Seattle, when citizen groups protested a signing project that had been developing for over a year, the traffic department simply dropped the project rather than mediate with the neighborhood groups. Several traffic engineers in the Phase I survey reported anger at local officials who make controversial policy decisions knowing that the major thrust of the protest will fall on the traffic department, as in Berkeley.

Traffic professionals are also wary of seemingly new or untried techniques that receive some public attention. Many traffic engineers are still extremely suspicious of sophisticated surveillance equipment and ramp-metering devices, although the engineering community as a whole has accepted their potential. In both Dallas and Houston, some city traffic engineers were extremely wary of the television and surveillance equipment installed on freeways there in the late 1960s; most Texas highway department officials were not and are not supportive of their continued use. Many traffic engineers are distrustful of technology that is untested; some respondents felt that public officials without the required technological training were being conduced by the private firms manufacturing such equipment. The Traffic Engineer of Seattle in a paper to the TSM Conference in Minneapolis in November 1976 noted that "there are many signal manufacturers with a solution in search of a problem." Others felt that the data available on certain locations or treatments were not sufficient for making a decision to implement certain techniques.

Transit Systems

Although the transit operator is often seen as the recipient of benefits from certain traffic engineering techniques, the systems themselves sought those techniques in less than half of the cities interviewed. Many transit operators saw the advantages of proposed engineering techniques to be minimal and so their participation in such projects was reluctant and ungracious. Local public officials who had urged the implementation of such techniques often felt the transit system did not know what was good for it and failed to understand why it was not more cooperative. In some cases the transit operator was not even consulted on the implementation of what appeared to be a project beneficial to transit. In Santa Barbara, city officials undertook the redevelopment of a downtown street to make it more pedestrian and transit oriented. The reconstruction work forced the relocation of buses to a parallel street; at the end of the reconstruction, the transit operator refused to bring the buses back along the street that had newly designed recessed curb areas for bus loading because it had not been consulted. In Dallas, the transit system is being forced to go along with the city's plan for transit traffic signal priorities, although it is opposed to the plan because it is a department of the city and is fearful of losing its annual subsidy.

Observers see the reaction of transit systems as conservative or irrational. It is entirely understandable, however, that transit operators who do not see any value in a proposed project and who, in fact, may experience increased costs due to the rescheduling or rerouting required, oppose such projects. Even if an arterial redesign or priority treatment decreases traffic interferences or speeds up traffic flows (a goal of the traffic engineers), it may not increase ridership or reduce operating expenses (the goal of the transit system). Although these goals are not necessarily in conflict, unless a proposed engineering treatment meets both, it is unlikely to receive support from both the traffic department and the transit operator. Transit systems were generally supportive only if they had high auto-bus accident rates or they were currently experiencing significant traffic delays on congested arterials and the treatment proposed was actually seen as addressing those problems.

Other Institutions

Most traffic engineering techniques are implemented without public protest or even interest. Increasingly, however, businesses and residential neighborhoods are reacting unfavorably to the introduction of such measures. Business and commercial enterprises protest if they perceive that construction disruption, loss of parking, or altered traffic flows might affect their freight deliveries or their profits. Residential neighborhoods protest if traffic flows or noise levels in or through their neighborhoods increase or if they feel inconvenienced by temporary construction or the final operation of the project.

Some traffic techniques, such as contraflow priority treatments, are self-enforcing, others are not. Such techniques are generally implemented without much discussion with the local police departments which will have the responsibility for enforcing such activities. The police are not enthusiastic about receiving new duties, and they are unhappy about the accident and other problems such treatments entail. In many cities the police simply do not enforce the traffic restrictions or ticket priority violators; Los Angeles has had severe problems with cars parked in the downtown priority lanes. If priority lanes are not patrolled, violations increase significantly; violators can interfere with transit operations and cause accidents.

Congestion and Pricing Disincentives

The actual theory behind congestion and pricing disincentives rather than some secondary or side effect of the implementation creates severe conflict. A whole group of institutions in society opposes the use of tolls and induced congestion as auto disincentives; other sets of societal groups and institutions do not oppose the idea in theory but become adamantly opposed when the technique is applied against them. The number of institutions in a community that is willing to attempt the implementation of pricing techniques is small; after the Los Angeles Diamond Lane experience, the size of that group became even smaller.

State and Local Traffic/Transportation Departments

The idea of imposing charges of some kind on auto drivers traveling alone is foreign to the way most U.S. traffic engineering professionals think about their job. In England, however, traffic engineers are more interested in traffic constraints to aid transit, as in the "zone-and-collar" plans, because transit vehicles are such a significant portion of the traffic flows.

Most traffic professionals think of road tolls as appropriate for only a very few transportation facilities, such as bridges with high congestion where there are limited alternative routings. Many professionals are concerned about the traffic back-ups and queues at toll plazas and the diversion of traffic to adjacent arterials when manual toll facilities are established. In the communities that have conventional road tolling, separate agencies were generally set up to administer the tolls and the facility, largely because such activities were not seen as appropriate responsibilities for traffic departments. However, when priority lanes were used in Los Angeles to increase congestion on adjoining lanes as a pricing mechanism, local and state traffic engineers were expected by political leaders to satisfactorily operate the project.

The local Los Angeles traffic department, which had authority only on arterials adjacent to the treated highway, was adamantly opposed to the Diamond Lane. The Los Angeles City Traffic Engineer called press conferences to give reporters data purporting to show increased congestion in residential neighborhoods. His actions undoubtedly inflamed the public by giving them a basis to doubt the technical competence of the state highway department, CALTRANS.

The actual idea of treating the Santa Monica Freeway in this manner was originally part of the plan of CALTRANS District Office, so indicating it did have support from some transportation engineers. It was, in fact, the technical aspects of the Diamond Lane project that interested some of the higher levels of management in CALTRANS, although for many engineers the pricing component was difficult to accept. The treated highway, the Santa Monica Freeway, was fully equipped with an electronic surveillance system with sensors located in the pavement; almost all the ramps onto the facility were fully metered. CALTRANS felt it could closely monitor all system changes and effectively collect relevant data because of this technical capability. However, CALTRANS apparently did not have the expertise to effectively manipulate the metering equipment in conjunction with the priority pricing treatment, at least initially, and metering difficulties added to the over-all operational problems of the facility.

Transit Systems

Transit operators have been supportive of congestion and pricing disincentives when such programs appeared to promise the significant diversion of auto drivers to transit. As with high-occupancy priority treatments, transit operators are most supportive when they have existing routes along the treated highway and excess capacity on those routes. Most transit systems, however, were only marginally involved in the planning or implementation of pricing techniques.

Other Institutions

Many transportation planners know of the political failure of the Los Angeles Diamond Lane. Few professionals know that identical political reaction forced the cessation of the similar "zones-and-collars" program in Nottingham, England, and that a planned priority-congestion treatment on Boston's Southeast Freeway was dropped after the Los Angeles experience.

Some observers have noted that the preimplementation publicity on the Los Angeles Diamond Lane was limited and that the real impact of the lane was never made clear to the public. These observers feel that the strong protest that developed was public anger at sudden and unpredictable shifts in travel patterns. They feel that had publicity and public information been managed better, with proper notice, the public would have been able to create or expand carpools or investigate transit service and thus would have been more receptive to the priority treatment. However, the Nottingham treatment was completely and fully advertised, and public outcry was virtually the same. Although it may be possible to drastically change people's travel habits by educating them to the benefits of higher occupancy travel, available evidence indicates that the benefits are perceived as too small or too distant to really serve as a motivation for most travelers. In addition to outcries from travelers, in Los Angeles, neighborhoods along the route protested traffic changes they perceived in and through their neighborhoods as travelers changed routes or queues backed up on access roads.

These public outcries both in Los Angeles and Nottingham had significant impact on the key institutions involved. First, some elected officials seized on the programs in both cities as examples of bureaucracy run wild; one observer noted that there are always some public officials looking for an issue to put them in front of the voters in a favorable way. These local elected officials, as well as downtown business groups and, in Los Angeles, the major newspaper, put intense pressure on the technical institutions involved to withdraw the priority pricing technique. In Los Angeles, the treatment was stopped when a federal court ruled that an Environmental Impact Statement was required. In Nottingham, local labor politicians ran on an antizone and collar plank; when the Labour Party came into power in Great Britain, the treatment was stopped.

Another institutional implication of the public reaction to such treatments was a diminution of public faith in the technical competence of the traffic and transportation departments, and this too has further implications. Although CALTRANS had some antihighway trouble in California, they were generally well regarded by the public; a regional planner in Los Angeles noted that even protesting public groups were willing to accept CALTRANS' technical assessments and data on issues in conflict. However, the over-all impact of the Diamond Lane, which was clearly not anticipated, coupled with the initial metering problem and the public controversy between the Los Angeles City Traffic Engineer and CALTRANS officials over technical data, clearly lowered public belief in CALTRANS' technical competence. Not only will this make CALTRANS unwilling to attempt other potentially controversial tech-

niques in the future, but it will also serve as a warning to other traffic and transportation departments.

There are also some indications of public and official reaction to more conventional, and less controversial, tolling experiences. Increases in tolls on bridges and facilities that are already tolled have created significant public outcries in the New York and San Francisco areas. In 1976, when the revenue bonds of the toll road between Dallas and Fort Worth were paid off, there was discussion of continuing the tolls to keep the facility congestion free; public protest quickly convinced the Texas Legislature to remove the tolls.

Vehicle Access Restrictions

Three general classes of access restrictions were considered: parking controls, freight management programs, and auto-access restrictions. Although, the underlying factors and the incentives may vary from one type of restrictive measure to another, many factors influencing the institutions involved in restricting vehicle access in limited areas are the same.

Private Firms

Private business and commercial activities have become supportive of projects restricting access when they perceived that the measures would enhance the area's business potential or act as an incentive to its redevelopment. This has generally been the reason for private support for pedestrian malls. In Boston, many of the major downtown firms were involved in the city's request to UMTA for an Auto-Restricted Zone (ARZ) Planning grant. Also, some businesses support restrictive measures because parking shortages and traffic congestion are seen as having a deleterious impact on their operations. However, in many cases, businesses are not unanimous in their support of such techniques; they fear that significant changes will adversely affect their operations or profits. If business conditions are not bad, or if traffic congestion is not perceived to have a negative impact on their operations, many businesses are unwilling to risk upsetting their current situation. Often businesses and merchants must bear some of the costs associated with conversion to a reduced accessibility area (usually via assessments on property owners). In essence, they are asked to pay for a measure that they are not sure will increase their business. Even where large amounts of federal assistance seem likely, as in the Tucson and Providence ARZs, businesses there were simply opposed to the concept because its actual impact could not be predicted in advance. In the absence of severe problems, strong pressure, and available capital, inducing private firms to agree to participate in the implementation of major vehicle restriction programs has not been easy.

Downtown firms are generally opposed to areawide parking restrictions on much the same grounds. Unless severe parking problems create business difficulties, firms are unwilling participants at best and often strong and vocal opponents. Many parking programs, such as the major ones in San Francisco and Boston, created a pricing structure aimed at penalizing long-term parkers but not affecting short-term parking so as not to interfere with shopping and recreation trips. Firms in both cities were

still opposed, because they were afraid that higher long-term rates would create a "chilling effect" on short-term parkers as well. A reviewer of the Boston parking plan has noted that those implementing parking control plans are never willing to admit that the plans will affect short-term shoppers, even if they suspect such will be the case, because they know the opposition such an admission would generate. Most implementing agencies have claimed that parking controls only redirect trip times or cause a diversion to high-occupancy vehicles; it is clear to many firms, however, that such restrictions may reduce total trips by reducing discretionary shopping trips.

Downtown or core area firms have had mixed reactions to freight management programs. In general, businesses are supportive of changes that increase their efficiency or reduce their problems; the difficulty is that the same freight management plan does not equally affect all firms in an area. Because most commercial areas have a mix of businesses, certain parking or loading restrictions are viewed favorably by some firms and with alarm by others. A freight movement study prepared for the FHWA concluded that, in areas with a variety of business activities, it was necessary to work with all firms involved to develop a compromise plan. The exemplary Manhattan garment district freight movement study and plan was made easier to implement because of the greater uniformity in the businesses involved.

Local Public Agencies

Generally, the transit system and local traffic departments participate in a limited way in the development of any of the major types of access controls, although the traffic department may have the legal authority required to implement parking controls. Both the transit system and the traffic department are usually required to participate in a technical capacity in an access-restriction plan decided on by local policy-makers.

However, a significant point that is often ignored is that if parking and other restrictions were actually successful in causing a diversion to transit, the transit system might not have the capacity to handle the new ridership. The City of Long Beach, Calif., estimated that a parking plan proposed there that would reduce traffic from 6 to 10 percent would require a tripling of the available bus fleet.

A significant institution often forgotten until after the project or proposal is underway is the police department. Although all of the major access controls are extremely sensitive to enforcement, many projects were begun without any serious discussions with the police. The lack of understanding of the needs of enforcement personnel was often reflected in the original EPA parking control plans that had clearly unenforceable components. For example, the Boston plan envisioned the use of color-coded stickers; travel inside of Route 128 was to be restricted for each color one day of the week. Such difficult plans were not likely to appeal to the police.

Local police departments do not like traffic patrol functions; they are generally understaffed and assign the enforcement function low priority. In Boston, for example,

part of the control plan was a ban on on-street parking between 7:00 and 9:00 a.m.; Boston's meter maids, however, do not go on duty until 8:00 a.m. Consequently, violations of the ban were high. The police were not willing to change their duty hours or shift responsibilities in any way. As a result of this experience, the ARZ planning group in Boston worked more closely with the police, but serious difficulties still remain.

As discussed in the "High-Occupancy Vehicle Priority" section, for most police departments the staffing problem may be independent of the question of whether the proposed activity is considered appropriate. For example, the ARZ consultant to UMTA recommended that the police be paid for their increased traffic duty; however, traffic enforcement is still low priority work in most departments, and many departments would not assign regular-duty officers to the work. It may be necessary to hire civilian traffic wardens to perform the enforcement jobs the police find inappropriate.

Other Institutions

Public reactions to limited-access facilities and to freight

management programs have been generally either neutral or supportive. Most of the public do not need to travel through or park in areas with intense freight delivery activity, and so they are not inconvenienced by such plans. In fact, if truck travel is effectively restricted to certain parts of town or certain times of the day, the positive results may be very visible to ordinary travelers. Restricted-access malls are also generally well perceived by the public. If they do not like them, they can always go somewhere else (which is, of course, what businesses are worried about), so people rarely make a political issue out of such activities.

Reaction to parking controls, however, has often been hostile as people have been forced to make major changes in their travel behavior without receiving or perceiving direct benefits. The actual impacts of parking measures on VMTS—and thus pollution, energy consumption, and traffic congestion—are not clear; but, if positive results are obtained, they are not dramatic enough to compensate travelers for the inconveniences they must endure. In San Francisco, public and business protest forced a reduction of the original parking surcharge, although data exist to show that parking charges did reduce congestion.

CHAPTER THREE

INTERPRETATION, APPRAISAL, AND APPLICATION

The experiences of communities attempting to carry out cooperative transportation programs described in Chapter Two can provide guides to implementing the more complex programs represented by the C-R packages. Although no experiments of the scope of C-R packages have yet been carried out, clues to potential institutional problems are suggested by local experience with these more restricted programs. The purpose of this chapter is to extrapolate that experience to identify institutional barriers to implementing C-R packages and suggest strategies for overcoming them.

To provide a framework for this discussion, the major characteristics of institutional problems will be reviewed. Next, within this framework, specific problems and their treatment will be presented. Finally, an example of C-R package implementation will be presented in the form of a hypothetical case history, describing the sequence of events, the occurrence of institutional problems, and the application of strategies that would suggest precedures for successful implementation to other communities.

MAJOR CHARACTERISTICS OF INSTITUTIONAL PROBLEMS

Programs to reduce peak-period traffic congestion, like

all transportation improvement programs, develop through a sequence of phases: preimplementation, start-up, and continued operation. The preimplementation phase consists of conceptualization, planning, promoting, funding, obtaining formal approval, modifying restricting laws or regulations, and assigning implementation responsibility. The start-up phase may begin with land acquisition and construction of facilities; may involve purchase and installation of equipment; but always includes detailed planning of operations, public education about new procedures or facilities, and, finally, initiation of program operation. Continued operation includes the day-to-day management, provision of services, maintenance of facilities, and, hopefully, evaluation and improvement of the initial system.

The institutions involved in this process do not necessarily participate in all three phases. Often, those performing the most important preimplementation tasks play only minor roles in the start-up phase, and are disassociated from the day-to-day operations once the program is underway. These are the concept designers and program promoters who are often support staff to the regional transportation planning authority, members of the MPO itself whose formal approval was necessary, and the various representatives of state and federal transportation agencies

who serve as advisors to the MPO or are channels through which funding assistance is obtained. Other institutions are active participants only during the start-up phase in constructing facilities or installing equipment. And, finally, some institutions enter the scene only when the program is put into operation—those agencies that deliver services, enforce, regulate and license, and generally manage and maintain the continuing activity. Even sources of funding the day-to-day operation are often different from those available for the planning and start-up tasks.

Most of the institutional problems that plague attempts to implement several activities within a coordinated transportation improvement program originate in the failure to recognize the full range of agencies and organizations these activities will involve and to take into account those factors that determine these institutions' participation in or approval of the program.

Institutional barriers to implementing complex congestion-reducing programs can be examined more rationally if one recognizes that some are inherent to the particular techniques selected; others are created by the need to coordinate the activities of independent agencies within a joint program, regardless of which techniques are involved; and still others are generated by the specific setting in which the C-R program is attempted by factors such as the community's particular transportation resources, political structure, and economic and social conditions. In suggesting strategies to overcome these institutional barriers, one finds that those related to particular techniques are directly applicable to virtually any C-R implementation program. Strategies for dealing with coordination problems can be applied with some modification to fit many situations. Those related to community characteristics are the least transferable, but may provide a program coordinator with a point of departure for devising similar strategies to meet his particular situation.

Specific institutional problems and solutions are discussed in the following sections within this framework of technique-related, joint-implementation, and site-related factors. Each of these three sections identifies the public and private entities involved in carrying out congestion-reducing activities and the roles they are required to perform. Institutional factors affecting their ability and willingness to participate or support the program are noted, and strategies for reinforcing positive factors and eliminating negative ones are suggested.

TECHNIQUE-RELATED PROBLEMS AND SOLUTIONS

When communities look for a solution to their peak-period traffic congestion problems through the coordinated application of several congestion-reducing techniques, they have the option of implementing one of the C-R packages recommended in NCHRP Project 7-10 or of selecting other combinations of techniques best suited to particular local transportation needs and resources. Most communities will probably find one of the recommended C-R packages basically applicable, but will add or eliminate a few program elements to fit the local situation.

Because local agencies will be dealing with different combinations of C-R techniques and many of the institu-

tional problems of these coordinated implementation programs relate directly to the individual techniques selected, it will be helpful to set aside, for the moment, the concept of complex C-R packages and, in this section, to examine in detail the problems associated with particular techniques and strategies for dealing with them. One will return to the packaging concept in the section following this in which institutional problems of joint implementation of several C-R measures will be discussed.

In NCHRP Project 7-10 study, 17 techniques of reducing peak-period traffic congestion were found to be both feasible and effective. In this study an initial analysis of major institutional factors suggested that certain elements of the problem were common to groups of techniques. Institutions most often found that carrying out primary implementation roles and the institutional problems inferred by this allocation of responsibility served as the basis for categorizing the 17 C-R techniques into five groups sharing similar problems and potential solutions. The resulting groups and institutional factors considered are given in Table 6.

In the following discussion each of the five groups of C-R techniques is dealt with in turn. Initially, problems common to the several techniques are described and strategies suggested for avoiding or overcoming them. This is followed by analysis of the special institutional problems presented by individual techniques and possible solutions to these. A check list is also provided for each C-R technique—identifying the institutions that would be involved in its implementation and the roles they would be called on to perform, and briefly noting possible institutional barriers to their participation or approval and strategies for overcoming them.

Traffic Engineering

The traffic engineering group consists of two C-R techniques:

1. Freeway surveillance and control.
2. Maximizing use of existing facilities.

Relatively few institutional problems occur in the implementation of these techniques, largely because they represent the most traditional approach to relieving peak-period congestion—improving the capacity of the system to meet increased travel demands. Most applications are under the control of local road and public works departments, utilize well-established sources of federal and state funding assistance, and present no challenge to existing laws and regulations.

Local traffic engineering agencies are among the most independent units of local government. Although certain needs for improvements to the road system are often identified by planning and enforcement agencies, traffic engineers depend primarily on their own measurements and observations of traffic problems to determine needs and priorities. Detailed plans are drawn up and implemented within the agency with little or no interference from other segments of local government beyond budgetary restrictions.

Institutional problems of primary concern in traffic en-

TABLE 6
COMMON INSTITUTIONAL FACTORS IN IMPLEMENTING 17 C-R TECHNIQUES

| Techniques | Primary Implementation Authority | Primary Approval Responsibility | Primary Legal and Regulatory Restraints | Primary Funding Sources |
|---|--|---------------------------------|---|-------------------------|
| <u>Traffic Engineering</u> | | | | |
| 1. Freeway surveillance and control | State Highway Engineering | FHWA, State DOT, local MPO | EPA, local business and residential dislocation | FHWA |
| 2. Maximizing use of existing facilities | City Traffic Engineering | FHWA, local MPO | Local business and residential dislocation | FHWA |
| <u>Transit Improvements</u> | | | | |
| 3. Circulation systems | Transit District | UMTA, local MPO | None | UMTA |
| 4. Priority-arterials | Transit District | UMTA, local MPO | City Traffic Engineering | UMTA |
| 5. Priority-expressways | Transit District | UMTA, local MPO | State Highway Engineering | UMTA |
| 6. Extended-area service | Transit District | UMTA, local MPO | State PVC | UMTA |
| 7. Incentives to use transit | Transit District | UMTA, local MPO | None | UMTA |
| <u>Restricting Automobile Use</u> | | | | |
| 8. Road pricing | City or State Traffic Eng. | local MPO, State DOT | EPA | City or State DOT |
| 9. Parking controls | City Police, Traffic Eng. | local MPO | Private owners penalized | City |
| 10. Traffic cells | City Police, Traffic Eng. | local MPO | Local bus. & residential dislocation | City |
| 11. Auto-free zones | City Police, Traffic Eng. Redevelopment Agency | local MPO, HUD | Local bus. & residential dislocation | City/HUD |
| <u>Changing Land Use</u> | | | | |
| 12. New towns | Private investors | State Land Use Authority | Local zoning plan | Private |
| 13. Planned neighborhoods | Private investors | City Planning Authority | Local zoning plan | Private |
| 14. Zoning and building codes (mixed use) | Private investors | City Planning Authority | Local zoning plan | Private |
| <u>Employer Initiatives</u> | | | | |
| 15. Staggered work hours | Employers | local MPO, UMTA | None | Private, UMTA |
| 16. Ridesharing | Employers, City | local MPO, UMTA | Insurance, PVC regulations | Private, UMTA |
| 17. Communications in lieu of travel | Employers | local MPO | None | Private |

gineering activities are those involving public reaction to enforced changes in travel patterns. Objections tend to be localized in the immediate commercial or residential area affected rather than throughout the community at large. Except in rare cases where users of a major highway or arterial route have gained the support of local news media and special-interest groups, the only dissent will be among those whose specific convenience or livelihood is affected.

The greatest difficulty in devising strategies for preventing or overcoming negative public reaction is that the public at large commonly fails to give serious consideration to a proposed modification and appears to recognize its impact on their particular situation only after they come face-to-face with the accomplished fact. Public information programs prior to implementation may elicit no significant negative response, but this is not at all an assurance that protests will not be heard once the program is in operation.

Nonetheless, the best insurance against unexpected public protest is to make sure that the proposed action has been reviewed by a truly representative citizen advisory body and that the information given to this group (as well as to the public at large) to evaluate the proposal represents a true estimate of its probable effects. Traffic engineers convinced of the value of a proposed improvement are often tempted to omit a public consideration or to present only the positive factors. The Diamod Lane experiment in Los Angeles was well publicized prior to operation, but according to some users of the route none of the preimplementation pamphlets or news releases had adequately prepared them for the situation they found themselves in when the program actually began.

Freeway Surveillance and Control

Definition. Free flow of traffic is maintained by increasing vehicle carrying capacity through design improvements, such as restriping, addition of lanes (shoulders), direction signs, and reversible lane operation; and by regulating entry with on-and-off ramp controls activated in response to human or electronic surveillance systems.

Institutional Roles. Most existing systems have been developed as cooperative efforts between federal, state, and local traffic and transportation departments. The extent of participation varies and is usually dependent on the funding structure. Primary responsibility for development and operation normally lies with state highway authorities. In some cases, as in Chicago and Los Angeles, a special office within the state or local government structure has been created to administer the program. Enforcement is carried out by state highway patrol or city police personnel. The roles of the institutions involved, the barriers to participation or approval, and the strategies to gain participation or approval are summarized in Table 7.

System design is carried out either by the primary implementing agency or by outside consultants, as in the cases of Houston and Dallas where Texas A&M's Transportation Institute designed the system. Funding sources for research are primarily FHWA and UMTA, with contributions from the state and city.

Equipment purchase and installation have been carried out under matching state and federal highway construction funds, specifically interstate highway construction funds and the TOPICS program; in Houston, the city also contributed to the program. Operating funds are often pro-

vided from state highway sources, although the City of Dallas both funds and carries out operation and maintenance of its North Central Expressway System.

Formal approval of proposed freeway surveillance and control systems by the designated metropolitan planning organization (MPO) is now required for all programs relying on federal transportation assistance. Since ramp-entry controls affect traffic on streets adjacent to the freeway, the MPO will look for potential congestion problems

in these locations and may attempt to coordinate improvements to vehicle capacity to affected city streets with the development of the freeway entry control system.

Institutional Problems. Freeway surveillance and control programs have experienced institutional problems. As in other jointly implemented programs, the participants have not always been able to agree to the design concept, implementation schedule, share of funding, and responsibility for different tasks. Also public reaction to entry

TABLE 7
INSTITUTIONAL FACTORS—FREEWAY SURVEILLANCE AND CONTROL

| Institutions Involved | Institutional Roles | Barriers to Participation or Approval | Strategies to Gain Participation or Approval | Penalties |
|---|--|---|--|---|
| Regional Transportation Planning Agency (MPO) | Conceptualization Planning Formal approval | Conflicts with overall regional plan Owners of businesses and residences adjacent to freeway protest initial congestion on city streets, lack of access at peak travel times Freeway users are disturbed to find ramps closed at different times or entry delayed | Funding assistance for planning Experience of other cities that congestion problem is temporary Coordination of street improvements to aid traffic flow Public information program to interpret ramp signs and signals and suggest alternative routes Additional police assigned to direct traffic | All federal and state funding withheld until plans are coordinated |
| State DOT/Highway Agency | System design* Acquisition and installation* of equipment Funding | In-house experience inadequate for system design | Funding available to contract with consultants Federal technical assistance | Federal highway funds for equipment and installation withheld until completion of sound system design |
| U.S. DOT | Funding | Insufficient appropriations Policy favors other techniques | Establish long-term policy and stabilize funding | Federal and state requirements for city commitment before project is implemented |
| City Traffic and Transportation Agency | Operation* Maintenance* Monitoring* | Inadequate post-implementation funds to support continued operation | State-city agreements on long-term funding responsibility Monitoring function may be provided for under special federal or state study | |
| State Highway Patrol City Police Department | Operation* Enforcement | Inadequate budget for additional work-load Dislike of enforcing new program under criticism by highway users and adjacent property owners | Increased budget commensurate with additional work-load Public information program on probable long-term benefits Instruction to aid drivers in finding alternative routes and avoid ticketing, especially in initial stages Agreement between state and local government for long-term funding | State or city government orders agency to cooperate |
| *Special Agency - may be established by state-city agreement to implement program and perform these functions | System design Acquisition and installation of equipment Operation Maintenance Monitoring | Insecurity of funding to maintain operation | | |

restrictions during the initial phase of operation has resulted in projects being abandoned.

Freeway users may find it confusing if ramps are closed during certain time periods, or frustrating if it is necessary to wait for long periods at on-ramps until they are permitted to proceed. Property owners along affected adjacent streets may protest the increase in congestion, while merchants may object to attempts to solve this problem by restricting on-street parking and to the fact that access to their establishments from the freeway is denied during peak periods. Highway patrol and police personnel may be reluctant to enforce an unpopular program, especially if no provision has been made for their increased work load. No legal or regulatory barriers to implementation exist. It should be possible to avoid critical institutional problems if adequate measures are taken to relieve congestion on adjacent streets and instruct the public in the over-all advantages of the system and how to interpret and respond to entry signs and signals.

Maximizing Use of Existing Facilities

Definition. Traffic throughput on existing streets is improved by designs, regulations, and controls that minimize potential conflicts between vehicles. This is accomplished by a broad range of measures that includes one-directional streets, channelization, pavement markings and directional signs to facilitate entry and exit, and design improvement and synchronization of traffic signals. Removal of on-street parking to free additional lanes for moving vehicles is often included in this group of measures, but is treated in this report under the general heading of "Parking Control," the primary purpose of which is to discourage use of private automobiles in congested areas.

Institutional Roles. As can be seen from Table 8, these measures are normally carried out by city traffic engineering, road, or transportation departments. Some computer-controlled signalization programs, such as in Tallahassee, were joint efforts of the Federal Highway Administration and the state, county, and city governments. Turn-out bays for bus loading and unloading will require cooperation between the local transit and traffic authorities.

Funding for most existing projects came from the TOPICS program administered by FHWA. City police enforce the measures. Formal approval of the MPO is necessary for eligibility of these projects for federal-funding assistance.

Institutional Problems. TOPICS-type improvements have been broadly implemented throughout the nation without incurring significant institutional problems. In rare instances improvements resulting in increases of traffic volume and speed in residential areas may be protested, but may usually be met by providing a single signalized crosswalk or alternative crossing in a critical location, such as a school.

Conversion of downtown streets to one-way pairs may generate some initial objections from retail businesses, but experience indicates that the resulting improved flow tends to increase business volumes and time should provide the solution to this problem. Reversible lanes require signs clearly indicating when a vehicle may and may not enter

TABLE 8

INSTITUTIONAL FACTORS—MAXIMIZING USE OF EXISTING FACILITIES

| Institutions Involved | Institutional Roles | Barriers to Participation or Approval | Strategies to Gain Participation or Approval | Penalties |
|---|--|--|--|---|
| City Traffic/Road/Transportation Department | Planning Design Construction-Installation Maintenance Monitoring | None significant | | |
| Metropolitan Planning Organization | Formal approval | Objections to higher speeds, more traffic in residential areas Initial objections of merchants to one-way street designations | Provide safe crossings, especially near schools Show experience in other areas of business increases with improved traffic flow | |
| U.S DOT State DOT/Highway | Funding | TOPICS program being replaced Overlapping FHWA/UMTA funding programs, especially for transit turn-out bays | Clarification of joint funding program and long-range policies - special attention to enforcement eligibility needed | |
| City Police Department | Enforcing | Additional work-load without sufficient budget | Provide necessary funds to increase manpower and equipment for new work-load | City government requires agency to enforce new measures |

in one direction and a public information effort to introduce the system to regular users of the route. Public acceptance of turn-out bays for transit use is high, but some conflicts between local transit and traffic agencies regarding funding responsibility have occurred.

In seeking to establish common factors of opposition to transportation projects, an ITE Technical Council Committee recently studied 98 projects throughout the country (19). Primary sources of opposition were citizens', en-

vironmentalists' and homeowners' groups. The major objection to the projects was damages to the environment, followed by air and noise pollution. Opposition strategy most often took the form of court action, statements at public hearings and through news media, and community meetings. In 60 percent of the cases the projects involved residential areas, while 17 percent affected commercial areas. Opposition occurred more frequently during the construction and specific site or route selection than during earlier right-of-way acquisition and information meetings. Of the 84 projects challenged, only 17 percent were carried out as originally planned, 13 percent were abandoned, and the remainder were being held in abeyance pending preparation of environmental impact statements or review and modification of plans.

Transit Improvements

Five C-R techniques make up the group of transit improvements. These are:

1. Circulation systems.
2. Priority treatment on arterials.
3. Priority treatment on freeways.
4. Extended-area transit.
5. Incentives to use transit.

Institutional problems common to all transit techniques are policy conflicts arising from opposing transportation goals, difficulties of developing urbanwide integration of services, and attitudes of transit administrators and labor unions. Confusion as to the purposes of public transit can be observed at all levels of government. Is it primarily a social service to provide mobility to the transportation disadvantaged? If so, then transit should be heavily subsidized on a permanent basis to offer low-fare transportation throughout the community, including low-demand areas. Is transit a tool for reducing air pollution, automotive fuel consumption, and traffic congestion? Then services should be designed to compete in convenience, comfort, efficiency, and cost with the automobile, oriented primarily to serving commuters and subsidized on the basis of the indirect social benefits to be derived from improved air quality, energy conservation, and reduced traffic congestion. Or is transit a public utility, like water and power, to be paid for by its consumers? If this is the case, services should be focused on high-demand routes and fares set at a level that will cover costs without subsidy.

Transit authorities at federal, state, and local levels are torn between these goals, emphasizing first one and then another. At one moment fares are heavily subsidized to provide mobility to those without access to cars or to promote transit ridership among commuters. A short time later subsidies are withdrawn and fares are raised to meet the increased operating deficit, as occurred in Los Angeles. Suburban demand-responsive systems are put into operation under demonstration grants, prove to increase use of line-haul transit, and are then abandoned when the demonstration is over because the community is unable to assume the full burden of system costs, as in Haddonfield. The Santa Clara County dial-a-ride system was forced to close down because it was too popular and each new rider in-

creased its operating deficit. While these policy conflicts are unresolved, it is very difficult for transit administrators to make sensible long-term management decisions and for the public to accept transit as a reliable means of transportation.

The solution to this problem lies in establishing sound transportation policy that sets priorities and compromises among the conflicting goals. Local governments are often more successful in accomplishing this than are state and federal governments, but their ability to maintain their positions is weakened by policy fluctuations at federal and state levels that affect funding assistance.

Integration of urban transit enables all of the diverse publicly and privately owned services to operate as elements of a single areawide system in which the user may travel anywhere in the community on a single fare, transferring easily between different modes and systems. Also, under transit integration, wasteful duplication of service is eliminated and resources are reallocated to extending its availability; and the several operations benefit from combined planning, purchasing and marketing programs, and the joint use of equipment and facilities.

Institutional arrangements for transit integration are:

1. *Tariff associations.* Contracts between operators provide for joint-fare schedules and distribution of jointly collected fare revenues, as is currently practiced by airlines.
2. *Transit communities.* Agreements between operators not only provide for common tariffs, but also provide for coordination of routes and schedules and, where appropriate, pooling of rolling stock, as railroads do.
3. *Transit federations.* A separate institution is formed by member transit operators who delegate to it the authority for rationalizing services, setting fares, and distributing revenues. The Hamburg Transit Federation in Germany is an example of this approach.
4. *Mergers.* Separate transit companies or authorities are combined under single administration under which they may operate as separately managed subdivisions or lose their identity completely. The Metropolitan Transit Authority in New York is an example of the former, and Metro Transit in Seattle is an example of the latter.

The two major institutional barriers to transit integration are legal constraints and attitudes of transit operators. Privately owned systems are controlled by Public Utilities Commissions that specify mode, service area, and fare schedules. Publicly owned systems function under enabling legislation that sets the service area, establishes local sources of funding, and often limits the types of transit service the agency may operate. In order to enter into agreements for joint ticketing and revenue sharing, or transferring functions of planning, purchasing, maintenance and public information to a transit federation, or merging with other systems, these legal and regulatory constraints must be removed. The process is often lengthy, especially when changes must be made at the state and federal level.

Many of the delays and obstacles to transit integration, however, are due to the conservative attitudes of transit management. Competition between operators, even among publicly owned, subsidized systems, is common. Transit

personnel often view attempts at integration as threats to their independence and job security. One of the most interesting examples of this was observed during the initial negotiations between the Bay Area Rapid Transit District (BART) and A-C Transit on rationalizing routes. A-C Transit refused to abandon certain bus services that paralleled BART rail lines on the grounds that these were its most profitable routes. Both systems were deficit operations, and property owners in Alameda and Contra Costa counties were assessed by each transit district to meet this deficit. Whatever profit A-C Transit realized on these routes was lost by BART in underutilization of its parallel service. The taxpayers' interests would have been better served by the reallocation of the buses to feeder services to BART stations, but the instinctive reaction of A-C Transit management was to consider BART a competitor and to examine the economics of the situation only with regard to their own operation. The solutions to this problem are: a strong regional transportation body that can identify the optimum allocation of transit resources and withhold funds until operators agree to cooperate, and a well-informed public who can insist through their votes that their taxes be used in the most effective manner.

Much has been written elsewhere about the effect of transit union policies on the growing costs of public transportation and the restraints of innovative transit operations by the protection transit employees are afforded by the provisions of Section 13C of the Urban Mass Transportation Act. This report will attempt only to summarize the problem. Briefly, labor represents the major cost of providing public transit, and, under the increasing demands of transit unions, it is no longer possible to meet operating costs. Continuous subsidies are necessary because fares high enough to cover costs would place transit service beyond the reach of the transportation disadvantaged and reduce demand from those that have the alternative of driving.

The present high cost of labor stems not only from increased wage rates but from the combination of the peaking characteristic of transit and union policies on specialization of job activities. Demands for transit peak in morning and evening commuting hours that extend beyond a normal 8-hour workday. Enough vehicles and drivers must be provided to meet this peak demand. Drivers usually make one or two trips during each peak period and sometimes no more than one more trip for the remainder of the day.

Drivers are paid, however, for a full working day. Some contracts allow for 8 working hours within a 10-hour span at regular pay, while others require overtime pay for a span of more than the 8 hours necessary to include both peak periods. Unions do not permit drivers to apply their idle hours in any other transit tasks, such as vehicle repair or cleaning (which is reserved for another union), or in office work. Drivers spend these hours at leisure or occasionally moonlighting at other jobs, such as gardening.

The eventual solution to this problem lies in negotiating labor contracts that would permit drivers to perform other productive functions, during off-peak hours, or permit part-time hiring of those drivers needed only at peak commuting times. One strategy might be for transit management to offer higher individual salaries for personnel car-

rying a combination of tasks, perhaps with priority for those displaced as new job openings occur.

Most authorities on transit believe that this solution is impossible to effect at the present time. However, interest in low-cost alternatives—such as taxis, jitneys, vanpools, and other user-operated vehicles—is increasing at all levels of transportation responsibility, and public reluctance to increase present levels of transit subsidy is becoming more evident. Some compromise will have to be reached if transit unions are to participate in the continuing growth of public transportation.

Traditional attitudes of transit management can also be barriers to improving service. Many holding senior positions began their careers in privately operated systems suffering under diminishing ridership and financial difficulties. The common management response to this situation was to curtail services on less profitable routes, avoid investment in new equipment, minimize maintenance, and depend on overutilization of capacity during commuter peaks to cross subsidize off-peak operation. Services were largely oriented to regular users, so that bus stops were often unidentified, destinations of vehicles were poorly indicated, and route and schedule information was difficult for a new rider to obtain.

Although nearly all transit systems are now under public ownership as a result of former federal policies restricting grants to publicly owned services, personnel trained in private companies still tend to make important management decisions in the perspective of their former private enterprise situation. Improvements in service generally follow evidence of existing demand rather than seek to generate demand by extending routes or increasing capacity. Operations are commonly confined to mass transit using high-capacity vehicles. Innovation is limited to express service and occasionally subscription riding that utilize the same vehicles and operating techniques. CBD circulation services are almost invariably provided by the same large buses, although smaller vehicles would function better in downtown traffic. Paratransit options for feeder and circulation systems are rarely implemented by the transit authority, itself, and it will bitterly oppose attempts of others to serve this market. Although there are notable exceptions, the vast majority of transit systems in this country reflect these management attitudes.

The solution to this problem can be found in the education of present and future transit administrators. UMTA both provides assistance to individuals and participates in conferences to improve technical skills and awareness of new transit developments among the profession. Some states also sponsor seminars and workshops for transit management. Another effective means of transferring new ideas is exchange visits between cities where visitors can observe experimental programs in operation.

Circulation Systems

Definition. Circulation systems are public transportation services operating within activity centers such as CBDs and business districts of suburban communities. These systems characteristically provide dense routing patterns and frequent stops, and most passenger trips are

short. Their primary purpose is to encourage the use of transit rather than private vehicles within these areas by providing commuters and shoppers with transportation to their specific destinations from either line-haul transit routes or peripheral park-and-ride lots.

The modes most frequently employed are buses and minibuses operating along fixed routes, usually in a loop design. Circulation systems may, however, encompass jitneys, shared taxis, dial-a-ride vans, and people-movers.

Low fares are characteristic, and many services operate fare-free.

Institutional Roles. Institutions involved in the development and operation of circulations systems vary according to mode and local political and economic conditions (see Table 9). Where buses and minibuses are used in fixed-route service the local transit authority often designs, promotes, funds, and operates the system. Funding assistance from UMTA capital and operating grants is often

TABLE 9
INSTITUTIONAL FACTORS—CIRCULATION SYSTEMS

| Institutions Involved | Institutional Roles | Barriers to Participation or Approval | Strategies to Gain Participation or Approval |
|---------------------------|---|---|--|
| Transit Authority | Planning Promotion Funding Operation Evaluating | May disapprove use of taxis and jitneys | Incentives Penalties Demonstrate benefits to transit operation of supplementary services (feeder systems and relief of peak capacity needs) |
| Taxi and jitney operators | Planning Administration Operating Funding | Regulations prohibit jitney and/or shared taxi operation Operating costs require fares too high for market | Require taxis to operate in shared mode |
| CBD merchants | Planning Funding | Some may not see the value of supporting the system | Increase business Reduce costs of providing employee and customer parking |
| Local government | Planning Administration Funding | Transit deficit already too great to add new services Other budgetary priorities | Information on jitney and taxi alternatives Public expresses needs Reduce downtown congestion Reduce needs for public CBD parking Technical assistance |
| MPO | Promotion | Lack of promotional experience | Negotiation |
| Transit unions | Approval Approval | Object to non-union competition | Budget increases for new personnel Trial period with traffic monitoring |
| City police | Regulation (taxi, jitney) | Increased work load Fear disruption of CBD vehicle movement | Require participation |
| State PVC | Regulation (taxi, jitney) | Existing laws prohibit shared taxi and jitney | Local government makes strong demands |
| State DOT | Funding | Existing laws prohibit | Local government promotes changes State DOT joins local government in promoting changes These programs cost relatively little and promote other transit use |
| U.S. DOT | Funding | Other programs have priority Fear conflicts with U.S. Dept. of Labor if taxi and jitney services are funded without local transit union approval | Strong pressure from state and local government and private operators |

obtained. Many systems are also partially funded by the state. Occasionally, local merchants contribute to the support of the system. In Lincoln, Neb., for example, 95 CBD business firms provide \$55,000 annually in total support of the "Mini-Line" that carries 850 passengers per day at a \$0.10 fare.

Jitney and shared-taxi services are operated by private owners as profit-making ventures. A more recent development, originating in Southern California, is the "turn-key" operation in which local government contracts with a private taxi company to provide low-fare demand-responsive service and subsidizes the system out of the city general budget.

More rarely, a single large retail firm will provide park-and-ride services for its customers with a shuttle service carrying passengers between a peripheral parking facility and the downtown location.

Institutional Problems. Circulation systems are well received by users, especially if they also provide for easy transfer with line-haul transit. Local business firms also recognize benefits in increased sales and relief from the necessity to provide parking for all of their customers.

Systems operated as supplementary services by the local transit district rarely face critical institutional barriers. There may be some initial difficulties in designing routes and schedules to meet users' needs, and there may also be some minor delays or problems in funding. If the system requires local financial support, the promoting agency can offer evidence from other cities of increased business activity following the implementation of circulation transit. Also, where downtown businesses are taxed to support public parking facilities, the city may find it more economical to direct some of these funds to developing a circulation system rather than to the construction of additional public parking facilities.

Institutional problems encountered in initiating jitney and shared-taxi circulations systems, on the other hand, may be so great that implementation is impossible. Legal restrictions against the operation of jitneys have existed in most U.S. cities since 1910-20 when privately owned transit companies feared their competition. Even though nearly all transit systems are now publicly owned and operate at a deficit, most transit personnel continue to see jitneys as a threat and strongly oppose attempts to remove the restrictions. A handful of cities, such as San Francisco and Atlantic City, has maintained jitney services, and their experience indicates that the public benefits by the increased availability of transit services and that the jitneys even relieve the mass transit system of the need to meet peak demand with additional vehicles and drivers that will be idle the remainder of the day.

The most effective strategy to overcome transit agency prejudice against jitneys is to present an economic analysis of transit versus jitney costs of meeting this portion of peak demand and arrange for local agency personnel to meet with their counterparts in cities that permit jitney operation. Objections of transit unions competition from non-union services may also occur, as previously discussed.

Legal and regulatory restrictions against shared-taxi operation are also prevalent. Most city and state public

utility authorities prohibit the use of taxis in other but "premium service"—that is, one passenger or party at a time with direct travel between the specific origin and destination desired by the users. Taxis are also regulated as to service area, fares and number of vehicles, qualifications of drivers, standards of service, and methods of operation. Entry into taxi operation is usually restricted by limiting the number of permits and/or granting exclusive franchises to taxi companies for a specified service area.

Most of those communities that do permit shared riding are small and have no other or very limited mass transit service. Washington, D.C., is the most notable exception in permitting not only shared-taxi operation but also free entry into the market. Many large cities also have illegal "gypsy" taxis that serve markets inadequately reached by licensed companies. Regulatory authorities frequently tolerate these operations because they provide mobility for low-income users and serve ghetto neighborhoods where licensed drivers often refuse to pick up and deliver passengers.

Attitudes of transit agencies and established taxi operators can be critical barriers to instituting shared riding and free entry. Transit authorities may welcome privately operated feeder services in suburban markets where they offer no service, but may object to competition within the CBD. The position of taxi operators is more difficult to forecast. The taxi industry is still largely opposed to free entry, but has grown more receptive to the concept of leasing in which each driver is an independent entrepreneur rather than an employee. The industry is also becoming increasingly interested in shared riding because escalating operating costs have forced premium-service fares out of reach of many former users.

Again, economic analysis demonstrating the advantages of shared-taxi operations is the most effective strategy for obtaining both transit and taxi support. It can be shown that transit ridership increases when feeder connections can pick up and deliver passengers at their homes or places of work. It can also be shown that taxi revenues will increase under shared use.

Another strategy for utilizing shared taxis to meet local transit needs is "turn-key" operation, many examples of which have been developed in small communities in Southern California. Under this scheme, the city contracts with a local taxi operator to provide low-fare door-to-door demand-responsive transportation. The taxi company has full responsibility for operating the system—hiring and supervising drivers, maintaining vehicles, dispatching, and collecting fares. The company bills the city for these services according to the provisions of the contract, usually at a fixed rate per vehicle-hour or passenger-mile, that allows the operator a profit. The city sets the fare and subsidizes the difference between the taxi operator's charges and revenue from fares. The city also may, as in California, purchase the vehicles needed under a state assistance program and, in turn, lease them to the taxi company for a nominal sum. Most cities also handle public information and ticket sales. Unfortunately, they are relatively inexperienced in these areas and should be provided with

technical assistance in the initial phases of the program. Costs to the city to subsidize transit service have uniformly been found to be less for turn-key arrangements than for traditional fixed-route bus service.

Priority Systems on Arterials

Definition. Transit service is expedited by reserving lanes on arterial routes for the exclusive use of buses (and frequently carpools) and freeing buses of certain general restrictions on vehicle movement. Priority routes may utilize reserved bus-only streets or CBD curb lanes, from which on-street parking is prohibited, or median lanes. Buses may travel in the direction of adjacent automobile traffic flow or contraflow. Reserved lanes may be physically separated by barriers or grade level or may only be indicated by pavement markings and street signs. Systems with physically separated median lanes can be reversible, corresponding to the major direction of traffic movement at morning and evening peaks. Lanes may be reserved for exempt vehicles permanently or only during peak commuting hours.

Other priority measures on arterials include signal preemption by buses, exemption from restrictions on nontransit vehicles for loading and unloading passengers or making left or right turns, and use of railroad rights-of-way.

Institutional Roles. Arterial priority systems are frequently implemented in conjunction with connecting freeway priority systems. From Table 10 it can be seen that local agencies primarily involved are the transit authority and the traffic engineering department. Either may be the principal promoter and planner, although in some urban areas, such as Miami, Fla., the county transportation agency carries out these functions. Traffic engineers will be responsible for installation of fixed devices for signal preemption and placement of barriers or street markings and signs for reserve lanes. The transit authority will be required to make adjustments to routes and schedules and, if the system involves signal preemption, to install such equipment on vehicles; but it will function primarily in the long-term operation.

In some urban areas, the MPO has been the originator of the program and its principal promoter, but in all cases it will be called upon for formal approval. Funding of priority systems can be done entirely by local or state and local government. However most existing projects have been heavily supported by FHWA and UMTA. Ensuring that reserved lanes are free from unauthorized vehicles is the responsibility of local enforcement agencies. Finally, business firms and residents along the priority routes may become heavily involved in the program if they perceive the system as detrimental to their interests.

Institutional Problems. The source of the most critical institutional problems with implementing priority systems lies in their funding. Both FHWA and UMTA have strong interests in priority treatments and are often involved in the same program. In one area a combined freeway-arterial priority project was complicated far beyond its original plan by UMTA's insistence on adding park-and-ride lots and express bus services and FHWA's insistence on fly-over ramps. Each of the federal agencies wanted

the other's funds used on items that both had the authority to provide, and local representatives found it necessary to prepare two series of grant applications and progress reports to meet the differing requirements of the two agencies.

Other communities reported conflicts at the local level between public works and transit agencies over the same problem—whose funds were to pay for what. Projects implemented without federal assistance were generally carried out with fewer delays and problems. The need and prospects for a more coordinated and consistent federal transportation assistance program are discussed in Chapter Four.

Another significant institutional problem of priority systems is enforcement. Until recently, federal-assistance programs contained no provision for the additional demands on local enforcement agencies for policing reserved lanes. Such funds are now available, and none of the communities surveyed in this study had yet received any such funds. In addition, all priority systems that remove lanes from those previously available to private vehicles intensify congestion on the remaining lanes, at least at the beginning. Both drivers and local businessmen and residents object, and the police, who are commonly not consulted in the planning stage, will often refuse to cooperate in enforcing so unpopular a program. One priority project was forced to hire off-duty officers to patrol its system, because none of the local enforcement agencies were willing to allocate any of their on-duty manpower to the task.

Strategies for dealing with the enforcement problem are, first, to consult with these agencies in the planning phase for input on the resources they will need to meet their new responsibilities and to obtain the additional funds they require for increased staff and equipment. Secondly, an effective public information program should be carried out to prepare drivers and affected property owners for the initial increase in traffic congestion and explain the long-term benefits that are expected.

Objections of local merchants to reduced parking access for customers and goods delivery can be alleviated in part by the same public information program if it is accompanied by practical alternatives to present arrangements. These can include exemption during specified hours for delivery vehicles and convenient park-and-ride facilities for customers.

Legal barriers to priority systems depend on state enabling legislation and judicial interpretation. Traditionally, streets and highways have been established as rights-of-way for general public use. Measures that differentiate among users may be called upon to show that they serve the public interest. In a recent case involving an arterial bus lane, the Wisconsin Supreme Court ruled that without a change in existing statutes the police power of the city could not discriminate against the use of the street. The District of Columbia has established the legal authority for priority lanes in the D.C. Code as follows (8):

The traffic lane closest to the right hand curb on the following streets shall, during the times set forth below, except on Saturdays, Sundays and Holidays, be reserved for the use of buses; provided, however, that other vehicles may enter or leave the bus priority lane for the purpose of taking on or discharging a passenger

TABLE 10
 INSTITUTIONAL FACTORS—PRIORITY SYSTEMS ON ARTERIALS

| Institutions Involved | Institutional Roles | Barriers to Participation or Approval | Strategies to Gain Participation or Approval | Penalties |
|----------------------------------|--|--|---|--|
| Local traffic engineering agency | Conceptualization Planning Construction (street marking signs) Monitoring | Participation or Approval Increase congestion on remaining auto lanes Believe transit funds should be used | Incentives Discourage auto use over long-term Negotiate | Local government orders Withhold funds until resolved |
| Transit authority | Planning Promotion Operation Monitoring | Believe road funds should be used Need to revise schedules, routes and reallocate vehicles | Negotiate Additional funding for revisions at initiation | Withhold funds until resolved |
| MPO | Formal approval | Drivers and local business object | Public information on benefits | Withhold state and federal assistance |
| Police | Enforcement | May be unpopular or confusing Need additional resources | Public information on operation Additional funding | Local government orders |
| Local business | Approval | Object to removal of street parking Reduced access for deliveries | Provide park-and-ride service Establish new delivery procedures | |
| Local government | Funding | Other priorities Drivers and local business object | Analyses of benefits and disbenefits | Withhold state and federal assistance |
| State DOT | Funding | Other priorities | Analyses of relative benefits of this action | |
| U.S. DOT | Funding | Other priorities Multiple-agency involvement | Analyses of relative benefits of this action Clarify areas of responsibility | |

or to make a right turn unless such turn is otherwise prohibited by an official traffic control device.

Vehicles other than buses entering the bus priority lane to make a right turn shall be permitted to enter only within the same block as the right turn.

The burden of proof shall be upon the driver of a vehicle other than a bus entering such lane to show that he entered for the purpose of taking on or discharging a passenger or of making a right turn.

Buses are not restricted solely to the bus lanes; they are permitted to by-pass right turning or loading vehicles.

Taxis and private vehicles are permitted in the bus lanes to load or unload passengers, and, although not specifically mentioned, mail trucks are also permitted to stop in bus lanes during peak periods.

Priority Systems on Freeways

Definition. Transit service is expedited by allocating certain freeway lanes to the exclusive use of buses or buses and carpools and by providing special access to freeways

for these vehicles. Lanes reserved for high-occupancy vehicles may be created by constructing a new lane along freeway routes or by restricting one of the lanes formerly open to all vehicles to buses and carpools. Newly constructed lanes are usually separated from other traffic by permanent barriers and are provided with special access ramps. Reversible lanes, either along the median or from the opposing lanes, may be employed where peak-period traffic is heavily oriented to one direction in the morning and the opposite direction in the evening.

Other freeway priority measures include special access ramps, by-pass privileges at toll plazas and at controlled entry points, and bus stops along freeways with feeder bus or pedestrian access. Some priority systems rely solely on these preferential measures, but most systems combine these with the designation of exclusive lanes.

Institutional Roles. Since freeways are normally federally funded state highways, local government must obtain the cooperation of these levels of authority to implement freeway priority systems. In many cases, a special agency is created combining federal, state, and local transportation interests to plan, administer, and monitor the project, as well as to carry out necessary preimplementation construction and public information duties. Either within such an authority or under an informal cooperative arrangement, local, state, and federal traffic and highway engineers will carry out the various functions of planning, construction, funding, public information, administration, operation, and monitoring. The transit authority will also be heavily involved in both planning and operation of bus services. The local police and state highway patrol will be responsible for enforcing the priority system. The local MPO must give its formal approval. A summary of the institutions involved, their roles, barriers, and strategies is given in Table 11.

Institutional Problems. The major institutional problems of highway priority systems are policy agreements within special cooperative organizations, conflicts of interest between UMTA and FHWA, the reluctance of enforcement agencies to prevent violators from using the facilities reserved for high-occupancy vehicles, traffic on peripheral roads, and reallocating and upgrading transit resources to take advantage of priority treatment. These problems and possible solutions were discussed earlier under the sections on "Freeway Surveillance and Control" and "Priority Systems on Arterials."

Another critical problem involves funding. Of the several alternatives for providing priority on freeways for high-occupancy transit and carpool vehicles, the most successful in terms of traffic safety, improved travel times for priority vehicles, and public acceptance are those that rely on newly constructed priority lanes separated from other freeway traffic by physical barriers and provided with special access ramps. Costs of such systems can run as much as \$5 million per mile. The San Bernardino Busway in Los Angeles, for example, was implemented at a cost of \$53 million—\$40.5 million in FHWA and California State highway funds, \$8.6 million in UMTA funds, and \$3.6 million and \$300,000, respectively, by the Southern California Rapid Transit District (SCRDT) and the Southern Pacific Railway (9).

Priority systems that use part of the existing highway capacity are much lower in cost, but face critical problems of adverse public reaction and reluctance of enforcement agencies to stop and ticket violators. The incidences of accidents tend to increase if the priority lane is the farthest from entry and exit ramps, and congestion of nonpriority lanes is usually increased. The congestion is supposed, in theory, to persuade the commuter driving alone to change his mode of travel to transit or carpooling, and there is some evidence that this may occur over the long run. Improvement in transit travel times, however, does not usually result. Unfortunately, most drivers are slow to change their commuting habits. Alternative routes are also commonly congested at the initiation of a priority project, and transit is often unequal to the sudden increase in demand. The system may not yet work, as designed, but might if it were given time; however, the public, seeing only the negative impacts, will often react so strongly that the project must be abandoned.

Two strategies can be employed to reduce the intensity of public disapproval. The first is to include in the public information program an honest appraisal of the probable difficulties commuters will face in the first weeks of operation. The second is to ensure that adequate alternative routes and modes are available and familiar to the freeway user before the program is implemented. Transit authorities, as well as traffic engineers, often view the congestion created by such priority systems as a useful method of increasing ridership of high-occupancy vehicles. What they fail to understand is that commuters find existing transit and carpooling more restrictive and less convenient than driving alone and will resent being forced into these modes unless improvements in the convenience of these modes precede the implementation of priority treatments.

Legal problems of freeway priority systems largely depend on the priority technique used. Liability is of particular concern with contraflow lanes (7). The Marin County system, for example, was designed and constructed by CALTRANS, the California state transportation agency, but was operated under the authority of the special state-designated Golden Gate Bridge, Highway and Transportation District. Apparently CALTRANS is liable should the design or construction be identified as the cause of an accident, whereas the Golden Gate Authority is liable if the fault was in its operation. Although some operators of contraflow systems, such as the Port Authority of New York and New Jersey, have increased their liability insurance in anticipation of suits involving the system, none were filed for this cause against any of the cooperating agencies.

The court decision that put an end to the Los Angeles Diamond Lane was not based on the legality of freeway priority measures, because California is one of the few states that has passed specific legislation permitting the reservation of lanes and preferential access for high-occupancy vehicles. Rather, it took advantage of the neglect to prepare an environmental impact study to reject a program that was intensely opposed by a large and vocal portion of the community. It is particularly ironic that the project was defeated by the absence of an EPA document, because the purpose of the Diamond Lane was to help

TABLE 11
 INSTITUTIONAL FACTORS—PRIORITY SYSTEMS ON FREEWAYS

| Institutions Involved | Institutional Roles | Barriers to Participation or Approval | Strategies to Gain Participation or Approval |
|--|---|---|--|
| Special authority (local, state, federal transportation authorities) | Planning Administration Construction Operation Monitoring | Agreement among members as to allocation of responsibilities Agreement on scope of project Insufficient funds | Incentives Negotiation or reorganization |
| Local traffic engineers | Planning Administration Operation | Lack of experience Peripheral traffic problems | Negotiation or reorganization Examine lower-cost alternatives Federal and state assistance |
| State highway authority | Planning Administration Funding | Negative impacts | Technical assistance from federal and/or state level Planning and funding to eliminate |
| DOT | Planning Funding Monitoring | Overlapping FHWA-UMTA interests Priorities not established | Pre-implementation impact analysis Examine alternatives DOT policy and organization |
| Transit authority | Planning Operation | Insufficiently consulted Need to reschedule services Insufficient resources | Consult in initial phase Technical assistance Funding assistance |
| Local or state enforcement agency | Enforcement | Some priority systems generate accidents, traffic and are unpopular with the public | Modify system Provide funds for additional manpower |
| MPO | Formal approval | Poorly coordinated with off-freeway movement Public disapproval Other negative impacts | Add measures to handle adjacent local traffic Public information Environmental impact analysis Withhold DOT funds |

Los Angeles to meet EPA requirements for reduction of automotive pollution. This event suggests that legal barriers to transportation changes are not necessarily limited to those inherent to a particular technique, such as priority treatments. If the action provokes the opposition of an important segment of the community, the legal justification for halting it will be found somewhere. The primary strategy for avoiding such legal action is to be aware of public attitudes toward restrictive transportation measures

and design programs so that they offer more incentives and fewer penalties.

Extended-Area Transit

Definition. Commuter use of public transportation between suburban residential areas and the CBD is promoted by operating express services that reduce travel time to a level competitive with privately operated vehicles. Express

services are often supplemented by feeder operations and park-and-ride facilities in the outlying areas and CBD circulation systems, and by bus priority treatment.

Institutional Roles. Table 12 shows that transit authorities have the responsibility for planning, promoting, operating, and monitoring extended-area transit. Funding assistance for acquisition of buses, construction of park-and-ride lots, and operation of the system is available under various UMTA programs, and some existing systems, such as the Seattle "Blue Streak," have been implemented under UMTA demonstration grants. State assistance is also frequently obtained, either for making up some of the non-federal-matching funds or in providing some of the priority measures. Formal approval by the MPO is necessary. Local public works agencies frequently construct publicly owned park-and-ride lots. If park-and-ride lots are located on privately owned land, such as shopping centers, the cooperation of the owners must be obtained.

Institutional Problems. There are no institutional barriers to implementing express bus services beyond obtaining the necessary funding. It has been noted, however, that ridership of express buses is very sensitive to the level of fares and the availability of convenient feeder connections and parking.

Problems do arise, however, in connection with park-and-ride lots. If the parking facility is too small to accommodate demand, commuters arriving too late to find space in the lot will park on surrounding streets, as occurred at the BART station in Daly City. Local business and residential property owners will object to all-day use by commuters of these limited on-street spaces. The solution is to make prior arrangements for supplementary parking that can be put into use to meet growing demand.

Additional park-and-ride space can often be obtained by arrangements for the use of space at theaters, churches, or other facilities whose normal parking demand falls outside of working hours. Some legal difficulties have been encountered when lessees agreed to commuter use of parking without the approval of property owners. Shopping centers are also potential sites for park-and-ride facilities, because they are characteristically designed for peak-parking accommodation of growth and seasonal demands. Most will welcome park-and-ride arrangements either without charge or at a nominal fee because users frequently patronize shopping center businesses on their way home from work.

Transit Incentives

Definition. Commuters are encouraged to use transit for work trips rather than drive by a broad range of measures to make the public more aware of the availability of transit and to improve its comfort, safety, and convenience. Public information techniques include advertising and promotional programs, publication and distribution of route and schedule information, telephone information services, bus stop signs, and route identification on vehicles. Promotional programs may include fare reductions either systemwide or for special users—reduced fare passes and easy fare-payment techniques, such as no-barrier systems in which tickets and passes are only spot-checked, but violators are heavily fined.

Passenger comfort is obtained through new vehicle design for smoother riding, easy entry and exit, wider aisles and seats, handrails, improved lighting, air conditioning, and high standards of maintenance. Safety and convenience are provided by security services well-designed shelters and terminals, dependability of service, and responsiveness of routes and schedules to passenger demand.

Institutional Roles. These roles are summarized in Table 13. The transit authority usually takes full responsibility for implementing transit incentive measures. It may, however, call on citizen or business groups for suggestions or on local media for technical advice. If fare reductions are involved, the approval of local public bodies subsidizing transit operation will be necessary and the formal approval of the MPO is also required. UMTA funding is available for promotion and other activities that provide incentives to transit use. Local merchants or citizen groups may also be involved in suggesting or sponsoring particular transit incentive measures.

Institutional Problems. The primary barrier to successful transit incentive programs is the attitude of transit personnel to such activities. Many view promotion as an inappropriate function for transit operators and an unnecessary expenditure of available resources. One senior officer of a large transit system interviewed in an earlier study (12) concluded that public information services were not an important factor in transit ridership from a survey conducted exclusively on transit vehicles that showed only 3 percent of passengers had used the information service for that trip. The fact that only transit users were interviewed and most of those were regular commuters did not affect his confidence in the results of the survey.

An excellent example of transit promotion strategy is provided by the program undertaken in 1972 by the Long Beach Transportation Company under an UMTA demonstration grant (13). Initially a house-to-house canvas was made of 70,000 homes (70 percent of total homes in the service area) and free passes were given away. Speakers were sent to 13 community groups, such as the California Council for the Blind, the City Planning Council, public welfare and employment agencies, and service organizations. On-board promotion included small gifts, such as flowers on Mother's Day and candy at Christmas. Transit services were advertised in all local media. Questions raised at the meetings, such as "Why can't there be a substantially reduced fare for senior citizens?", "Why is there no East-West service in the northern portion of Long Beach?", and "Will downtown get minibus services like Los Angeles?", drew the transit company's attention to specific consumer needs, and it was able to make system changes to meet these needs.

Many transit administrators are preoccupied with the day-to-day operation of the system to the extent that they are not interested or informed as to consumer needs and attitudes. Paratransit options that might provide that extra convenience that will gain potential riders are largely ignored. Fares are raised when operating costs increase without any serious consideration of how this will affect patronage and over-all income from fares. Fare incentive programs are usually directed to casual users of transit for the purpose of increasing off-peak revenues rather than

TABLE 12
INSTITUTIONAL FACTORS—EXTENDED-AREA TRANSIT

| Institutions Involved | Institutional Roles | Barriers to Participation or Approval | Strategies to Gain Participation or Approval | Penalties |
|--------------------------------------|--|---------------------------------------|--|-----------|
| Transit Authority | Planning Promotion Operation Monitoring | Lack of experience Lack of funding | Technical assistance Funding assistance | |
| State DOT | Funding | None | | |
| U.S. DOT | Funding | None | | |
| MPO | Formal approval | None | | |
| City public works | Construction (park-and-ride lots) | Lack of funding | Funding assistance | |
| Private owners of parking facilities | Lease or use arrangements | None | | |

toward commuters who might be persuaded to leave their cars at home.

The solution to this problem is already being found in federal programs to promote better understanding and competence in promotional activities. Another solution lies in clarifying policy at all levels of transportation administration as to the function of public transit relative to the transportation disadvantages, environmental concerns, and long-term financial support. Conflicts over the function of transit and how it is to be financed make it difficult

TABLE 13
INSTITUTIONAL FACTORS—TRANSIT INCENTIVES

| Institutions Involved | Institutional Roles | Barriers to Participation or Approval | Strategies to Gain Participation or Approval | Penalties |
|-----------------------------|--|--|--|--|
| Transit Authority | Planning Implementation Monitoring | Believe promotion unimportant Lack of skill Procedures not known | State and federal funding for this purpose Technical assistance Establish standardized monitoring procedures | TSM plan must include some promotion measures Require for further funding |
| Local Government MPO | Funding and approval Formal approval | Other priorities | Evidence of effectiveness | Withhold state and federal assistance |
| State transportation agency | Funding Technical assistance | None | | |
| UMTA | Funding Technical assistance | None | | |
| Community groups | Planning (suggestions) | Not sufficiently consulted | Incorporate in planning process | |
| Merchants' associations | Funding (shoppers' services) | Not sufficiently consulted | Incorporate in planning process | |
| Local welfare agencies | Planning | Not consulted | | |

for transit administrators to make sensible management decisions. One year the transit authority may be encouraged to reduce fares to promote ridership and the next year criticized for too large an operating deficit. The importance of a consistent transportation policy is discussed at length in Chapter Four.

Restricting Automobile Use

Four of the C-R techniques seek to reduce peak-period

traffic congestion by discouraging the use of automobiles through pricing penalties and legal restraints. These are:

1. Road pricing.
2. Parking controls.
3. Traffic cells.
4. Auto-free zones.

The characteristic that sets these techniques apart from the others is that they inflict hardship on drivers of private automobiles rather than encourage alternative patterns of commuting. In doing this they run counter to the tradition of free access to public roadways, and this is the major institutional barrier to their implementation.

Public protest of restraints on automobile use should be expected. They can be dealt with only in part by well-designed public information programs that point out the social and economic benefits to the community that could result from their implementation. Approval of the concept by the community at large can be outweighed by the more forceful objections of individuals whose commuting habits are disrupted or groups whose special interests appear to be threatened by the measure.

There are more effective strategies. One is to provide for adequate commuting alternatives prior to implementation so that they will be available when the program is initiated. These may take the form of increased transit capacity and innovative additions to service, ridersharing promotion, rescheduling of work hours, or improvement of alternative routes.

A second strategy, aimed at special-interest groups, is to invite them to participate in the planning process where they can express their concerns and measures can be taken to relieve them. Some of their objections may be based on misconceptions of the impact of automobile restraints on business. These can be reduced to some degree by information on the experiences of business in other communities where these techniques have been applied. However, there is a need for more specific analysis than has been carried out on the economic impacts of restrictive techniques on different social groups and types of business activity and how they change over time.

Some of the objections of special-interest groups will be valid. Low-income workers have less ability to pay pricing penalties and fewer options for alternative hours and locations of employment. These problems might be met with some innovative method of exempting this group from restrictions or by selective subsidy. One strategy might be for employers to offer subscription bus service or compensation for pricing penalties as incentive programs, with or without public contributions.

Local firms may suffer business losses immediately following the imposition of automobile restrictions. Their support of the proposed program might be gained by a postponement or relief of city business taxes during this period. Business may also be disrupted if preimplementation construction is involved. This problem can be overcome by taking special care to see that access to stores and offices is maintained and public interest in the progress of the project is promoted. Retail sales of many establishments actually increased during construction of the Nicollet

Mall in Minneapolis for these reasons. The promoting agency can also exercise some ingenuity when it is absolutely essential to remove access to the front entrances of business establishments by encouraging arrangements between adjacent firms for passage via rear service entrances, utilizing temporary covered walk ways or simply painting the route on the street surface.

Local firms may also be obliged to incur additional expense of improving property if the area is being upgraded. The promoting agency can be of assistance here in facilitating construction loans or grants either from private investment or public programs. By providing the opportunity to discuss such problems with affected groups, the promotion agency can seek solutions that will ensure the support and cooperation of these groups in implementing the project.

Road Pricing

Definition. The basic concept of road pricing is to assess the actual user of a roadway to cover the public cost of providing the facility. Formerly, tolls were imposed on bridges, tunnels, and expressways solely for the purpose of defraying costs of construction and maintenance. More recently, it has been proposed that the driver inflicts an additional social cost to the community and other drivers when he uses public roadways—air and noise pollution, energy consumption, increased travel times, and potential for accidents through congestion. This recent concept is the justification for proposed schemes of assessing drivers the “true economic cost” of their use of roads and imposing variable tolls that favor high-occupancy transit and carpool vehicles and penalize the one-occupant private automobile. None of the proposed “true economic cost” schemes have yet been put into operation, but systems of variable tolls on bridges, tunnels, and expressways have been implemented. These systems usually offer reduced-fee or free use of the facility to buses and carpools, and many provide special bypass lanes that permit these vehicles to avoid the delay at control points.

Institutional Roles. Toll systems are normally operated by state highway authorities or by special agencies created by the state to manage the facility. In San Francisco, the Oakland Bay Bridge is under the control of the State Highway Department, whereas the Golden Gate Bridge is operated by the Golden Gate Bridge, Highway and Transportation District. These agencies plan, implement, and monitor variable toll systems. Formal approval of the activity by the MPO is now required to qualify for federal-funding assistance. State highway patrols are usually responsible for enforcement, but agreements may be made with local police to share in this responsibility. (See Table 14.)

Institutional Problems. Barriers to the implementation of road pricing techniques include legal constraints, poor public acceptance, and enforcement problems. The legal situation with regard to imposing user fees to modify travel behavior is not clear-cut. At the federal level, Title 23 of the U.S. Code prohibits tolling on federally aided roads except where user fees are applied to recovering state shares of construction costs (5). However, with the recent

recognition of the utility of variable tolls in promoting transit and carpool commuting, FHWA has been called on to reevaluate Title 23 and recommend appropriate modifications. Precedents have been established justifying the application of tolls to achieve social benefits of reduced traffic congestion, air pollution, and energy consumption; and the U.S. Department of Transportation apparently supports that position.

At the state level, however, legal barriers to pricing techniques can be more critical. State contributions to the construction of bridges and similar tolled facilities are normally raised by the issuance of bonds, the repayment of which is tied to anticipated revenues from a set schedule of user fees. The state's primary responsibility is held to be to the bond holders, and it will usually reject pricing schemes that would reduce revenues. Unfortunately, pricing strategies that depend on increasing tolls for single-occupancy vehicles are usually rejected by the public. Acceptance of pricing mechanisms for modifying travel behavior is growing at the state level. The Golden Gate Bridge, for example, was to have been operated toll-free after construction costs had been met in 1973, but the District was given new authority by the State of California to continue to levy tolls and to use this money for public transit and other transportation improvements within its jurisdiction.

Pricing schemes have proven to be the least acceptable to the public of all C-R techniques. Regular users of tolled facilities, particularly commuters who believe they have no option but to travel over the facility at peak period in their own cars, resent the discrimination between their mode of travel and high-occupancy vehicles. The least acceptable discrimination is a new surcharge placed on one-passenger cars, while programs that permit carpools to travel at reduced fees or toll-free are less resented. Those drivers paying the full toll also object to use of these revenues to subsidize transit services that they do not use. Public information efforts are useful only up to a point; commuters who resist changing their mode of travel may only find additional sources of grievance in public announcements of new bus acquisitions and current numbers of carpools traveling toll-free.

The best strategy is to keep the program constant until it becomes an accepted situation. Unless absolutely unavoidable, no changes should be made during this initial phase in rates, method of payment, vehicles exempted, or treatment of violations.

Enforcement of variable toll systems is primarily a problem of the period immediately following implementation, when resentments are high and "beating" the system is a new challenge. Monitoring of the initial program to allow carpools toll-free use of the San Francisco-Oakland Bay Bridge showed that 30 percent of bridge commuters attempted to illegally use the carpool lane, and one inventive commuter even had two dummy "passengers" permanently in the back seat of his car to avoid paying the toll (9, p. 50). If strong efforts are made at the beginning of the program to arrest and fine violators, experience has shown that, as the system becomes accepted, the number of violations decreases. System administrators find that a minimum enforcement program will hold violations down to an acceptable level.

Parking Controls

Definition. Drivers of low-occupancy vehicles are discouraged from adding to congestion of CBDs and major travel corridors by limiting the supply of parking accommodation and exacting a high price for such space as can be found. Since the most severe congestion occurs at peak commuting hours, parking controls are frequently designed to discriminate selectively against all-day parking and to be

TABLE 14
INSTITUTIONAL FACTORS—ROAD PRICING

| Institutions Involved | Institutional Roles | Barriers to Participation or Approval | Strategies to Gain Participation or Approval | Penalties |
|---|--|--|---|--|
| State highway authorities) Special districts) City traffic agencies) | Planning Promotion Management Operation Monitoring | Legal restraints on recovery of construction costs Additional facilities and/or manpower required Uncertainty of effective level of toll | Funding assistance to cover losses and modification of repayment program Funding assistance to cover construction and start-up costs Further experiment and analysis of results | Technique must be considered in overall planning process to qualify for federal assistance |
| MPO | Formal approval | Negative public response generally Low-income captive users of route unfairly burdened | Public informed on purposes and provided with travel alternatives Low-cost transit and carpool | Withhold local funding assistance |
| U.S. DOT | Funding Formal approval | None Legal restraints of discriminating on use of federal highways | Precedents for using pricing in the public interest | |
| State Highway Patrol Local Police | Enforcement | Reluctance to enforce unpopular measure Increased work load Not consulted | Public information program Funding assistance Include in planning process | Participation required |

in favor of short-term parkers who are the source of CBD business income. The supply of commuter parking can be reduced by restricting length of parking by meters or other regulation, by prohibiting on-street parking either permanently or during hours when commuters would be starting work, by building codes restricting the parking accommodations individual firms may provide for their employees and customers, or by placing a citywide ceiling on the total number of spaces in privately owned parking facilities. Pricing penalties can be implemented by increasing rates for all-day parking in publicly owned facilities or by levying special parking taxes or fees for long-term use of private accommodations.

Institutional Roles. Table 15 shows that local traffic and transportation agencies normally carry out planning, promotion, and monitoring of parking control programs. Formal approval of the program will be required from the MPO. Funding may be provided by state- and federal-assistance programs. If off-street public parking facilities are used, they may be funded by taxes assessed within parking districts and proposed changes in rate schedules will need the approval of local property owners. Public works departments will be involved in the construction of public facilities and in providing signs and road markings to identify on-street parking restrictions. Local police will be called on to enforce these restrictions.

A special parking authority may be created to operate public facilities or to administer a new program of variable parking taxes in private facilities. Under such programs the operators of profit-making parking lots would be required to participate in imposing these taxes on their customers. If the program calls for limiting accommodation of employee and customer parking within local business establishments, these institutions may find it necessary to give priority to customers and make alternative parking or commuting arrangements for employees.

Institutional Problems. Institutional barriers to parking controls will vary widely depending on the method of restraint used and whether the parking accommodations are under public or private ownership. All parking management schemes that discriminate against all-day parking by commuters run some risk of legal contest under the equal protection clause of the Constitution. Inequities of treatment are forbidden unless there is a "substantial distinction between classes," and the law applies to the entire class (14). Parking controls may also be challenged under the constitutional provision for due process with regard to curtailment of private parking space or loss of business because of parking restrictions, and the promoting agency may then be required to prove that the action is necessary to the public interest. An important precedent was recently established by a U.S. Supreme Court decision that commuters constituted a distinct class and that the City of Pittsburgh was constitutionally entitled to put the automobile commuter to the choice of using other transportation or paying an all-day parking penalty.

Metering or otherwise restricting on-street parking will normally meet little or no opposition. Some special exemptions may have to be negotiated for vehicles belonging to residents of the street or where it offers the only

access for goods delivery and pick-up to business establishments. Local firms will tend to favor the controls, because this provides more short-term space for customers. Enforcement is the major problem, and the responsible agency should be given an opportunity to review and comment on proposed changes in parking regulations and be provided with funds necessary to support its additional workload.

Institutional factors of implementing discriminatory parking fees in public off-street facilities are very similar. Here, enforcement will be primarily the responsibility of the facility staff. Where facilities are supported by taxes collected within a designated parking district, some questions may be raised by the taxpayers as to future revenues and assessment. The promoting agency has two options: to set a fee schedule that will generate equal revenue, or to persuade taxpayers that business in the area will increase with the greater availability of short-term parking.

Parking controls over privately owned facilities are exercised in two ways: by limiting the number of spaces, or by increasing the cost through parking taxes or fees. Parking supply may be limited by setting a ceiling on the total number of CBD spaces or on the number that individual business firms may provide for their customers or employees. These controls are exercised under zoning and building codes. Pricing disincentives may apply equally to all use of facilities or selectively penalize long-term parking.

Legally, taxation is a state power and local governments have no inherent taxing power except as specifically granted by state constitutions or legislation. However, local government does have the authority to regulate private parking through licensing fees. Regulating rates of commercial parking establishments can be justified on the basis of control of business in the public interest.

One of the major institutional barriers to establishing controls over privately owned parking is lack of experience to select effective levels of pricing disincentives and to forecast their economic effects on the commercial parking industry or business establishments. Strong resistance to proposed parking controls should be expected both from commercial operators whose customers include a large portion of commuters and from retail establishments that depend on free customer parking to compete with outlying shopping centers. Incentives to gain their cooperation could include short-term relief or postponement of other business taxes, technical assistance with reallocating space and revising management procedures, and public information as to the goals of the program.

Traffic Cells and Auto-Free Zones

These two techniques are so closely related that they share the same institutional characteristics and are therefore discussed together in this section.

Definition. Congestion in selected areas of cities is eliminated by designating them as auto-restricted zones (ARZs) in which either through-traffic or all-private vehicle use is prohibited. The former is accomplished by dividing the area into traffic cells. Automobiles may enter all cells, but only pedestrians and public transit are per-

TABLE 15
INSTITUTIONAL FACTORS—PARKING CONTROLS

| Institutions Involved | Institutional Roles | Barriers to Participation or Approval | Strategies to Gain Participation or Approval | Penalties |
|--|-------------------------------------|--|--|--|
| Local transportation agency | Planning Promotion Monitoring | New laws required to tax privately-owned facilities Uncertainty of effective price structure | Legal assistance and model legislation More demonstrations and analysis of results | |
| MPO | Formal approval | Community business not in agreement Unequal burden to low-income drivers | Data on impacts in other communities made available Experiment with techniques to reduce fees for selected commuters | Withhold state and federal assistance if this technique is not considered in overall program |
| Parking authorities | Administration Operation | More complex rate structure to administer | Operating assistance or operations planning assistance | Participation required by local government |
| Parking Districts | Funding Approval | Resent interference of other agency Business taxed to support - district fears loss of trade and higher taxes | Consult during planning phase Guarantee that any short term deficit will be covered from other sources Select variable rates to encourage short-term parking by customers | |
| Owners of profit-making parking facilities | Operation | Reluctance to collect unpopular tax Fear loss of parking customers and added expense of accounting work with new taxes | MPO provides notices accepting responsibility and indicating new tax rates, also public information program Technical assistance with new procedures Relief of some or all local business tax to compensate for new business expense | Cooperation required by new laws |
| Owners of customer and employee parking | Operation | Fear loss of customers and employees Resentment of government interference | Information program Consult during planning phase | |
| Police Department | Enforcing (on-street parking) | Additional work load for current personnel for increased operating budget for more staff to enforce new regulations Reluctance to enforce unpopular regulations | Funding to cover additional personnel MPO provides strong public information program | Participation required by local administration |
| City or County Public Works Departments | Construction | Additional work-load and costs of marking curbs and placing signs | Funding normally available from state and federal programs | |
| State DOT | Funding | Funding options do not include assistance to all participants, especially private owners | Revise funding laws and regulations to cover all participants | |
| US DOT | Funding | Insufficient data to assess potential benefits | Develop reliable and widely usable monitoring techniques | |

mitted to cross over internal boundaries between cells; private vehicles traveling from one cell to another must leave the controlled area and use an external route to the entry point of the second cell. The purpose of this is to eliminate through traffic from the congested area.

All use of private vehicles is prohibited in auto-free zones. Pedestrian facilities are developed, and, if the size of the area dictates, transit circulation services may be provided. The two approaches may also be used in com-

ination. In this case, the center of each traffic cell is designated as an auto-free zone, and private vehicles entering the zones are restricted to a single route circling the auto-free area.

Institutional Roles. Primary roles of planning, promotion, administration, operation, and monitoring will often be shared by the local transportation and land-use agencies. One or the other may dominate the program depending in part on the political skill of agency administrators and in

part on the sources of funding. The project may be initiated primarily as an urban renewal effort and funded by redevelopment grants and loans from the U.S. Department of Housing and Urban Development (HUD) or by local bond issues. In this situation the city traffic or transportation agency may be called on only to assist with the transportation elements. Conversely, the project may be initiated as a traffic control measure and funded by federal transportation improvement grants, occasionally supplemented by a special tax assessment to provide for peripheral parking. In such cases the land-use agencies may only be called on to participate in a planning capacity.

The City Department of Public Works will carry out necessary construction of barriers, street improvements, or public parking facilities called for in the plan. The City Police Department will be responsible for enforcing vehicle restrictions.

The approval and cooperation of local business firms and property owners are essential, if the program calls for upgrading privately owned structures within the restricted area and where special tax assessments are introduced. (See Table 16.)

Institutional Problems. Although a number of successful examples of ARZs now exist, none were implemented without long delays in overcoming institutional barriers. These barriers included initial lack of support by area business firms and property owners, legal questions involving public access and damage to private economic interests, funding problems, interagency cooperation, and criticism of the public at large.

Business firms within the proposed project area may evidence concern over possible losses of business from restricting automobile access. CBD merchants in most urban areas have already suffered from the competition of outlying shopping centers. They are opposed not only to measures they believe would further discourage downtown shopping but also to those calling for additional CBD taxes or investment in upgrading property. The first concern can best be overcome by providing information on business impacts of ARZs in other cities. The second problem can be treated by economic assistance. Tax payments can be postponed or assessed on the basis of improvement in profits and real market value of CBD property. Low-interest loans for rehabilitation or replacement of deteriorated structures can be arranged either under federal urban renewal assistance or through local lending institutions. Upgrading of CBD property can also be accomplished by strict enforcement of city building codes, as Jacksonville does.

Legal questions may be raised concerning the city's right to restrict access to public streets. Precedents for such action are well established, and the court decision is likely to be favorable if the promoting agencies are prepared to show that sufficient pedestrian transit circulation and peripheral parking opportunities will be provided and that environmental benefits would accrue.

Institutional problems regarding funding assistance need solutions at the national level. Not only do FHWA and UMTA have different programs for assisting local development of ARZs, but DOT and HUD have similar overlapping interests. Transportation funds can be used for the

traditional HUD purposes of pedestrian walkways, street furniture, lighting, and landscaping; and redevelopment funds can be used in DOT's areas of street improvements and peripheral parking structures. The problems local government faces are to determine which funds to use for which purposes, secure agreement among the federal agencies, and then deal with the difficulties of duplicate paper work and coordinating the timing of expenditures. This problem is discussed further in Chapter Four.

Although ARZs are generally well received by the public, problems can occur when the program is first implemented and drivers are confused by the new restrictions, especially with regard to traffic cells. The two European cities using traffic cells found it necessary to redesign their original system of driver instruction signs within the project area and to intensify their public information programs.

Changing Land Use

It is believed that, in spite of the difficulties of implementation and the time lag before benefits can be realized, the best permanent solution to peak-period traffic congestion lies in changing our existing patterns of urban land use. By locating places of work and residence closer together, needs for the extensive commuter trips that create congestion are reduced.

Three techniques for modifying urban land use found to be potentially effective in alleviating peak-period travel are:

1. New towns.
2. Planned neighborhoods.
3. Zoning and building codes.

New towns present special institutional problems that warrant separate discussion, but planned neighborhoods and the use of zoning and building codes have so much in common that they are treated together as related approaches to achieving a more efficient mix of land uses. All land-use reforms have one characteristic in common: planning is a public responsibility, but implementation depends essentially on the cooperation of nongovernment institutions (large private developers, small property owners, individual business firms, and lending institutions). Also, changing land use affects more elements of urban life than any of the other congestion-reducing techniques and is therefore particularly subject to the scrutiny of special-interest groups and the public at large.

New Towns

Definition. New urban complexes are developed within which residents commute to work and carry out their normal day-to-day activities free of the need to travel to the central city except on rare occasions. A full range of housing options, employment, shopping, recreation, education, and other public facilities is provided for in these self-sufficient communities. The internal transportation system is characteristically oriented to walking, biking, and transit circulation; and the use of private automobiles is restricted either entirely to, or to a few, access roads.

Under the original concept of new towns these communities were located at some distance from major cities

and separated from other urban developments by large expanses of open land. More recently, the concept was expanded to include "new-towns-in-town" in which similarly self-sufficient communities were created within the boundaries of existing urban developments.

Institutional Roles. As Table 17 indicates, new towns rely primarily on private investors who plan the community; purchase the land; install roads and public utilities; and construct housing, commercial, and industrial structures and community facilities. Other business firms willing

to relocate in the new town provide the essential employment opportunities, and private individuals purchase residential properties and become the labor force for the relocated businesses.

A proposed new town development must have the formal approval of the local city or county government having jurisdiction over the land area and of the regional planning authority. If transportation elements are to be developed under FHWA- or UMTA-assistance programs, the approval of the responsible MPO is needed as well. The state

TABLE 16
INSTITUTIONAL FACTORS—TRAFFIC CELLS AND AUTO-FREE ZONES

| Institutions Involved | Institutional Roles | Barriers to Participation or Approval | Strategies to Gain Participation or Approval | Penalties |
|---|---|---|---|---|
| City traffic/transportation agency | Planning (traffic management) Promotion Operation Monitoring | Lack of experience Legal constraints on street closing Local opposition Drivers confused New taxing authority may be needed | Technical assistance Favorable court decisions Promotion program Informational signs, literature Precedents established in other cities | |
| City Police Department MPO | Enforcement Formal approval | Additional work-load Local opposition | Funding assistance Promotion and information program | Cooperation required by City Withhold federal assistance |
| Local Redevelopment Agency and/or Planning Agency | Planning (redevelopment) Administration (redevelopment) | Funds to support public and private activities Legal problems of property acquisition | Federal funding assistance and/or bond issue Hearings out-of-court settlements | |
| City Public Works | Construction (barriers, street improvements, parking facilities) | Special-purpose funds needed | Funding assistance arranged by promoting agency | Cooperation required by City |
| Local business firms and property owners | Approval | Fear loss of business because of reduced access Expense of upgrading property Special tax assessment | Information on experience in other cities Funding assistance Tax adjustments promised if business losses experienced | Enforcement of building codes |
| Transit authority | Planning Operation | No experience with special circulation systems Costs of adding services | Technical assistance Funding assistance | |
| U.S. DOT | Funding | Overlapping funding authority | New joint policies | |
| U.S. HUD | Funding | Insufficient appropriations | Prove benefits to urban areas | |

TABLE 17
 INSTITUTIONAL FACTORS—NEW TOWNS

| Institutions Involved | Institutional Roles | Barriers to Participation or Approval | Strategies to Gain Participation or Approval | Penalties |
|--|---|--|---|----------------------|
| Private investors | Planning Promotion Funding Construction | Large investment with slow rate of return - high interest Observed failure of existing projects to meet goals for land sales | Proposed government "land bank" HUD loans for interest and tax payments until property is sold Grants for public improvements | |
| Business firms | Operation (relocation) | Moving costs Risks of obtaining essential labor Increased cost of shipping to markets and from sources of materials Isolation from contacts with buyers and suppliers | Relocation assistance program: loans and grants; technical and legal assistance; guidance in decision to move | |
| Private individuals | Operation (relocation) Administration (community organization) | Adequacy of employment opportunities High taxes for new public facilities Isolation from large-city medical, educational and cultural resources | Coordinated scheduling of business and individual relocation State and federal assistance Good transportation facilities and emergency services | |
| Local government) Regional plan authority) MPO) | Formal approval | Conflicts with local development plan Economic competition with existing communities | Negotiate changes in local ordinances Dispersal policies for federal and state agencies and critical industries | |
| State development agency | Formal approval Funding | Costs of providing roads and other public utilities Conflicts with state development plan No program or appropriations Insufficient evidence of benefits | Grants for public facilities Negotiation Determine potential benefits and promote if justified | |
| HUD | Funding | Lack of appropriations Observed failure of existing projects | Analysis of causes of failure and development of new strategies | |
| DOT | Funding (transportation elements) | Other priorities HUD-DOT overlapping authority | Determine potential benefits Joint-policy agreements | Required by Congress |
| State transportation agency | Construction (interurban) | Conflict with state plan Other priorities | Negotiation Federal assistance | |

development agency will usually be called on to evaluate the proposed project both for its compatibility to the over-all state development plan and its qualifications for charter as a new city. Once incorporated, the new local government will be involved in the planning process.

Federal assistance in funding new towns will depend largely on current HUD programs, but DOT may become involved in meeting the community's transportation needs. New towns isolated from existing urban centers will usually require the cooperation of the state transportation

agency for improving highways between the new community and the central city, and possibly in providing public transit access within a regional system.

Institutional Problems. A combination of economic and political factors has frequently been observed to be effective barriers to the successful implementation of new towns. The economic problems center around the high-cost planning, land acquisition, and construction, where returns on this investment cannot be realized until the site is ready for occupancy and properties are sold to individual families

and business concerns. Financing charges often constitute over 50 percent of the investment required. Inflation is increasing development costs and therefore the resale prices of developed property. Investors anxious to dispose of completed sites may be obliged to assume the financing for these individual purchases, in which case the only return of the original investment is represented by the down payment.

Although financing conditions have become more difficult, so have the politics of establishing a new town. Setting up school districts, water districts, sewer districts, and other community facilities and services meets with increasing demands to satisfy the state and local government regulation and the concerns of environmental groups and existing communities. As requirements for permits, impact analyses, and public hearings grow, development schedules are delayed and interest costs increase. This situation has reached a point that a notably successful developer recently announced that his company will attempt no future new towns (15).

Solutions to the economic problems of new towns require changes in federal policies. When Congress passed the Urban Growth and New Community Act of 1970, the new HUD Office of New Community Development (ONCD) was authorized to guarantee up to \$50 million of each developer's bonds; plus interest on the bonds; plus technical assistance and financing for roads, schools, sewers, and other public facilities. Fourteen new towns were underwritten by ONCD under this program, but in August 1976 HUD announced that all but six were in such difficulties that ONCD would have to take over their administration. Four of the six surviving projects were continuing only under an emergency measure in which HUD would make the annual interest payments on their bonds. One of those to be taken over by ONCD, Gananda, near Rochester, N.Y., had lost its original investors' entire \$1.4 million and was expected to cost bank creditors nearly all of their \$9 million investment (16).

Critics of the New Communities program point out that ONCD assistance was, in fact, limited to minimal mortgage guarantees, while developers made commitments believing that they would receive the entire assistance package. Appropriations necessary to support the full program were not made during the Nixon administration. HUD did not apply to Congress for such funds and did not even expend the limited funds it had available. In January 1975 HUD announced that no additional applications for federal assistance to new communities would be accepted (17).

The strategy most often suggested is the formation of a new and powerful national development corporation in the form either of a public body with private operating subsidiaries or of a joint public-private undertaking. This development corporation would be empowered to raise capital through bonds, conventional debt, equity capital, general and special revenue sharing, and by other innovative methods. A land development bank would be created, with tracts parceled out to developers only when all preparations for development had been completed. The major purpose of the corporation would be to share the risk among the several developers (17).

Other strategies call for identifying the benefits to established urban areas of new communities and innovative arrangements for sharing in these benefits. Finally, the existing process of evaluating environmental impacts and obtaining approval for new developments should be examined. This last topic is discussed further in Chapter Four.

Planned Neighborhoods and Zoning and Building Codes

Definition. Over-all intraurban travel needs are reduced by promoting mixed land uses by means of planned neighborhoods and revising and enforcing local zoning and building codes. Planned neighborhood projects upgrade older residential areas in central cities from which people employed in the CBD can commute to work by short transit trips or by walking. Changes in zoning and building codes permit the new construction of apartment houses in the CBD, within convenient walking distance of downtown offices and stores, and the introduction of new employment opportunities into suburban areas, thus reducing needs for long commuting trips into the central city.

Institutional Roles. As can be seen from Table 18, primary responsibility for implementing these techniques lies with the local planning authority. This agency modifies former land-use plans to accommodate mixed residential and business activity, revises existing zoning and building codes to conform to this plan, promotes the participation of local investors and property owners, and evaluates the impacts and progress of the project. It may also apply for HUD assistance for planning. New construction or rehabilitation of sites may be financed entirely by local sources; but, if urban renewal funds from HUD are used, the local redevelopment agency will be responsible for applying for this assistance and for carrying out detailed planning and scheduling of demolition, construction, and relocation of displaced residents and businesses. Improvements to streets and other public utilities will be carried out by the city's public works department. The transit authority may be called on to adjust services to accommodate new patterns of commuting to work.

Formal approval of projects will be required from the regional planning body, from the MPO if federal transportation assistance is desired, and normally from the state planning agency, as well. Approval of special-interest groups concerned with business, personal or environmental impacts is also necessary. Private developers will be involved in major land acquisition and construction, while local property owners may be called on to upgrade their own residences or business establishments.

Institutional Problems. Types of institutional problems encountered in efforts to mix land uses will vary depending on the location of the project site, the extent of physical changes programmed, and the method of funding. If the purpose of the program is to introduce employment opportunities and low-income housing to middle and upper income suburbs, local residents will probably resist such changes out of concern for the possible deterioration of residential quality of the area and decreased property values. The best strategy is to introduce new elements gradually, beginning with types of business activities that

TABLE 18
 INSTITUTIONAL FACTORS—PLANNED NEIGHBORHOODS AND ZONING AND BUILDING CODES

| Institutions Involved | Institutional Roles | Barriers to Participation or Approval | Strategies to Gain Participation or Approval |
|--|---|--|---|
| Local planning authority | Planning Promotion Regulation Evaluation | Conflicts with existing land use policies Lack of funds Lack of experience | Incentives Technical assistance to evaluate potential benefits and set up evaluation process Funding assistance |
| Local redevelopment agency | Planning Promotion Funding Evaluation | Federal assistance difficult to obtain - timing, reporting Local property owners object | Change federal policies and procedures Public information program |
| City Public Works agency | Construction (public utilities) | Lack of funds | Funding assistance |
| Transit authority | Operations | Unexpected demands to add to or change existing services | Consult in planning phase Funding assistance |
| Regional planning body) MPO) State planning agency) | Formal approval | Uncertain of potential benefits and problems | Nationwide data on experiments and technical assistance with local evaluation techniques |
| State transportation agency | Funding | Other priorities | Strong local political action |
| HUD | Funding | Inadequate appropriations Rigid policies | Increased appropriations Revised policies and procedures |
| DOT | Funding | Conflicts of authority among FHWA, UMTA and HUD | New inter-agency policies |
| Private developers | Funding Construction | Financing costs increase with political delays | Streamline procedures and/or funding assistance |
| Local property owners | Funding Construction | Reluctance to invest more in deteriorated area | Demonstrate local commitment to redevelopment Funding assistance |
| Special interest groups | Approval | Business, personal or environmental concerns | Public information based on data from other areas |

offer employment opportunities to current residents and moving later to include employment and housing for lower income residents. Proper location, architectural controls, landscaping, adequate access roads and parking facilities, and addition of a suburban transit circulation service can be utilized to preserve and even improve the existing residential environment.

If the program is focused on increasing or improving residential accommodations in the central city, one important institutional problem has its origin in the conflicting

goals of urban renewal in general. One goal is to improve the quality of housing for the center city low-income residents. The other is to attract back into the city those middle and upper income families who fled to the suburbs. This conflict in policy is discussed further in Chapter Four.

CBD renewal may take the form of massive physical changes in realignment of streets requiring extensive demolition and new construction, or it may be limited to rehabilitation of existing structures and modest street improvements. In the former case, land is usually acquired by

the local redevelopment agency and held until the public works elements have been completed and sites are ready for resale. This process usually takes several years, during which time the land is off the tax rolls, and the city not only is involved in extraordinary expenses but it also simultaneously suffers a significant loss in revenue. This situation can become even more critical when no buyers can be found for the prepared sites. The strategy used by successful renewal agencies is to locate potential redevelopers before any move is made to acquire and clear parcels of land. Then, a well-coordinated scheduling of demolition, street improvements, and public utilities can reduce the length of time the land is under public ownership. Other problems of major renewal efforts include the reluctance of owners to sell their property and losses of business to displaced firms. The compensation and relocation process, no matter how well handled, will normally be delayed by some suits that must make their way through the courts.

Less ambitious projects involving the rehabilitation of existing structures face the particular difficulty that individual property owners are made responsible for contracting or otherwise seeing that the required improvements are carried out, and most have very little experience in this area. Where public loans or grants are provided, the redevelopment agency assists in recommending procedures and verifying the capability and reliability of contractors. Owners of low-income residential properties are often reluctant to cooperate because of the costs and complications of carrying out rehabilitation.

Lack of consistency in federal redevelopment goals and funding, plus the heavy burden of paperwork in applications and progress reporting, has persuaded many cities to attempt renewal projects without HUD support. Public improvements are financed from local revenues, whereas improvements to private property are carried out under private investment. The strategy used is the strict application of local building codes, which force property owners to make necessary repairs where possible or to demolish substandard structures where rehabilitation is not practical. The initial cooperation of local lending institutions is essential, because loans in deteriorated neighborhoods are normally refused. Once the impetus for renewal is underway, however, property values increase and both owners and loan institutions are more confident that improvements to neighborhood property represent a sound investment.

The concerns of special-interest groups—local residents, business firms, environmentalists, and the like—will have to be met with good public information programs and opportunities for these groups to participate in the planning process. Techniques for this are treated in a later section on "Special-Interest Organizations."

Employer Initiatives

Three C-R techniques rely heavily on the active participation of individual employers, both in government and in the private sector. These are:

1. Staggered work hours.
2. Ridesharing.
3. Communications in lieu of travel.

Each of these approaches to reducing peak-period traffic congestion has unique institutional problems that are discussed under separate headings. But the primary institutional barrier to implementation in all three techniques is the failure to obtain essential support and cooperation of employers, and that problem will be considered here.

Although no communitywide attempts have yet been made to substitute communications for daily commuting to work and most experimental programs have been aimed instead at reducing the need for intercity travel, there has been considerable experience with ridesharing and modifying work hours. This experience provides insights into problems of obtaining employer support and suggests strategies that can be applied to all three approaches.

As a general rule, benefits to the community at large from these congestion-reducing measures are far greater than those to individual employers. Especially in the initial stages—when new administrative procedures must be designed, equipment purchased, and staff time diverted to organize the program—costs to the employer may far outweigh any direct benefits he can perceive. For this reason, it is generally difficult to enlist the enthusiastic and long-lasting support of large numbers of employers.

Although instances can be found where the economic interests of institutions were served by staggering work hours to relieve peak congestion in elevators and cafeterias or by reducing the need to augment employee parking accommodations through carpooling and vanpooling, economic factors rarely operate as an incentive to employer participation. In fact, they more often operate as a barrier to participation. Employers can recognize direct program costs, in the purchase of vehicles for vanpooling or audiovisual equipment for communications systems, and indirect costs, through loss of productive staff time for program administration or setting up new administrative procedures to accommodate new working arrangements. On the other hand, employers cannot foresee with any certainty the economic benefits that might accrue from their participation.

No instances were observed where management initiated ridesharing or work rescheduling in response to employee demand. Rather, management is sometimes reluctant to become involved, in such programs, because of possible employee turnover among those who cannot adjust to new working arrangements or because of more serious conflicts with labor unions and other employee associations.

In a survey of major employers in the San Francisco Bay Area to determine which types of employers were more willing than others to participate in these programs (18), the following observations were made:

1. Firms that employ a skilled, non-union work force appear to be readier to innovate in transportation. This appears to be the result of a combination of factors: greater consciousness of community image; less concern that transportation initiatives will complicate labor-management relations; and the perceived need to compete for professional talent in a sellers market.
2. Firms that are engaged in R&D and high-technology production also seem more receptive to company initiatives in transportation. It appears that these firms, which are accustomed to innovating in their

product line, find it more appropriate to innovate in the social organization of travel and work hours.

3. Company headquarters seem more ready to endorse a larger employer role in transportation than branch plants. Two hypotheses are advanced to explain this phenomenon: 1) the image value of community service appears to be valued higher and 2) executives seem to use efforts in transportation to advance their careers by identifying themselves as managerial innovators.

The success of C-R programs requiring the active cooperation of large numbers of employers relies on a continuing promotion and sales effort. These activities may at first appear to fall outside of the normal functions of transportation engineers and planners, but they are essential in obtaining the level of employer participation necessary to achieve significant impacts on traffic congestion.

The initial promotion effort is particularly important because many employers will be persuaded to participate only when they can observe for themselves that other establishments have adopted the program and are happy with the results. Two strategies that can be applied in this initial phase are:

1. Obtain the sponsorship of prominent business and civic leaders.
2. Approach employers most likely to cooperate.

The successful use of the first strategy is described in a report on the Manhattan staggered Work Hours Program (19):

The Port Authority (of New York and New Jersey) tackled this problem by securing the assistance of prominent businessmen and creating cooperative task forces composed of civic and trade organizations and public agencies. Thus, for the Downtown Manhattan Program, the sponsor has been the Downtown-Lower Manhattan Association whose Chairman is David Rockefeller, Chairman of the Chase Manhattan Bank. In Midtown, a Midtown Task Force on staggered Work Hours composed of 26 organizations is chaired by Andrew Heiskell, Chairman of Time Incorporated. The corporate organizations making up the Task Force reads like a blue book of leading business and public organizations. In Newark, the co-sponsor will be the Greater Newark Chamber of Commerce. . . . The backing of the prominent civic and business organizations lends force to the requests for participation. . . .

The second strategy is suggested by the findings of the San Francisco survey that institutions most likely to adopt employer initiatives are independent establishments or headquarters of larger firms whose production relies on innovation and high-level technology and whose work force is largely skilled and nonunionized. This group will generally include such institutions as universities, research organizations and manufacturers in aerospace, communications, data processing and electronics control systems. However, every community has institutions in activities other than these that are noted for public service and imaginative leadership. Community leaders and organizations can assist the promoting agency in identifying both firms and public agencies that would also be good candidates for initial participation.

Techniques for maintaining an effective promotion program include:

1. Approach only top management personnel.
2. Maintain current records on each institution contacted and progress made.
3. Develop statistics on program growth and effectiveness.
4. Publicize program achievements and participants.
5. Periodically evaluate the effectiveness of promotion measures used.

One of the most frequent observations of those involved in promoting staggered hours and ridesharing programs was that attempts to elicit participation through personnel other than top management were seldom effective. Middle management was found generally to be conservative and unwilling to be the spokesmen for innovative programs within their organizations. Nor were employee groups discovered to be sufficiently interested to initiate strong demands for new working or commuting arrangements they had not yet experienced.

Even if support were to come from either of these levels of personnel, they lack the authority to make a commitment to the proposed program. This authority lies with top management. Experienced promotion staff find that they have more success if their initial contact with an institution is with its president, director or manager, arranged through a person at similar position outside the organization.

Essential to a well-run promotion effort are up-to-date records on each institution contacted. These should include any survey data indicating the number of employees who would potentially be involved in the program and particular factors that might affect its need or desire to participate (such as entry point or internal peak congestion or inadequate parking facilities); a log of letters, telephone calls or visits made by the promotion staff, assistance given, and problems discussed. Periodically, these records can be reviewed to determine progress made and whether further promotion efforts should be taken or the institution dropped from the list of active candidates.

Funds available for promoting C-R programs among employers are often limited, and the small staff assigned to this function may view the detailed keeping of such records as a tedious and time-consuming activity that they cannot afford to carry out. However, nearly all experienced program developers have found that generalized promotion efforts through media advertising, meetings, and distributing promotional literature are far less successful in obtaining employer participation than approaching a smaller number of employers on an individual basis. This usually requires a series of letters, calls, or visits. With good records to refer to, the staff member can avoid repeating information that the employer has already received or forgetting specific problems that have previously been discussed, and, thus, can make each contact as effective as possible.

Statistics on program growth and impacts are usually developed to justify requests for project funding and for press releases. The degree of detail feasible depends both on the funds designated within the project for this purpose and data available from other local sources, such as traffic-monitoring programs. Occasionally, federal or state assistance is provided under a demonstration grant to evaluate an innovative project. Even where resources are limited,

however, some indicators of program growth and its effects both on congestion and on participating institutions must be developed—first, to evaluate the program as a whole and, second, to demonstrate to prospective participants that they will not be harmed by entering into the program.

Some institutions that have successfully adopted employer initiatives in ridesharing, modifying work hours, and, perhaps, eventually substituting communications for travel to work may prove eager to describe their experiences and could be persuaded to assist the promoting agency in this area. If the agency were to provide each of these volunteer authors with a standardized list of topics and data to be covered, these reports could be used not only individually as news items but also collectively as the basis of a valuable research document.

Many employers may be reluctant to commit themselves to an untried action, but will follow bolder institutions when they see examples of successful experiences. Publicity given to these examples can be effective means of persuading other employers to join in the program. In addition, such publicity offers an opportunity to reward early participants by giving public recognition to the firms' concern for the community and creative leadership.

An expectation of public recognition can also act as an incentive for initial support, but special care should be taken that the subject is introduced in a manner that will not offend the institution's representative by suggesting that he is being bribed by the offer of free publicity. One approach might be to mention that the promoting agency will be preparing public releases about early participants, and, if the institution should decide to be one of them, would it have any objection to being included. Perceptive promotion staff will recognize that the program will benefit as well from the agreement and take care to discuss it in that context. If the representative appears open to the idea, the promotion staff member may also explore the possibility of the institution's public relations office supplying much of the material.

Other important incentives in promoting employer participation may take the form of technical and financial assistance. In the initial phase, technical advisors might be brought in from federal and state transportation agencies, or from programs already carried out in other cities, to assist employers with problems of obtaining essential changes in existing laws and regulations; negotiating with labor unions and other employee groups; designing new administrative procedures; developing or utilizing existing technology, such as computer-matching programs for ridesharing; acquisition of program-related equipment, such as vans, or services, such as insurance; and estimating the economic costs and benefits of participation to individual institutions.

Although the initial responsibility of these technical advisors would be to help the first cooperating institutions implement their individual programs, their more important long-range purpose would be to develop a similar competence within the community. Staff of the promoting agency may be trained to perform these functions, but the agency can also look for volunteers among local business and professional people and organizations to become the community's experts in some areas.

Financial incentives could take the form of tax relief for participating firms; for example, a rebate on city business taxes in the first year of an employer's joining in the program that would compensate for some of his initial costs. Other incentives could be funding assistance obtained through the action of the promoting agency from federal and state sources and passed on to cooperating institutions in the form of services or loans for the purchase of equipment. The agency might also sponsor the formation of cooperative nonprofit organizations of employers that could reduce the risks of liability to individual firms and could negotiate more favorable rates for insurance or bulk purchases of equipment and services.

Staggered Work Hours

Definition. Traditional working hours are modified to redistribute travel to and from jobs over a broader time span, thus reducing the intensity of peak commuter use of transportation facilities. Programs to accomplish this vary in the degree of discretion allowed the employee in determining his own work hours. The term "staggered work hours" is most commonly used to describe programs under which different groups of employees start and end work at predetermined intervals (usually every 15 minute), probably diverging no more than 1 hour on either side of traditional commuting times. "Flexible work hours," "flex-time" or "flexitime," are the most frequently used terms to describe programs in which the individual employee selects his own times of arrival and departure from work. Depending on the type of employment, he may have complete discretion over his schedule, or will be required to be at work during certain critical hours but free to select the remaining hours. A third approach to modifying work hours is the shortened work week in which employees report to work only 4 days, but stay for as much as 10 hours each day.

Institutional Roles. The approval and active participation of employers is essential to implementing a staggered work-hours program. Large-scale programs involving a number of employers are planned, promoted, and monitored by regional transportation and planning organizations or by transit authorities. Wherever transit is an important mode of travel to and from work, local transit operators must be drawn into the planning process to coordinate service with new patterns of commuting demand. Similarly, work assignments of enforcement agencies may have to be rescheduled to meet the lengthened peak commuting periods, although traffic problems, themselves, should be less severe. Occasionally, labor unions or other employee associations must approve of the proposed changes in work schedules, especially where they might involve members working more than 8 hours in one day.

Since staggered work-hours programs may be undertaken with relatively little public investment, program costs in some communities are borne entirely by local government and employers. Funds are available, however, from both UMTA and FHWA for planning and promotion activities and, in some cases, evaluating program impacts. UMTA funds may also be used to upgrade transit facilities and to cover increased operating costs occasioned by the program.

Formal approval of the MPO is necessary to qualify for federal funding assistance. (See Table 19.)

Institutional Problems. The major institutional barrier to implementing staggered work-hours programs is obtaining the support and participation of employers. Projects involving a small number of institutions with very large work forces have been the most successful, both in ease of implementation and in benefits from reduced congestion. Examples are federal offices in Washington, D.C., and the

national government complex in Ottawa, which employs 53 percent of the total downtown labor force.

The problems that management may perceive in rescheduling work hours are difficulties in rearranging work assignments, establishing new procedures for supervising and evaluating employee performance, and maintaining the existing availability of staff to the public and other business contacts during traditional business hours. Technical assistance should be provided in analyzing work tasks to

TABLE 19
INSTITUTIONAL FACTORS—STAGGERED WORK HOURS

| Institutions Involved | Institutional Roles | Barriers to Participation or Approval | Strategies to Gain Participation or Approval |
|---|---|--|---|
| Regional Transportation/Planning Authority or MPO | Conceptualization Formal approval | Not supported by local employers Insufficient benefits perceived especially with fuel consumption Lack of experience in obtaining employer support Insufficient funds for essential promotion activities | Incentives Provide data on benefits experienced by employers in other cities Counteract with transit incentives and promotion of vanpool and carpool programs |
| Special office or task force of regional or local authority | Planning Organizing Promotion Administration Evaluating | | Funding and technical assistance from federal and state transportation agencies Local governments agree on sustaining shares of costs |
| Transit Authority | Operation (transit) | Unexpected changes in demand patterns Insufficient resources to meet extended peak demands | Primary agency consults in planning Federal funding for additional vehicles and operating costs |
| Local police | Enforcement (traffic regulation) | Changes in commuting patterns conflict with existing work assignments | Special funding for redesign of work assignments Primary agency consults in planning phase |
| Public and private employers | Operation | Internal coordination of work is difficult Safety and security problems when few employees work very early or late hours Staff inaccessible to outside contacts during traditional hours New procedures required for supervising and evaluating personnel performance Turnover of employees not able to commute at new times Employee ridesharing arrangements suffer | Technical assistance provided for devising new procedures and identifying critical hours for types of jobs Reduce local business tax for participants Offer reduced transit fares for employees traveling off-peak Offer reduced parking fees for off-peak use Primary agency consults with employers in planning stage Redesign or institute compatible car- and vanpool arrangements |
| Employee Labor Unions | | Unions may require overtime pay for work over 8 hours in one day | Negotiate with unions |
| U.S. DOT State Highway/DOF | Funding and technical assistance | Available funds channeled to other programs Benefits perceived as insufficient to justify funding | Appropriations designated for low-cost transportation improvements such as this |

identify types of personnel and hours necessary to meet the needs of clientele and suppliers, establishing new supervisory procedures, and designing new methods for internal flow of information.

Employers may also find it necessary to negotiate with labor unions or other employee organizations with regard to overtime rates for personnel who will work more than 8 hours in a given day. Some labor contracts require that employees be paid time-and-a-half when this occurs, even though the total work week does not exceed 40 hours. Programs that require personnel to be present during specific hours at the beginning and ending of the work day that spans a period of more than 8 hours are the most subject to overtime pay demands. Examples of this can be found in transit union contracts, where employees are needed during the morning and evening rush hours. The same problem can arise under 4-40 programs where employees are required to work under a fixed schedule of four 10-hour days each week.

Among the laws requiring premium pay for more than 8 hours per day are the Contract Work Hours and Safety Standard Act and the Walsh-Healy Public Contracts Act. Almost all types of alternative work schedules are disallowed under Title 5 of the U.S. Code, while the Fair Labor Standards Act requires that interstate commerce and public administration employees be paid overtime after 40 hours of work per week. This Act also provides for collective bargaining regarding overtime and support of the 5-day work week. Labor unions generally reject the 4-40 scheme, especially where the three nonwork days are not consecutive, but have been found to approve a 4-day plan that offers reduced 32- to 35-hour week.

Flexible hour programs, however, are less subject to overtime pay demands. Employers may prohibit staff from logging more than 8 hours per day unless they agree to a regular rate for any excess hours they choose to work. Also, the types of jobs most suited to self-determined scheduling are usually those in which the labor force is not unionized or otherwise strongly organized.

Employers with successful carpooling or vanpooling programs may be reluctant to adopt work rescheduling, because it might disrupt the existing ridesharing arrangements inasmuch as employees will be traveling to and from work at different times. Experience in Toronto, however, revealed that subsequent to work rescheduling new riding pools were formed and more than twice as many employees joined the new pools than had abandoned them. Under a fixed, staggered work-hours program this problem may be lessened by the strategy of assigning personnel within the same office, or location of a dispersed operation, to the same schedule.

Some management objections might also be raised concerning safety and security problems where a few employees worked very early or late hours. Costs of additional security personnel, power for lighting and operating equipment, and heating for the extended work day should, however, be compensated for by the improved efficiency of those working during these off-hours without the normal daytime distractions. Finally, some employee turnover may occur when new fixed work schedules cannot be coordinated with family responsibilities and other personal

demands on time. If the employees involved are thought to be critical to the operation, management can opt for special arrangements in these cases. In other cases, new personnel would have to be found and trained. Experience indicates, however, that only a small percentage of employees cannot or choose not to make the adjustment to the new schedule.

Institutional problems may also occur when transit operators and enforcement agencies are not consulted during the planning phase and suddenly find themselves obligated to revise their existing systems to accommodate new commuting patterns. These problems are discussed in a later section on "Joint Implementation Problems and Solutions."

Additional legal problems may have to be dealt with if parking restrictions and pricing mechanisms are used as penalties to promote off-peak travel to work, or if the relief of city business taxes is used as an incentive to employer cooperation. Project funding, however, should not present a serious barrier to implementation. Although an UMTA technical studies grant of \$200,000 was provided for the Manhattan project "to investigate and advance the concept," staggered work-hours programs can be implemented at such minimal costs that no federal or state assistance is necessary. If the community should feel the need for such assistance, however, proposals for modifying work hours easily qualify for federal funding within the TSM program.

Ridesharing

Definition. Commuters enter into agreements to travel together to and from work on a regular basis, thus relieving peak-period congestion by reducing the number of vehicles on the road during these critical hours. Schedules are fixed by agreement among the participants and are essentially inflexible for the individual rider. The shared ride may have only single points of origin and destination, but more frequently arrangements will be made for some route deviation at the beginning and ending of the trip to provide participants with door-to-door service.

The most common form of ridesharing is carpooling in which all members may take turns in offering the ride, or one member will consistently provide the vehicle and drive and receive compensation from the other members. In rare cases the vehicle may have been jointly purchased and operated by a long-established commuter pool.

Other forms of ridesharing include vanpooling, subscription bus services, and group riding of taxis. Vehicles for vanpooling are most often purchased by employers who then assign responsibility for organizing and operating the commuting service to individual employees. Frequently these employee-operators will be permitted to keep receipts from fares in excess of operating costs, thus providing an incentive for full-capacity ridership. Subscription bus pooling is most often used for long-distance commuting trips where routes and schedules of regular transit do not meet the needs of a fairly large group of riders. Most often the riders form a cooperative, contribute a regular monthly or annual fee, and contract with a local transit operator to provide both the vehicle and driver. Occasionally,

employers in difficult-to-reach locations will contract for the subscription service in order to ensure themselves of the labor force they desire. Group riding of taxis is provided on a regularly scheduled basis at a reduced rate by a local taxi operator under agreements with predetermined groups of commuters. Participants make their entire journey to and from work in the shared taxi, or the group ride may take place only at one end of the trip between a transit terminal and home or work. Route deviation may be included in the arrangement so that riders

have the additional convenience of travel to and from their specific origin and destination points.

Institutional Roles. Institutional arrangements for ride-sharing are described in Table 20; they vary widely, depending on the mode involved—carpool, vanpool, or subscription bus—and the local circumstances under which the program originated. Carpool programs most often are initiated as communitywide efforts in which a local transportation agency carries out the primary roles of planning, promotion, and administration. This can be a new func-

TABLE 20
INSTITUTIONAL FACTORS—RIDESHARING

| Institutions Involved | Institutional Roles | Barriers to Participation or Approval | Strategies to Gain Participation or Approval | Penalties |
|---|---|---|---|--|
| Employers | Planning Promotion (Internal) Operation | Responsible personnel diverted from regular work High costs of insurance Complex administrative tasks | Analysis of savings to employer in reduced parking needs and employee absence and tardiness Nationwide survey of experience to set new rates City-wide matching service Technical assistance Tax incentives | Local restrictions on increases in employee parking accommodations |
| Local transportation agency or carpool organization | Planning Promotion (city-wide) Administration | Lack of employer or rider response Inadequate technical skill | Assistance with promotional techniques Training and computer programs for matching | Must be included in TSM plan |
| MPO | Formal approval | Public response does not justify expenditure on program | Federal and state information programs | Local transportation assistance withheld |
| DOT | Funding Technical assistance | | | |
| EPA | Formal approval | | | |
| State DOT | Funding Technical assistance | | | |
| State PUC | Regulation | Existing laws restrict vanpool operations | Modify regulations to exempt ridesharing from common-carrier classification | |
| Private transit operators | Approval | See ridesharing as unfair competition | Innovative approaches to use of private companies in ridesharing | Legal decisions establish non-competitiveness |
| Employees | Operation | Insufficient compensation for additional responsibilities | Innovative bonus or profit-sharing system | |
| Transit authorities | Operation (subscription buses) | Lack of interest | Encourage inquiry by rider groups | |

tion for an established agency; or the primary function of a specially created public office, as in Seattle, or of a nonprofit organization, as in Los Angeles. Where communitywide matching systems are utilized, this agency or special-purpose organization will operate it, calling on employers only to assist in promoting participation among their employees. Under different institutional arrangements, a more active role is required of employers to operate an internal rider-matching system and administer the company's program. The local agency in this case focuses its efforts on obtaining the participation of employers rather than the labor force. In all cases, technical assistance from DOT and state transportation agencies is needed in the form of computerized or manual matching systems, administrative procedures, and promotion techniques.

Vanpool programs rely more heavily on the initiative of individual employers, and may even be undertaken in the absence of any particular encouragement by local transportation authorities. Frequently the employer himself provides the vehicles and designs incentive programs for those employees who drive and manage the operation of their individual vans. Funding assistance for the purchase of vans may be obtained under FHWA loans. Technical assistance from both state and federal transportation personnel may also be used, and the state PUC is frequently involved in questions of regulating vanpool operations. Private operators of transit systems may also become involved in questions of unfair competition.

Subscription bus services are most frequently provided by local transit authorities who supply vehicles and drivers at agreed-upon rates to groups of commuters with common travel needs. Few transit authorities actively promote this type of service, but more frequently provide it in response to requests from groups of riders or employers. The state PUC may become involved if the subscribers form a cooperative to purchase their own vehicle and hire a driver.

All types of group-riding measures are encouraged by EPA and are evaluated by that agency for their effectiveness in reducing automotive pollution. Ridesharing is also one of the most common activities undertaken within TSM programs and, therefore, is subject to the approval of the MPO.

Institutional Problems. In spite of its being such a widespread and broadly approved approach to reducing traffic congestion, air pollution, and energy consumption, ridesharing is subject to a number of important institutional barriers. These include: legal problems with regard to public utility regulation of common carriers, liability, tax status, and unfair competition; problems of security with regard to confidentiality of rider-matching files and personal safety; and reluctance of both employers and employees to participate.

Under the common definition of state PUCs, common carriers are vehicles operated for profit in carrying passengers. Ridesharing arrangements will fall under this definition if it can be shown that the driver of such a vehicle benefits from the activity. Carpools in which members take turns in driving their own cars are usually exempt, but those in which one individual consistently drives and collects money from passengers may fall under scrutiny.

Generally, if the money collected only compensates the driver for his expenses, there is no problem. However, where employers provide financial incentives to drivers and organizers of pools, as is frequently done under vanpool programs, several difficulties may arise. First, the service may be required under PUC regulations to obtain a certificate of public necessity and convenience. Second, it may be challenged by existing transit company of unfair or illegal competition, particularly where federal funds were used for the purchase of the vehicle. Third, the Internal Revenue Service will consider these incentives, or, indeed, any compensation above personal travel costs, as taxable income.

The principal solution to these problems lies in exempting ridesharing arrangements from PUC regulation. Some states have already moved in this direction, and there have been local court decisions that group riding is not unfairly competitive to transit. Some consideration might also be given to exempting driver incentives for pooling from IRS definitions of taxable income. Another strategy suggested is that, technically, profit-making pool operators should form carpool cooperatives that could handle tax matters for members (11).

The remaining legal barrier is that of liability and the related problem of high insurance rates. Under carpool arrangements all members may be liable for third-party damages, regardless of whose vehicle or which driver is involved, because the passengers are not guests in the car but part of a group sharing the ride for their mutual advantage. Moreover, if the employer has taken an active role in promoting ridesharing arrangements, he also may be liable. This is a particular risk when the employer owns the vehicles used in a vanpool program. Because of the uncertainty of liability and lack of experience in compensation for damages involving group riding, insurance rates, especially for vanpooling, are extremely high. In a study of 33 vanpooling programs, costs of special van insurance ranged between \$225 and \$780 per vehicle per year, with the majority at the upper end of the range (20).

Several strategies have been employed to reduce insurance costs. Some states permit employers to apply workmen's compensation to coverage for employee-passengers, thus requiring only third-party insurance from other sources. Some programs are self-insured through employee credit unions or student unions. Some employers include the vans under their fleet policies, and in one case a contractor operating the service for profit paid the insurance himself and deducted it as business expense. Vanpool and carpool operators can also enter into a cooperative where they could benefit from limited liability and group rates for insurance.

Security also presents problems in ridesharing arrangements. One of these is to preserve the confidentiality of lists of names, address, places of work, and travel times of those entered into a matching file. Misuse of files for commercial or illegal purposes is a possibility that must be guarded against. Personal security is also a potential problem with large-scale ride-sharing programs, where people are strangers to each other. Up-to-date records of the membership of groups, active investigation of com-

plaints, and eliminating offenders from the matching list are the most practical strategies for dealing with this problem.

Strategies to gain employer participation in general has been discussed earlier. Those particularly pertinent to ridesharing programs are technical assistance with administrative procedures, proof by economic analysis of the benefits to the company of encouraging ridesharing, and financial assistance in the purchase of vehicles and setting up programs and in reducing insurance costs. A range of both computerized and manual matching programs has been developed under DOT sponsorship and is available to employers. Considerable literature on promotion and administrative techniques has also been prepared both by DOT and many state transportation agencies. Many companies discover their own needs for instituting carpool or vanpool programs, but the promotion programs of local transportation agencies could be greatly enhanced by the development of a formula to assist other companies in analyzing their own situations and determining how they might benefit from participating in the program.

Federal-aid highway funds are now available in the form of interest-free loans to cover 90 percent of the cost of purchasing 8- to 15-passenger vans and to cover personnel and other direct project costs. Funds are repaid as they are recovered through fares, but may be used to insure against employers' losses if projects fail. Research is currently underway to determine vanpool accident experience to establish more reasonable insurance rates and to develop innovative approaches to meeting needs for adequate protection.

Incentives to gain employee participation in carpool programs include free or preferential parking rates and locations, access to lanes and ramps reserved for high-occupancy vehicles, and park-and-ride services. Incentives for vanpool programs usually include an arrangement under which the driver-organizer may keep that portion of fares collected above a set amount that compensates the employer for the cost. This encourages the driver to seek out new riders to fill any empty seats and to maintain a high level of service to keep his passengers. Convenient, reliable, and low-cost travel to work are the attractions of the system to the riders. Employers may also make adjustments in work hours and provide loading zones and convenient parking to promote vanpool use.

Subscription bus services are frequently implemented under employer contracts with local transit authorities, who subsidize low-fare or no-fare service as an incentive to employee use. Some systems include special late service so those employees whose work does not always permit them to leave promptly at the end of the day are assured of transportation home. Employers generally find marked improvement in employee work attendance.

Communications in Lieu of Travel

Definition. Peak-period traffic congestion is reduced by permitting employees to work at home or at a suburban communications center, traveling only occasionally and at off-peak hours to central offices. Telephone, teletype, and more complex audiovisual equipment provide for essential

communication between the dispersed labor force and the administrative center.

Experience in substituting communications for travel have focused on eliminating needs for intercity trips and have used sophisticated electronic equipment to transmit voice, hard copy, and visual images on picture tubes. Although no notable experiments to eliminate daily intracity work travel have been carried out, it is believed that a number of urban employees do, in fact, work informally under such arrangements, using such simple communications media as the telephone and mail or delivery service.

Certain types of business activity—such as finance, insurance, and research—that largely involve the transfer of information, as opposed to the manufacture of a physical product, appear to be the prime candidates for decentralized working arrangements. Equipment for transferring this information may be placed in an employee's own home for his individual use or in a cooperatively used communications center located, for example, in a suburban shopping center within easy reach of several dispersed workers.

Institutional Roles. Although DOT, HUD, and the National Science Foundation (NSF), as well as major manufacturers of communications equipment, have been involved in the development of communications as substitutes for travel, local attempts to apply this technique to the daily work-trip will rely almost entirely on the initiative of individual employers. These employers will carry out planning, administration, and operation; promote acceptance among its staff; finance the acquisition and installation of communications equipment; and monitor the results. The role of federal and state governments would be limited to regulation (FCC and PUCs) and granting CATV franchises.

However, should a local transportation agency initiate a broad program of substituting communications for daily commuting to work, similar to existing carpool and staggered work-hours programs, there would be a very different allocation of institutional roles. The agency would promote employer participation; plan the over-all strategy, including arrangements with providers of communications equipment and services for favorable terms and with local government for tax incentives for participating employers; and monitor and evaluate the citywide program. This agency might also apply for federal and state assistance.

Although communications substitution for travel is not among the current TSM options suggested to communities, it is possible that DOT would be interested in funding such an experiment as a demonstration. The MPO would then become involved in giving the proposal its formal approval. Similarly, if HUD should be interested, the regional planning body would have to approve the program. Table 21 outlines the institutional responsibilities as they would exist if a communitywide communications substitution program were undertaken.

Institutional Problems. Lack of experience in substituting communications for daily travel to work is the primary problem. It is not yet known how many and what types of jobs could be carried out in dispersed locations, what type of equipment or information system is required

by these activities, or what effects this would have on employee performance and morale. Its effectiveness in reducing peak-period congestion cannot yet be anticipated.

Much of the equipment developed under the communications concept is highly sophisticated and costly. Estimates of the cost of a cable TV network capable of serving the number of users necessary to have an impact on traffic congestion range between \$30 and \$50 billion in investment capital plus another \$1,000 per year per employee (21). Since resources available to local transportation agencies do not even approach these amounts, the only solutions lie in devising less costly alternatives for meeting communications requirements.

JOINT IMPLEMENTATION PROBLEMS AND SOLUTIONS

The preceding discussion shows that the implementation of single congestion-reducing techniques may involve a number of institutions at all levels of government and in the private sector. As individual techniques are combined in the broad congestion-reduction programs represented by the C-R packages, the institutions whose participation and approval are necessary for successful implementation are multiplied.

Common Problems of Joint Programs

Certain types of institutional problems appear to be common to cooperative programs involving independent agencies and organizations regardless of the particular techniques being implemented. Such problems, suggested by the experiences of cities reported in Chapter Two, can be summarized as follows.

Individual action agencies are reluctant to depart from their traditional approaches and to use their available staff and funds to pursue activities in which they have little experience or confidence in successful results. They fear encroachments on their independent status by other local agencies promoting joint action, by the MPO, and by state and federal involvement in the program. Some see the MPO and other agencies as competitors for funds made available through federal and state assistance programs. Many action agencies have established methods of dealing with what they consider to be their particular constituencies and are reluctant to enter into cooperative programs that involve broader citizen input and possible redirection.

The centralized planning authority—regional council or MPO—faces the difficult task of satisfying each of its member governments' constituencies and effecting compromises between their individual demands and areawide transportation needs. It must see that the local program conforms to the often conflicting requirements of federal and state authorities and find the optimum balance between pursuing approaches the community needs and wants the availability of federal and state funding assistance for other approaches. Without any real authority within the traditional structure of local government or implementing powers, the planning body can carry out complex C-R programs only through the implementation authority of local action agencies. Where these agencies' implementation plans conflict with each other or with the over-all program goals, the planning body must, without alienating

the agencies, reject these plans and suggest feasible alternatives. It must also work within the effective political structure to eliminate legal or regulatory barriers to proposed activities and ensure that essential participants have adequate funding to carry out their assigned tasks. Finally, the central planning authority must provide opportunities for citizen input so that approaches unacceptable to the public at large can be avoided and, at the same time, ensure that special interests do not dominate the planning process.

TABLE 21
INSTITUTIONAL FACTORS—COMMUNICATIONS IN LIEU OF TRAVEL

| Institutions Involved | Institutional Roles | Barriers to Participation or Approval | Strategies to Gain Participation or Approval | |
|---|---|--|--|-----------|
| | | | Incentives | Penalties |
| Individual employers | Planning) Administration) Promotion) Evaluation) (Internal) | Lack of knowledge of options Uncertainty as to effect on personnel performance and morale Cost of equipment and risk | Nationwide information program Demonstrations and investigation of existing informal programs Funding assistance Tax incentives | |
| Local transportation agency | Planning Promotion Administration | Technique unfamiliar, not included in TSM options | Federally-sponsored study and promotion of feasible approaches | |
| DOT) HUD) NSF) State transportation and/or development agency) | Funding | Costs of currently-conceived programs beyond resources | Innovative substitutes for high-technology systems | |
| Regional planning body) MPO) | Formal approval | Lack of knowledge to evaluate | Further information development and distribution Federal funding assistance made available | |
| FCC) State PUC) | Regulation | | | |

Nongovernment institutions that represent these special interests fear that their concerns will be overlooked in the decision-making process and are quick to see and resent token participation. Often, they do not fully understand the long-range purposes of the proposed measures and the roles of the planning body and implementing agencies. Individual business firms and other private organizations called on for active participation may refuse to cooperate for fear of disrupting existing work routines, being exposed to possible government interference, having to absorb both losses in productivity of personnel assigned to project tasks and other direct project costs, and encountering difficulties in carrying out unfamiliar project activities. Both these types of nongovernment institutions need access to a central project authority that can take cognizance of their concerns, provide them with the information they need to judge how the proposed program would affect their interests, and, where necessary, supply practical assistance in carrying out specific implementation tasks.

Strategies for Obtaining Cooperation

Benefits from congestion-reducing programs can be realized only with long-term commitments of participating agencies and organizations to achieve lasting changes in local travel patterns. It is essential that the program be compatible to the over-all transportation plan for the area and that a sound organizational framework for cooperative action be provided within which the several institutions can function on a permanent basis.

Recognizing that the existing institutional structure and political climate of urban areas varies, it is still possible to suggest some strategies for achieving continuity of cooperative transportation programs that could apply to many different communities.

Centralizing Authority

Although the initial proposal to undertake a C-R program may be made by one of the local action agencies, the program will benefit by being implemented under the sponsorship of the areawide transportation planning authority. This will provide the best opportunity to ensure that the C-R activities conform to the area's long-range transportation goals and policies. It will also help to eliminate some of the problems of interagency rivalries by placing the official leadership of the project in a neutral body.

The areawide planning body may be a multipurpose regional agency carrying out transportation planning as one of its functions, or it may be an organization created solely to deal with transportation matters. In either case, the organization functions more effectively when its membership is made up of the chief elected officials of local units of government rather than appointed representatives, since mayors and county supervisors or councilmen have the authority to commit their political subdivisions to supporting the joint program. Also under either functional arrangement, transportation plans must be drawn up within the context of over-all area development plans, particularly with reference to land use. If the organization's function is limited to transportation planning, there should be an established procedure for ensuring that trans-

portation decisions are compatible with development goals and policies.

Where the designated planning region is very large and includes a number of counties and cities, some organizations have found it impossible to satisfy all of the diverse local interests and eliminate some members' fears that their joint decisions favor the larger jurisdictions. They have sought a solution to this problem by allocating planning authority to subregions and limiting the central authority to routine approval of subregional plans. This solution is not recommended, except as a last resort when the regional body is too torn with dissension to function at all, for the following reasons. The resources available for research and planning are divided and similar tasks are duplicated by separate staffs. Some of the smaller subregions may not have the funds or personnel to carry out these responsibilities adequately. Some regionwide decisions must be arrived at, because all subregions will be affected by the development of interurban highways or transit systems. The decision process is drawn out because of the difficulty of scheduling the meetings of the various subregional councils in an efficient sequence to expedite the matter. Lines of communication between federal and state transportation agencies and the area become more complicated, and there is greater potential for confusion and delay in obtaining funding assistance for local programs.

Central transportation planning authorities appear to operate best when divided into functional levels rather than geographical divisions. At the top are heads of local government whose primary functions are to set transportation goals and policies and evaluate the over-all desirability and political feasibility of proposed programs. At the second level are representatives of such local operating agencies as the transit district and road and public works departments. These form a technical committee that proposes specific transportation improvements and implementation plans. Many communities have found it valuable to include in this technical committee representatives of federal and state transportation agencies. They usually function as *ex officio* members, advising the committee on new policies, research findings, and funding opportunities; and generally providing liaison with their agencies.

At the third level is the professional support staff that carries out the detailed research and planning tasks for the technical committee, the services of meetings of this committee and the policy group, and the preparation of documents for submittal to member governments and federal and state transportation agencies. Continuity of planning activities is better ensured by the appointment of a full-time staff director, who can give these tasks his entire attention, than by a member of the technical committee, who is assigned this role.

Another important function of the technical staff is to handle publicity and public relations—disseminating information on a regular basis to selected organizations and individuals, responding to inquiries, and providing liaison between citizen advisory groups and the policy and technical bodies.

Involving Participants in the Planning Process

It is highly desirable that all of the institutions that are

to carry out implementation tasks in the C-R program be brought into the planning process. Not only does this practice reduce the possibility of institutions refusing to cooperate when the project is implemented, but it can also bring to light problems they might face in carrying out their future responsibilities while there is still time to develop solutions or modify the plan to avoid them.

Agencies not normally included in the development of transportation plans can be excellent sources of information that may be vital to the success of the program. This is particularly true in the case of agencies that work regularly with the public, such as welfare services, redevelopment authorities, and police. Their exposure to the public enables them to anticipate commuters' responses to proposed measures and can be of value in avoiding unexpected public opposition when the program is carried out. This is equally true of private organizations, such as business firms, whose participation is essential in programs calling for changes in times and places of work and ride-sharing. Their familiarity with employee attitudes, union positions, and labor laws can help the planning agency in selecting feasible programs.

It may not be possible before the C-R program is fully conceptualized to identify all of the institutions that will eventually be involved, but provisions should be made for adding them to the planning structure when their roles become apparent. Nor is it practical to burden the entire planning structure permanently with all of the participants of every action program. The structure should be flexible to allow for heavy involvement during the planning and initial implementation phases of institutions contributing to particular programs and for their lesser involvement once the program is underway.

Strategies for achieving both broad representation and the efficiency of a compact planning organization are to assign participants to special project task forces rather than to assign them as permanent advisory bodies. Once their work is accomplished the task force can be dissolved or maintained in an inactive status. To be successful this treatment must be accompanied by an effective communications link to the permanent planning body, so that members of former or inactive task forces can continue to be informed about the progress of the project and, in turn, pass observations and evaluations back to the central planning authority.

Arranging Meetings

It should be recognized that individuals capable of making the greatest contribution to the project planning process are nearly always those who have many other important responsibilities and heavy schedules. It is wise to utilize their assistance only when there are useful tasks for them to accomplish. Meetings should be held to a minimum and scheduled irregularly rather than at set intervals so as to avoid bringing these people together when there is nothing that really needs their attention.

When meetings are scheduled, however, they should be well planned. Agendas and pertinent data should be in members' hands sufficiently ahead of the meeting date so that they are prepared to discuss and decide on matters that will be presented. Some effort should be made to see

that the meeting takes place at a location convenient to most of the participants; that the room is quiet, clean, and comfortable; and that it is provided with any necessary display, public address, or other equipment in good working order. Particularly to be avoided is the meeting in a staff member's cluttered office, interrupted by telephone calls or consultation with other staff, and where those attending the meeting have no place to spread out papers or make notes.

Providing Communications

One of the most important functions of the centralized planning body is to provide for the exchange of information among the several action agencies and between them and other institutions and the public that are affected by transportation measures they undertake. This function is met only in part by arranging meetings at which these parties can face each other and discuss their different approaches and concerns.

Meetings are probably the least efficient of the methods available for communicating information. They are very time consuming, especially for those arranging them. Only a limited number of topics can be discussed, details cannot be thoroughly investigated, and they offer the opportunity for one or more vocal interests to focus the attention of the group on certain points at the exclusion of others equally or more important.

Some planning agencies have found it more effective to limit meetings to those occasions when formal approval of the group as a whole is needed and to substitute written communications where the purpose is to transmit information. The advantages of this approach are: more institutions can be informed by the distribution of documents than can be accommodated at a working meeting; recipients have time to consider the ideas presented, to refer back to clarify initial misunderstandings, and to formulate pertinent questions; and, even more importantly, those genuinely concerned will respond to the agency's request for comments, while those whose interest is marginal, but who are often tempted by a meeting situation to discuss extraneous matters, will either not respond or their comments can be given the degree of attention they warrant.

In order for this approach to work, however, it is essential that the planning agency provide evidence that the comments received in writing are being considered no less than if they had been presented at a meeting. This evidence will take the form of modifications to the initial document distributed for comments, or, where the agency takes an opposing view, it will take the form of follow-up telephone calls, letters, or personal visits. If necessary, the conflict may be resolved by discussion at a meeting of the task force or committee.

SITE-RELATED INSTITUTIONAL PROBLEMS AND SOLUTIONS

Three important institutional factors determined by the implementation site are the unofficial power structure, special-interest organizations, and community attitudes. These factors can affect public acceptance of C-R pro-

grams. Since the combination of these institutional characteristics is unique to each community, it is possible only to suggest strategies for dealing with them in general terms. Project promoters may find some of these suggestions applicable to their own particular situation.

Unofficial Power Structure

In all communities there is a well-recognized power structure formed around a nucleus of personalities who essentially determine how the community will act. Often these individuals have no official place in the local government structure, or, where they do, they exercise influence out of proportion to their official positions.

Transportation planners and technicians in line operating agencies may, prior to this attempt to implement a C-R program, have had no occasion to come in contact with this unofficial power structure. This is more likely the case in large cities where those working in public agencies tend to be isolated from the local political process. Without insight into the existence of these personalities and their influence on local government, those designing the C-R program may find themselves promoting specific activities or institutional arrangements that run counter to the opinions and working arrangements of this element of the community.

Program designers may first become aware of this unofficial power structure when they meet with unexpected opposition when presenting their proposals to agency directors or elected officials of local government. Politically inexperienced technical personnel may be shaken by such an experience, particularly if they perceive the objections as based on misunderstanding of the program's purposes or procedures. It serves no useful purpose for the program designer to protest the influence of this unofficial element over local government matters; he must learn to work with it. First, he should inform himself about these personalities and how their special interests relate to transportation measures. A good source for this is the authority present when opposition to the proposed program was initially met. He should then establish a line of communication between these influential people and the program design group so that misunderstandings can be cleared away and compromises reached. Contact may be made through informal meetings, but an even more effective strategy might be to have representatives of the unofficial power structure appointed to the citizen advisory group where they can grow more familiar with proposed transportation actions and become involved with the future success of the program.

Special-Interest Organizations

Every community provides a number of organized special interests that may see their particular concerns threatened by proposed transportation measures. Special-interest groups can effectively block a C-R program by organizing public protest, by instituting legal proceedings, or by using their influence with elected officials.

The positions of some of these organizations may appear to the promoters of transportation programs to be unreasonable and irreconcilable with program goals, and agency

personnel are tempted to ignore them. Unfortunately, these special interests are usually too strong to disappear through inattention, and, when the project is implemented, opposition may be all the more intense for having received no prior recognition by the promoting agency.

Aside from these practical considerations, there are other reasons why project planners should maintain open communication with special-interest groups. They are, after all, highly concerned with the welfare of certain groups within the community or the quality of urban life. These concerns may be threatened by some element in the plan that could easily be modified to remove that threat without damaging the program as a whole. Special-interest groups may also have creative suggestions for program improvements that would make the project more effective and acceptable to the public.

The same system used by the central planning body to work with participating institutions can be extended to include these special-interest groups. They could be represented on citizen advisory committees attached either to the central planning authority or to the C-R project task force. Contact could be maintained primarily through distribution of documents accompanied by requests for study and comment by the group, and meetings could be restricted to occasions when official approval of the citizen advisory body was needed. Here, too, evidence of effective feedback into the planning process is essential.

Community Attitudes

Public acceptance of the same congestion-reducing measures will differ from one urban area to another because of community attitudes. In many communities there are strong prejudices against federal and state involvement in local affairs. Some will forego funding assistance in order to avoid the influences and constraints that appear to them to accompany this assistance. Some communities also strongly oppose attempts of local government to interfere with the individual's rights to drive his private automobile. Also, in many cities, procedures have been established for "grassroots" planning for community facilities and services by individual neighborhoods, and there may be opposition to C-R measures implemented on a citywide basis by municipal or metropolitan authorities.

Community attitudes toward government authority over local transportation not only vary from one location to another but also change over time. Greater public awareness of needs to conserve energy, reduce automotive pollution, and reverse the trend of urban blight is modifying public opinion as to the proper role of government in restricting and redirecting urban travel. Public opinion is also changed when a community experiences successful transportation improvements.

It should be remembered that traffic engineers and transportation planners view traffic congestion differently from the general public. To the former, it is a serious problem urgently in need of correction. To the average driver, however, it is merely an aggravation that he accepts as a normal part of his daily work trip. This is demonstrated by the number of drivers who insist on adding their cars to an already crowded freeway at rush hour rather

than choose another route, time, or mode of travel. Commuters will apparently tolerate intense levels of congestion, accompanied by tension and high risk of accidents, while they will strongly resist congestion-reducing measures that interfere with their established travel patterns.

Many drivers will feel that their rights are threatened by newly imposed user penalties for traveling over a bridge during peak-period or long-term parking, or by the designation of an exclusive lane for buses and carpools while they remain confined in an even more congested condition on the adjacent lanes. The Los Angeles Diamond Lane Demonstration is a case in point. It was expected that drivers in congested lanes would see traffic flowing freely on the reserved lane and rationally come to the conclusion that they should form carpools or switch to transit. Instead, few made this rational choice, while the majority protested the experiment until they were successful in defeating it.

In general, programs will fare better if more incentives and less penalties are employed—or new options rather than restrictions. Acceptance can be more easily gained for variable user tolls, for example, if carpools are exempted rather than if single-passenger vehicles are charged more than the former fee. ARZs are more likely to be well accepted if peripheral parking lots and shuttle service to the CBD are in operation before the area is closed to private vehicles. In addition to consulting with public-service agencies and special interest groups, the transportation planner can help to avoid transportation actions that will prove unacceptable to the public at large by putting himself in the role of the driver or transit user and test his personal reaction to the measures being proposed.

One of the most difficult problems in dealing with public response is to choose correctly what information should be publicly disseminated. Some promoting agencies understate the difficulties that commuters will face when measures are first put in effect for fear that the true picture would cause the public to reject the proposed program. Commuters are then unpleasantly surprised, believe the program has unexpectedly gone wrong, and lose confidence in the promoting agency. It is better in the long run to prepare the regular users of a route or transit system for problems at the start of the program and suggest that they leave a little extra time for their commuting trips. The promoting agency may have to deal with some preimplementation opposition as a result, but it is unlikely that this opposition would be less than if it were postponed until the program was actually put into operation. It is preferable to be faced with the need to modify the approach before it is implemented than to have to abandon it afterwards.

On the other hand, if the program elements are to be phased over an extended period, the entire program need not be presented in detail to the public before the first phase is initiated. It is particularly not advisable if more radical changes in the existing transportation system are planned for later phases. Public attitudes toward transportation controls may become more favorable if experience with the initial measure is good, or circumstances may occur that will modify the long-range program. No useful purpose is served by generating early public opposition to

measures that will later be more acceptable or may not, after all, be implemented.

It is also strongly recommended that C-R programs not be oversold to the public in terms of immediately discernible benefits. Changes in urban travel patterns take place slowly, and only moderate improvements in traffic flow should be expected in the initial implementation period. If the public is promised dramatic changes, it will be disappointed and may assume that the experiment has failed and should be abandoned.

Finally, it is better to move slowly toward changing urban commuting habits, beginning with measures that have a high probability of public acceptance, and gradually building support for more radical controls.

EXAMPLE OF C-R PACKAGE IMPLEMENTATION

In the preceding pages, a number of potential institutional barriers to implementing congestion-reducing packages have been identified and strategies have been suggested for overcoming them. This section presents an example of how a local agency might apply these strategies in carrying out a C-R program for its particular community.

The discussion takes the form of a hypothetical case history. One of the eight packages of C-R techniques recommended in NCHRP Project 7-10 is adapted to the specific setting on the basis of local transportation needs and resources. The initial attempt to implement the program encounters problems stemming from the existing institutional structure for transportation action and community characteristics. Strategies are employed to overcome these problems, and the program finally is successfully implemented.

The setting for this hypothetical example of C-R implementation is drawn in part from Case Study 4: Seattle, presented in Appendix C, because this helps to provide a realistic background of geographic features, institutional framework, community attitudes and transportation needs, and resources. However, in order to illustrate certain kinds of institutional problems and solutions applicable to a broad range of urban settings, some features of the actual transportation environment have been changed and others invented. This hypothetical example of C-R package implementation neither represents a recommendation of a specific course of action for Seattle nor anticipates what institutional problems might actually arise in carrying out such a program.

Selecting an Appropriate Package of C-R Techniques

In this hypothetical case study, the King County Subregional Council of the Puget Sound Council of Governments has recognized that peak-period traffic congestion is increasing primarily on the bridges crossing Lake Washington to the east of the city and on the north-south freeways where they pass through the central city (see Fig. 1) and to a lesser degree within the CBD itself. In spite of the growth in transit ridership since the city and county bus systems were consolidated under the Municipality of Metropolitan Seattle (Metro), and in ridership under the promotion efforts of the Seattle-King County

in the variable toll system on Evergreen Bridge. It is sure that commuter use of transit would be increased by improved service in suburban residential areas, additional CBD transit, and a more intensive incentive program. It also believes that more cross-Sound commuters could be persuaded to travel without their cars if transit services at both ends of the ferry trip were made more convenient through coordination of schedules and joint ticketing (one fare for all three segments of the trip).

As to the optional techniques recommended in the package, the Council sees the value of continuing to pursue road pricing in its toll form and parking controls, utilizing local zoning and building codes to implement some of these controls. It does not, however, believe that traffic cells and major auto-free zones are appropriate to the community at this time. It recognizes that the topography of downtown Seattle restricts the construction of new arterial capacity around its perimeter, which is essential to a traffic cell system, and restricting automobile entry to the CBD prior to the development of improved transit alternatives would be a hardship for those working there and, especially, for cross-Sound commuters. Therefore, the Council eliminates these two options from its plan. Instead, it decides that its new ridesharing program offers an effective means of reducing the number of private automobiles traveling at peak-periods and is compatible to the other elements of the program. Finally, the Council is concerned over peak demands on the capacity of the transit system if the desired mode shifts take place. It therefore decides to distribute some of the peak travel by encouraging staggered work hours among major employers in the community, and will look to innovative modes of paratransit to accommodate part of the peak demand.

The package selection process has involved: (1) analysis of existing problems and transportation resources, (2) evaluation of the applicability of one of the recommended packages, and (3) elimination of some proposed techniques and the addition of others. The result is a congestion-reducing program tailored to the needs and opportunities presented by the particular community.

Organizing the Project Task Force

As a first step in implementing the C-R program, the Council forms a special task force made up of government agencies that will be called to carry out the several activities. These include:

1. Metro Transit.
2. State Ferry System.
3. City Traffic Engineer.
4. City Planning Department.
5. County Road Department.
6. County Planning Department.
7. Seattle-King County Commuter Pool.

Because the primary thrust of the program is transit improvement, Metro Transit is designated as the lead agency and assigned the duties of coordinating the task force activities.

The initial task force experiences some serious organizational problems. First, there are conflicts between agencies. City and county planning departments want greater emphasis placed on transit improvements within their

different jurisdictions. Commuter Pool's prior interest in paratransit options leads it to look for improvements in CBD circulation and extended-area services through these means, while Metro Transit seeks solutions through increasing traditional fixed-route bus services. The State Ferry System protests that it is impossible to persuade ferry commuters to travel without their cars if transit connections on the other side of Puget Sound are inadequate. Parking restraints are proposed that will require the cooperation of both city police and private owners of parking facilities, but these are not represented on the task force; nor are the employers, who will be asked to adopt staggered work-hours measures. Moreover, Metro Transit is not able to provide the sustained staff support needed by the task force in arranging meetings, keeping members informed of new developments, and producing documents because of its commitments to its primary task of delivering transit services to the area.

The task force presents these problems to the Subregional Council and asks for assistance. First, the Council concludes that if something is to be done about reducing the number of private automobiles brought into the CBD by the ferry, the problem must be treated in cooperation with the Kitsap County Subregion. At the same time it is pointless to involve Kitsap County with program elements being implemented exclusively in King County. The Council decides to separate the problems and refer that of integrating the ferry service and transit on both sides of the Sound to the regional level and assign the other program elements to a reorganized subregional task force. A transit integration work group is formed of representatives of the State Ferry System; Metro Transit; transit operators in Kitsap County; the Cities of Seattle, Winslow, and Bremerton; and the King and Kitsap Subregional Councils. This work group reports to the Puget Sound Council of Governments and receives staff support from the regional organization.

The C-R task force is reorganized to include, in addition to its original members, representation from the Seattle Police Department. An advisory group consisting of owners of CBD parking facilities and major employers is formed. Both groups are serviced by the Subregional Council's staff so as to relieve Metro Transit of this burden, and an objective evaluation of alternatives in providing CBD circulation and extended-area transit services is undertaken. It is found that in many cases the paratransit options are more effective and economical.

Designing the Implementation Program

Each of the member agencies of the task force is assigned specific areas of responsibility for detailed implementation plans, including proposed schedules and budgets and identification of potential sources of funding and any existing legal or regulatory restraints. These plans are then coordinated by the staff. Conflicts and inconsistencies between plans are discussed and resolved by the task force.

Metro Transit

The first institutional problem to be solved is the question of Metro Transit's authority to involve itself in paratransit. Since the analysis of alternative modes indicated

that demand-responsive and flexible-route jitney services were good solutions to transit needs in extended areas and to supplement existing CBD circulation, Metro Transit has been assigned the task of designing a workable interface between mass transit and these paratransit modes. Consultation between state and local legal representatives results in the conclusion that Metro's authority to provide transit services with the funds provided by the special local sales tax infers a responsibility to utilize the most effective and economical means available, even if some of these means were not recognized as service options when Metro's authority was established.

Under this broader concept of transit Metro now proposes subsidizing taxi companies to provide feeder services to suburban express bus routes and to operate flexible-route jitney services along routes not presently traveled by buses in the CBD. Two more institutional problems are brought to light by this proposal. Taxis both in Seattle and in the remainder of King County are not permitted to carry more than one party at a time or to deviate from the most direct route in carrying that party to its destination. Also, under that mode of service, these taxi operations are not eligible for federal transportation assistance and do not qualify for protection under the provisions of 13 C.

Taxi Operators

The first task is to revise local regulations to permit taxis to operate in shared mode and establish new rate schedules for this type of service. This cannot be done without the cooperation of the taxi operators. Recognizing that their cooperation is also essential in carrying out the proposed services, the task force makes room on its advisory board for representatives of the local taxi industry. These taxi operators then assist Metro Transit in drawing up proposed regulations and designing feasible paratransit operations.

Carpool Program

Because of the contacts with employers in the community developed through its promotion of ridesharing, the Carpool Program staff is assigned the additional responsibility of designing the staggered work-hours element of the C-R program. They consult frequently with the advisory committee, informing themselves on attitudes of employers and testing the acceptability of different incentives that they might offer. They also prepare estimates of changes in peak travel demands that they refer to Metro for reallocation of transit vehicles and to the Police Department and State Highway Patrol for adjustments in work loads. The State Highway Patrol is now added to the task force and contributes its estimates of impacts of proposed increases on freeway traffic.

City Traffic Engineer

The City Traffic Engineer is assigned the task of eliminating on-street parking and suggesting loading and unloading areas and routes for new CBD flexible-route jitney services. His recommendations include designation of additional reserved lanes, one-way streets, and synchronization of signals to facilitate transit movement.

City Planning Department

The City Planning Department works with the Traffic Engineer to establish limits on parking space to be available in the CBD and recommends changes in local zoning and building codes to reduce supply in excess of this amount. It also proposes a system of variable rates that favor carpools and short-term "shopper" parking and that discriminate against single-passenger commute vehicles. All-day off-street parking will be discouraged by different methods depending on the ownership of these lots.

In the case of publicly owned facilities, a schedule of fees can be established in which parking is free or provided at reduced rates for the first 90 minutes, and for each hour thereafter higher rates are charged. Where parking is provided for employees and customers by local business firms, additional property taxes will be placed on space used by employees and the owners assisted in promoting alternative means of commuting—transit passes, subscription buses, or ridesharing. Where parking is provided in lots operated for a profit, a new system of graduated taxes will be added to the commercial parking fee.

Owners of Business and Commercial Parking Lots

Because the cooperation of private owners is essential in implementing the last two techniques, the Planning Department spends a great deal of time working with the members of the business community on the advisory committee. They discover that the most persuasive means of obtaining their acceptance of the proposals is to analyze the potential economic impacts on business firms: advantages of reserving available space for customers rather than employees; more profitable use of area converted from employee parking to other purposes; comparisons of costs of providing space for employees' cars versus company-sponsored commuting alternatives; and for owners of profit-making parking facilities comparisons of income to be derived from increased potential turnover in short-term parking compared to existing all-day use by commuters.

Negotiations between the Planning Department and private owners of parking facilities were made easier by inviting representatives of the business community to participate in the program design. Not only did they have questions and suggestions that broadened the outlook of the professional planners, but they became personally involved with the success of the C-R program and worked toward finding solutions satisfactory to both parties. New parking taxes and building codes restricting space allocated to parking are approved by the City Council.

County Road and Planning Departments

These county agencies are assigned the task of identifying needs for demand-responsive feeder services in smaller cities and unincorporated areas, working with local planners and neighborhood associations. At the same time they construct demand patterns for local transportation to shopping centers and community facilities with the idea of providing mobility within these less densely populated areas with off-peak use of the system devised for commuter feeder service.

The county agencies work with Metro Transit in selecting transfer points between the paratransit and express bus services and with local taxi companies in designating service areas and designing peak and off-peak services. They discover that latent demand for off-peak transit in these low-density areas is greater than was originally thought and that costs of providing this service at low fares would exceed transit funds provided by the existing revenues from the special sales tax. This problem lies beyond the intended purposes of the C-R program; so, as a separate undertaking, the county departments start to work with local welfare agencies to consolidate the various social-service transportation systems and seek out additional sources of funding for supporting off-peak transit.

Integrating Ferry and Bus Transit

Meanwhile the State Ferry System, Metro Transit, and communities in Kitsap County are working on the problem of integrating bus and ferry services so that cross-Sound commuters need not bring their cars into downtown Seattle. They are looking at four aspects of transit integration: upgrading Kitsap-side bus services; improving transfer facilities; coordinating bus and ferry schedules; and joint ticketing.

Upgrading Kitsap-Side Bus Services

Three different approaches are used to improve bus connections to ferry terminals in Kitsap County. In the City of Bremerton, the publicly owned bus system is expanded by purchasing minibuses and breaking up the former long loop routes with segments so that commuters may travel more efficiently from residential areas to the ferry terminal. In Winslow and certain other communities, privately owned bus companies acquire additional vehicles through contractual arrangements with the cities to provide low-fare transit for senior citizens and are permitted to use these vehicles to supplement peak-period service to the ferry terminals. The State Ferry System goes into bus operation in other areas where no transit service is available, adopting some of the techniques used by the Golden Gate Bridge Authority in the San Francisco area. Institutional problems include obtaining federal assistance for the purchase of minibuses by Bremerton Municipal Transit and state assistance to acquire vehicles for the cities contracting for senior citizen transit with privately owned companies, and expanding the authority of the State Ferry System to operate feeder bus services.

Improving Transfer Facilities

Terminal structures are upgraded. Waiting rooms are made more comfortable and attractive and provided with additional customer services, such as newsstands and snack shops. Bus-loading areas are expanded and sheltered from the rain by marquees; signs are placed to indicate specific loading areas for transit vehicles going to different destinations, and schedules and route maps are posted. Parking spaces close to the terminal are reserved for carpool vehicles whose riders will leave these cars on the Kitsap side and complete their trips in Seattle by CBD transit. The

only institutional problems involved in this activity are allocating state highway funds to improving ferry terminals and contracting with operators of customer services.

Coordinating Bus and Ferry Schedules

The major institutional problem of coordinating bus and ferry schedules is that the existing routine of seasonal changes in the ferry schedule does not coincide with the regular, four monthly schedule changes used by Metro Transit. However, the State Ferry System recognizes that commuting hours remain the same, regardless of season, and undertakes to maintain commuter ferry services on the same schedule throughout the year, but varies its off-peak services according to seasonal demand. Negotiations with the several unions involved in operating the ferry system are time consuming, but are finally concluded satisfactorily.

Metro Transit is now free to continue its existing 4-month schedule revisions and allocation of routes to drivers in accordance with the transit union demands. However, it maintains the same routes and schedules throughout the year that provide commuter connections with the ferries.

Joint Ticketing

Ideally, a passenger should be able to transfer freely from the Kitsap bus service to the ferry to the CBD circulation system without having to purchase individual tickets for each portion of the ride. It has been found in areas, such as New York, that commuter use of public transit increases when such arrangements are made.

Since the participants in this joint activity would include a state agency, a metropolitan transit authority, a city-owned system, and private bus companies, the group looks for a technique that would permit them to cooperate in this limited area without becoming involved in each others' more extensive individual activities. They decide to form a tariff association, as currently practiced by commercial airlines, where contracts between participants provide for setting joint fare schedules and distributing jointly collected fare revenues. This tariff association may later evolve into a transit federation in which members allocate to the central body the authority also to rationalize services among the several providers and set routes and schedules. However, at this point, the group believes that it can achieve coordination of services under the less binding cooperative working arrangements and does not wish to attempt the more radical change in their independent status.

The institutional problems of forming a tariff association are now legal ones. The private companies are free to contract for joint fare collection and distribution, but publicly owned systems may not be. The critical factor is that the public services are subsidized with funds approved by the voters and the State Legislature for this specific purpose. The first task the group must undertake is to agree on a joint fare schedule that will yield as much revenue to the members of the association as they would receive if fares were collected separately. If they can demonstrate that the joint-ticketing arrangements will not involve a cross subsidizing of other operators' services, the

principal objection to the proposed measure will be eliminated.

Forecasts of ridership and costs of operation are prepared and show that costs per passenger for the separate transit services will be lower because of higher utilization of vehicles. This is particularly true of the ferry service because the capacity of vessels to carry passengers is multiplied as automobiles are replaced by walk-on travelers.

Approval for entering into the tariff association is finally given to the publicly owned services.

Initial Implementation

Institutional problems arise in the initial implementation of the C-R program. Poor coordination of program elements produces restrictions on commuter travel before alternatives are available. There are also difficulties in obtaining the cooperation of employers in staggering work hours.

Restrictions Prior to Alternatives

Procedures for reducing the supply of CBD parking are ready before vehicles can be acquired and operations can be organized for improving transit services. With the desire to get the program started, and the belief that transit ridership would increase sharply when new feeder services were implemented if commuters were already experiencing difficulties in finding places to park, the parking controls were put into operation first. Having no adequate alternatives to driving to work, commuters were extremely angry about the new controls. Local elected officials received complaints from citizen groups and individuals, and the press and other news media took up the issue. Owners of parking lots had difficulty in justifying the new system to their regular customers, and the police were subjected to so much criticism in trying to enforce on-street restrictions that they avoided ticketing violators.

The new parking regulations had to be rescinded. Public announcements were made that these restrictions had been tried on an experimental basis to see what problems might develop and they would not be implemented again in the same manner. There was a certain amount of truth to the statements; unexpected problems had occurred and the task force was making a new effort to find solutions to them. One strategy that grew out of this effort was a public information program directed at users of commercial parking lots. Notices were printed to be displayed in these lots describing the new tax structure and identifying local government rather than the owner of the lot as responsible for the changes. Press releases were prepared

describing the C-R program in its entirety and indicating the extent of support among community groups represented on the advisory committee.

Many citizen groups remained opposed to the program for some time. Public hearings were held, and the advisory committee was enlarged to include representatives of these groups. It took several months for the ill will caused by the precipitous implementation of parking controls to be dissipated and public acceptance of the C-R program to be gained.

Staggered Work Hours

In spite of its generally good relationship with local employers, the carpool program staff had difficulty in gaining employer cooperation in staggering work hours. Many listened and agreed with the idea in principle, but few took any further steps toward carrying out the program within their own offices and factories.

The staff concluded that what was needed was the sponsorship of leaders in the business community, technical assistance to employers in determining which functions could be placed on staggered hours and setting up new administrative procedures, and some additional incentives. Business leaders were contacted and their support was enlisted. Publicity was given to their participation. The Chamber of Commerce was persuaded to set up a program for mutual assistance in internal procedures by businessmen who had experience with the program.

Finally, it obtained the approval of the City Council to offer a rebate on the local business tax to firms that modified their work schedules.

Successful Implementation of the Program

When new transit feeder services in King County were ready for operation and cross-Sound bus and ferry systems were integrated, the C-R program was initiated. Transit ridership increased, not only at peak commuting hours but also throughout the day. Parking controls were introduced gradually as demands for space eased. Staggered work hours have spread the peak demand for both road and transit facilities. With this and the increased capacity of the public transportation system through the use of para-transit vehicles, commuter travel is more comfortable and convenient and continues to attract new riders. The most dramatic change has been in the reduction of auto-ferry travel across Puget Sound, where transit users enjoy the convenience of coordinated schedules and transfer between modes with a single monthly joint pass.

CONCLUSIONS AND SUGGESTED RESEARCH

CONCLUSIONS

Implementation Tasks and Institutional Roles

Local implementation of complex packages of congestion-reducing techniques requires the support and cooperation of many public agencies and private organizations. Authority for essential decision-making and action is dispersed among a number of federal, state, and local agencies; the more transportation measures included in the package, the greater the number of these authorities will be involved. Also, the more extensive the program, the more nongovernment institutions may become involved either as representatives of special interests within the community or as employers, investors, or property owners carrying out specific implementation tasks.

The implementation process falls into three phases: preimplementation, start-up, and continuing operation. Preimplementation activities are program conceptualization, planning, promotion, funding, formal approval, and removing legal and regulatory constraints. Start-up tasks may include land acquisition and construction or purchase and installation of equipment, but will always cover detailed operations planning, public information, and, finally, initiation of operations. Continued operation includes the day-to-day provision of services, maintenance of facilities and enforcement, as well as continuing evaluation and improvement of the system.

Institutions involved in the implementation process do not necessarily participate in all three phases. Often those performing the most important preimplementation tasks play only minor roles in the start-up phase and are dissociated from the day-to-day operations once the program is underway. Some are active only in providing new facilities and equipment during the start-up phase, whereas still others enter only as enforcers, regulators, or deliverers of services during the continuing operations phase.

The particular effectiveness of C-R packages stems from the interaction of several mutually reinforcing techniques. If the local C-R program is to be successful, all of those institutions whose participation or approval is essential to implementing the selected C-R techniques must be persuaded to support the program.

Barriers to Institutional Cooperation

Barriers to obtaining the cooperation of institutions essential to the C-R program can be objective, in the sense that they represent practical, external constraints; or subjective, in the sense that they originate in contrary personal interests and attitudes. Objective barriers can include legal and regulatory constraints; insufficient funding; or inadequacies of staff, equipment, or technical skill. Subjective barriers, on the other hand, can consist of

vested interests in exclusive authority or access to funds; rivalries between agencies, communities, or local levels of government; interpersonal conflicts; fears of undue federal and state influence over local decisions; or interference of government in private business.

Transportation professionals commonly regard the external factors as the critical barriers to the implementation of joint transportation programs. Public employees, especially, tend to view existing limits of legal authority and regulations prohibiting innovative transportation measures as absolute barriers. Experience indicates, however, that such constraints can be changed, often very efficiently, if the changes have the support of key institutions and individuals. What are perceived as external legal, funding, or resource barriers may, in fact, be largely internal barriers stemming from convictions of agency personnel that they are powerless to change them.

Sources of Institutional Problems

Institutional problems in implementing complex congestion-reducing programs can be anticipated by recognizing that they derive from three sources. Some are inherent in the individual techniques selected. Others result from needs to coordinate the activities of several, essentially independent institutions, regardless of the particular techniques involved. Still others originate in the unique combination of physical, social, and economic characteristics of the community in which the program is carried out.

Technique-Related Problems and Strategies

The 17 C-R techniques recommended in NCHRP Project 7-10 as both feasible and effective in reducing peak-period traffic congestion can be categorized into five groups according to common institutional problems they present and strategies that can be employed to overcome them:

1. Traffic engineering techniques.
2. Transit improvement techniques.
3. Techniques for restricting automobile use.
4. Techniques for changing land use.
5. Techniques relying on employer initiative.

The primary institutional problems common to each group and recommended solutions are summarized here.

Traffic Engineering Techniques

This group consists of the two C-R techniques of freeway surveillance and control, and maximizing use of existing facilities.

The most critical institutional problem in implementing traffic engineering techniques is gaining public acceptance where the measures employed are restraints on free access to roadways: reserving lanes for the exclusive use of high-occupancy vehicles, controlling entry to freeways (especially where buses and carpools are exempted), prohibiting through-use of roads, and restricting traffic flow on CBD streets. Opposition to these measures most often comes from commuter groups whose established travel patterns are disrupted. It may also come from neighborhood organizations or business groups concerned with increased local traffic or reduced access.

Strategies suggested for dealing with this problem are as follows. (1) Consult with enforcement agencies about probable driver response to proposed measures, as well as potential agency cooperation in enforcing proposed measures. (2) Prepare regular users of affected routes with on-site distribution of information on system changes, scheduling, and possible difficulties of initial implementation. (3) Anticipate traffic and access problems in adjacent streets and include measures to treat these in the implementation plan.

Transit Improvement Techniques

The five C-R techniques in this group are circulation systems, priority treatment on arterials, priority treatment on freeways, extended-area transit, and incentives to use transit.

The major institutional problems affecting implementation of all transit techniques are inconsistencies in federal policies governing local assistance programs, lack of area-wide integration of transit services, and high labor costs.

Communities relying on federal funds to improve public transit find it difficult to pursue long-range development plans because of frequent changes of policy in local assistance programs. They complete eligibility requirements only to find they must comply with new ones, or they find their transit improvement plans invalidated by shifts of funding emphasis from one approach to another. The over-all guidelines that would provide for a more consistent administration of federal aid to communities are lacking because federal transportation policies have not been adequately defined, such as the extent to which transit should provide for urban mobility and the degree to which federal government should influence local transportation decisions.

Although the final solution to this problem rests in clarifying transportation policies at the federal level, local government can assist itself in maintaining a steady long-term transit development program with the following strategies. (1) Establish community goals for urban transportation that will guide it in selectively adopting or rejecting various measures as they are given funding emphasis in federal-assistance programs. (2) When participating in demonstration projects, resist putting systems into operation that the community cannot continue to support when federal aid is withdrawn. (3) If this is not possible, ensure that a portion of the planning effort is directed toward developing alternative techniques and funding mechanisms. (4) Seek new means of subsidizing

public transit independent of federal-assistance policies. Explore innovative approaches, such as selective subsidy of the transportation disadvantaged. Develop data on economic and social costs to the community of supporting automobile use as a means of obtaining public approval for increasing local subsidy of transit.

Total integration of urbanwide transit services incorporating a systemwide fare structure, coordination of routes and schedules, and joint use of facilities equipment and administrative services, is accomplished only with sustained efforts that may take several years. The most useful strategy for promoting transit integration is to initiate the integration program with a relatively noncontroversial activity, such as joint publication of routes and schedules or joint sponsorship of a mutually useful research study. The success of such a cooperative venture can establish patterns for joint action and make it easier to resolve conflicts of interest when more sensitive tasks, such as rationalization of services, are attempted.

The problem of increasing needs for subsidy of public transit because of high labor costs is a nationwide problem and can only be solved at that level by obtaining the cooperation of transit unions for more efficient utilization of transit workers. Labor costs could be considerably reduced, for example, if drivers could carry out maintenance, repair, and other support services when they were not operating vehicles, because drivers are largely unemployed during off-peak hours. No strategies are suggested for local action other than to support nationwide efforts to reach a solution to this problem.

Techniques for Restricting Automobile Use

Four C-R techniques apply pricing penalties and legal restraints on the use of automobiles to reduce peak-period congestion. These are road pricing, parking controls, traffic cells, and auto-free zones.

The characteristic that distinguishes these techniques is that they inflict hardship on drivers of private automobiles to change undesirable travel patterns rather than present alternatives. This is the primary source of critical barriers to their implementation. Strategies recommended are as follows. (1) Provide adequate commuting alternatives prior to the initiation of restraint on automobile use, in the form of new or improved transit services, ridesharing, and park-and-ride or peripheral parking facilities within walking distance. (2) Where certain socioeconomic groups are unequally penalized by pricing mechanisms, provide relief through selective distribution of special entry or use permits. (3) Where operators of parking facilities are forced to impose new pricing penalties for long-term parking, ease customer relations by media and on-site public announcements that these are dictated by a community program to reduce congestion. (4) Where business concerns are affected by reduced automobile access, provide assurances in the form of reliable information on long-term business benefits experienced in other communities and, if feasible, insurance against significant losses of business. Provide inducements in the form of public improvements to enhance the area; arrange loans for private improvement of individual business premises and

exemptions from local business taxes during construction and initial implementation phases.

Techniques for Changing Land Use

It is believed that changing existing patterns of land use offers the most effective long-run solution to urban traffic congestion. The three basic techniques utilized are new towns, planned neighborhoods, and zoning and building codes.

The common institutional characteristics of these techniques are: they depend largely on the cooperation of individual property owners; federal involvement is through the Department of Housing and Urban Development rather than the Department of Transportation; and implementation and its recognizable benefits usually take several years to achieve. Although environmental concerns over the use of urban land have increased the legal difficulties of obtaining local authorization for utilizing land for new purposes, the primary institutional problem lies in obtaining the cooperation of individual property owners and business concerns, large private developers, and lending institutions.

Actions recommended at the national level include the creation of a land bank, in which tracts of land could be held until developers were prepared to use them, and a national development corporation empowered to raise capital to finance large-scale projects. It is also essential that policies governing federal assistance for urban redevelopment be clarified so as to provide greater continuity in funding of local programs.

Strategies suggested at the local level include the following. (1) When introducing nonresidential activities into residential neighborhoods, do so gradually, beginning with those that offer employment opportunities to current residents; maintain residential values by locating these facilities adjacent to rather than in housing developments, utilizing architectural controls and landscaping, and provide adequate access roads and parking. (2) When attempting large-scale in-town redevelopment, select reuses for the project area and locate investors willing to proceed according to these plans prior to land acquisition and clearance. (3) If CBD renewal does not require large-scale clearance, attempt to carry out the program without federal aid. Rely on local building and zoning codes to enforce necessary improvements. Obtain cooperation of property owners and local lending institutions by public information stressing potential increases in business activity and property values.

Techniques Relying on Employer Initiative

Three C-R techniques rely heavily on the active participation of individual employers in both public and private sectors. These are staggered work hours, ridesharing, and communications in lieu of travel.

Although each of these techniques presents some unique implementation problems, the primary institutional barrier in all three cases is that the community stands to benefit more from them than will the employers whose cooperation is required. Existing administrative procedures, employee assignments, and customer relations may be dis-

rupted; and employers may have to contribute staff time or facilities or new capital investment to make the program work. Employees may be unwilling to cooperate, thus presenting the employer with possible losses of valued personnel and even labor union problems.

Local agencies promoting programs calling for employers' initiative have three major tasks: to inform employers of potential benefits to their individual concerns; to reduce costs to employers and provide compensation; and to promote acceptance among employees. Strategies for accomplishing these are as follows. (1) Initiate the program by obtaining the sponsorship of prominent business and civic leaders and by approaching institutions most likely to cooperate—independent establishments or headquarters of multilocation firms whose activities rely on innovation and high-level technology and whose work force is largely skilled and nonunionized. Approach only top management personnel. (2) Promote employer cooperation through a sustained program supported by up-to-date records on individual institutions contacted and statistics on program growth and impacts. Publicize program accomplishments and recognize cooperating institutions and individuals. (3) Provide economic incentives to participation by informing employers of benefits realized by other employers taking part in the program, arranging funding assistance for purchase of vanpool vehicles or communications equipment, and providing rebates of local taxes to participating firms. (4) Arrange technical assistance for employers, such as centralized rider-matching services or a volunteer pool of executives from local firms already taking part who can advise new participants on administrative problems. (5) Assist employers in gaining employee acceptance by promotion programs directed toward individual commuters and, where necessary, providing speakers to employee groups to explain the program and point out individual benefits of participating.

Joint-Implementation Problems and Strategies

Certain institutional problems are common to cooperative transportation programs independent of the particular techniques being implemented. These problems derive primarily from lack of a viable organizational framework within which action agencies, MPOs, and nongovernment institutions can each make their optimum contributions to the joint effort.

Action agencies are frequently reluctant to undertake unfamiliar tasks of unproven value, especially where the strong leadership of another local agency or the MPO appears to threaten their independence. The MPO, with no established authority within traditional government structure, must effect compromises between transportation improvements desired by individual governments and area-wide transportation needs, and ensure that the adopted program meets federal and state eligibility requirements for funding assistance. Having no implementing powers, the MPO must work through local action agencies; it must resolve conflicts between individual implementation plans and ensure that participating agencies have adequate funds to carry out their assignments.

Nongovernment institutions representing special interest

groups fear that their concerns will be overlooked and are quick to recognize and resent token participation in the decision-making process. Individual business firms and private organizations may refuse to participate in essential roles for fear of disrupting their primary activities, suffering economic losses or increased government control.

Strategies suggested for developing a workable organizational framework for joint implementation are as follows. (1) Implement cooperative programs under the sponsorship of a central authority to ensure that it will conform to the community's over-all transportation goals and policies as well as avoid problems that can arise if it appears that one action agency is dictating to another. Organize it by functional level rather than jurisdictional or geographical divisions with heads of local government at the policy-making level, representatives of operating agencies at the second level, and a professional support staff at the third level to provide continuous research, documentation, liaison with citizen groups, and public information. (2) All institutions required to perform implementation tasks should be incorporated in the planning process. This both reduces the possibility of later refusal to carry out essential tasks and provides valuable inputs to the plans. The organizational structure should be flexible to permit the introduction of new agencies or private organizations as their potential roles are identified. To avoid burdening the central organization with an unnecessarily extended permanent membership, flexibility should allow for reducing the level of participation when institutions have fulfilled their planning functions. (3) Meetings should be held only when there are useful tasks to be accomplished and involve only those representatives crucial to these matters. Irregular scheduling rather than meeting at fixed intervals can avoid calling people together when their attendance is not needed. Plan meetings well: provide members with agendas and pertinent data for prior study; and select a quiet, clean, comfortable meeting place adequately equipped with necessary audiovisual aids in good working order. (4) Provide for efficient exchange of information between the central agency and participating action agencies and private institutions, and with the public. Where the purpose is to transmit information, written communications are preferable to meetings; more institutions can be contacted and more responses can be given proper attention. However, evidence must be provided that the written responses are considered no less than if they had been presented at a public meeting by replying to criticisms or questions and incorporating useful suggestions in final documents.

Site-Related Problems

The important institutional factors determined by the implementation site are the unofficial power structure, special-interest organizations, and community attitudes. These factors will affect public acceptance of C-R programs; but, as they present unique problems in each community, only generalized strategies can be suggested.

Community decisions are not necessarily made by those elected or appointed to positions of authority in local government. Often they are determined by a nucleus of

influential personalities who either have no place in the official political structure or exercise influence out of proportion to the public offices they hold. Transportation planners and engineers attempting to initiate a large-scale cooperative C-R program may find their proposals blocked through the opposition of this unofficial power structure. Although previously unaware of its existence and resentful of its influence over official government operations, the program promoter must learn to work with it. Strategies suggested are as follows. (1) Identify individuals and their special interests relating to the proposed program. (2) Meet with them to discuss points of conflict and possible misunderstandings. (3) If possible, arrange the appointment of a representative of the unofficial power structure to the citizen advisory committee where he can grow more familiar with the proposed program and be involved in its success.

Special-interest groups viewing a proposed transportation program as a threat to their particular concerns may effectively block its implementation through organizing public protest, instituting legal proceedings, or using their influence with elected officials. The following strategies are recommended for dealing with such problems. (1) Maintain open communications with special-interest organizations, being ready to modify the original plan by eliminating points of unnecessary conflict and incorporating useful suggestions. (2) Incorporate groups with long-range interests into the project's citizen advisory structure.

Public acceptance of the same C-R program will differ from one area to another because of community attitudes. One community may have such strong prejudices against federal or state involvement in local affairs that it will forego funding assistance from these sources. Another may be committed to neighborhood self-determination and reject programs calling for increased transportation authority at metropolitan or even municipal levels. Still others may oppose any additional constraints on automobile use.

Community attitudes can change over time, however, as a result of increasing concerns over energy, pollution, or deterioration of the CBD. They can also be changed by observing the success of local transportation programs in their own or other communities. Strategies for gaining community approval for C-R programs are the following. (1) Select measures that employ incentives rather than penalties to achieve desired changes in commuting habits. (2) If restrictive techniques appear to be essential, implement them in combination with incentive measures and ensure that adequate commuting options are made available prior to implementation. (3) Test community acceptance of proposed programs by consulting with citizen representatives and agencies dealing directly with the commuting public. (4) Do not attempt to disguise potential implementation problems or negative impacts. They will become apparent when the program is put into operation, and it is preferable to alter or even discard an unacceptable program prior to implementation rather than to be forced to abandon it afterwards. (5) Prepare commuters for changes that will affect their established travel patterns. Openly discuss problems that may be encountered during initial implementation; otherwise, should they occur,

commuters may believe that the program has been incompetently handled and thus failed to function as anticipated. (6) Promote community support for measures about to be implemented through public information efforts. Describe the immediate program and benefits expected. Follow through by reporting progress and results as the project continues. (7) Avoid publicizing details of programs not scheduled for immediate implementation. Experience with current projects may generate changes both in future project design and in public acceptance of proposed measures.

SUGGESTED RESEARCH

Extensive research on institutional problems of transportation improvement programs has been completed or is already underway. No further research into institutional barriers *per se* is suggested here. However, this study did reveal two areas in which better information could improve the local institutional environment for carrying out not only C-R packages but also other large-scale transportation improvements. These areas are:

1. Increasing public awareness of the costs of automobile use.
2. Determining the long-run political feasibility of centralizing urban transportation authority.

Public Awareness of the Cost of Automobile Use

It is recognized that the public is not fully aware of the total personal costs of driving and is therefore unable to make valid comparisons with costs of using alternative modes. Further, the public has even less understanding of the costs to the community in maintaining road and parking facilities, loss of more productive uses of the land these occupy, investment in enforcement and emergency services, and deterioration of the environment through noise and air pollution. Without this understanding it is often difficult to obtain approval for public expenditures to develop alternative transportation modes.

Considerable research has been carried out on this topic, but the results have been reported in highly specialized format and terminology and data vary from one source to another. The purpose of this study would be to compare the results of available research reports, select what appear to be the most reasonable estimates, and organize this information in a form that local agencies could effectively relay to the public.

Political Feasibility of Centralized Transportation Authority

It is now generally recognized that the various elements of urban transportation systems are interdependent and that these systems also strongly affect and are affected by other local factors such as land use and the economy. There has been a marked trend toward coordination of

planning and implementation of public programs in these areas by placing these functions under the authority of centralized bodies, such as regional planning councils and MPOs. Federal policies have promoted centralization of authority, and it has also been frequently recommended by researchers into urban problems as the best solution.

From observations drawn during the course of this study, however, it appears that a strong regional body or MPO may not be politically feasible over the long run and, perhaps, not totally desirable. Single-function agencies have constituencies whose interests they serve and promote. A multifunctional agency cannot focus that degree of attention on any one of these constituencies. Moreover, an efficient centralized body can result only under conditions of strong leadership where many day-to-day decisions are made without consulting its entire membership. This appears to be an inherently unstable political situation, because members whose particular concerns are ignored, while they see the interests of other members promoted in this manner, will withdraw from the organization. Where this situation has occurred, as in Seattle, the central planning body must be reorganized, perhaps into a less efficient but more local-responsive institution.

Since many current federal and state transportation agencies are encouraging local governments in the direction of centralized authority, there is a need to evaluate the long-term benefits and disbenefits of this concept. Regional planning bodies and MPOs in different areas of the country, numbers of member governments and agencies involved, and varying population sizes should be studied; and observations would be drawn from their experience as to how local governments can best structure centralized authorities so that they are both efficient and responsive to varying local needs.

The research recommended would include an examination of regional planning bodies and MPOs within a broad spectrum of geographical location, population size of planning area and socioeconomic characteristics, and number of member governments and individual agencies. Degrees of authority exercised by these bodies over local transportation action would be evaluated. Conditions under which they were formed and how their formal structure and actual influence changed over time would be noted. This information would be correlated to see if there were any significant relationships between factors, such as number of member governments and continuity of the organization's structure or degree of centralized control. General conclusions would be drawn of advantages and drawbacks of strong central authority and its long-term political feasibility. Finally, recommendations would be made for public policy with regard to how to promote centralization of transportation functions and how regional authorities and MPOs can best be structured to balance efficiency with responsiveness to the needs and desires of individual constituencies.

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APPENDIX A

ELIGIBILITY OF FEDERAL-AID HIGHWAY FUNDS FOR TRANSPORTATION SYSTEM MANAGEMENT *

INTRODUCTION

This report is intended to acquaint state and local decision-makers with the wide range of transportation system management (TSM) improvements that can be implemented with federal-aid highway funds. The report is oriented to the problems of the urban areas (areas greater than 5,000 people), but many of the actions can also be applied to the problems facing rural areas. With this information, it is hoped that state and local transportation officials will be able to more readily implement TSM projects that can improve the efficiency of the movement of people and goods on their highways.

AN OVERVIEW OF FEDERAL-AID HIGHWAY FUNDS

There are four major federal-aid highway funding sources that can be used to finance TSM improvements depending on the type and location of the TSM project:

1. Federal-aid interstate.
2. Federal-aid primary.
3. Federal-aid secondary.
4. Federal-aid urban.

In general, projects are funded at a 90 percent federal share when benefiting the Interstate System and a 70 percent federal share when benefiting the primary, secondary, or urban systems. Special matching provisions, which may increase the federal share payable, are available to states with a large amount of public land or nontaxable Indian land.

Projects associated with a carpool/vanpool program, such as described in the "Ridesharing Activities" section, are eligible for funding at a 90 percent federal share with primary or urban system funds.

Other sources of funds are available for special highway projects related to the following areas:

1. Railway-highway grade crossings.
2. Pavement markings.
3. High hazard locations.
4. Roadside obstacles.
5. Safer off-system roads (i.e., off the federal-aid system).
6. Resurfacing, restoring, and rehabilitating the federal-aid Interstate System.

Federal-aid funds from the special program resources for each of these areas are subject to certain matching levels

and limitations. Projects to improve railway-highway grade crossings, pavement markings, high hazard locations, and roadside obstacles may also be financed from any of the four major federal-aid highway-funding sources.

The TSM actions are applicable to urban areas; thus, federal-aid interstate, primary, or urban system programs may be potential sources of funds for implementing projects in these areas. Some of the TSM actions, particularly the TOPICS-type, are also applicable to rural areas; thus, federal-aid interstate, primary, or secondary system programs may be potential sources of funds.

In general, the funds used to match the federal-aid highway funds cannot come from other federal-funding programs; they must come from state and/or local sources. There are, however, three federal programs that currently can be used to provide possible sources of matching funds for federal-aid highway programs.

1. *The Local Public Works Capital Development and Investment Act of 1976.* This Act provides employment opportunities in high unemployment areas through expeditious construction or renovation of public facilities. The provisions of the Act are administered by the Economic Development Administration (EDA). The supplementary grants may be used for local matching of other federal programs. The Federal Highway Administration (FHWA) division offices cooperate with EDA in processing applications and providing information. Although initial funds are committed, extensions of the Act are likely.

2. *State and Local Fiscal Assistance Act of 1972 (P.L. 92-512), as amended in 1976 (General Revenue Sharing).* A state or local area can use any revenue sharing funds under this Act, and appropriated by the state after December 31, 1976, as its share of a federal-aid highway project.

3. *Housing and Urban Development (HUD) Community Development Block Grants Program.* These program funds are available to provide the local match for federal-aid highway projects. The highway expenditures have to be in support of broader community development programs.

ELIGIBLE TSM PROJECTS

For the purposes of discussion, eligible TSM projects are presented under six general headings. In general, all work, except for the purchase of buses and rolling stock for fixed-rail systems as well as some features of ridesharing activities, falls under the broad category of Traffic Oper-

* U.S. Department of Transportation, Federal Highway Administration, May 1977.

ations Improvement Programs. Although the six subdivisions cause some repetition, this was done to aid those interested in any one of several currently popular subject areas, such as parking, preferential lanes, ridesharing, etc. Eligible items from any of these categories may be combined to make up a federal-aid project. The six categories are:

1. Traffic Operations Improvement Programs (TOPICS).
2. Preferential or Exclusive Lanes for High-Occupancy Vehicles (HOVs).
3. Ridesharing Promotion and Activities.
4. Provisions for Parking.
5. Pedestrian and Bicycle Facilities.
6. Provisions for Public Transportation.

Traffic Operations Improvement Programs (TOPICS)

TOPICS is the acronym given for Traffic Operations Program to Increase Capacity and Safety. In general, TOPICS-type actions are traffic engineering and operational improvements that are designed to reduce traffic congestion and facilitate the flow of traffic, both people and vehicles, on existing facilities. This can include improvements located on any federal-aid highway system or improvements that are not on any federal-aid system but will benefit traffic on a federal-aid system.

TOPICS-type projects can be undertaken individually or in combination to achieve many desired results. Among them are improvements to increase the vehicle capacity of a facility, improvements for safety, and improvements to increase the vehicle occupancy. Specific actions that can be funded to achieve these, as well as other desirable results, include:

1. Preliminary engineering for alternative analysis, environmental assessment and reports, traffic analysis, project data collection and evaluation, and design.
2. Construction engineering including project evaluation undertaken as part of the specific construction project.
3. Right-of-way acquisition, relocation assistance, and utility relocation.
4. Physical improvements to roadways, intersections, and interchanges:
 - a. Lane or shoulder widening; reconstruction or other width modifications; construction of shoulders or additional lanes (thru or turn), median barriers, and guardrails; replacement parking; landscaping; channelization; pavement markings; signing and signals for capacity and/or safety or for preferential treatment of HOVs.
 - b. Grade separations for railroads, pedestrians, bicycles, or vehicles.
 - c. Reconstruction of restrictive segments that prevent full use of existing capacity along a route.
 - d. Removal, reconstruction, or replacement of structures that restrict traffic flow.
 - e. Construction of separate traffic lanes and necessary facilities to:
 - (1) Accommodate the loading, unloading, and

transferring of passengers at transit terminals and intermediate stops.

- (2) Accommodate carpools, vanpools, and buses.
- (3) Accommodate the loading, unloading, and movement of trucks.
- (4) Permit HOVs to bypass freeway ramp metering and control devices.
- f. Provision of necessary accommodations for the enforcement of HOV lanes.
- g. Resurfacing, restoration, and rehabilitation of roadway sections.
5. Traffic Control and Surveillance System (computerized and noncomputerized):
 - a. Installation of traffic signals.
 - b. Making signals more responsive to traffic conditions (e.g., with traffic-actuated control).
 - c. Interconnecting signals to achieve better traffic progression.
 - d. Provision of separate lane controls for HOVs, trucks, or emergency vehicles.
 - e. Provision of signalized intersections with bus or emergency vehicle preemption devices.
 - f. Hardware acquisitions and installation for computerized surveillance, control, and communication equipment.
 - g. Software preparation and initial programming that is relevant to computerized system operation.
 - h. Surveillance systems for the collection and analysis of data on person and vehicle movement.
 - i. Diverting traffic from congested areas (e.g., with changeable message signs).
 - j. Establishing one-way operations.
 - k. Reversing the direction of traffic on selected traffic lanes to increase capacity during peak periods or to provide a contraflow lane for HOVs.
 - l. Providing freeway ramp metering and control devices to improve traffic flow on the facility.
 - m. Providing HOVs with a way to bypass freeway ramp metering and control.
 - n. Surveillance and monitoring equipment that is necessary for the enforcement of HOV lanes.

Preferential or Exclusive Lanes for High-Occupancy Vehicles (HOVs)

Preferential or exclusive lanes for HOVs can be implemented by designating or reserving an existing lane(s) for use of HOVs or by constructing an additional lane(s) for use of HOVs. Designating an existing lane involves employing certain TOPICS-type actions that modify the facility to accommodate HOVs. The TOPICS-type work that can be done to provide exclusive or preferential treatment on an existing facility was presented earlier in the TOPICS section of this report and will not be repeated here to any detailed extent.

Exclusive or preferential lane(s) for HOVs can be added to routes on the federal-aid primary, urban, and secondary systems at the federal participation level for that system. The HOV lanes can be added to the completed interstate routes under certain conditions.

General items that are eligible for funding when HOV lanes are implemented on federal-aid routes are:

1. The construction of the additional lanes or the designation of an existing lane(s).
2. The necessary traffic control systems to assure the safe and efficient operation of the HOV lane.
3. The installation of passenger shelters and facilities that can enhance the use of the HOV lane.

Some specific activities that are eligible for funding when HOV lanes are added include:

1. Preliminary engineering.
2. Right-of-way acquisition.
3. Reconstruction of shoulders or median in order to provide the additional lane and/or police refuge area.
4. Modifications to ramps, intersections, and median barriers.
5. Installation of necessary signs, signals, pavement markings, median barriers, and guardrail.
6. Initial public information and promotional expenses. Only primary or urban system funds can be used to provide 90 percent of these costs, regardless of the system.
7. Initial enforcement and personnel costs associated with implementing the HOV lane. Only primary or urban system funds can be used to provide 90 percent of these costs, regardless of the system.
8. Surveillance and monitoring equipment to enforce HOV lanes.

Ridesharing Activities

Federal-aid primary and urban systems funds can be used for a wide range of activities to encourage and promote carpooling and vanpooling. Normally, the federal-aid urban and primary systems fund-share is 70 percent of the project cost; however, for projects that encourage and promote ridesharing, federal-aid primary and urban systems funds can participate in 90 percent of the project costs. In addition, ridesharing activities need not be restricted to any federal-aid highway system.

Federal-aid funds that are used for ridesharing activities cannot participate in the cost of constructing new facilities to encourage ridesharing, such as additional highway lanes or parking areas for HOVs. Also, federal-aid funds cannot be used for projects that will encourage substantial numbers of transit users to switch to carpools or vanpools.

Specific costs related to the following five types of activities that encourage and promote ridesharing are eligible for funding:

1. Systems for locating and informing participants of potential carpools, vanpools, or buspools (manual or computerized):
 - a. Computer hardware and software costs.
 - b. Related installation costs (including labor).
 - c. Specialized procedures to serve the elderly and handicapped.
2. Work necessary to designate existing highway lanes as preferential carpool or bus and carpool lanes:
 - a. Preliminary engineering including data collection.
 - b. Minor physical modification.

- c. Necessary signing and pavement marking.
- d. Providing initial enforcement equipment, personnel costs, promotional expenses, and public information. These are eligible costs until the project is fully developed. This development time would normally not exceed 6 months.
- e. Reimbursement for any actual losses in toll revenue caused by the designated lane on a toll facility.
3. Traffic control devices necessary to advise motorists and control the movement of carpools or carpools and buses (see TOPICS section).
4. Signing and minor modifications of publicly owned facilities in order to provide preferential parking for carpools:
 - a. Trail blazers.
 - b. On-site signs designating highway interchange areas or other publicly owned facilities as parking for carpools.
- c. Public information and promotion expenditures.
- d. Reimbursement for any actual losses in income or additional costs as a result of designating space for carpool vehicles. Costs or losses resulting from a reduction in the per vehicle user charge for parking are not reimbursable.
5. Acquisition of vanpool vehicles for a vanpool program (user fee for participants in a vanpool program, based on a reasonable number of riders per vehicle, must be charged for the use of each van; this fee must cover the cost of reasonable vehicle depreciation as well as its operating and maintenance cost):
 - a. Personnel and other costs incurred that are directly attributable to the establishment of vanpool programs.
 - b. Vehicle acquisition costs as long as appropriate provision is made for repayment of this cost within 4 years.
 - c. Actual financial losses that may be incurred if the vanpool project is "aborted" prior to an agreed upon date for determining whether the vanpool project should be terminated. The duration of the protection of financial loss due to aborting a vanpool project should not exceed the first 12 months.

For carpool/vanpool projects, the value of donated public service announcements that are properly valued and that could have been purchased as an eligible public information and promotion expense may be used as the local match (but not to exceed 10 percent) for the project.

Provisions for Parking

Three types of parking facilities can be funded under the federal-aid highway program: (1) fringe and transportation corridor parking, (2) replacement parking, and (3) commuter carpool parking.

1. *Fringe and transportation corridor parking.* Appropriate federal-aid system funds can participate in the cost of constructing parking facilities on or in proximity to any federal-aid highway in order to encourage the use of public transportation or public transportation and other HOVs. These facilities must be located outside the central business

district and designed in conjunction with existing or planned public transportation to be eligible for federal-aid participation. The appropriate source of federal-aid highway funds available for the project depends on which federal-aid route will benefit from the parking facility. The following specific items are among those eligible:

- a. Preliminary engineering.
 - b. Right-of-way cost.
 - c. Landscaping and sanitary facilities.
 - d. On-site signing and pavement marking.
 - e. Off-site informational and guidance signs.
 - f. Passenger loading facilities including shelters.
 - g. Lighting and security facilities.
 - h. Traffic control devices that are necessary to enable vehicles to use the parking facility.
 - i. Parking and safe storage facilities for bicycles.
2. *Replacement parking.* When the implementation of a TSM project requires the removal of on-street parking in an area that has a critical shortage of parking spaces, federal-aid funds may be approved for participation in the cost of constructing off-street parking. For funds to be approved, the replacement facility must meet certain conditions; for example, the facility must replace parking on a one-for-one basis.
3. *Commuter carpool parking.* If consistent with highway design and operations, any portion of existing highway right-of-way may be used for commuter carpool parking. Construction of an appropriate hard surface and other necessary features are eligible when safety, operational, and aesthetic considerations dictate. Public transportation does not have to serve this type of parking facility.

Pedestrian and Bicycle Facilities

A number of activities to provide pedestrian and bicycle facilities are eligible for federal-aid highway funding. When provided concurrently with a normal highway improvement and within the right-of-way of the highway, they are treated as incidental construction items of the highway construction project and may be financed with the same category of federal-aid funds—that is, interstate, primary, secondary, or urban system.

Bicycle and pedestrian facilities may also be provided independently of other highway construction projects either within an existing highway right-of-way or on special right-of-way, or easements always from a federal-aid highway system, if they will serve bicycle or pedestrian traffic that would normally desire to use the system route. Federal-aid primary, secondary, and urban systems funds may be used for such independent facilities.

This flexibility in the use of highway funds enables the provision of:

1. Pedestrian and/or bicycle overpasses and underpasses on or serving traffic that might use a federal-aid route.
2. Bike trails or walkways on, adjacent to, or serving traffic that might use a federal-aid route.

3. Auto-restricted zones.
4. Elevated pedestrian walkways or skyway systems.

Some of the specific items that are eligible for funding when providing such projects include:

1. Preliminary engineering.
2. Utility relocation.
3. Right-of-way costs.
4. Landscaping.
5. Traffic and pedestrian control devices (for the roadway as well as the pedestrian and bicycle facility).
6. Fixed lighting sources.
7. Pedestrian shelters, information signing, and related displays.
8. Transit loading shelters.
9. Bicycle storage facilities.
10. Comfort stations.
11. Curb cuts.
12. Barriers.
13. Grading, drainage, pavement, and structures.

Public Transportation

In general, any of the federal-aid highway system funds can be used to develop and improve highways for the exclusive or preferential use by buses or other HOVs. Also included as eligible public transportation improvements are fringe parking facilities and shelters to serve bus and rail transit, as discussed in preceding sections of this report.

Federal-aid urban system funds can also be used to finance public transportation improvements that need not be located on any federal-aid highway system. These include:

1. The purchase of buses.
2. The construction, reconstruction, or improvement of transit facilities (including fixed rail).
3. The purchase of passenger equipment (including rolling stock for fixed rail systems).

CLOSURE

The success of TSM rests not with just implementing one or two individual activities on existing facilities, but with packaging various actions that complement and reinforce each other to achieve a desired objective. For example, an exclusive HOV lane may be implemented within a corridor accompanied by the construction of parking lots, improvements in bus service, improvements to local arterials, and promotion of carpool matching service. TSM actions can be packaged and implemented as a complete strategy for more efficiently moving people and goods on existing facilities.

Further information concerning the operation of the federal-aid highway program in a particular state can be obtained from the FHWA division office for that state.

APPENDIX B

UMTA FUNDING *

The following describes the process by which localities obtain UMTA financial assistance to carry out mass transportation planning and to proceed with transit capital and operating assistance projects in urbanized areas.

The grant programs covered by this process are the technical studies program (Section 9 of the Urban Mass Transportation Act of 1964, as amended), the capital grant program (Section 3 of the Act), and the operating and capital assistance apportioned program (Section 5 of the Act). Interstate substitution and urban systems transit projects (funded under Title 23, Sections 103(e)(4) and 142(a)(2), respectively) and special projects for the elderly and handicapped (Section 16 of the Act) are also covered by this process.

GRANT PROGRAMS

Technical Studies

The technical studies (Section 9) program provides funds for the planning, engineering, designing, and evaluation of urban mass transportation projects and for other technical studies included in a program (completed or under active preparation) for a unified or officially coordinated urban transportation system as a part of the comprehensively planned development of the urban area. Section 3 and Section 5 projects proposed for implementation in the Annual Element of the Transportation Improvement Program should be a result of planning analysis and evaluation undertaken through the technical studies program. The proposed projects are then advanced for federal funding consideration.

Technical studies funds may be used for developing the submissions applicable to the Section 3 and Section 5 programs. Such information should be an outgrowth of a well-executed planning program.

Section 3, Section 5, Interstate Substitution and Urban Systems, and Section 16

Only public agencies are eligible for capital assistance grants under Section 3, and for interstate substitution and urban systems transit grants. Private, nonprofit agencies are eligible for capital grants only under Section 16(b)(2). Private transportation companies may participate in UMTA-assisted projects through contractual arrangements with a public agency.

Under Section 5 of the Urban Mass Transportation Act only designated recipients are eligible for assistance. Other agencies, both public and private, may participate in Sec-

tion 5 projects through contractual arrangements with a designated recipient.

Only those facilities and equipment used in operating expenses incurred in urban mass transportation service are eligible for assistance. A transportation service is considered urban if it is provided in an area that includes a built-up place and is appropriate for a public transportation system serving commuters and other passengers with recurring trip purposes. Any service provided on a continuing and collective basis to the general public or a portion of the general public with special needs is considered mass transportation. UMTA includes within this definition any service that cannot be reserved for the private and exclusive use of individual passengers.

The following describes the general eligibility of capital and operating projects under each program:

1. Section 3 of the Urban Mass Transportation Act authorizes federal financial assistance for:
 - a. Capital grants for the acquisition, construction, reconstruction, and improvement of facilities and equipment.
 - b. Loans for the acquisition, construction, reconstruction, and improvement of facilities and equipment and for the acquisition of real property for future mass transportation use.
2. Section 5 of the Act authorizes federal financial assistance for:
 - a. Capital grants for acquisition, construction, reconstruction and improvement of facilities and equipment that are located within urbanized areas.
 - b. The payment of operating expenses to improve or continue mass transportation operations serving urbanized areas.
3. With respect to interstate substitution and urban system transit projects, it should be noted that federal-aid highway statutes differentiate between highway and non-highway public mass transportation projects.

The Federal Highway Administration (FHWA) administers all highway mass transportation projects that include development or improvement of exclusive or preferential bus lanes, bus passenger loading areas and facilities, and fringe and transportation corridor parking facilities that serve public mass transportation passengers. UMTA administers all nonhighway mass transportation projects that include all undertakings to develop and improve mass transportation facilities and equipment other than those included in the definition of highway mass transportation

* Texas State Department of Highways and Public Transportation, 1977.

projects. Nonhighway mass transportation projects are eligible only under the federal-aid urban system and the interstate withdrawal provisions of federal highway statutes.

Nonhighway public mass transit projects must meet UMTA's regular statutory and administrative requirements for Section 3 projects. Urban systems projects also must be included in the state's urban systems program of projects. Applicants for interstate substitution and urban systems transit projects must meet the criteria contained in the applicable regulations (23 CFR 476.300 and 23 CFR 810.300, respectively).

4. The special transportation needs of the elderly and handicapped persons are addressed in Section 16 of the Act, which declares it to be "national policy that elderly and handicapped persons have the same right as other persons to utilize mass transportation facilities and services." Section 16(b)(1) of the Act authorizes the Secretary to make grants and loans to local public bodies to assist them in providing such specialized services and makes funds authorized under regular program authority (Section 3) available for these purposes. Applications must comply with all the requirements of a Section 3 grant as contained in this manual. Section 16(b)(2) is a supplemental program that is available only to private nonprofit organizations to assist them in providing specialized services for elderly and handicapped persons.

Matching Ratios

The following matching ratios have been established for the various programs:

| <i>Grant Program</i> | <i>Federal Share of Project Cost</i> | <i>State*</i> |
|---------------------------|--------------------------------------|---------------|
| Section 3 Capital | 80% | 13% |
| Section 5 Capital | up to 80% | 13% |
| Section 5 Operating | up to 50% | None |
| Federal Aid Urban Systems | 70% | 19.5% |
| Interstate Substitution | 80% | 13% |
| Section 9 | 80% | None |
| Section 16(b)(2) | 80% | None |

* References to the "State" refer to Texas.

GRANT APPLICATION PROCESS

The major shift in emphasis under the new system is away from project-by-project applications to systemwide program decisions. The new system focuses much of the local and UMTA decision-making process around an annual program review that includes the transportation improvement program, a transportation systems management element, the long-range plan, and a new consolidated system description that replaces several "exhibits" in the old application process. These revisions enable UMTA to approve grants at the time of TIP approval. As a result, the planning and programming processes assume added significance because they become directly linked to the grant approval process. The new grant process is based on the following separate submissions of information to UMTA:

1. Assurances, agreements, and plans that are only sub-

mitted once, and updated as changing circumstances warrant.

2. Annual submissions, including the TIP/AE, TSM, and transit system description. All of this information relates to areawide rather than project-specific considerations, so it is appropriate to the annual program approval determination.

3. Information required for the project application—including project specific materials and assurances.

The following discussion explains the proposed submissions and UMTA's review of them.

1. *Continuing assurances, agreements, and plans (one time only submission).* The applicant's continuing assurances, agreements and plans will be submitted once by each applicant in an urbanized area; they will no longer be part of each project application. They will apply to the applicant generally, and will not be resubmitted to UMTA unless they must be updated or modified. They will be kept on file by UMTA and their validity will be assured by the applicant in each project application. They include master list of assurances, civil rights assurance, opinion of counsel, land acquisition and relocation assurance certification, designated recipients documents, and minority business enterprise plans.

2. *Transportation improvement program, annual element, system description material.* The joint UMTA/FHWA planning regulations require an urbanized area to submit an endorsed annual element (AE) of its transportation improvement program (TIP). Under the existing system, the review of the TIP is essentially limited to a determination of compliance with planning requirements. Under the new system, the TIP, the transit system descriptions, and other materials will be reviewed together and many required certifications and grant approvals will be made at this stage. The transit system description material, which is submitted in conjunction with the TIP, will be areawide in nature and describe such items as the existing and proposed public transportation system, the geographic and socioeconomic characteristics of the area, and the impact of the proposed transit improvements on the area and its residents. Review and approval of the TIP/AE and the system description material as well as the prior or concurrent submission of continuing assurances, agreements, and plans, as previously discussed, will enable UMTA to make the following determinations:

- a. Compliance with the DOT Title VI civil rights regulations.
- b. Compliance with UMTA's elderly and handicapped regulations.
- c. Compliance with UMTA/FHWA joint planning regulations, resulting in a joint UMTA/FHWA planning certification (this includes UMTA's TSM requirements).
- d. Compliance with the Section 5 requirement for half-fare for elderly and handicapped.
- e. Compliance with the Section 3(e) provision of the Act concerning the participation of private companies.
- f. Compliance with UMTA's charter and school bus service regulations.

- g. Compliance with the maintenance of effort requirement for Section 5 operating and capital assistance grants.
- h. Compliance with the public hearing requirement for operating and certain capital assistance projects. This public hearing may be broadened to include discussion of the entire mass transit portion of the TIP/AE.
- i. Compliance with the project notification and review requirements of OMB Circular A-95 (at the discretion of the state and areawide clearinghouse, any project application can be required to undergo a detailed project A-95 review).

Individual project approvals for operating assistance grants, and for routine bus grants for areas under one million, will all be made at the time of the approval of the AE of the TIP.

For routine bus projects and operating assistance grants, the material accompanying the TIP/AE must contain the following information for each project (which material may be consolidated, if feasible):

- a. Project assurances, certifications, and standard forms.
- b. Detailed description.
- c. Project financing.

- d. Identification of labor unions.

PROJECT APPLICATION PROCESS

Under the proposed new system, simplified grant applications for capital projects (other than the routine bus purchases which will have been approved at the TIP stage) consist only of the following:

1. Letter of application.
2. Specific project assurances, standard application forms, and certifications.
3. Narrative exhibits (project description, project financing, identification of labor unions, project justification, public hearing, environmental impact assessment (not required for the public takeover of private transit systems, relocation and land acquisition (as needed), and evaluation of flood hazards (construction projects only)).

The project application is prepared by the applicant or designated recipient for specific projects contained in the approved transit portion of the AE. Projects appearing as individual projects in the AE may be combined into a single project application, as long as the project application meets all the necessary requirements to make an approval under the various programs represented in the combined application (Section 3 and Section 5 programs, and interstate substitution and urban systems transit projects).

APPENDIX C

CASE STUDIES OF FOUR SELECTED CITIES

CASE STUDY 1: DALLAS, TEXAS

The City and the Region (Field work was undertaken in 1976. Statistics are believed to be correct as of that year.)

Dallas is the eighth largest city in the country. It is the center of Dallas County, as well as one of the two major urban centers in a 16-county region in north central Texas (see Fig. C-1). In 1970 Dallas had a population of 844,401; this was a 24.2 percent increase from the 1960 figure. The estimated 1976 population was 888,450, or an additional 5.2 percent increase.

The economic and population growth of the Dallas area and of the region as a whole has been extremely high; from 1960 to 1970 the population of the entire region grew almost 37 percent. This rapid growth reflected a high in-migration attracted by the rapid industrialization of the area and the continuing development of major commercial and business centers.

The low-density and underdeveloped areas of the region are expected to continue to attract industries, land developers, and prospective residents, so that the Dallas-Fort

Worth region will continue to do well compared to other U.S. metropolitan areas. For example, between 1974 and 1976, the entire region experienced an average of only two-thirds of the unemployment rate of the country as a whole. The cost of living is approximately 9.5 percent below the U.S. urban average. However, the over-all impact of current demographic trends and economic conditions is likely to be reflected in smaller regional gains in the future.

In 1970, Dallas and the other major urban center in the region, Fort Worth in Tarrant County (1970 population of 393,476) were each the core of a separate standard metropolitan statistical area (SMSA). In 1973 the U.S. Census Bureau combined these two SMSAs and added three new counties to form one Dallas-Fort Worth SMSA with a combined 1976 (estimated) population of 2,719,250. It is estimated that the Dallas-Fort Worth region defined by the Census will become the fourth largest in the United States in the 1980 Census.

The action of the U.S. Census Bureau reflects a growing urbanization occurring between the two major popula-

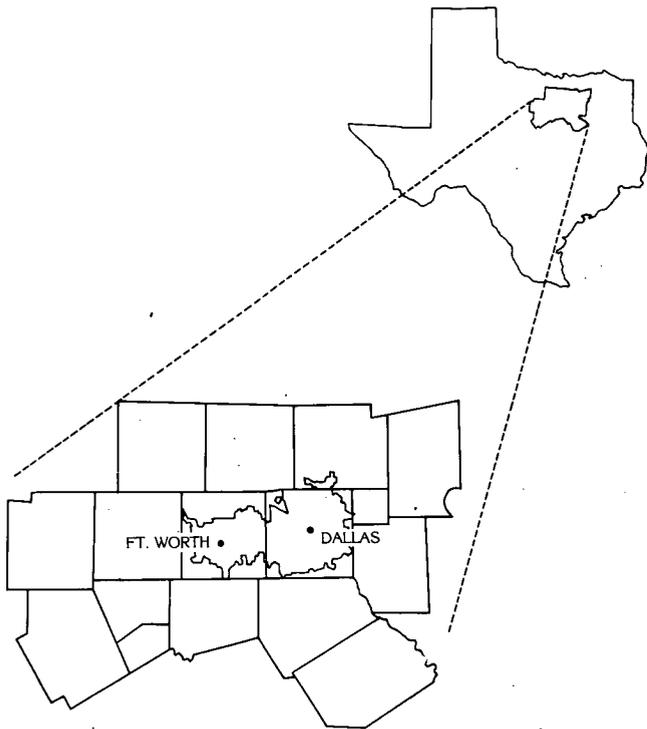


Figure C-1. Location of the Dallas, Tex., study area.

tion centers of Dallas and Fort Worth, located only 14 miles apart. A major development in the corridor between these two cities is the Dallas/Fort Worth Airport, one of the largest in the world, which opened in January 1974. It is the fourth busiest airport in the United States in carrier operations, and the fifth busiest in the world. The employment and growth opportunities offered by the airport have further encouraged population and economic growth in the area between the two cities.

The Dallas-Fort Worth region has strong and diversified industrial development. In 1975 the Dallas region led the state with 89 new or expanded industrial projects. Several major insurance and banking concerns have located, or are expected to locate, national headquarters in Dallas in the next few years. (For example, Braniff International has announced plans to construct a \$25 million training and administrative complex on 28 acres at the regional airport.)

In 1974, Texas became the third most populous state and the nation's tenth largest consumer market. Sixty percent of all air cargo and more than 50 percent of air passengers entering or leaving Texas go through Dallas-Fort Worth. The World Trade Center, which opened in 1974, and the Dallas Market Center may combine with the recommended direct air service to Europe to increase the region's international influence. The Dallas Market Center itself is one of the largest wholesale merchandising facilities on a single site in the world; annual sales at the Center alone exceed \$3.25 billion. Between 1970 and 1975, 30 new shopping centers were opened in Dallas County alone, and four major regional centers were opened.

The region is a recognized distribution, transportation, and financial services hub for an 11-state area. Trans-

portation equipment is the area's leading manufacturing employment sector.

The area is also a recreational and vacation center, housing three major amusement parks. The relatively large concentration of service industries in the region makes it less sensitive to recession.

As in other metropolitan areas, "urban sprawl," or rapid suburbanization, is generally considered a problem. Seventy-eight percent of the population growth in the region between 1970 and 1975 occurred in Dallas and Tarrant Counties, but the growth rates in the cities of Dallas and Fort Worth were significantly less. It appears that, while both cities continue to show large numerical increases in population, their share of the region's total population growth is declining.

Although the City of Dallas had the largest volume increase in housing stock of any city over 2,000 in the SMSA, it issued only 45 percent of the residential building permits in Dallas County since 1970. A similar situation occurred in Tarrant County; only 27 percent of the residential building permits in Tarrant County from 1970 to 1976 were issued by the City of Fort Worth. Regional planners have concluded that growth within the region will continue at higher intensity outside of, but within close proximity to, the central cities.

Transportation System

Like many large cities, Dallas is bisected by several major freeways; far less commonly, Dallas is also served by two major toll roads. There are almost 413 freeway miles in the total region, approximately 20 percent within the Dallas city limits. The Dallas North Tollway is a 9-mile 6- to 8-lane urban expressway linking the Dallas CBD to the north central section of the city; it is entirely within the city limits. The Dallas-Fort Worth turnpike is a 23.5-mile 6- to 8-lane roadway running east-west from the CBD of one city to the other; approximately 7 miles are within the Dallas city limits. Both are operated by the Texas Turnpike Authority, an agency created by the Texas Legislature in 1953 to build and control both facilities. (In April of 1977, the Texas Legislature voted to drop the toll on this road because the revenue bonds issued in 1953 had all been repaid.)

Effective utilization of the regional roadway network is not high; the total occupancy of all vehicles during the morning peak averaged 1.29 persons in both 1975 and 1976. Average work-trip occupancy rates in Dallas County rose significantly from 1.23 in 1973 to 1.3 in 1974 after the October 1973 to March 1974 oil embargo. However, in 1976 average vehicle occupancy in the City of Dallas dropped to the preembargo rate of 1.24 people per car for the work-trip; city reductions in vehicle occupancy occurred in spite of major carpooling programs in the City of Dallas and throughout the region. Over-all, regional planners found the highest occupancy rates on long distance trips and in low-income areas; lowest occupancy rates occurred in the more affluent areas of Dallas and the region. The City purchased Dallas Transit System (DTS) in 1964. DTS offers scheduled service to Dallas residents 7 days a week, 22 hours per day along a 450-mile route network. Scheduled miles and hours of service declined

each year from 1971 to 1973; however, they were expanded significantly in 1974 to meet a projected upsurge in activity due to the oil embargo. Ridership in 1975 decreased to the preembargo level, so 1975 scheduled miles were reduced to a level comparable to 1973 levels of service. In 1976 management changes to improve system efficiency increased scheduled route miles by 4.5 percent.

In 1975, the Dallas Transit System carried approximately 25,685,000 revenue passengers; 1976 ridership totals are not yet available, but DTS officials expect a 2.3 percent decrease in ridership, which will be the smallest reduction in five years. Although ridership increased significantly in 1974, it has normalized to below the 1973 pre-energy crisis patronage level. DTS officials reported to the City Council that they expect ridership to continue to decline.

Other DTS operational data bear notice. In general, peak-period bus occupancy ratios in the with-flow direction average 50 percent higher than all-day occupancy rates. Three of the system's highest occupancy routes are express bus services, which are not profitable in spite of full occupancy (seated) on in-bound trips in the morning peak. Over-all, transfer passengers constitute 23 percent of total DTS patronage and that figure has been increasing. This may be explained by the fact that only two of the system's 34 line groups operate as crosstown routes, entirely outside the Dallas CBD.

DTS revenues have declined from \$11.2 million in 1971 to \$10.4 million in 1976. Operating expenses have increased from the 1971 level of \$11.2 million to \$16.4 million in 1976. The operating ratio of revenue to expense was 0.70 in 1976. In 1975 the cost per scheduled mile was \$1.14; it rose to \$1.31 per scheduled mile in 1976, although revenue per scheduled mile also increased (due to efficiencies introduced) from \$.78 in 1975 to \$.91 in 1976.

The Dallas Transit System currently operates a fleet of 401 51-passenger buses. DTS is in the middle of an active bus replacement program and hopes to add 50 new buses to its fleet in 1977; this goal, however, has been delayed by pending litigation. Dallas is one of six cities in a bus-buying consortium initiated by the City of Houston. The consortium drew up specifications for all the buses to be purchased; GMC won the contract with its TRANS BUS. Subsequently, other bus companies filed suits claiming the consortium's specifications were written so as to exclude all vehicles except those of General Motors; a federal court injunction was issued preventing the awarding of any bids for buses where federal funds were involved. In March of 1977 a federal court removed the injunction without deciding the merits of the case. Because of this controversy, it is unlikely that DTS will have any new buses in place before 1978.

In addition to DTS, regional commuters may use the services of CITRAN, the municipally owned system in Fort Worth; and Texas Motor Coaches (TMC), a private transit operator who has been providing scheduled transit service between Dallas and Fort Worth for over 40 years. The Dallas Transit System, itself, offers express service to outlying municipalities on a contract basis.

Express service to and from the Dallas-Fort Worth

Regional Airport is offered by the SURTRAN System, contractually established jointly by the cities of Dallas and Fort Worth; both bus and taxi services are offered, the latter under a subcontract to SURTRAN Taxicab, Inc. SURTRAN operates four basic designated routes to Dallas on headways ranging from 30 to 45 minutes, 7 days a week. A fifth route runs from the airport to the City of Arlington. The bus service uses 45 late-model 30- to 39-passenger GMC coaches.

The bus operations currently carry about 910,274 people, or 13 percent of the enplanements at the airport. Some of the ridership also includes those working at the airport. The SURTRAN System was and continues to be a controversial operation. Service was begun in January 1974 with 15-minute headways; low ridership forced a 50 percent reduction in service miles and hours. The System still operates at a loss.

The 100-cab SURTRAN taxi fleet, which required no subsidy, carries approximately 250,000 passengers per year. Excess taxi profits go to support the SURTRAN bus operations; this has been approximately \$30,000 per year. Only SURTRAN taxis can originate service from or within the airport; other taxi companies may only bring passengers to the airport. Several taxi operators in the region have been understandably angered by this arrangement.

Taxi service to the region is offered by 13 taxicab companies controlled by 10 separate owners; the total regional fleet is estimated to be 783 vehicles of which 730 are available to Dallas and Fort Worth alone. There are two independently operating taxicab firms in Dallas. Most of the other regional operators are very small (under 25 cabs) and operate in a limited area.

The City of Dallas and the region are served by a number of specialized transportation systems designed for the disadvantaged, elderly, or handicapped. Although there is some move to coordinate and rationalize the myriad of transportation services provided, there is, as yet, no over-all social service transportation network—only a large collection of very small service providers.

Institutions and Regional Planning

The City of Dallas is surrounded by 23 incorporated areas in Dallas County; the largest of these is Irving with a 1976 population of 123,250. Other nearby cities of some size in the county are Grand Prairie, Mesquite, and Garland. Each of these cities grew by more than 40 percent from 1960 to 1970. Rivalries among these cities and between Dallas and Fort Worth (in adjacent Tarrant County) are very real, and these rivalries are a significant factor in intergovernmental relations in the region.

The City of Dallas has a weak mayor-council form of government with the mayor and two of the ten council members elected at large, every two years in nonpartisan elections. The remaining eight council members are elected from individual districts, also in nonpartisan elections every two years. All 11 people are considered to be part-time officials and all 11, including the mayor, have equal votes on all issues.

The full-time chief administrative official of the city is the city manager. The heads of all the major administra-

tive agencies in the city, including the Office of Transportation Programs, are career civil servants.

County governments in Texas have traditionally been weak and have extremely limited planning and governance powers. Dallas County is presided over by an elected 5-person Commissioners Court. A major county function is the maintenance and upkeep of rural roads and thoroughfares in the unincorporated portion of the county.

The North Central Texas Council of Governments (NCTCOG) is the voluntary organization of governments that serves as the areawide planning body for the 16-county region (see Fig. C-2) for a number of regional functions, including transportation, environmental protection, and urban development. NCTCOG is the designated metropolitan planning organization (MPO) and the A-95 regional clearinghouse. The Regional Planning Office (RPO) of the State Department of Highways and Public Transportation (SDHPT) is the designated regional planning agency for comprehensive transportation planning as mandated by Section 134 of the 1962 Highway Act. NCTCOG in conjunction with the RPO is responsible for programming capital and operating funds for highways, transit, and airport projects within the north central Texas region. Like most councils of governments (COGs), NCTCOG is supported in part by membership dues levied on its constituent members; a larger source of support is federal

planning funds, including UMTA Section 9 planning grants and the 1/2 percent, Section 112 money mandated by the 1973 Federal Aid Highway Act.

NCTCOG is considered one of the leading councils of governments in the country; it has received a Certificate of Merit from UMTA for its use of UMTA's UTPS planning package and its testing and evaluation of new planning techniques prior to their general release. NCTCOG's strength comes not only from its professional staff but from the political relationships of the municipalities in the region and from the astuteness with which the staff treats those political issues. The rivalry between Dallas and Fort Worth has created a political base for NCTCOG, since both cities have turned to the COG for an ally or as a neutral professional force. Smaller cities in the region have grown extremely rapidly and have not had the professional staff or expertise to deal with the problems created by rapid urbanization; four cities in Dallas County alone experienced between 90 and 115 percent growth in the six years from 1970 to 1976. These cities have turned to the COG for professional assistance. The larger of the remaining cities in Dallas County have also attempted to use the COG as a buffer between themselves and the City of Dallas, both in a political and professional sense.

In 1974 the staff of NCTCOG was able to negotiate a governance structure that allowed the COG to receive the money made available by Section 112 of the 1973 Highway Aid Act, although many COGs in Texas did not receive that money. The State Department of Highways and Public Transportation (SDHPT) originally took the position that the additional planning money should go to the district office of the highway department because the money was basically highway money for highway planning; some highway engineers still voice this opinion. The COG was able to satisfy all parties in the region, even the highway department, by developing a new transportation policy structure, with 20 members, two of whom are from SDHPT. Although the agreement was made in December of 1973, controversy over the voting strength of individual members caused the federal government to withhold Section 112 money until March 1975.

The COG has a Policy Advisory Committee composed of elected officials or their representatives, and a number of technical committees composed of appropriate professional representatives from the member governments, assisted by the COG's own technical staff. The policy committee usually asks the technical committees to investigate their particular functional charge (e.g., regional health care) and make recommendations to the committee; the committee then evaluates the technical report and makes its own policy. Today, in the transportation area, NCTCOG has both a policy advisory committee and a steering committee composed of people from both inside and outside the regular COG governance structure.

The Highway Technical Committee, which is advisory to both the steering committee and the COG, is composed of professional engineering and planning officials from each of the cities and counties in the entire region augmented by the SDHPT Regional Planning Office. This technical committee is the highway planning arm of the COG. A

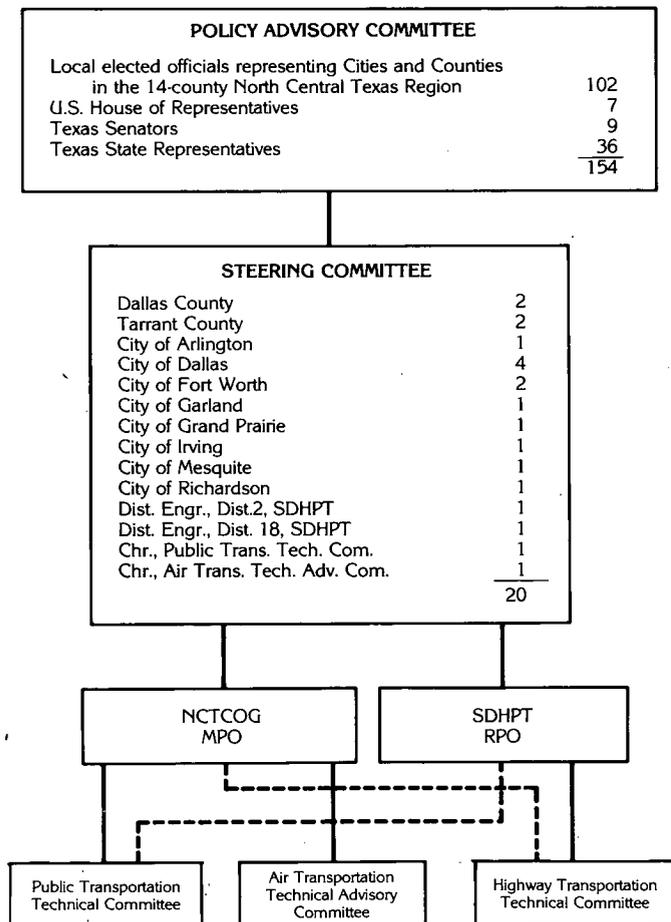


Figure C-2. Organization of the North Central Texas Council of Governments.

comparable Public Transportation Technical Committee serves the same function with regard to public transportation planning. Once these modal technical committees prepare evaluations and plans, they report to the Transportation Steering Committee, which has members from the eight largest cities in the region, the two counties, the two SDHPT District Offices, as well as the Chairs of the Air Transportation and Public Transportation Committees. Once the steering committee has made its decision or judgments, they are relayed to the Transportation Policy Advisory Committee, which is composed of local elected representatives from the 102 cities and counties in the region, plus members of the U.S. Congress and Texas state representatives and senators from the region. The steering committee has met almost every month since its 1974 inception; the policy advisory committee meets semi-annually, although there have been difficulties in obtaining a quorum.

NCTCOG has identified an intensive study area, within the 16-county region; its objective is to develop comprehensive multimodal transportation plans with both short-range and long-range elements for that study area (see Fig. C-3). Major sections of the long-range comprehensive plan for the north central Texas region for 1990 were adopted by the policy advisory committee in November 1974 and reaffirmed by the committee in November 1975 and November 1976. The long-range highway element envisions 701 miles of freeway in the intensive study area, or a 73 percent increase over 1976. The long-range public transportation plan calls for improvements built on the two publicly owned carriers in the region (Dallas Transit

System and CITRAN)—including both increases in area-wide bus service and 103 miles of exclusive guideway transit.

The COG has also prepared a transportation improvement program (TIP), which lists highway, transit, and airport projects anticipated over a 5-year period. The first TIP was approved by the Policy Advisory Committee in November 1974; it has been modified each year to reflect delays in construction, funding problems, and occasionally changes in the committee's priorities. The NCTCOG TIP is evidence of a substantial commitment to the existing system. For example, in 1977, \$47 million is listed for highway maintenance and improvement, while \$7 million worth of transit improvement projects are listed. A number of highway extensions and widenings are included in the TIP as are expansions of local bus systems and the development of regional priority bus networks.

NCTCOG also has the responsibility for preparing the transportation system management (TSM) element designed to achieve maximum efficiency and productivity in the entire region's transportation system. Although some professionals dispute this assessment like many agencies, NCTCOG's first TSM element in 1976 was not a plan but rather a compilation of all relevant projects underway or completed in the region. The 1977 TSM element stresses that NCTCOG will attempt to provide leadership and act as an information resource for local governments on TSM strategies, planning techniques, and local programs statistics. In addition, the COG will provide the analytical procedures and mathematical tools that consider the interactive effects of TSM projects on the entire transportation

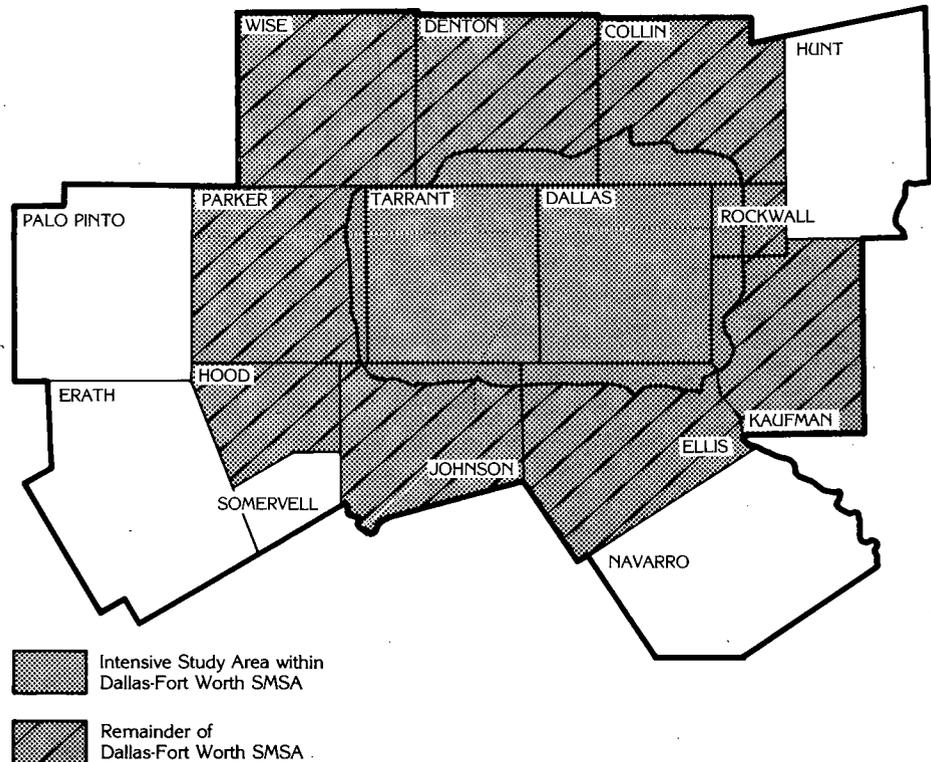


Figure C-3. North Central Texas Planning Region.

normal capacity of the facility, the facility is able to handle them because of the freeway ramp metering. In 1971, approximately 44 percent of all person-trip movements to the Dallas CBD occurred in the corridor (see Fig. C-5).

Candidate UDCP projects were proposed in "Final Report: Urban Corridor Demonstration Program for Dallas, Texas," March 1972.

The initial recommendations for the Dallas UDCP included:

1. Physical modifications and control measures to improve traffic service on the North Central Expressway and frontage roads.
2. Special control techniques and control hardware to provide priority treatment for buses at arterial intersections.

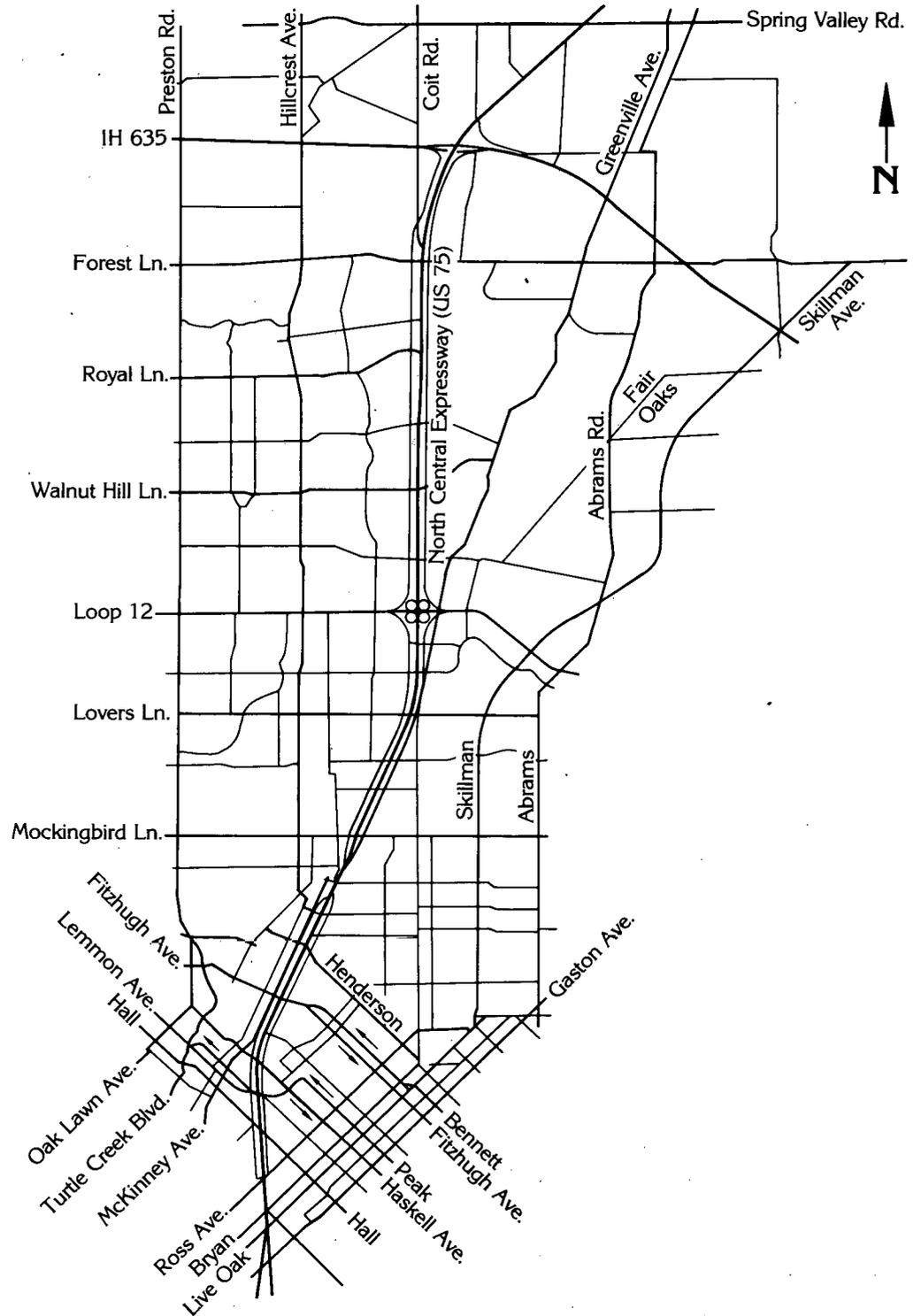


Figure C-5. North Central Expressway project.

3. Construction of an elevated busway from I-635 (LBJ) to downtown Dallas, generally parallel to North Central Expressway.

In early 1971, while the UCDP planning was still in progress, the 11 participating cities were asked by the Department of Transportation to propose "early action projects" for funding during the then current (1970-71) federal fiscal year. The City of Dallas requested a \$25,000 grant to subsidize the expansion of service on the Spring Creek bus line from 17 bus trips per day to 44 trips per day.

In 1973, the Federal Highway Administration informed the city that additional money would be available in July of 1973. The city submitted the following proposals:

1. *Main Street Bus Way*. This project called for the conversion of a six-block section of a major east-west street passing through the core of the CBD to a street to be used exclusively by transit vehicles.

2. *Dial-A-Ride Service to Park-and-Ride Terminal*. This proposal called for a dial-a-ride system to serve a 10-square mile area around the North Dallas Park-and-Ride terminal.

3. *Terminal Park-and-Ride Operation*. This proposal asked for a subsidy to manage the Park-and-Ride Terminal in northeast Dallas near LBJ and Central Expressway.

4. *Development of Car/Buspooling Vehicle*. This proposal called for the development of specially designed 6-passenger vehicles with contour bucket seats, having 3 rows of 2 seats each.

5. *Incident Detection System on North Central Expressway*. This proposal asked for \$175,000 to install and use equipment to detect incidents on the freeway and to relay this information to motorists.

6. *Low-Power Radio Motorist Information System*. This project asked for \$75,000 to install low-power radio transmitters at major traffic generators and to advise motorists that traffic information was being broadcast over the low-power radio.

7. *Express Bus Service*. This proposal asked for \$61,822 to subsidize express bus service operation for the Dallas Park-and-Ride System between the North Dallas Park-and-Ride location and the CBD.

8. Carpooling in the Dallas area.

9. *Extension of Arterial Control System*. This proposal called for bus priority at almost every signalized intersection in the corridor that buses pass through.

10. *The Telephone Dial-In Motorist Information System*.

From these adventuresome proposals, only four were ultimately chosen and were or are being implemented under the auspices of the UCDP:

1. The Spring Creek Express Bus Subsidy to provide express bus service between the residential areas in the far northern area of the corridor and the CBD. Federal grant: \$25,000.

2. The North Central Park-and-Ride Express Bus Subsidy to provide express bus service between the North Dallas Park-and-Ride terminal and the CBD. Federal grant: \$62,355.

3. North Dallas Dial-A-Bus Service to collect commuters and deliver them to the Park-and-Ride terminal. Federal grant: \$146,126.

4. Bus priority on frontage roads, arterials, and ramps; preferential treatment to buses at signalized intersections and ramps and roadway improvements to facilitate bus movements and decrease interference with other traffic. Federal grant: \$720,700; City matching: \$132,385.

The federal grant breakdown is as follows: UCDP-FHWA, \$700,000; and UMTA-Section 5, \$148,800.

The local contribution is: Section 5 Local Match, \$37,200; and City Operating Budget, \$132,385. The preliminary total amounts to \$1,018,385.

Express Bus Services

Spring Creek Service and North Dallas Park-and-Ride. Two types of express bus service were implemented in Dallas. The Spring Creek Service increased services during the peak hours on an existing bus line. The route operated nonstop 7 miles from downtown Dallas along the North Central Expressway and then left the freeway and used the frontage roads to provide local service in an intensively developed apartment neighborhood and in areas of single family residences.

The improvement of this service increased the number of daily bus trips from 17 to 44, which represented a doubling of morning inbound bus trips and a tripling of afternoon outbound bus trips. The express bus service was provided from 6:00 a.m. to 10:00 a.m. and from 2:30 p.m. to 7:00 p.m. The 27 daily express bus trips were superimposed on 17 preexisting local service bus trips serving the same residential area.

The express bus service produced a 91 percent increase in patronage along this line but required a 159 percent increase in bus trips. During the demonstration, the average loading was 19 persons per trip. Distribution of patronage between new riders and riders diverted from local buses in the corridor was about equal, with 205 new riders and 200 diverted riders for a total of 505 new passengers on an average week day.

Sixty-eight percent of the users had a car available for their trip but had chosen the bus as a matter of personal preference. This is more than double the systemwide experience of 31 percent "choice" ridership. Over 50 percent of the riders indicated that they diverted from auto transportation either as a driver or as a passenger.

Although funding under the UCDP ended in 1972, the bus service established under the program was continued at reduced level under city sponsorship.

The second type of express bus service was a route connecting the North Central Park-and-Ride facility with downtown Dallas, a distance of 14 miles via the North Central Expressway. This service consisted of 36 inbound and 37 outbound trips daily with 5-minute headways during the peak hours and frequent service during the midday. The park-and-ride facility was originally a drive-in theatre having approximately 1,000 parking spaces. This facility is located in the northern end of the study corridor in close proximity to the North Central Expressway.

A contract agreement was entered into with the owner of the drive-in theatre adjacent to the expressway, which enabled the city to use the private facility during the daylight hours at a cost of \$2,000 per month. The contract

has a 30-day cancellation clause that permits either the city or the owner of the drive-in theatre to terminate the agreement on 30 days' notice.

The North Dallas Park-and-Ride provides 73 total bus trips and serves approximately 1,600 passengers a day. Transit loading is fairly high for Dallas, with 28 passengers per trip for the 45 peak-period bus trips and 11.5 per trip for the 28 off-peak bus trips, or an over-all average of 22 passengers per trip. A survey of park-and-ride users indicated that (1) 65 percent of the users were auto drivers, whereas the remainder were either auto passengers or kiss-and-riders; (2) 70 percent of the users were from households having two or more autos; (3) 70 percent of the users traveled more than 3 miles to use the system; (4) 67 percent of the users had an income greater than \$10,000, and 24 percent had an income greater than \$20,000; and (5) 98 percent of the users were favorably impressed by the service and had only minor suggestions for improvements.

From June 1974 through May 1975 the difference between the total cost of providing the express bus service (\$378,912 including bus and terminal operating expenses) and the total revenue (\$236,743 generated by the \$0.50 fare and the \$0.25 per car parking fee) was \$142,169. During the study period, a \$64,355 grant subsidized part of this loss. Since July 1975 the City of Dallas has continued to provide the service at its own expense.

Dial-a-Ride. The dial-a-ride service was initiated July 7, 1975, for a 1-year demonstration period. It functioned as a feeder to the fixed-route express bus to and from the North Dallas Park-and-Ride terminal. The vehicles were dispatched by two-way radio from the existing Dallas Transit System Communication Center.

Initially, four 20-passenger minibuses circulated within a 5-square mile area collecting users of the express bus service and delivering them to the terminal. After 6 weeks, an average of 26 passengers per day were using the system. On August 18, 1975, the service was expanded to serve a 10-square mile area; that change increased ridership to 36 passengers per day. At a fare of \$0.50 per trip and with an average daily ridership of 36, the average daily deficit involved in providing the service was \$311.00. Because of the low number of people using the service and the high cost, it was discontinued in November 1975.

Bus Priority Strategies. The design for the bus priority system was completed in 1975, and it was expected that construction would begin in the 1975-76 fiscal year. The system was designed to have digital computer control over 62 signalized intersections in the corridor, 38 of which were to be located on three major arterials and have bus detectors and bus preemptions features. Another eight signalized intersections on the north central frontage road were designed to be equipped with bus preemptions equipment.

The bus priority system sponsored by UCDP was designed to be part of a comprehensive program of freeway corridor optimization using surveillance and control techniques that had been developing in Dallas for several years. The major elements in this system were already installed and operating (C-2). The existing system includes traffic

sensing; ramp metering at 39 entrance ramps along a 10-mile section; an 8-camera closed-circuit TV monitoring of operation; the coordinated and responsive operation of 15 frontage road interchanges; an experimental driver advisory information system employing changeable message signs; and Operation Talk-Back, which enables a resident of the North Central Corridor to call the control center for up-to-date, real-time information on the state of traffic on North Central. This surveillance and control system was not formally a part of or financed by the Urban Corridor Demonstration Project, but the bus priority traffic control system portion of the UCDP was designed as a component of the over-all computer control signal system.

Planned ramp modifications included five ramps to be equipped with remotely controlled gates without bus detectors, one southbound entrance ramp to be equipped with a remotely controlled gate and also with bus detectors, and a bus bypass ramp with a vehicle detector that will hold the metering signal at the auto ramp in a red state while the bypass ramp is in use by the buses.

On the freeway portions of the UCDP Priority System, eight signalized diamond interchanges were planned along the North Central Expressway frontage road to be equipped with actuators to provide bus preemption. Signalized intersections were to be equipped with bus detectors and operated in a manner similar to that envisioned for the arterial system. Bus stops, if any, would be moved to the far side of the intersection.

The objective on the arterial portion of the UCDP Bus Priority System is to bring a total of 62 signalized intersections in a corridor south of Mockingbird Lane and east of Central Expressway under computer control. This corridor has a total of five bus routes on arterials into and out of the CBD. The 62 controllers will be under remote computer control from the Noel Page Building. All signalized intersections on the three bus arterial routes mentioned earlier will be equipped with two bus detectors for the detections of outbound buses on those arterials. The total system is designed to be responsive to peak-hour volume and its progressive needs, as well as to individual intersection bus priority requirements. This system has not been implemented.

UCDP Institutional Problems

At the time the study team completed its field work in 1976, the signalization strategy of the Dallas UCDP had not been implemented, although planning was begun over eight years before and formal approval to begin preliminary engineering was received in 1971.

The proposed signalization program was originally part of the North Central Expressway Freeway Optimization Program, a cooperative venture initiated in 1969 between the City of Dallas and the Texas Highway Department. This Freeway Optimization Program produced the existing freeway ramp metering program, as well as the interchange signal and the motorist information programs. In 1970, when the city became aware of UCDP, it submitted a lengthy list of fairly well-defined freeway optimization projects; of that list of options only the city's application for a bus priority program was approved in August 1971. The city went ahead to implement several of the other

proposals suggested to but rejected by FHWA, while continuing to plan for a bus priority system.

The city received \$700,000 from DOT in June 1973 to implement most of the proposed bus priority projects. However, the traffic department underestimated the equipment and software needs of such a system. The specifications for the desired equipment required advances in the state of the art; moreover, similar facilities put in place under the Freeway Optimization Program began to have serious failures. The problems with this equipment were so serious in 1976 that officials felt that substantial sums of money would be required just to rehabilitate it. The SDHPT has withdrawn all funding from these projects because of their technical problems and limited impact. The city is now in the position of deciding whether to "cut the losses" already associated with the over-all system or go ahead with the new part UCDP will pay for. The city had to advertise for bids twice—the City Council rejected the first bids in February 1976 and finally accepted the second bids in March of that same year. Although a work order was issued to the successful bidder in May 1976, these technological problems were holding up construction.

Some observers noted that, in 1975, UMTA became very interested in the signalization concept and urged Dallas to go ahead with the UCDP element; in June of that year UMTA allowed \$148,800 of Section 5 money to be used for implementing the system. Other observers felt some of the technology firms involved were successful in getting the city to continue its efforts.

The traffic control department also underestimated the political impact of seemingly technical decisions. One part of the system proposed closing ramps in some neighborhoods closer in to the CBD to reduce congestion by reducing short trips. Some of the affected neighborhoods were Black communities, and the council forced the department to change plans several times to reduce the inequities created by such a solution. The city transit system, DTS, viewed some of the UCDP projects as extremely risky. The Dial-a-Ride System, an idea that originated with the council, was an embarrassing (and expensive) failure. Several park-and-ride lots tried in the early 1960s failed. New park-and-ride activities have shown impressive ridership, and they did meet their true operating costs. The city felt these systems were successful because they were able to divert "choice riders" to transit, but DTS perceives these systems as an increasing financial drain.

The city subsidizes the operating losses of DTS, but it is far from a politically neutral issue. Because of the conservative climate of the area, DTS cannot be assured of an ever-growing local public subsidy. Each year at budget time the local newspaper reports that council people berate the system for its increasing deficit and decreasing ridership. DTS feels that it may be engaging in activities that increase subsidy requirements.

For example, some DTS respondents saw no advantage in the proposed signalization projects. The System did not wish to change their schedules and to print new timetables, and they felt that the projects being considered would

have no positive impact on their operations. Some observers agree that DTS would participate but only because it might face the loss of its existing subsidy.

Significant institutional problems have also arisen with the successful North Dallas park-and-ride. The park-and-ride service began operation in a 500-space parking facility near the northern end of the corridor, offering both express bus service to the CBD and the new SURTRAN express service to the regional airport. When SURTRAN airport service began in earnest, the lot overflowed and the CBD-oriented facility had to be relocated. After much negotiation, the CBD lot was relocated to a nearby drive-in theatre with approximately 1,500 parking spaces. Because of the rental charges, the city began a search for a suitable lot to purchase.

In 1972 the city in cooperation with NCTCOG approached UMTA for assistance in purchasing a lot adjacent to the interstate facility. UMTA felt that the site would qualify for interstate funding and suggested an application to FHWA. FHWA informed Dallas that such requests must be submitted through the SDHPT's regular highway planning process; in 1974, after several iterations, the FHWA tentatively approved the site and the use of interstate funds. In 1974, the city also received voter approval of revenue bonds to provide the local matching money, and they began public hearings and preliminary site development. In late 1975, although there had been no formal protests at the public hearings and there had been reportedly "many favorable meetings" between the city and the neighborhood, the community near the site complained that the traffic created by the facility would have an adverse effect on their neighborhood. The SDHPT refused to consider that site further.

The city staff prepared a detailed evaluation of an alternative site, which originally had been ranked very low. The FHWA was extremely concerned. Some city officials reported that the FHWA refused federal highway assistance for the new site because it was no longer adjacent to an interstate facility. FHWA officials refute this and report that they were worried about the previously low evaluation given that site; they asked for more data and analysis. Other observers report that it was the SDHPT, and not FHWA, who refused to allow the site to be chosen unless it would get the 90/10 interstate money. Several observers report that the SDHPT failed to keep the FHWA fully informed of the city's intentions, largely because the facility was not considered to be viable. Also there was concern that the use of noninterstate funds for this purpose would likely increase demands for similar projects elsewhere on an already overburdened source of funds. There were obscured communications between SDHPT, the city, and the FHWA.

At this point, city officials began considering resubmitting the application to UMTA. They began communicating with both FHWA and UMTA officials over the content of an acceptable application and began rewriting the site evaluations already in progress. Problems arose because UMTA and the FHWA did not seek the same criteria, and Dallas feared losing one potential funding source or the other. At times city officials felt

changes requested by either agency were marginal and only served to delay the point at which either federal agency would have to make a decision. As of the date the study team concluded its field research, no site has been approved for federal funding.

One proposed element of the proposed Freeway Bus Priority System will definitely not be implemented because of institutional problems. Originally, a contraflow priority concept was planned for I-30 west from the Dallas core; some highway planners felt that this was the best corridor in the entire state for such a trial because of the uneven directional flows in the peak periods. In early 1974, the city put together a technical transportation committee composed of the heads of relevant city departments, and meetings were held sporadically over 2½ years to inform the committee of the plans being developed by the traffic department. In late 1975, as the project came close to implementation, significant conflict arose on the transportation committee. DTS did not want carpools to be permitted in the priority lane; SDHPT did not feel it was appropriate to spend \$3.5 million to accommodate only 30 buses per day, and the police department said the whole idea was totally unenforceable and simply refused to cooperate. The city attempted to arbitrate these disputes but finally admitted failure in July 1976 when this element was formally dropped from the UCDP.

Dallas faced significant problems with federal agencies in several of its C-R experiences. Explanations of these difficulties vary, but almost all observers agree that poor communications between the relevant institutions, coupled with everyone's lack of experience with the new diversion provisions of the highway fund, created many of the problems. In addition, although both UMTA and the FHWA supported the urban corridor concept, both agencies were prone to quarrel over who should pay for what; the city felt itself pulled between the two agencies and was uncertain as to how to proceed without jeopardizing all future funding from either agency. Many city officials felt that neither UMTA nor the FHWA was really sincere in its professed desire to expedite the implementation of energy conservation projects; when the pressure created by the October 1973 oil embargo subsided, some officials were even less certain of federal willingness to fund such projects.

The federal perspective reported to the study team was very different from that of the city. Some federal officials felt the city was not sincere in its desire to implement such projects and was only interested in obtaining easy money. Because the diversion provisions of the 1973 Highway Act and the 1974 Energy Act were relatively untested, FHWA felt it had to be cautious and require a full and detailed analysis of all alternatives. Clearly, they were afraid of funding activities that would create dangerous precedents, but they were also cautious about the relatively sketchy plans submitted by the city. Both UMTA and FHWA officials felt their repeated requests for revised applications were completely justified.

The regional planning body, NCTCOG, had relatively little to do with most of the Dallas C-R projects, although it was required to formally approve the allocation of both

Section 5 and urban systems money. NCTCOG did provide some technical information to the city, but COG officials are quick to point out that they serve only in an advisory role and must wait to be asked for assistance by the city. As previously mentioned, this view permeates the COG's entire approach to TSM planning; they stress that ideas must come from the individual governmental units and the COG can only provide technical information and coordinating services.

The role of the former Texas Highway Department, now the State Department of Highways and Public Transportation (SDHPT), in the implementation of the Dallas C-R combinations is not clear. Some SDHPT officials were very cautious about the diversion of highway money to transit because of the newness of the concept and the enabling legislation. This caution was perceived by some observers as a conscious attempt to hold up the UCDP and carpool projects. Highway officials, however, point out that city justification and supporting analysis for these projects were weak and SDHPT caution and deliberate speed were appropriate.

Carpool Demonstration Program

In the fall of 1973, the Environmental Protection Agency promulgated regulations designed to reduce air pollution through reducing vehicle-miles of travel (VMT). In response to these regulations, the City of Dallas developed a multifaceted plan to control auto emissions and consequently to improve air quality. One facet of the plan was carpooling.

At the same time, the Federal Highway Administration was in the process of developing computer software suitable for matching people interested in ridesharing. However, as of late 1973, the FHWA ridesharing software had not been implemented in any large urban area. The City of Dallas prepared and submitted to FHWA a proposal to implement a ridesharing program using the FHWA program. The City of Fort Worth also prepared and submitted a similar proposal. Prior to offering the computer matching service to the public, pilot studies were conducted with city personnel data to determine if the FHWA program had the technical capability to do the matching. Upon successful completion of the pilot studies, ridesharing information was made available through the Cities of Fort Worth and Dallas to citizens throughout the region.

The Program. The City of Dallas applied for and received part of the area's urban system funds for a demonstration carpool project as authorized by the National Highway Energy Conservation Act. This action was not without controversy, since state law prohibited the expenditure of state money for advertising or promotion; under Texas law federal highway money was commingled with state funds, and all funds became subject to state budgetary constraints. Eventually, the issue was settled to the satisfaction of the highway commission, and the project began on March 1, 1974.

The program was made the responsibility of the City Traffic Control Department. The staff geared a continuing public and marketing effort toward individual major employers, groups of employers, aggregations of employees,

and educational institutions. The primary program emphasis was on contacting employees through their employers. Meetings were held with employers to describe the program, give detailed information on the service, and provide instructions on how to participate. Repeated contacts were made to obtain company commitment and employee participation. No incentives by the city staff could be offered by the city as a part of the program, but the importance of incentives was emphasized; for example, employers were urged to establish preferential parking privileges.

Initially, efforts were directed primarily to major employers and employment centers. The employees of the City of Dallas and the local agencies of the federal government were furnished information first. Then, letters from the Dallas City Manager inviting the top 300 major employers of the area to a meeting to discuss carpool matching service attracted representatives of 78 firms (26 percent of those invited). Letters, telephone calls, and visits were made to government agencies, Dallas Independent School District, Dallas County Community Colleges, Dallas Baptist College, Southern Methodist University, University of Texas Southwest Medical School, all major hospitals, all satellite cities, University of Texas at Arlington, and all major tenants with activities at Dallas-Fort Worth Regional Airport.

Employer representatives received general information, and, in each case, every effort was made to recruit, or to have the employer appoint, a transportation coordinator who would distribute information, answer questions, and collect information forms. Forms from applicants at each work place were collected by the coordinator and sent to the project office for coding and processing. Computer-matched lists identified by employer and department number were returned to the coordinator for distribution in his or her company. Data from new personnel as well as data on changes in place of employment and place of residence ideally flowed from the coordinator to the program office to keep the information in the data file current.

Thirty six of the top 300 firms contacted complied. Only 12 percent of the potential number of employers obtained the information necessary to offer their employees an opportunity to get ridesharing lists.

A second approach consisted of setting up an information booth in a number of activity centers, such as major office buildings and arcades. The general public was offered information on ridesharing and the opportunity to obtain a list of possible ridesharers by mail.

A listing in several locations in the telephone book and a direct line telephone with a recorder to answer after hours was the third means of making contact with the general public to let it know that the service was available.

A follow-up telephone survey of a sample of 28 participating employers was made at a later stage of the program. Sixty-five percent of these firms reported that the company had a policy or program directed toward energy conservation, but the emphasis was on measures to reduce electrical power usage.

Ninety-nine nonparticipating firms were also surveyed. Fifty-seven percent of the spokespeople for these firms said that their companies had an energy conservation program,

but carpooling appeared as a component in only 20 percent of such programs.

The 127 firms surveyed represented 123,000 employees. Although 90 percent of the spokespeople for the nonparticipating firms said that they knew that the City of Dallas was offering the carpool matching service, the firms had not afforded their 60,000 employees the opportunity to complete and submit application forms. Thirty-six percent of the nonparticipating firms said that they would like more carpool program information, but less than half of these firms subsequently responded positively to the information they received.

At a later date, a letter from a distinguished Dallas citizen to 645 major employers offered carpool information and assistance in setting up vanpools. Sixty replies were received, and 42 interviews resulted. Only 36 of the major employers subsequently completed the process of encouraging their employees to participate, fill out application forms, and finally to act on the information they received.

The letter to major employers also sought to interest firms in sponsoring vanpools as a means of reducing vehicle-miles traveled. Two firms made inquiries and, in one instance, the city staff collected all necessary information and developed the potential for a vanpool program requiring 12 vans; however, inability to obtain immediate delivery of vehicles aborted the effort. Only two vanpool programs were operating in the region, when the study team completed its field research, and they were company sponsored.

Because of legal and financial constraints, the City of Dallas could only support *planning* for vanpools. The actual formation of a vanpool program had to be the responsibility of each employer. The rideshare staff worked with employers on vanpool programs by providing lists of interested persons who could ride with one another in a vanpool.

For example, in June 1976, the carpool office was asked to prepare a vanpool proposal for a number of firms in northwest Dallas. The proposal was presented at a chamber of commerce meeting in the area. The consensus of the chamber members was that the city should financially support a vanpool program in the area. Since the city could not do so, no further action was undertaken.

In May 1975, a contract for public information and program marketing consultation was negotiated with the Engleman Company to recommend a marketing program and to assist in its operation. The program designed by the consultants appeared to offer the promise of providing desirable publicity and attracting favorable attention to the program, but the consultants were not able to enlist community leaders of sufficient stature to put their plan into operation. Consequently, no significant progress was made in publicizing the service.

The Dallas program staff also cooperated with the FHWA and its consultant, Bigelow-Crain, in field testing an improved edition of the Carpool Computer Matching Program in 1976.

As can be seen from Table C-1, operating costs were primarily for salaries and indirect personnel costs (66.6 percent) and data preparation and processing (19.5 percent). The remaining miscellaneous costs averaged \$800 per month. The budget anticipated a \$25,000 expenditure

for public information and marketing, but, since proposals for spending this allocation did not develop satisfactorily, it was not spent. Money not used for marketing allowed extension of the program through December 1976. A sum of \$35,000 from urban systems funds has been allocated to this program for 1977.

Quantitative measures and sample survey responses indicate that between 4,500 and 5,000 persons formed carpools as a direct result of this program.

Institutional Problems. Traffic department officials were not convinced of the efficacy of the carpool concept; they themselves did not originate the idea of the program. A federal official reported that the city had considerable, unobligated urban systems funds at the time, and the carpooling idea seemed an easy way to both forestall EPA sanctions and to increase the amount of urban systems money coming into the city budget. Not an insignificant factor in this region of rivalries was that the City of Fort Worth had also applied for a carpool program. It was generally agreed that city staff members were not favorable to the concept's applicability to Dallas.

The carpool staff was demoralized by both the low response rate from employers and by the generally discouraging vehicle-occupancy data. Although vehicle occupancy did go up in 1974 in the region, it began dropping back in 1975 and was below 1974 levels in 1976.

Staff members found most promotional and marketing techniques to be useless. They found a great deal of "lip-service" given to the value of carpooling, but very few changes in ingrained behavior. The staff found mass meetings, public announcements, and TV spots to be ineffective; the most effective method of dealing with private employers was constant, repeated, individual contacts. The staff felt that had employers been willing or able to provide incentives to their employees, more carpools would have been formed. As a corollary, they felt that if the city had had more incentives to offer individual employers, they would have been more willing to participate.

City officials were even more discouraged by the reluctance of other public agencies to become actively involved in the carpooling effort. Officials hoped to model parts of the Dallas program on the Portland experience, where governmental agencies provided a major source of new carpools; many Dallas agencies flatly refused to participate.

The Dallas program is generally considered a failure although other programs may have comparable outcomes. If the Dallas program diverted 5,000 people as it estimates, the average total cost was \$33 per diverted person; California data indicate that \$40 per diverted driver may be an average for comparable programs. The highly regarded Houston carpool program may not have diverted any more people either relatively or absolutely. In short, the Dallas program may be regarded as a failure only because it so regards itself.

Other C-R Combinations

The Dallas Transit System operates park-and-ride services at three locations within the city, one of which was discussed earlier. But DTS has a more interesting arrange-

TABLE C-1

EXPENSES OF OPERATING THE DALLAS DEMONSTRATION CARPOOL PROGRAM (MAR. 1, 1974—SEPT. 30, 1976) (C-3)

| | | |
|----------------------------------|-----------------------|-------|
| Personnel (Salaries) | \$101,938.30 | 62.0% |
| Personnel (Indirect Costs) | 7,594.04 ^a | 4.6% |
| Public Information | 8,587.89 | 5.2% |
| Equipment Rental | 6,052.58 | 3.6% |
| Postage | 450.31 | |
| Printing & Supplies | 5,554.78 | 3.3% |
| Keypunching & Data Processing | 32,712.49 | 19.5% |
| Telephone | 1,736.62 | 1.0% |
| Travel | <u>1,386.69</u> | 0.8% |
| As of September 30, 1976 - TOTAL | \$166,013.70 | |

^aInsurance - Pensions - Hospitalization - etc.

ment with the City of Garland; Garland contracts for a park-and-ride service from the Garland terminal to the Dallas CBD at a set rate, with operations being managed by Garland, while buses and drivers are provided by DTS. Garland owns the park-and-ride parking lot and a 1,500-square foot terminal, having utilized an 80 percent Section 5 grant to construct that facility. The service, inaugurated in November of 1975, has grown substantially and has reduced its monthly operating deficit from 57 percent to 16 percent.

This arrangement was made possible by the regional agreement on the distribution of UMTA Section 5 formula funds; the only three recipients eligible for Section 5 funds in the region are Garland, Dallas, and Fort Worth. Garland, with a 1976 population of 123,250, does not now have a transit system but feels its rapid growth necessitates a city system. The city is continuing its push for independent status and has hired a consultant to assist in the preparation of a 5-year transit development plan.

DTS also operated an experimental free downtown circulation loop between 9:00 a.m. and 3:00 p.m. Freebus, as it was called, had to be terminated before the demonstration period was over because of excessive financial losses; passengers boarded in the free zone, rode to outlying areas, and then refused to pay. DTS reformulated the route as a very limited downtown service with a fare.

DTS has had greater success with reserved bus lanes in both the Dallas CBD and on major thoroughfares in the city. A study is now underway to determine the feasibility of a reconfiguration of Main Street in downtown Dallas as an auto-restricted zone during peak hours. DTS has also requested funds from the 1976-78 Unified Work Program to hire a consultant to assist in developing strategic marketing plans.

CASE STUDY 2: HOUSTON, TEXAS

The City and the Region (Field work was undertaken in 1976. Statistics are believed to be correct as of that year.)

The City of Houston is the urban center of Harris County and the core of a 13-county region in southeastern Texas (Fig. C-6). Houston is the fifth largest and the fastest growing city in the country. The 1976 estimated

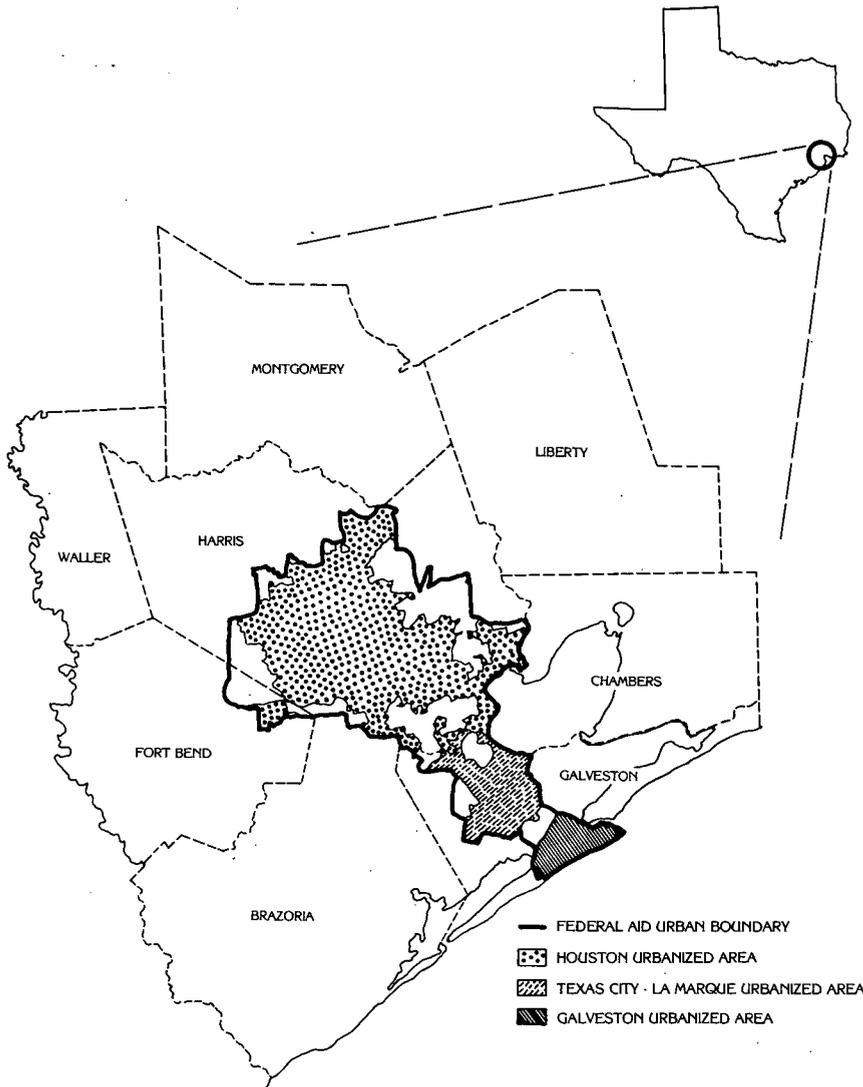


Figure C-6. Location of the Houston, Tex., study area.

population of the city was 1,476,000, a 22 percent increase in population in the six years since the 1970 census. Houston's rate of growth was seven times the national average from 1950 to 1960. The 13-county region had a 1970 population of 2.3 million people, 80 percent of whom lived in either Harris or Galveston County. Harris County, itself, experienced a 27.3 percent increase in population since 1970.

The region of which Houston and Harris County constitute the core is defined in several ways to meet different needs. The 13-county area was designated as one of the state's 24 planning regions by the Governor in 1969 and is coterminous with the boundaries of the regional council of governments (COG). A smaller 8-county region has been designated the study area for comprehensive highway planning. Lastly, the TSM area is the urbanized area only of Harris, Ft. Bend, and Galveston counties.

Houston has the third lowest density of the 20 largest cities in the United States, largely due to Texas' liberal annexation laws. In 1976, the city contained 503 square miles, which is an average population density of 3,000

people per square mile. Such low densities contribute to the city's dependence on the automobile.

Houston and the 13-county region comprise a major U.S. center of finance and construction. The Houston area is the ninth largest manufacturing area in the United States and the second in construction activity. The ports of Houston and Galveston combined are the third largest port facility in the country, largely because one-fourth of the nation's petroleum refining capacity and one-half of the nation's petrochemical production occur in the region.

Houston is linked to the Gulf of Mexico by a 50-mile long deep-water ship channel that is lined with industrial plants, mostly of the petrochemical industry. The ports of Houston and Galveston are a major hub for raw materials, such as oil, sulfur, forest, agricultural, and livestock products.

Houston is known as a community with a strong economy even during periods of national recession. In 1976 Houston's unemployment rate was almost half of the national average. At the same time, its population growth rate of 1,000 per week is one of the highest in the nation.

There are three other rapidly growing cities in the region—Pasadena, Baytown, and Texas City. The City of Pasadena, located in the southeast section of Harris County is the second largest city in the Houston SMSA; it experienced a 60 percent growth in population to 108,000 from 1966 to 1976. Pasadena is the center of a number of petrochemical complexes and contains a 9,000-acre industrial district. The City of Baytown is located at the mouth of the San Jacinto River at Galveston Bay in southeastern Harris County; it is on the Houston Ship Channel 30 miles east of downtown Houston. Baytown with a 1976 population of 54,000 is the center of one of the world's largest oil refineries, the Exxon Company refinery.

Texas City is located on Galveston Bay and contains a major petrochemical complex. With the contiguous City of LaMarque, Texas City comprises an urbanized area, as defined by the U.S. Census Bureau, of 60,000 people. There are ten major chemical industries and oil refineries in the urbanized area.

The City of Galveston, in Galveston County, is another important city in the area; the city limits of Galveston are also the limits of the Galveston urbanized area as designated by the U.S. Census Bureau. Galveston is located on an island; the city, with a 1976 population of 70,000, contains all but the western tip of Galveston Island. The island is connected to the mainland by an interstate highway. The city is a popular resort community, and the population can double during peak tourist season.

Houston has achieved some fame as the largest city in the country to have no zoning laws; the city has minimal restrictions on commercial, industrial, or business development. Residential land uses are generally protected by deed restrictions which can be a strong form of land protection. Houston is also noted for its continuing annexation of adjoining land; in Texas, a city of its size is allowed to annex up to 10 percent of its current area each year and to exercise planning and subdivision control in unincorporated areas up to 5 miles beyond the city limits.

The Transportation System

By 1985 Houston is expected to be the hub of 8 freeways radiating out from the CBD, crossed by two concentric freeway loops.

Beltway 8, circling the city at a 12-mile radius from the CBD was under construction in 1976. Implementation of the 20-year plan would result in 10 radial and 3 concentric freeways in Houston.

In 1976 there were 202 miles of completed freeways in Harris County and 188 miles in various stages of development. One hundred and four miles of the existing freeway network are within the city limits of Houston. Houston is the crossroads for I-10 and I-45.

Data derived from 1970 census information indicate that auto occupancy in the Houston area is only 1.28 people per car in peak periods; average auto occupancy for vehicles entering the CBD is 1.37 people per car. Of all commuters traveling to and from work in Houston in private cars, 86 percent are driving alone. For the 14 percent in some sort of ridesharing arrangement, average vehicle occupancy is 2.5 people.

The City of Houston acquired the assets of the major private transit operator in the region in April of 1974, utilizing an UMTA Section 3 grant. The Houston transit system, designated HouTran, is administered by the City Office of Public Transportation and operated under contract by a private management firm. HouTran provides service within the city limits and to 11 enclave cities adjacent to the city, which will probably be annexed shortly.

In 1973, prior to the acquisition of the private transit operation, Houston voters rejected a proposal to create an independent transit authority and give it bonding and taxing power. The rejected proposal included a 20-year long-range plan that contained a rail rapid transit element.

In 1976 the Houston transit system operated 418 buses, 100 of which were delivered during the summer of 1975. In late 1975, the City of Houston put together a consortium of 6 Texas cities (including Dallas) to purchase advanced design buses; the city wrote the vehicle specifications and the consortium accepted the GMC bid. American Motors contested the awarding of the bid, as detailed in the Dallas case study. This legal difficulty effectively prevented Houston from enlarging its present fleet until the summer of 1977 when the suit was resolved.

The first public subsidy to the transit system came in 1975, the year after the system was acquired by the city. In that year, revenues were \$12.2 million and expenses were \$16.6 million for a deficit of \$4.4 million, which the city met out of general revenue sharing funds. In 1976, expenses increased 20 percent, whereas revenues decreased by 11 percent; the operating deficit more than doubled to \$9.7 million. The 1977 deficit is projected at \$12.0 million.

In 1976 the City of Galveston leased transit buses from a privately owned company and contracted with the company to manage the system (it no longer does so). The city used UMTA Section 3 funds to purchase vehicles and facilities that are operated by a management company.

In 1976 Texas Bus Lines, Inc., a private company also operated service in the Houston area daily on two routes in Pasadena and on three routes from Galveston into downtown Houston. (As of 1978, the two Pasadena routes have been suspended and are in litigation.)

Civic Transportation Services, Inc., under the name of Suburban Bus Lines, operates workday commuter subscription service between the Champions area in northwest Harris County and downtown Houston. Two buses make four round trips in the morning and four round trips in the afternoon.

Gray Line Tours, Inc., whose primary business is sight-seeing tours and charter service, operates scheduled commuter service on weekdays during peak periods between downtown Houston and outlying areas.

Airport ground transportation between Houston Intercontinental Airport and points within metropolitan Houston is provided by taxis, an airport limousine/bus service under contract to the city. Air Coach Bus Service provides ground transportation to four satellite terminals in the Houston area, seven days a week. Nine of 15 buses are used at any particular time over two routes.

Intercity bus service is provided by Continental Trail-

ways, Greyhound, Kerrville Bus Company, and Texas Bus Lines.

In 1976 there were 820 active taxi cab permits outstanding in the City of Houston. Greater Houston Transportation Company (Yellow Cab) held 614 permits; Lone Star held 72 permits; Square Deal held 36 permits; Skyline held 29 permits; and Jacks Cab held 24. The balance of the permits was spread among the other 23 companies. One company, Greater Houston Transportation Company, also offers a special service for handicapped patrons in specially equipped vehicles to accommodate wheelchairs.

A number of social agencies provide social service transportation to their clients; the city is currently making a strong effort to coordinate the many service providers in the region. In August of 1975, the city and HouTran began a system of fixed route, specialized transit services for the handicapped.

Institutions and Regional Planning

There are three urbanized areas within the 13-county Gulf Coast State Planning Region. In 1970 there were four cities over 40,000 in the three urbanized areas (Baytown, Galveston, Pasadena, and Houston) and 30 cities under 40,000.

The City of Houston has a mayor-council form of government; the mayor is the chief executive officer of the city and also a member of the legislative body. The mayor is elected every two years in a citywide nonpartisan election and appoints (and may remove) the heads of most city departments including the city's Traffic and Transportation Department.

Houston has an 8-person city council with 3 members elected at large and 5 members elected at large to serve specified districts. The council is elected every 2 years in nonpartisan elections.

The three counties in the urbanized area are each gov-

erned by a nonpartisan elected county commissioners court. Counties in Texas have few powers; their major responsibilities are the maintenance and repair of rural roads.

Transportation planning for the entire 13-county region surrounding Houston is the responsibility of the voluntary council of governments, the Houston-Galveston Area Council (H-GAC), and the Houston-Galveston Regional Transportation Study Office of the State Department of Highways and Public Transportation (SDHPT). H-GAC has the responsibility for both long-range and regional planning issues; it is both the A-95 regional clearinghouse and the metropolitan planning office (MPO) with a steering committee designated by the governor. H-GRTS is responsible for regional highway planning and for coordinating all activities with H-GAC and the various local units of government in the 8-county region.

In May of 1974, H-GAC obtained the MPO designation from the governor, as required by Section 112 of the 1973 Highway Act. The H-GAC made specific agreements to pass through some of the Section 112 funds to Houston, Pasadena, Baytown, Texas City, and Galveston to allow these cities to update their land-use data. The Policy Advisory Committee for Multimodal Transportation Planning meets biannually to review the plans and recommendations of the Transportation Steering Committee. The steering committee is composed of both elected officials and transportation professionals from the units of government in the 13-county area (Fig. C-7).

H-GAC views its role as limited to providing assistance and coordination to its members. The City of Houston is generally acknowledged to be the most influential member of H-GAC. Although there is some sense of rivalry in the region, there is great disparity in city sizes and significant geographic distance between Houston and most of the other cities of any size. The city's liberal use of annexation privileges has prevented many nearby residential develop-

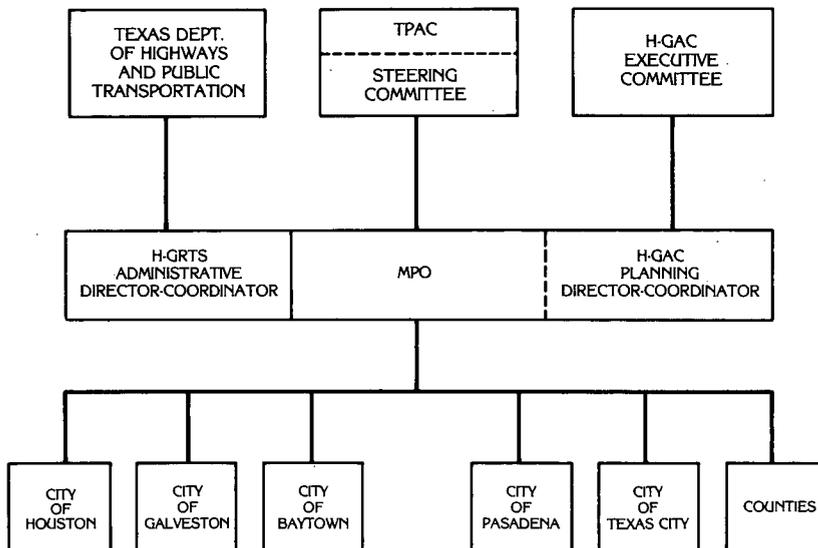


Figure C-7. Organization for transportation planning in the Houston-Galveston area.

ments from becoming significant suburban rivals. Therefore, there is relatively little need for the H-GAC to act as a buffer or a referee between cities; Houston is the acknowledged urban center of the region. The H-GAC does not view its role as initiating TSM-type activities for its constituent governments or planning individual region-wide TSM projects. The H-GAC appears to fit the "bottom-up" model of TSM planning and implementation (C-13).

The Houston Office of Public Transportation has taken a key leadership role in transportation planning in Harris County. The Houston Office has even been active on the state level; it is credited with the success of 1975 state legislation, which authorizes the state to pay 65 percent of the local match on any federal transit grant to any Texas locality. This legislation, in effect, reduces the cost to a city of any aided transit investment to \$0.07 on the dollar.

The first step in the long-range 13-county regional planning process is the individual development of individual modal plans. Running projects are joint efforts of all agencies involved. In 1976 H-GRTS completed a first draft of the "Horizon Study," which is the preliminary long-range highway and arterial network for the 8-county region. This is an expansion of the freeway and arterial plans for Houston and Galveston, adopted by H-GAC in 1970. In 1976 H-GAC was completing the airport/airsystems update, which is the air transport section of the multimodal plan. Finally, the City of Houston's Office of Public Transportation engaged a team of consultants to update the transit action program for the transit input to the long-range multimodal plan. It is expected that the various plans will be combined and alternatives will be tested. The result of this work will be a recommended plan for transportation improvements during the next 20 years.

Short-range planning activities are highway oriented. The 1976 transportation improvement program (TIP) identified transportation projects costing approximately \$133,729,000 for construction of state roads in the region during 1976. Seven major highway projects were completed and opened for traffic in 1976, including 15.1 miles of expressway. The H-GRTS area saw three new construction starts in 1975, all of which were portions of an approved Interstate which had been delayed because of funding problems.

In 1976 the Cities of Houston and Galveston actively pursued transit improvements. Galveston constructed a new downtown bus terminal, purchased a bus washer, and installed transit route signs. Island Transit received 15 new transit coaches, which vastly improved the quality of Galveston's public transportation. Galveston obtained an UMTA grant of \$129,454 to match its operating deficit and \$1,130,000 to help acquire capital equipment. Hou-Tran and Houston's Office of Public Transportation received UMTA approval grants totalling \$8,253,220 to acquire 130 transit coaches, signs, and benches. The largest single transit project of 1976 was the acquisition of land to construct a bus storage and maintenance facility. UMTA approved \$40,577,736 for this project.

In 1976, roadway projects in the region with federal aid totalled \$134 million; the 1977 TIP projected total is

\$182 million. A total of \$52 million was spent on transit in the 3-county region in 1976; the 1977 TIP projected total is \$81 million.

Experience with C-R Combinations

The City of Houston has recently had a number of experiences in implementing or attempting to implement C-R techniques. Four major joint projects using funding from more than one source have been or are being considered by the region: The Car Share Carpool Program, transit vehicles purchases, park-and-ride services are being partially funded by urban systems money, whereas originally several contraflow projects were funded from UMTA's Service and Methods Demonstration Program. Houston was the first city to use urban systems money to purchase buses for the city transit system. The buses were bought for park-and-ride services using 70% federal funds matched with 9.5 percent state funds. The most notable experiences are with the package of UMTA-sponsored priority treatments intended for implementation on major radial travel corridors in the city.

Houston was also selected by UMTA as one of four cities in the country to receive demonstration funds to develop a downtown people mover plan (DPM); the grant of \$33 million is to help advance the DPM technology.

Urban Corridor Programs

The city began negotiating with UMTA in early 1975 for a grant to test certain priority concepts. In July of 1975, the City of Houston received preliminary approval from UMTA for a 2-year service and methods demonstration (Section 6 grant) to initiate improvements on four major traffic corridors in the Houston metropolitan area. The Houston grant was seen as an exemplary demonstration project; it was intended to stimulate other cities to consider similar types of coordinated improvements such as park-and-ride and contraflow treatments. The traffic corridors chosen had previously been identified as candidates for major transportation improvements by a 1974 State Department of Highways and Public Transportation/District 12 report, which had been requested by the city. The demonstration program provided for the study and implementation of corridor improvements, including park-and-ride facilities, contraflow lanes, and preferential ramp signalization on the Gulf (IH-45), Katy (IH-10 West), North (IH-45), and Southwest (U.S. 59) Freeways (see Fig. C-8). The four traffic corridors originally scheduled for improvement through the demonstration program generally represented the freeways with the highest volume and most congestion in the city.

The major thrust of the original Houston application was on contraflow treatments. The City Office of Public Transportation found support for this concept in the 1974 SDHPT study, which concluded that the contraflow idea could be implemented on one or two of Houston's most congested freeways: Katy (IH-10 West) and North (IH-45). These freeways currently are experiencing the greatest vehicular delay during peak-period travel. IH-45 and IH-10 originally showed sufficient imbalance between opposing traffic flows during peak-period travel to support

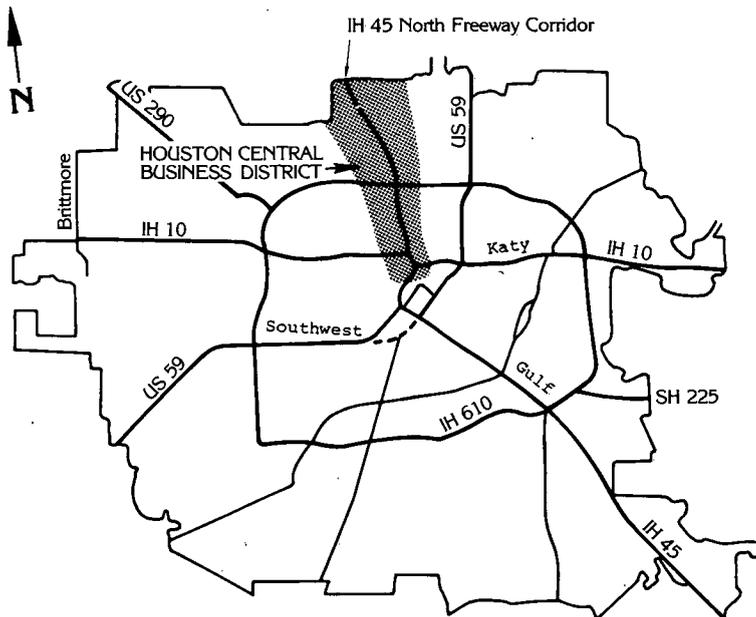


Figure C-8. Location of the Houston urban corridor projects.

consideration of contraflow. The original Service and Methods Demonstration Program grant provided for detailed feasibility studies as well as the construction of contraflow lanes on IH-45 and IH-10 West.

Although the contraflow concept was emphasized, priority signalization was also considered for the Gulf Corridor, which lacked appropriate traffic characteristics for contraflow application but did show appropriate characteristics for priority signalization. The city proposed to increase freeway vehicle occupancy on the Gulf Freeway by regulating and controlling the entry of the single-occupant vehicle, which would, in turn, encourage the lone driver to carpool or use public transit. The proposed corridor improvements consisted of the installation of on-ramp signal and metering devices designed to delay the single-occupant vehicle while allowing buses and carpool vehicles free-flow priority entry. This system would have required the installation of computerized traffic signal controls at critical intersections to compensate for diverted traffic.

SDHPT had already installed metered ramp control components on the Southwest Freeway, and the priority ramp control components requested through the demonstration program were designed to complement and enhance similar planned improvements being implemented by SDHPT for other freeways.

The Gulf Freeway Corridor. The Gulf Freeway Corridor (IH-45) is located in the southeast section of Houston. The population density within the corridor is only about 3,160 persons per square mile, although some new single-family residential and garden apartment projects are being developed. The 1990 projected density is 3,810 persons per square mile. The passenger movements to the CBD during peak periods along the corridor decrease as the distance from the CBD is increased. The current

peak-period movements are about 20 percent of the total daily passenger movement to and from the CBD.

Much of the Gulf Freeway was built in the late 1940s and early 1950s with the design features common then. The freeway is a 6-lane facility throughout, with an average daily traffic count of approximately 135,000 vehicles at its highest traffic location. The State Department of Highways and Public Transportation is now planning to widen the Gulf Freeway from 6 lanes to 8 lanes between Loop 610 and the CBD. It has also been suggested by SDHPT that the section from IH-610 be widened to 8 lanes with the median to be constructed as a separate 2-way bus lane.

Existing transit services in the Gulf Freeway Corridor are provided by two regularly scheduled routes. These buses could have potentially utilized the preferential ramp control devices. In addition, expansion of transit service in the corridor area was planned if corridor improvements were realized. The city also planned to purchase land and develop park-and-ride facilities on the Gulf Freeway Corridor using urban systems funds.

The Gulf Freeway has been successfully operating for several years with television camera surveillance and a computerized ramp metering control system for the a.m. peak inbound direction. This joint effort of the Texas Transportation Institute and the State Department of Highways and Public Transportation began as a research project and served as a forerunner to numerous freeway control projects throughout the nation. This inbound entrance ramp metered control system, between IH-610 and the CBD, has been operative during the a.m. peak hours since 1965. After installation of the control system, travel time was initially reduced, but has lengthened again in recent years as volumes have increased. A longer lasting benefit has been a 30 percent over-all reduction in

traffic accidents on the freeway during the controlled periods.

Subsequent to 1976, the Gulf Freeway was dropped as a candidate for contraflow or other treatment envisioned under the Service & Methods grant when the decision was made to widen the existing facility and possibly include a bus lane.

North Freeway Corridor. The North Freeway Corridor (IH-45) is a diverse area with contrasting land use. Less than 10 percent of the population within the corridor has a median family income in excess of \$12,000 per year, with approximately 20 percent having incomes of less than \$7,000 per year. Housing, population density, educational achievement, auto ownership, etc., vary greatly as does family income. In addition to other generators, there is a regional shopping center in this corridor, and the influence of the Houston Intercontinental Airport is significant. The average population density in the North Freeway Corridor is 1,420 persons per square mile, with a 1990 projected density of 2,650 persons per square mile. The North Freeway varies from 6 to 8 lanes, and the average daily traffic just inside IH-610 is estimated to be 120,500 vehicles. Much of the demand placed on this facility is due to the booming expansion in housing in northern Harris County and southern Montgomery County. Traffic studies have identified the North Freeway Corridor as having more peak-period congestion than any of the other three corridors. Additionally, plans by the State Department of Highways and Public Transportation for improvements to relieve present conditions on the North Freeway lay far behind plans to improve other freeways in the metropolitan area.

Studies initially indicated that the North Freeway contraflow demonstration project could be successfully implemented for both the a.m. peak inbound and the p.m. peak outbound traffic flows. Because of the freeway design in the vicinity of the downtown interchange, the project had to include exclusive lanes to bypass congested points. Recent studies, however, indicate that traffic volumes in the nonpeak direction have increased to the point where some congestion may occur in the off-peak direction if a lane is used for the contraflow treatment; a planned ramp-metering system is to be used to minimize such congestion.

Southwest Freeway Corridor. The Southwest Freeway (U.S. 59) was opened to traffic about 1961. Adjacent property has experienced a greater intensity of development than along any of Houston's other freeways. In addition to the CBD, Southwest Freeway serves the rapidly developing Greenway Plaza business-commercial-residential complex. The present population density is 3,390 persons per square mile with a 1990 projected density of 5,545 persons per square mile.

Severe traffic congestion occurs each parking day along the Southwest Freeway, including delayed traffic on the service roads, parallel major thoroughfares, and intersecting north-south streets. SDHPT recently installed ramp signals controlling both inbound and outbound traffic between Greenbriar and Bellaire Boulevard.

The southwest corridor was thought to be the best choice for the city's initial park-and-ride project. Originally, the

city hoped to open its first park-and-ride lot on the Southwest Freeway before the end of 1976. One lot was opened in the corridor in June of 1977; another in May of 1978.

Katy Freeway Corridor. The Katy Freeway (IH-10) extends from Houston's CBD west for approximately 27 miles to Katy, Tex., and intersects the Houston city limits. The average population density in this corridor is approximately 3,220 persons per square mile, with a projected 1990 density of 4,405 persons per square mile.

The 1974 SDHPT study had identified the Katy Freeway as appropriate for contraflow application, at least during the morning peak period. Trip studies indicated that during the a.m. peak hour there was a 67:33 inbound/outbound vehicle ratio on the Katy Freeway, and a 59:14 inbound/outbound vehicle ratio during the p.m. peak-period travel.

In 1976, none of the UMTA contrademonstration projects had been implemented. The contraflow treatment on the North Freeway had been delayed on technical grounds, and it appeared that financial constraints would force the city to choose only one of the remaining three sites for a contraflow application. (The contraflow treatment on the North Freeway was under construction in 1978 and expected to be in operation by mid-1979.) Two of the three remaining proposals are still under study.

The City of Houston originally planned two types of park-and-ride services: leasing existing parking facilities through the service and methods demonstration program and purchasing and developing new park-and-ride lots using urban systems funding. The city planned to use existing parking facilities on a leased basis on the Southwest and Katy Freeways, and urban systems funding was to be used to purchase and develop park-and-ride lots on the North and Gulf Freeways. The city originally hoped to open its first park-and-ride facility in 1976, but the first and only park-and-ride facility was initiated on the Gulf Freeway in March of 1977 using a department store's lot. New transit service had to be initiated, and buses are required to deadhead out from downtown Houston for 8 miles to the lot. Ridership is high and the city considers the service a success; over 300 riders a day use the service, and HouTran has already had to add one extra trip in both the morning and evening peaks. HouTran officials are less enthusiastic about the service, however, because it does not meet its operating costs.

Institutional Problems.

The original 1975 city submission to UMTA described Houston's problems and outlined solutions but had no detailed evaluation of traffic flow impacts or congestion measures. In July of 1975 the City of Houston obtained preliminary UMTA approval of the contraflow concept and authorization of a detailed feasibility study utilizing Section 6, Service and Methods funding. The SDHPT district office then made a number of technical comments on the proposal and notified the FHWA of their intentions.

Several respondents report that FHWA Washington staff were upset with the city and with UMTA because they had not been consulted earlier about the project that would take place on an interstate and federal-aid facility. FHWA

wrote UMTA an extremely critical letter. UMTA Washington personnel report that they thought that such coordination had already occurred at the local level. However, it is SDHPT's view that the responsibility for coordination with FHWA rested with UMTA.

In August of 1975 the Texas Highway Commission issued an order supporting the Houston program. Between August and December of 1975 the city negotiated a contract with the state office of SDHPT to conduct the detailed feasibility study, addressing the same general questions the city initially raised in its UMTA application; on December 15, 1975, the city signed a formal letter of agreement with SDHPT for this study. The preliminary report was submitted to the city in March of 1976, and the city paid the district office for the study under the terms of the agreement. The March 1976 report showed that the city had to make a choice because there was not enough UMTA money to do all four priority treatments; the IH-45 North Freeway project, for example, would take most of the UMTA money.

In April of 1976 SDHPT wrote to the FHWA regional office, submitting a rough layout of the treatments under consideration. In May, the city requested SDHPT financial assistance for the contraflow project, but SDHPT did not have funds available at that time (over and above the fully state-funded ramp-metering portion of the IH-45 proposal). (Later, after the creation of the State Public Transportation Fund, state monies were used for capital items in the contraflow program, and in November of 1977 UMTA agreed to the use of Section 5 funds for this project.)

In June of 1976 the regional FHWA office approved the concept and sent it on to FHWA Washington. At the end of June, FHWA responded to SDHPT with a series of 13 detailed questions about the proposals. Some of the questions were addressed to the techniques to be used to deal with safety problems created by carpools in the priority lane.

Some city staff were upset by the delays created by the SDHPT and FHWA procedures and felt that they were unnecessary. UMTA Washington officials were also concerned about the delays. In November of 1976, the city and SDHPT called a high-level meeting of FHWA, UMTA, and city officials. As a result, the FHWA approved the schematic layout of the IH-45 project on November 18, 1978. In the time since the Houston project had begun, the Los Angeles Diamond Lane conflict had occurred. SDHPT reported that all agencies wished to handle the IH-45 contraflow project in a way that would avoid a similar experience. UMTA felt that it would now be necessary to hold public hearings and to prepare an Environmental Impact Statement.

The public hearings were held in December of 1976. At the end of 1976, when the fieldwork for this case study was completed, the Environmental Impact Statement had not been signed and there was some conflict over its content. SDHPT officials reported that they could be ready to go to construction contract almost immediately if approval was received. City officials were still pursuing the contraflow concept, but it appeared to the study team that fulfilling a long series of procedural requirements,

some of which were not anticipated, had created some frustration on their part.

In 1976, when the study team was interviewing in Houston, frustration was high among some staff people in key agencies, and there was a, perhaps transitory, feeling that other agencies were responsible for delays in processing the plans for the proposed contraflow treatment. This feeling may appear to have arisen because all the agencies involved did not have a clear idea of the normal operating procedures of other agencies. The Houston case-study illustrates the problems that can arise when many agencies and levels of government are working together under new or different statutes or funding programs and when the agencies involved do not all have experience with the other participants' procedures and requirements. It also illustrates the problem that can arise when one institution or set of institutions does not clearly or statutorily have the "lead" responsibility for the successful implementation of a proposed C-R program; each institution in Houston, for example, seemed to believe that some other institution or level of government was responsible for the complex coordination of state and federal requirements.

Postscript

On September 14, 1977, the formal public hearing on the IH-45 contraflow treatment was held. SDHPT received formal FHWA approval of the project on September 20. On September 28, the Highway Commission issued a minute order authorizing the construction of the contraflow facility; on September 29, the Commission authorized the expenditure of state funds for the IH-45 installation. On November 4, 1977, the City of Houston received UMTA approval for the use of Section 5 funds on the contraflow treatment. On November 14, 1978 a firm was selected, and construction of the IH-45 contraflow treatment began on January 27, 1978. An SDHPT official reports that at 9.6 miles in length the contraflow facility will be the longest such treatment in the nation, the only one to be operated in both morning and evening peak periods, the only one with midpoint cross-over and as such required complex directional interchanges.

The 3-year gestation period was less than half that required for most major highway projects. An SDHPT official also points out that the implementation of such a project illustrates the high degree of cooperation among city, state, academic, and federal personnel and funding sources in Houston.

H-GAC officials feel that another indication of this cooperation is the recent METRO election. On August 12, 1978, the voters of Houston and Harris County approved the permanent establishment of a Metropolitan Transit Authority to be financed by 1 percent sales tax. The establishment of the MTA, or METRO as it is also called, was strongly and actively supported by the City of Houston, H-GAC, and district SDHPT officials who believe that their mutual cooperation was instrumental in securing the passage of the sales tax. Prior to the passage of the tax, the interim MTA staff met with H-GAC, SDHPT, and Harris County staff people, as well as with the staffs of the Cities of Baytown, Pasadena, and Houston to determine the short-range transit needs in Harris County.

CarShare Program

The Program. The CarShare program was created in March 1975 and funded for two years by the Federal Highway Administration and the Texas State Department of Highways and Public Transportation at a cost of \$240,000 with no local contribution. The project is continuing on urban systems money.

CarShare is an areawide matching program whose major objective is to provide a computerized-matching service for commuters. The program services Houston and the surrounding 8-county area, although there are no geographic limitations. Participation in the program is completely voluntary.

The most important aspect of the CarShare program has been an extensive public information campaign to educate the general public on area needs, problems, and solutions related to carsharing and public transportation.

CarShare does not use the FHWA computer program; rather it uses a program developed by the City's/Management Information Services. The computer program identifies a census tract for each applicant's home and work address. Once the applicant's geographic criteria have been met, the program matches according to arrival and departure times with a 15-minute variance before and after the indicated work times. Those candidates wishing to drive only are matched with riders and "shares." Those wishing to ride only are matched with drivers and "shares," never with other riders.

A majority of the applicants to the program work in the downtown (CBD) area. The matching rate has been very high for this area (98 percent), with each applicant receiving a maximum of 10 possible matches. The CarShare program has made contact with nearly 75 companies in an effort to encourage them to offer the program as a benefit to their employees. Each employer receives a portfolio describing the CarShare program with inserts of suggested guidelines for coordinating and promoting the program. Employers with under 250 employees are sent an Employer Guide Portfolio with additional brochures. The program has also conducted a presentation/workshop within the major activity centers in the city.

Several companies are offering incentive programs to employees to encourage carpooling and/or the use of public transportation. United Gas Pipeline Company implemented a plan to subsidize transportation and parking costs for 40 autos and reimbursement of parking costs up to \$55 a month at nearby locations for carpools of four or more employees. The plan also provides for a daily allowance on the basic round-trip HouTran bus fare.

The first phase of promotion in marketing the CarShare program was tied in with the national "DOUBLE UP AMERICA" campaign. The DOUBLE UP Houston materials had the CarShare logo imprinted to establish a local identity and the dial-in service number.

The CarShare program has received cooperation and assistance from the media. Many feature newspaper articles have been written on the program, with one suburban newspaper doing a feature story on four carpools and following up periodically to report the progress of the

carpool—how the members are getting along, how they like carpooling, etc. The program has also received extensive coverage in newscasts.

The program also has a dial-in service whose phone number has been displayed on outdoor advertising signs and advertised through radio announcements, TV spots, and newspaper coverage. Originally the city hoped to match all call-in applicants manually within a two-day period. Staff limitations and difficulties in finding matches have lengthened the two days to two weeks.

The concept of vanpooling is gaining popularity in the Houston area, and the CarShare program hopes to develop this option as well. Opportunities exist for more widespread organized use of vanpooling. Continental Oil Company was the first major Houston employer to implement a vanpool program with an initial 10 vans. Conoco absorbs all the administrative costs involved in running the program. The response from company employees has been so enthusiastic that more vans are on order for expansion of the program.

In June of 1975, the CarShare program joined with Conoco in sponsoring a seminar on employer vanpooling and the response was greater than anticipated. The CarShare Office has since advised several companies in regard to setting up vanpool programs and Brown & Root and Hughes Tool have ordered 10 and 6 vans, respectively, to implement a vanpool program for their employees.

At the end of its first year, the CarShare program had received 5,200 requests for matching services; 1,200 people came from the citywide dial-in service and the rest from private employers. The program was able to match approximately 43 percent of those who requested a match or 2,200 people. (This compares to the 4,500 people diverted in Dallas at a 31-month cost of \$166,000.)

The relatively low matching rate prompted the city to attempt a purge of the data base; they first asked people who wished to be removed from the list to respond and tell them so. They got very few replies, but their continued inability to match new people convinced them that a different style of purge was required. In spring of 1977, the CarShare program again wrote people in the data base and informed them that their names would be dropped unless they responded; they have received 500 responses so far. At the end of its second year of operation, in March of 1977, the CarShare program had 13,000 names in its data base, although they cannot know how many of those people are still interested.

The CarShare program, first funded for \$240,000 for 2 years, has just been funded for \$650,000 for the next 2 years (80 percent of this is from urban systems funds). A significant percentage of this money will be spent on developing real-time computer capability for the matching service.

Institutional Problems. City officials have always been extremely optimistic about the CarShare program and have relied heavily on an advertising and media campaign. Because they were so successful in developing good media contacts and getting a great deal of free publicity, CarShare officials were less than assiduous about developing a good network of private employers. Their

media approach seemed to be validated by the quick and cooperative response of several large Houston firms like Conoco. However, over time, it became clear that the media approach was not particularly successful in getting a large number of employers to participate, and the staff began to spend more time developing individual contacts with private firms. Unfortunately, at the same time increasing demands were made on the Office of Public Transportation's staff and their ability to spend any significant time meeting individually with employers was drastically decreased. The results can be seen in the small number of people actually requesting matching service.

SDHPT officials feel that the orientation of the Houston carpooling program is a good one and should be encouraged. SDHPT staff maintain that should energy constraints create travel shifts, the city will be in a good position to respond.

Other C-R Combinations

The Gulf Freeway has been successfully operating for several years with television camera surveillance and a computerized ramp metering control system for the a.m. peak inbound direction. This system, implemented through the efforts of the Texas Transportation Institute and the State Department of Highways and Public Transportation, has been operative between IH-610 and the CBD since 1965. Additionally, the State Department of Highways and Public Transportation installed metered ramp control components on the Southwest Freeway in 1975. The design, engineering, and installation of metering devices are handled by the State Department of Highways and Public Transportation as an operations improvement for better transportation systems management.

In October of 1971, pursuant to recommendations made by Alan M. Voorhees and Associates, Inc., for the Transit Action program, the curb-side lanes of Main Street in the CBD were reserved for buses. Turning movements were restricted during daytime hours, and truck loading zones were moved to adjacent streets. Subsequently, a number of routes were diverted to Main Street to take advantage of the improved speeds and maneuverability afforded by this special treatment.

During 1975, in conjunction with implementation of the minibus circulation and distribution system, 20 blocks of curb-side lanes were reserved for minibuses, regular buses, and right-turning vehicles. In addition, Houston's first application of contraflow transit lanes was installed over 7 blocks.

Planned for future study is the routing pattern of regular transit through the downtown area. Expected are recommendations for rerouting, transfer interface locations or terminals, application of reserved lanes, and the advisability of a bus-only street or transit/pedestrian mall.

As a matter of policy, the city's Traffic and Transportation Department exempts buses from turning-lane restrictions designed to enhance traffic flow unless there is an obvious safety problem.

Houston currently operates 15 routes with limited, arterial, or freeway express transit service; some of the 7

"true" freeway express routes are destined to be rescheduled if some of the proposed park-and-ride or contraflow treatments are put into effect. Houston recently inaugurated a special express service, the Gulfton Express, designed to compete with the car for certain southwest Houston residents by providing a transit service with limited residential collection and limited downtown distribution at either end of a line-haul express. The city also currently operates a successful downtown minibus service.

CASE STUDY 3: JACKSONVILLE, FLORIDA

The City and the Region (Field work was undertaken in 1976. Statistics are believed to be correct as of that year.)

In 1965 the Florida Legislature established a Local Government Study Commission to search for solutions to the problems created by shifts of population and economic resources from central cities to outlying areas. It concluded that the City of Jacksonville and surrounding Duval County would benefit by consolidation of the two separate government structures. Local voters approved the proposed measure, and in October 1968 the single county-wide urban-centered government of the present Jacksonville was created—except for four small cities, Atlantic Beach, Neptune Beach, Jacksonville Beach, and Baldwin, that elected to remain independent of the consolidated government (C-4).

Jacksonville, located in the northeast section of the state, is now the largest city by area in the continental United States—870 square miles (see Fig. C-9). Nearly 10 percent of this area is taken up by the St. Johns River, which winds its way from the southern border of the county through the Jacksonville CBD and out to the Atlantic Ocean less than 16 miles from the central city.

The land is flat, varying from sea level to only 71 feet. The climate is generally moderate—average temperatures ranging from 55 degrees in winter to 80 degrees in summer. The area is saved from excessive humidity by the breezes that come in from the ocean.

Population of the area is just under 600,000—70 percent white and 30 percent nonwhite (primarily black). Less than 10,000 of the residents are foreign born, and there is no problem of communicating with a large non-English speaking group as in some other urban areas of Florida.

Jacksonville is not only the principal financial center of Florida but also an important Atlantic port, served by four railroad lines and two interstate highways. The CBD of the city lies primarily north of the St. Johns River, but also extends across the river to the "south side" section where a major hotel and high-rise office buildings have recently been constructed. Access across the river is provided by five heavily used bridges, as shown in Fig. C-10.

A large-scale urban renewal effort is underway in Jacksonville that has some unusual features. First, there are two separate redevelopment programs. One, administered by the city's Department of Housing and Urban Development, is providing new low-income housing adjacent to

the CBD and in outlying areas under a federal-assistance program. The other is administered by the Downtown Development Authority and is carrying out commercial and moderate-to-high income residential developments within the CBD under exclusively local public and private funding. The latter program does not attempt to acquire blocks of land and structures in the CBD but, rather, uses the existing city building codes to require owners of substandard structures to rehabilitate them or demolish them. Thus, the downtown area currently presents isolated, new high-rise structures and older commercial buildings adjacent to cleared, unimproved lots, and individual blocks of deteriorated commercial properties about to be treated immediately adjacent to blocks of new and rehabilitated buildings.

Current Urban Transportation Resources and Plans

The automobile is the primary transportation mode for those entering and leaving the CBD, although use of transit is increasing, especially for those traveling to work. To facilitate the flow of traffic in the downtown area a one-way loop street system is being developed. Construction of ramps connecting the Main Street Bridge to this system has recently been completed and on-street parking has been removed and signals have been synchronized along part of the route. Parking facilities have been provided at the outer ring to encourage commuters and shoppers to leave their cars outside the CBD and walk or use transit to reach destinations within the area.

Public transit is provided by buses of the Jacksonville Transportation Authority, which currently operates about 200 vehicles. The majority are urban transit coaches seating 40 to 50 passengers. Ten others are suburban-type coaches (standard transmission, high-backed seats, and no rear door), and ten are smaller capacity, shorter vehicles that are used for downtown shuttles. Four vans are also in special service for transporting the handicapped.

Free park-and-ride lots are located at entry points to the downtown on major suburban commuter highways where frequent, shuttle-bus service to the CBD is available at a \$0.10 fare. Many other riders use the shuttle buses, as well, for CBD circulation, and peak-ridership of this service is noontime. Figure C-11 shows the location of these park-and-ride lots and routes of the shuttle bus service (C-5).

Jacksonville also intends to develop an automated, fixed-guideway people-mover system through the CBD and out to important medical, government, employment, and sports centers. Recently constructed office buildings have second-floor level facilities to accommodate pedestrian walkways and connections to the elevated people-mover. The existing long-range plans for routes, stations, and phasing of construction are shown in Figure C-12 (C-6). These plans, however, are subject to modification with future evaluation of needs and resources as they are perceived at that time.

Traffic congestion in Jacksonville, while not yet critical, is a growing problem. The bridges are, of course, the focal point of current peak-period congestion. The three outer bridges are tolled for the purpose of paying off their construction bonds, while the two central bridges, built

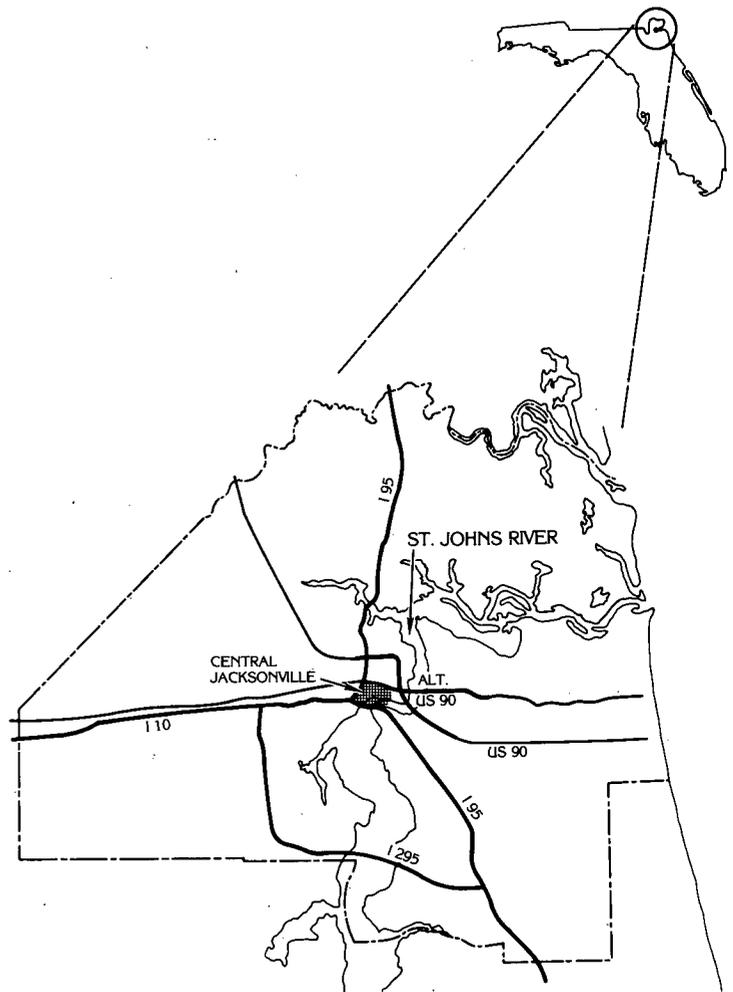


Figure C-9. Location of the Jacksonville, Fla., study area.

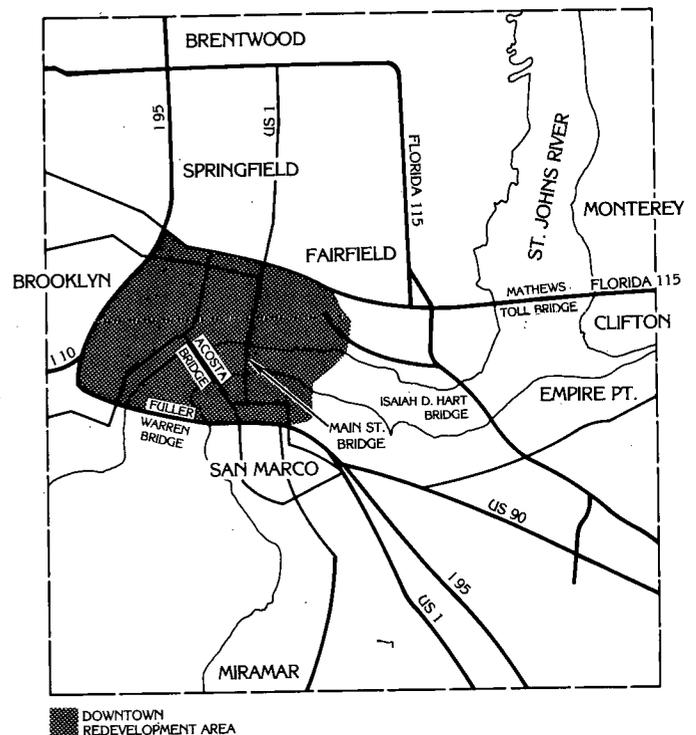
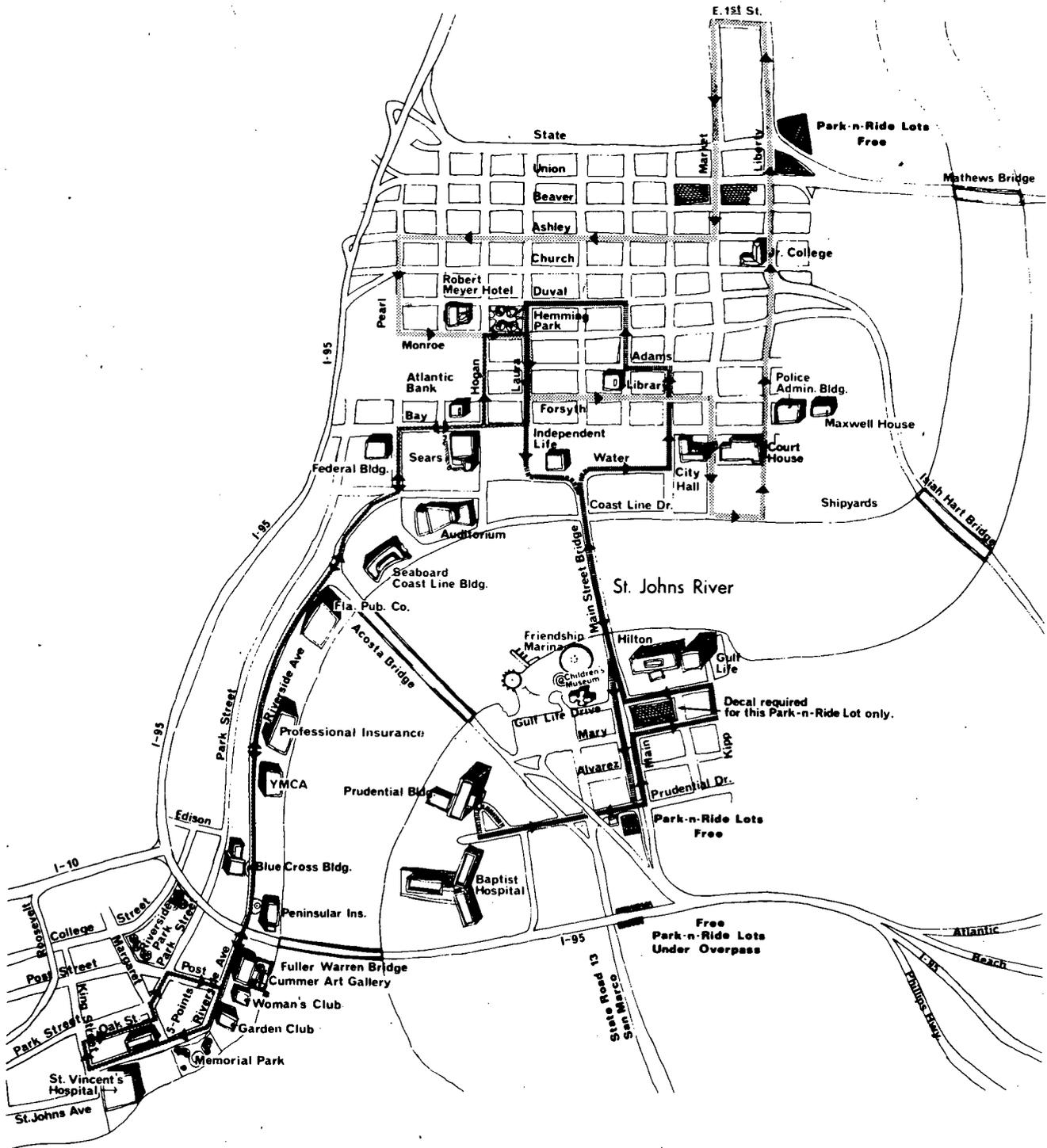


Figure C-10. Central Jacksonville.



- ~~~~~ RIVERSIDE SHUTTLE
- LIBERTY ST. SHUTTLE
- - - - - SOUTHSIDE SHUTTLE

Figure C-11. Location of Jacksonville park-and-ride lots and shuttle-bus routes.

before and immediately after World War II, have been paid for and can be traveled toll free.

The northernmost Mathews Bridge experiences a very strong one-directional flow of traffic that reverses between the morning and evening peaks. Treatment of this problem is made more difficult by the fact that it is heavily used by trucks that must travel very slowly over the steep incline of the roadway. If three of its four lanes are allocated to the direction of peak flow, congestion might occur in the counterflow direction. The feasibility of reverse lane and other preferential treatment is also being

investigated. Peak-period congestion is also experienced on the Fuller Warren Bridge, but in both directions and aggravated by the toll collection process. Toll facilities are currently being enlarged to alleviate some of the problem.

At present peak-period traffic problems normally last only for 20 to 30 minutes. Although short-term improvements are being directed toward immediate problems, a more important aspect of Jacksonville's congestion-reducing problems is focussed on long-term prevention of future critical conditions.

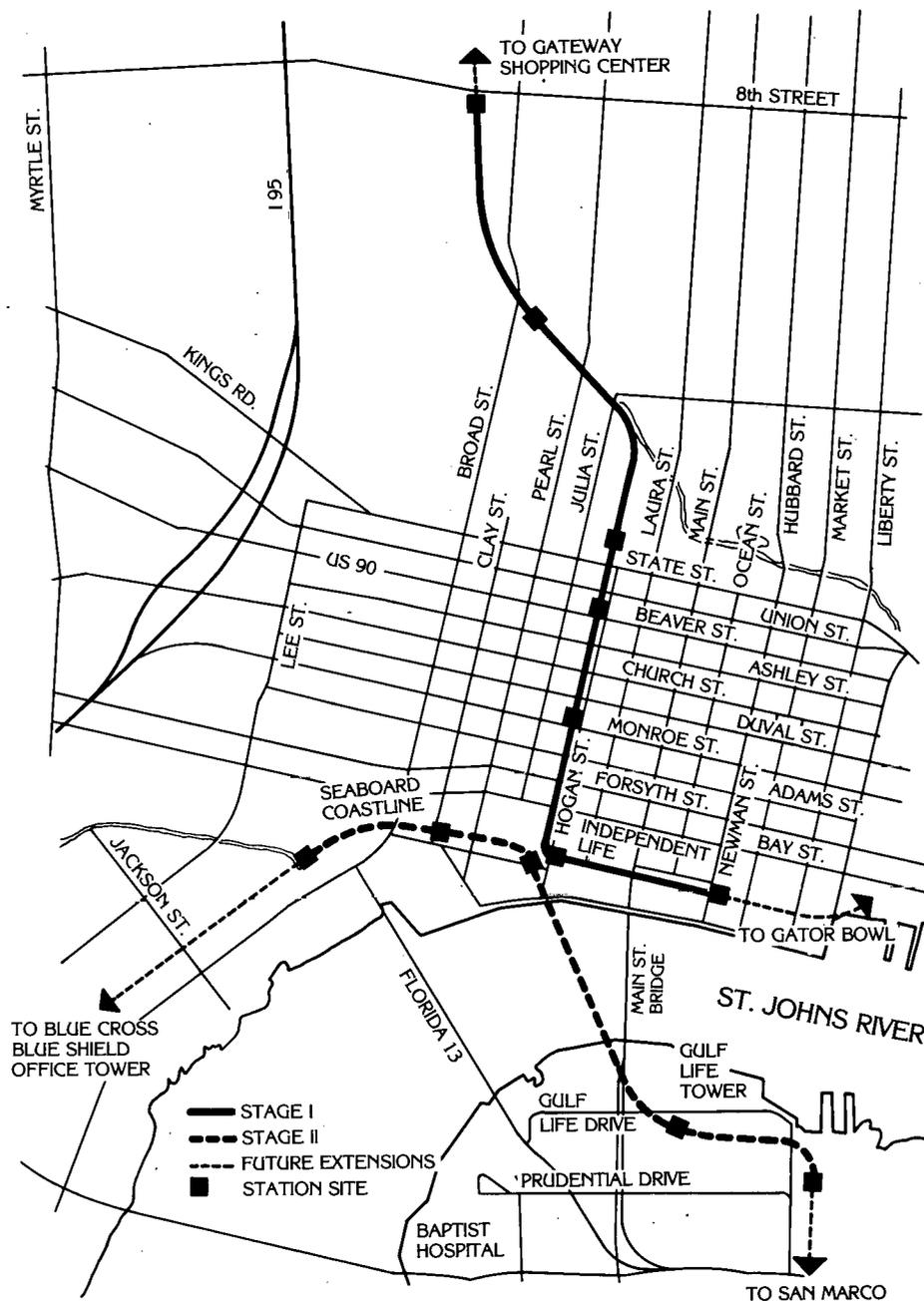


Figure C-12. Long-range plan: proposed Jacksonville downtown people-mover.

Institutional Structure

The government of consolidated Jacksonville operates under a charter passed by the State Legislature with a mayor-council form of government. The City Council, consisting of 14 members elected by district and 5 at large, passes ordinances, levies taxes, reviews and approves agency budgets, and appropriates funds. The Mayor, also elected, heads the executive branch and appoints most department heads, division chiefs, and members of independent agencies, commissions subject to council approval. The Mayor also proposes laws and ordinances and submits an annual budget to the Council. The Mayor has veto power, except as specified in the Charter, over actions of the Council, which may, in turn, override a veto.

Authority for transportation decisions and actions derives from the metropolitan planning organization (MPO), formerly known as the Transportation Policy Committee. The MPO sets goals and policies and is assisted in this by the Transportation Technical Coordinating Committee, made up primarily of technical planners and engineers of local operating agencies. Both these bodies have advisory members from federal and state transportation and urban planning agencies.

The Jacksonville Area Planning Board (JAPB), consisting of 9 members appointed by the Mayor and 2 ex-officio members, was formerly the MPO, until this function was shifted to the policy group in response to U.S. Department of Transportation requirements that MPOs be made up of elected officials. The JAPB and its staff now serve the MPO as technical and administrative support staff. It is primarily responsible for the preparation

of the annual budget and development of the work program and detailed work plans environmental impact studies and in accordance with the approved Unified Work Program as required to qualify under federal and state funding programs.

Transit services are provided by the Jacksonville Transportation Authority (JTA), which now owns and operates the bus system. This public agency, in turn, contracts with the Jacksonville Coach Company, who were the former private owners of the system, to carry out the day-to-day operations. This contractor is responsible for maintaining equipment, employing and supervising personnel, and meeting schedules and other operating standards designated by JTA. The Jacksonville Coach Company also negotiates union contracts with drivers and maintenance personnel, who technically remain employees of the private sector since Florida state law does not allow public employees the right to strike if dissatisfied with their situations.

JTA is also responsible for determining needs for major toll facilities including bridges and approaches, while the Public Works Department carries out detailed design, construction, and improvement of the local road system. State highways and bridges are, in fact, constructed by the local government and turned over, when completed, to the state DOT to maintain and operate (C-7).

JTA's enabling legislation includes a provision for the control of parking. At present, JTA's involvement is limited to providing free or low-cost park-and-ride lots, while other parking matters are handled by a city parking division within the Mayor's office. Figure C-13 shows the

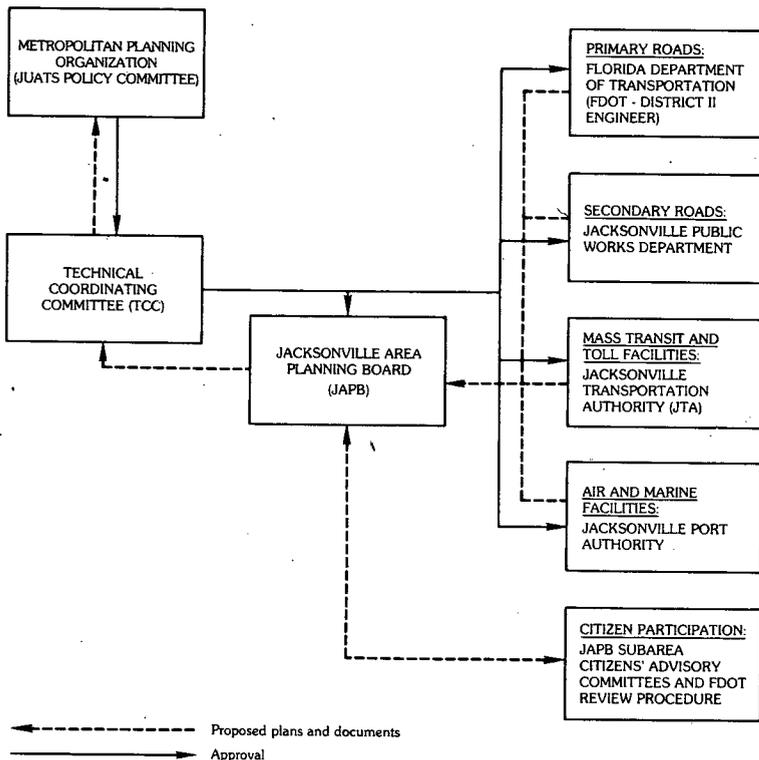


Figure C-13. Institutional framework for transportation planning and implementation in Jacksonville.

basic institutional framework for transportation planning and implementation in Jacksonville. The actual situation is somewhat more complex in that representatives of some of the agencies shown also serve other boards and committees and provide for more liaison and interdependence than can be indicated clearly in graphic form. In fact, it was informally estimated by one respondent, a member of several of these boards and committees, that Jacksonville's future development was essentially being directed by some 12 individuals serving in multiple roles within this institutional framework.

Institutional Problems

Institutional problems both pointed out by persons interviewed or observed by the project investigator involve all levels of government as well as nongovernment entities.

Problems related to federal government are as follows:

1. *Delays in obtaining federal-assistance funds.* Not only is the U.S. DOT grant processing time normally lengthy, but all processing apparently stops if any minor problem is encountered—such as one too few copies of a particular document—and does not reenter the routine until the missing piece is received.

2. *Unnecessary paper work to comply with labor regulations (13 C).* Recertification should be fast if nothing has changed, but the process is as long as the initial certification and requires a complete duplication of documentation as previously submitted and approved.

3. *No distinction is made between major and minor funding applications.* Relatively small requests for funds could be handled more efficiently at regional offices if the authority to approve these applications were transferred to these offices.

4. *Constantly shifting federal priorities.* UMTA, in particular, is subject to short-lived enthusiasm for one type of public transit solution, then another. Availability of funds for local assistance shifts from one approach to another more quickly than local transportation planners thoughtfully respond to. Systems designs for rapid rail must be exchanged for light rail; dial-a-ride experiments are encouraged and then discouraged. It is believed that each locality is best served by a combination of transit forms suited to its unique characteristics, but shifting funding policies encourage local government to emphasize whatever mode or technique is currently being federally supported rather than those that the community really needs.

5. *Discrepancies between stated funding policies and actual receptivity of the federal agency to applications.* One source suggested that within FHWA, the wider scope of transportation activities made eligible under the TSM program was not yet fully accepted by individual staff members processing grant applications. Funds were apparently more readily available for traditional approaches than innovative techniques, and approval of programs enlarged to include recent additions to the list of eligible activities was generally subject to much questioning and delays.

6. *HUD redevelopment funds for revitalizing the CBD involve so many delays and complications that some cities*

prefer to carry out renewal without federal assistance. By using only local sources of funding, cities find that they can avoid becoming involved with such HUD approaches to redevelopment as massive purchases of properties for clearance (and the inevitable few legal battles) and having valuable properties lie unused and off the tax roles until an acceptable developer has been found.

Problems related to state government are the following:

1. *Bonded indebtedness of bridges.* Construction of bridges in Florida is funded by the sale of bonds tightly supervised by the state government. Tolls are collected solely for the purpose of retiring the bonds, and each bridge is treated separately. Even local government vehicles, including police cars, are required to pay tolls. Using tolls as a method of road pricing to reduce peak-period congestion is not now possible in Jacksonville, because tolls cannot be manipulated under the terms of the bonds.

Problems related to local government are as follows:

1. *Parking prices in city-owned CBD lots are so low that they encourage drivers to bring their cars into the city.* Although parking fees in city-owned lots were recently doubled so as to promote the use of carpools or park-and-ride, they are still too low to achieve the desired impact. Further increases are being contemplated.

Problems related to nongovernment bodies include:

1. *Transit unions demand and receive wages that increase costs of transit service.* High wages, plus the unwillingness of unions to permit unoccupied drivers to do maintenance or other work, are common throughout the country. This is an area in which the need for reform is recognized nationwide.

2. *Dial-a-ride transit for the handicapped and elderly is too costly to operate except with nonunion drivers working at lower wage rates than unionized drivers.* JTA currently provides dial-a-ride services in four vans equipped with wheelchair lifts for the handicapped and elderly. The fare is \$1.00. This service has been operating only a short time, making use of nonunion drivers. JTA recognizes that it may not be possible to maintain the present service for two reasons. First, there is a private operator who is protesting that JTA's subsidized fare of \$1.00 represents unfair competition to his similar profit-making operation. Second, sooner or later the transit union will protest the use of nonunionized drivers, or the dial-a-ride drivers will demand wage rates equal to that of other JTA drivers.

Institutional Strategies

Two features of the Jacksonville institutional framework for transportation planning and implementation present examples of successful approaches to organizing and carrying out these functions: consolidated government, and close coordination of land use and transportation planning and development. Under the consolidated government the resources of the total urban-suburban complex are combined, and negotiations among several independent local governments are eliminated. Many cities throughout the country are in serious financial difficulty because

upper and middle income families have moved to suburbs beyond the city limits and low-income families have moved into the city. Suburban residents continue to use the city's transportation resources but contribute no tax support, while city residents need increasing amounts of subsidized transportation services. Federal assistance for urban transportation has worked toward the solution of this problem by encouraging the development of transit districts that extend beyond city limits and regionwide and areawide transportation planning. However, the local agencies who are ultimately responsible for implementing transportation improvements are still largely restricted in their area of authority by the old city boundaries. Conflicts between these jurisdictions as to the specific improvements that should be made and the allocation of available resources are often so intense that they delay implementation for several years.

Consolidation does not eliminate all parochial interests, especially where, as in Jacksonville, 14 of the 19 members of the City Council are elected by district. It does, however, provide a single forum for discussion and negotiation among representatives who work together and align themselves in different groups when other issues are under consideration. Also, each of these representatives has the authority to accept or reject proposals concerning his district without having to refer the matter back to another independent executive body. Unless some exceptionally strong personality conflicts within the Council are involved, decisions can be made and actions taken more easily and efficiently within the framework of a consolidated city-county government than between a number of smaller independent political units.

Jacksonville also presents an example of coordinated planning and development of transportation and land use. The local redevelopment authority, regional planning agency, and transportation authority are all represented on each others' boards. Executives of these agencies know each other, work well together, and contribute to each others' awareness of potential problems and opportunities.

Close coordination was particularly noted in the CBD redevelopment area where the people-mover, shuttle bus system, park-and-ride lots, downtown parking, the loop road system, elevated walkways, and use of interior streets are planned to promote the optimum pedestrian environment and easy access to facilities within the CBD.

When proposals for new residential or industrial development in outlying areas are presented, consideration is given to the travel demands such development would generate and transportation officials have the opportunity to influence the decision. They also have early intelligence of future developments so that long-range transportation plans can be modified to accommodate the new travel demands and they are prepared to provide the necessary facilities and services.

Two possible strategies of specific application to Jacksonville are also suggested here. With regard to the state restrictions on eliminating or reducing bridge tolls to promote ridesharing and transit commuting during peak periods, it is suggested that all five bridges be combined into a single "bridge district," and toll all at the same rates.

This would permit sufficient revenue to be collected to reduce tolls for carpools and buses (even police cars must pay now) and for off-peak users. It would also allow the collection of tolls in only one direction, since it would not be possible for drivers to cross in the free direction and return via an untolled bridge.

In making use of parking rates and restrictions to discourage commuters from driving to work in the CBD, it is suggested that JTA act on its existing authority to regulate both on-street and off-street parking currently under public ownership. A next step might be to explore the possibilities of limiting parking space in privately owned CBD structures through building codes and of a tax system whereby all-day use of privately owned parking lots would be discouraged.

CASE STUDY 4: SEATTLE, WASHINGTON

The City and the Region (Field work was undertaken in 1976. Statistics are believed to be correct as of that year.)

Located on the eastern shore of Puget Sound, the world's largest inland saltwater harbor, the city of Seattle is the major urban center in the Pacific Northwest. Seattle ranks as the 25th largest city in the nation with a population of 503,000, and the Seattle-Everett Metropolitan area, which extends to the boundaries of King County, contains over 1.5 million people.

The Central Puget Sound Region in which Seattle is located is a complex of mountains, inlands, and waterways connected through the Strait of San Juan de Fuca to the Pacific Ocean (see Fig. C-14). The city, itself, lies along a steep, narrow hill between Puget Sound and Lake Washington, and the ship canal which joins these two bodies of water north of the CBD and the Duwamish River at the city's south extremity make downtown Seattle virtually an island. Two floating bridges connect the city to the suburban areas across Lake Washington, while ferries provide access to communities across Puget Sound.

Seattle's location on Puget Sound between two mountain ranges results in a generally moderate temperature but frequent rainfall, especially during the winter months.

Highway and rail systems run predominantly in a north-south direction, and the city is developed along the same axis. The CBD parallels the waterfront, but is separated from it physically by steep grades that discourage easy circulation.

The deterioration of property along the waterfront led to a determined urban renewal effort, centered around Pioneer Square, the original site of turn-of-the-century downtown Seattle. Many of the older structures have been rehabilitated and are now occupied with shops, restaurants, and offices.

To the north of the CBD is Seattle Center, the site of the 1962 World's Fair. Many of the facilities are now being used for cultural and sports events, and the area has become an established part of urban activities. The center is connected to the CBD by a prototype monorail system constructed at the time of the World's Fair.

Seattle's largest single employer continues to be the Boeing Company, a major aerospace and commercial aircraft manufacturer. Serious local unemployment occurred

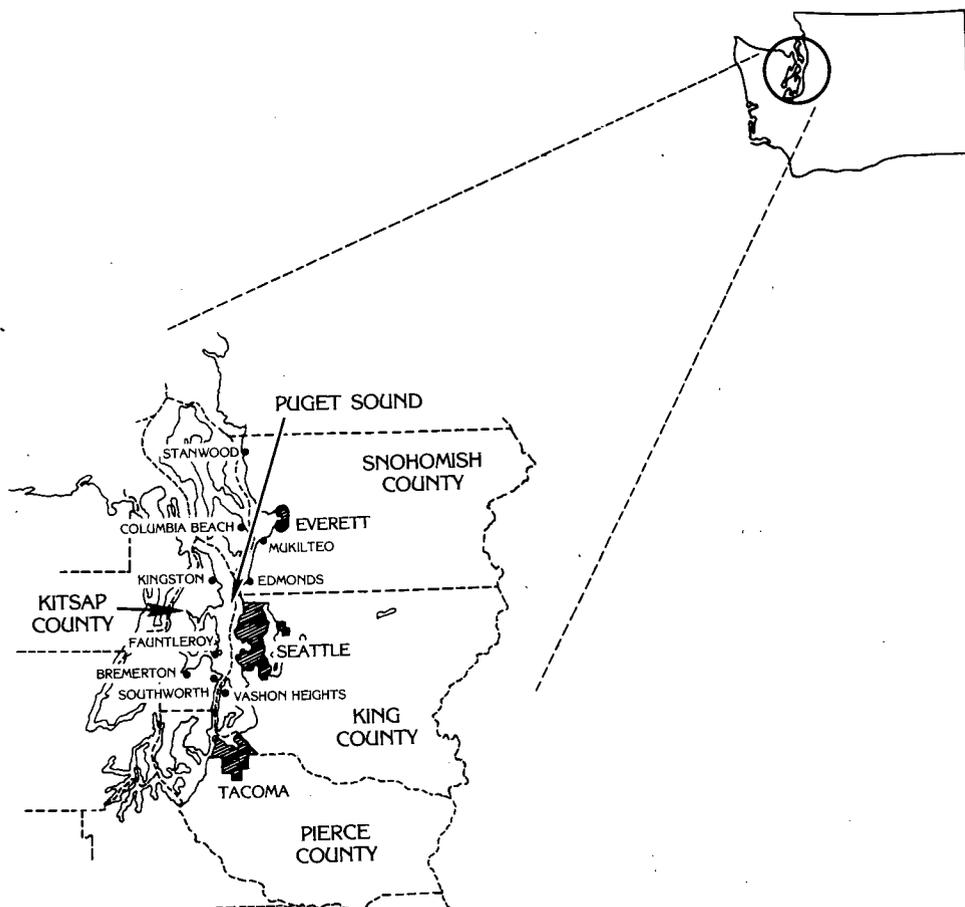


Figure C-14. Seattle and Central Puget Sound Region.

between 1969 and 1971 with the aerospace depression, and since that time the company has been diversifying its production with electronics, rapid transit, and hydrofoil craft. Trade, services, and government account for over 50 percent of current employment, however. Tourism is an important element in this. So also are foreign trade and the increasing business activity with Alaska.

Current Urban Transportation System

Daily vehicle-miles of travel in the Central Puget Sound Region was estimated in 1970 at 22.5 million, of which 820,000 miles were with transit. Only 2.6 percent of all passenger trips and 6.0 percent of all work trips were made by transit. Although transit ridership has shown increases since the 1970 study, travel in the Seattle area continues to be heavily automobile oriented.

Seattle is served by a well-developed system of freeways, as shown in Figure C-15. Interstate 5 is the major north-south arterial route passing through the downtown area. Interstate 405 is the bypass route, located on the east side of Lake Washington. The principal east-west freeway, Interstate 90, crosses the Lake Washington Floating Bridge, while State Highway 520 crosses to the north over the Evergreen Point Toll Bridge.

Peak-period congestion along the north-south routes is not severe, in part because of a system of express lanes that alternate direction to accommodate morning and

evening heavy use. Congestion is more critical along east-west routes where traffic is confined to one of the two bridges.

Transit service is provided throughout Seattle and King County by Metro Transit, a publicly owned system supported by a special sales tax levied throughout the area. Within the CBD "Magic Carpet" service is offered at no fare. A two-zone fare system is applied to rides outside the CBD, the boundary between the zones being the city limits. A \$0.30 fare is charged for travel within one zone plus a \$0.20 additional fare for rides crossing into the other zone. A number of incentive fare programs are offered, including reduced cost passes for senior citizens and students. Metro also provides an express bus service, the "Blue Streak," that brings passengers from outlying areas into the city center. Park-and-ride lots supplement this express service. Total revenue passengers for February 1977 on the Metro System was 3.3 million.

Over ten million one-way passenger trips are made annually between Seattle and communities across Puget Sound on ferries operated by the Washington State Department of Transportation, Marine Division. Over one-third of these trips are made by drivers of private automobiles crossing with their vehicles. The remaining two-thirds are predominantly passengers of these private automobiles accompanying the drivers. About 70 percent of passenger trips are made between Seattle Pier 52, im-

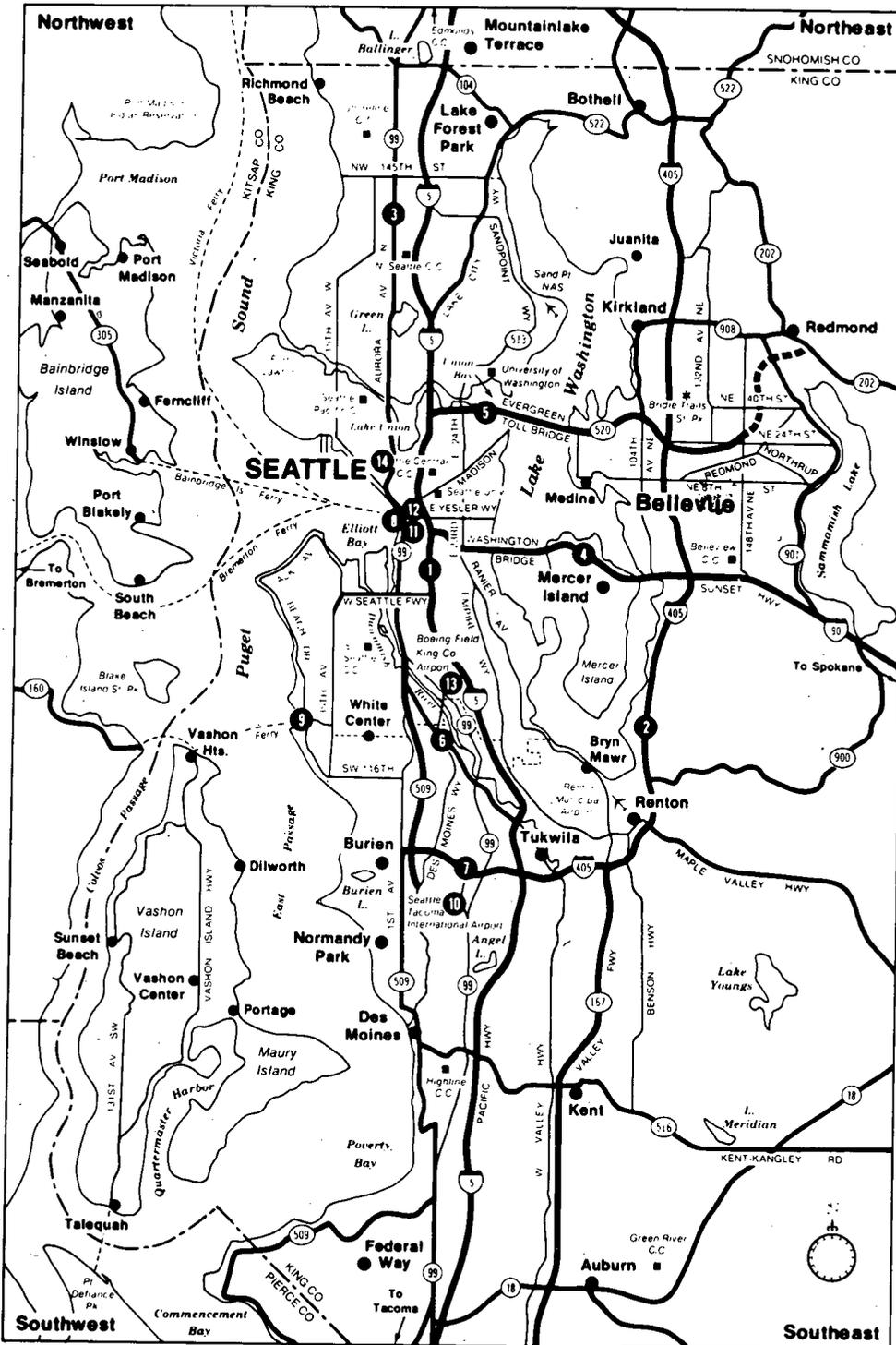


Figure C-15. Major highways serving Seattle.

mediately adjacent to the CBD, and Bremerton and Bainbridge Island in Kitsap County. Travelers between Vashon Island and Seattle, however, arrive and depart from Fauntleroy, a smaller facility located at the south edge of the city near the Seattle-Tacoma Airport and a major industrial area that includes Boeing facilities (see Fig. C-15).

Metro Transit provides connecting bus service to both Seattle ferry terminals and also offers commuter service

on Vashon Island—a part of King County—on buses that make the ferry trip with their passengers and continue service on the other side. Connections to the Bremerton Ferry Terminal are provided by a local, city-owned system.

Transportation Plans

The future development of transportation in the Central Puget Sound Region is outlined in three basic documents: the 1990 *Transportation System Plan for the Central Puget*

Sound Region (C-8), the Transportation Improvement Program for the Urbanized Area of the Central Puget Sound Region (C-9), and the Transportation System Management in the Central Puget Sound Region, 1976 (C-10). Essentially, these plans emphasize improvements to mass transit by means of a regionwide system of exclusive bus lanes, express routes, and park-and-ride lots. Primarily mass transit is relied upon rather than new highway construction to accommodate increasing travel demands. No new rapid rail or light rail systems are included in the current plans. They look to low-cost strategies, such as ridesharing, with carpool use of exclusive lanes in high demand corridors, staggered work hours and parking management to reduce traffic congestion, and to improvements in pedestrian and bikeway facilities.

Among the specific transportation improvement programs, the following are of special interest to this study of institutional problems of cooperative projects involving more than one agency or private organization.

Integration of Ferry and Bus Service

The 1990 Transportation System Plan (C-8) proposes the implementation of integrated passenger-only ferry service and bus transit to accommodate some of the future cross-Sound travel demand. Anticipated benefits include a reduction in the number of vehicles entering congested areas on either side of the Sound, and reduced requirements for parking and circulation facilities at ferry terminals.

Some ferry-transit coordination, although not well developed, does exist. In Seattle, two Metro Transit routes directly serve the Pier 52 terminal and provide shuttle service to other routes; however, most ferry commuters appear to find it more convenient to walk the one or two blocks to stops along these other routes rather than use the shuttle service. On the other side, in Snohomish County, all Bremerton Municipal Transit routes are within walking distance of the ferry terminal, and Metro's Vashon Island service takes passengers directly onto the ferries.

Local transportation planners do not believe that the availability of parking at terminals acts as a critical deterrent to walk-on ferry commuting, but that should this mode show a marked increase, existing parking facilities would have to be improved and supplemented. Routes with the greatest walk-on commuter traffic are Winslow-Seattle, Seattle-Bremerton, and Vashon-Fauntleroy. Generally, commuter parking demand is on the Kitsap side of the system. An exception to this is the Seattle-Bremerton route where the majority of the walk-on traffic is bound for employment locations on the Kitsap side. However, at some terminals, such as Vashon, the parking lot is not conveniently located, and there is no covered walkway to the ferry, and these conditions do reduce the acceptability of commuter parking lots.

The major problem in the coordination of transit and ferries has been changes in route timetable. The ferry system changes its timetable four times a year, and the transit companies change theirs less frequently. Metro, for example, changes its schedules three times a year at 4-month intervals. Transit and ferry route headways often do not

correspond. An analysis of origins and destinations of present auto-ferry commuters was carried out using morning ferry arrival on the Seattle side and evening arrival on the Kitsap County side. Applying a standard of a 30-minute commuting time, it was found that a large portion of these trips would exceed this standard under existing routes and schedules but could be brought within a 30-minute travel time by coordinating bus and ferry services.

Two studies are underway. One will determine the short- and long-range capital improvement needs for several alternative policy objectives with respect to fares, vehicle needs, and vessel and terminal improvements. The second study will review communications between the ferry system and the users, identifying deficiencies in the existing passenger information systems and recommending actions to improve public information.

Parking Management

Seattle has established three "special review districts" whose regulations include special parking restrictions. In addition, a resolution has recently been adopted for the downtown area, which includes the following policies:

1. The total number of parking spaces in the downtown shall remain approximately the same as the existing spaces as of June 1975.
2. The type of parking provided shall tend to be short term rather than long term.
3. Alternatives such as transit and carpool use shall be promoted, including using the incentives of outlying park-and-ride lots and peripheral carpool parking spaces (C-10).

The Seattle-Northgate lot proposed in the regional plan has been completed and provides parking for users of the "Blue Streak" express service to downtown Seattle. Metro has also formed agreements that allow temporary joint use for park-and-ride patrons at some 15 urban and suburban parking areas in King County. In addition, a number of other lots and parking areas are informally used by Metro park-and-ride patrons.

Under the sponsorship of the Commuter Pool program, six free or reduced rate parking lots have been made available to carpool vehicles and certain on-street parking spaces are reserved for carpool use in the downtown area. Metro Transit and Commuter Pool are studying the joint use of park-and-ride lots with an experiment at four such facilities. The Washington State Highway Department also provides parking for carpools at four lots adjacent to freeways and is developing additional sites. King County is currently studying the feasibility of using county or utility-owned land for "park-and-pool" facilities at ten more locations.

In addition to the park-and-ride and carpool parking programs, Seattle's parking management strategy includes several other elements. One is a proposed 20 to 25 percent business and occupation tax on long-term (over 6 hours) offstreet parking in the downtown area. This strategy, already in use in Pittsburgh, would be an implementation of the city's policy to discourage commuter parking in favor of short-term shopper parking. Also proposed are amendments to the off-street parking regulations of the zoning ordinance for downtown Seattle, which would prohibit new

principal-use parking and open-lot parking in the CBD core, while principal-use parking would become a conditional use in the remainder of the downtown. New accessory parking would be limited to a maximum number of spaces. The proposal would generally tend to restrict further expansion of nonresidential parking, particularly in the CBD core, and would encourage conversion of long-term parking to short-term use in high-demand areas. Seattle also has full and rush-hour restrictions on curb parking along major arterials and, in some cases, minor arterials. Choice parking spaces have been designated in many private lots and garages, as well as in many public parking areas, for the exclusive use of the handicapped.

Promotion of Ridesharing

Under the joint sponsorship of the City of Seattle, King County, the Municipality of Metropolitan Seattle (Metro), and the Washington State Department of Transportation, the Commuter Pool program was initiated in 1974. Operating out of the city's Traffic Engineering Agency, Commuter Pool offers free computerized ride-matching service to the public at large; assists individual employers in developing vanpools; operates bus pools and coordinates bus pooling with Metro Transit; provides free and reduced rate parking for carpool vehicles at six lots; and carries out commuter surveys and studies relative to specific ridesharing problems, such as insurance and impacts of changes in bridge tolls.

In support of this program vehicles with three or more riders enjoy not only reduced parking fees and bridge tolls but also special access ramps to freeways and use of reserved lanes. As of the beginning of 1977, the Carpool Ridematching File included over 10,000 individuals, and a survey showed 9 percent of commuters in the area pooling (C-11).

Current plans call for additional ridesharing experiments, such as:

1. Use of taxis for both demand-responsive and fixed route (jitney) group riding. Legal restrictions on taxi operation in these modes have been eliminated by the County Council and are expected to be removed shortly by the Seattle City Council. The possibility of using taxis as transit feeders in low-density areas is also under consideration.
2. Subscription buses carrying regular commuters from Tacoma to Seattle, and "Earlybird" riders who have non-peak work hour schedules. Metro will undertake an experimental direct bus service to the First Hill hospital center (C-12).

Institutional Structure

Responsibility for transportation planning and implementation in the Seattle urban area is fragmented among 13 public institutions at state, regional, metropolitan, county, and city levels, as shown in Figure C-16.

State

As the operating agency of the State Transportation Commission, the Washington State Department of Transportation carries out the traditional functions of highway construction and maintenance in the Seattle area, consults

in planning for transportation development, and occasionally provides funding assistance for innovative transportation programs. In addition, through its Marine Division, it not only controls tolled bridges but also operates the State Ferry System. This system carries over six million passengers per year across Puget Sound, most of whom are commuters to downtown Seattle. The agency maintains terminal facilities, including parking lots, and operates its own shipyard.

Region

Operating as a voluntary association of the counties of King, Kitsap, Pierce, and Snohomish, and 43 cities and 4 Indian tribes within these four counties, the Puget Sound Council of Governments (PSCOG) functions as the metropolitan planning organization (MPO) in relation to the U.S. Department of Transportation. The Standing Committee on transportation responsible to the PSCOG Executive Board is assisted by a technical staff in the preparation of transportation planning documents and applications for federal-funding assistance.

Prior to the summer of 1975 the regional organization for this 4-county area, the Puget Sound Governmental Conference (PSGC), carried out centralized planning for the region. Its professional staff, while functioning officially as technical support to the agency's executive board, played a strong role in determining PSGC policy, plans, and programs. The agency had the reputation for consistency of direction and efficiency of operation and was viewed by many transportation authorities, especially contacts within federal- and state-assistance programs, as a model regional organization.

Under the surface, however, conflicts grew between member governments. PSGC offices were located in Seattle, and representatives from other areas believed that the interests of this city and King County were dominating regionwide decisions. The traditional rivalry of Seattle and Tacoma, in Pierce County, may have been a contributing factor. Another was the former State Highway Department's failure to develop a formula for allocating urban systems funds to cities of under 400,000 population, but left it to local initiative to propose uses for these funds. The organization became polarized with cities against counties, and in the summer of 1975 three county governments withdrew from the Conference. Since PSGC was no longer fully representative of the region, FHWA and UMTA put the agency on notice of decertification. It was not until July 1976 that an MPO satisfactory to all parties could be reorganized.

Under the new name of Puget Sound Council of Governments, the MPO was organized into four autonomous subregional councils consisting of the local governments within each of the counties. Each of the subregions was to provide its own staff support, and the central technical staff was reduced from 53 to 23. (Since 1976, however, the concern for subregional autonomy lessened and plans to create four separate countywide technical support staffs were abandoned in favor of augmenting the central PSCOG staff. By mid-1978 that staff had grown to 53, exactly the same size it had been under the former PSGC organization.)

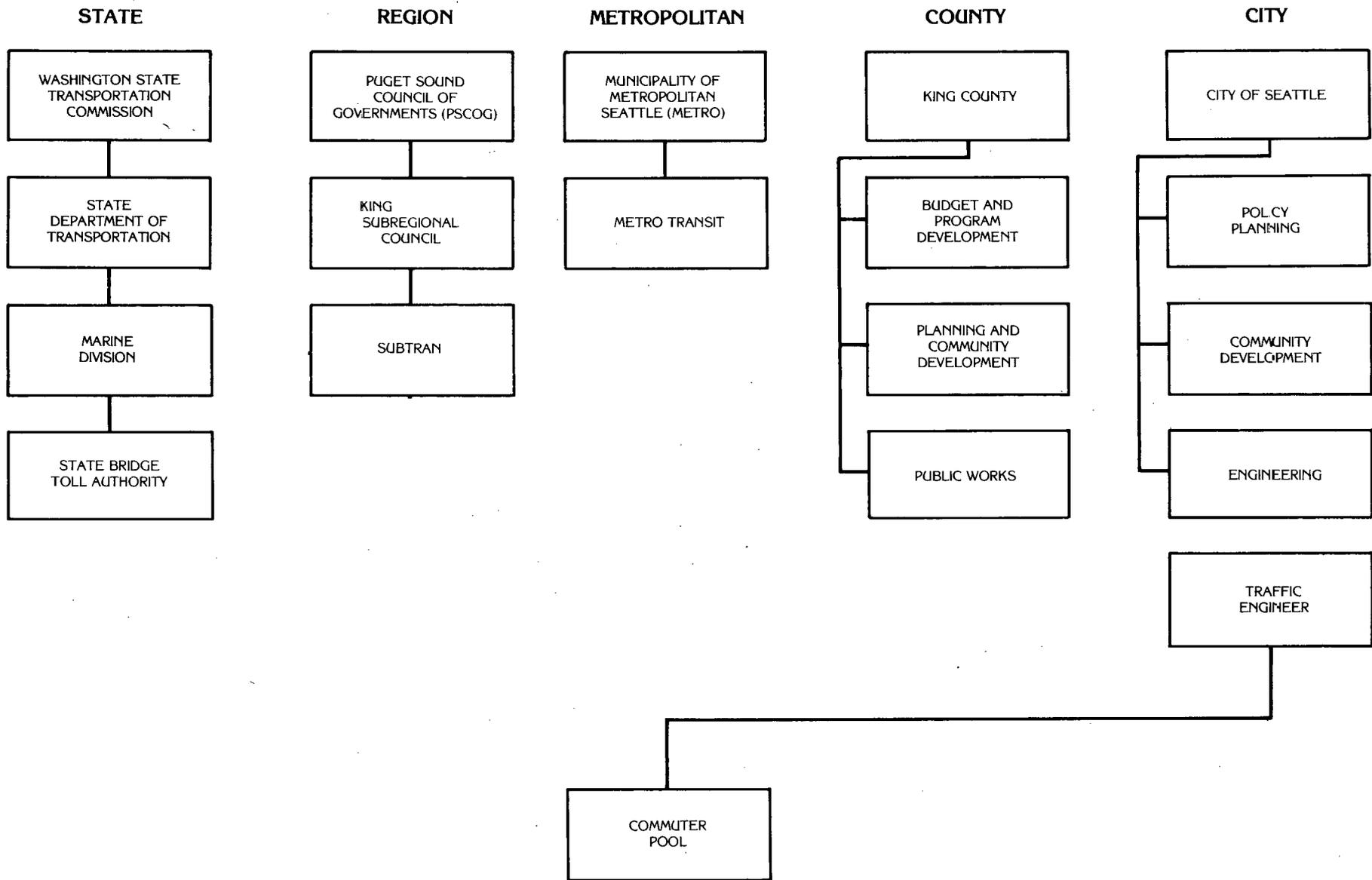


Figure C-16. Institutional framework for transportation planning and implementation in the Seattle area.

Metropolitan Area

Established in 1958 by the State Legislature as an independent unit of government, the Municipality of Metropolitan Seattle (Metro) had the initial responsibility for the planning and management of sewers and waste disposal throughout nearly all of King County. There was some thought at the time that the metropolitan government would subsequently take on additional responsibilities for services that could more effectively be administered on an areawide basis than by separate county and city governments.

In 1972 the city-owned Seattle Transit System and the privately owned Metropolitan Transit Corporation operating outside the city were merged and placed under Metro authority. A special sales tax of 0.3 percent levied throughout King County was approved by local voters to fund the transit operation. The system has been very successful, with ridership increasing 10 percent annually since the merger.

Metro Transit now employs a staff of nearly 400, in addition to 1,150 drivers. Advanced management techniques are applied to routing, scheduling, monitoring and evaluating, and other support activities. The public information system is excellent, and a citizen advisory group is consulted on proposed changes in operations. The system relies primarily on a fleet of 649 diesel buses, most of which have been acquired under Metro's management, with the assistance of UMTA capital grants. Passenger capacities of these buses range between 45 and 57, with the majority falling within 48 and 51. Thirty-four vehicles are suburban-type buses. No minibuses are used. There is, in addition, a trolley bus system that is currently out of operation pending facility improvements and the receipt of 109 new vehicles to replace old stock acquired in the 1930s. Metro also operates two trains on the monorail line constructed in 1962 to carry passengers from downtown Seattle to the site of the World's Fair.

Metro Transit is not free of problems, however. There is some conflict over priorities in service improvements between Seattle and other areas in the county. Residents of smaller towns and suburbs, occasionally using King County as their spokesman, would like to see their bus service equal in frequency and availability to that within the city on the grounds that it is a countywide system supported by a countywide sales tax. They believe that a disproportionate amount of tax revenues and proceeds from federal grants have been used to improve services in Seattle. The city, on the other hand, believes that resources should be allocated on the basis of intensity of transit use, on the grounds that the greater ridership in Seattle represents a greater demand for transit services.

Also, in meeting the difficult problem of creating a well-functioning system out of two impoverished, substandard operations, Metro has grown preoccupied, understandably, with the mechanics of providing bus mass transit, and is not taking the leading role one would have expected in developing alternative means of meeting the area's transportation needs. Innovations in parking controls, carpooling, subscription buses, dial-a-ride, and use of taxis as public transportation resources are being experimented with in Seattle. However, Commuter Pool is the primary agency, while Metro participates only in an advisory capacity. Ac-

ording to Metro sources, the barrier to their taking a major role in these other areas lies in their local source of funding—the special sales tax. Legal counsel believes that the voters approved the use of these funds for mass transit and that Metro may not take on the primary responsibility for other activities, although it may participate in an advisory role.

Serving a geographical area identical to Metro's, but not part of that organization, the Seattle/King County Commuter Pool was developed as a program under the instigation of the City Traffic Engineer in response to the 1974 energy crisis. The program is jointly sponsored by the City of Seattle, King County, Metro, and the State Highway Department and is supported primarily by federal-aid urban funds to local governments within the area.

Commuter Pool directed its first efforts toward promoting carpooling. It designed its own computerized rider-matching system and made it available free of charge to individuals throughout the area. Its activities extended into the areas of ridesharing incentive, and it has successfully negotiated with state and local government for reduced tolls, preferential freeway access, use of exclusive bus lanes, and free and subsidized parking.

At present, it is also involved in promoting employer-sponsored vanpooling—group use of taxis both in demand-responsive and jitney mode; and subscription buses, including a vanpool program at the University of Washington funded under demonstration grant from the Washington State Legislature. In effect, this organization has taken on the entire spectrum of paratransit development, which involves any group use of vehicles other than fixed-route mass transit.

County

Transportation planning and implementation for all areas outside of incorporated cities within King County involve three agencies—the departments of Public Works, Planning and Community Development, and Budget and Program Development. Public Works is responsible for the construction and maintenance of the county road system. Planning and Community Development coordinates land-use planning with road improvements and contributes to the identification of existing and projected transportation needs, within the 9 districts. Budget and Program Development integrates transportation projects with the total county capital expenditures program.

City

The allocation of transportation responsibilities within the city government parallels that of King County. The three agencies involved are the Department of Engineering, the Department of Community Development, and the Office of Policy Planning. The City Traffic Engineer carries responsibility for detailed planning and implementation of parking policies and street improvements within the city limits. Community Development uses citizen input to identify needs for transportation improvements within its neighborhood plans and incorporates these within an over-all development program for each area. The Office of Policy Planning provides coordination of the City Council's over-

all development goals and policies and proposed transportation improvements.

Institutional Problems

Seattle presents examples of several important institutional problems involving policies at the federal and state levels, rationalizing conflicting interests at the regional level, allocating transportation responsibilities at the local level, and obtaining essential cooperation from some non-government institutions.

Problems Related to Federal Government

Seattle and the Puget Sound Region have enjoyed a long and largely happy relationship with the U.S. Department of Transportation. The area has been an UMTA showcase for innovation in bus transit since the first demonstration of the "Blue Streak" express bus service in 1970. Communications between federal and local agencies also benefited by the fact that the Director of Transportation Planning of the former PSGC had previously worked for UMTA-D.C. Problems of decertification at the time of the breakdown of PSGC have been solved by the reorganization of the regional body. None of the persons interviewed had any serious criticism of the mechanics of grant processing within UMTA or FHWA; and, probably, because of their long experience with coordinated regionwide planning, local transportation agencies indicated no particular problems in understanding and responding to the requirements for long-range, TSM and TIP documentation.

One comment was made, however, concerning UMTA policy with regard to the Seattle area that merits mentioning. UMTA staff apparently values Seattle's success as a prototype bus community to the extent that it discourages local interests in other transit options, such as rapid rail and commuter rail. Local planners are given to understand that generous capital grants will be made for improvements to the existing bus system if they put aside, at least for the present, their consideration of rail alternatives, because UMTA would like to preserve and improve its best example of bus transit within a larger urban area.

In response to this understanding, the region's current long-range transportation plans omit any reference to future rail transit in Seattle, but the hopes for its eventual development are still very strong among certain key transportation policy makers. These local representatives see UMTA allow other cities, such as Los Angeles, to continue to consider the option of rail transit, but appear to be withholding that option from Seattle.

Another important factor in federal-local relationships in the Puget Sound Region should be mentioned that is not confined to this particular locality. There appears to be a move throughout the state toward greater local self-determination with regard to land-use and transportation planning. The shift of the A-95 clearinghouse function from the regional to the county level has been widely discussed and has the support of the state's Planning and Community Affairs Agency. The state DOT deals directly with county and city authorities, rather than through the regional body. Even within the City of Seattle, both land use and transportation planning is subdivided into discrete neighborhoods and corridors.

As the geographical area shrinks, however, the scope of planning and development grows. Land use, housing, public facilities, roads, parking, transit, and pedestrian movement are all considered within an integrated planning process. Citizen input is an important part of the planning process. Recent federal experiments with Integrated Grant Administration (IGA) are being observed, and many local agency representatives would like to see an even stronger federal policy shift to block-type grants within which the community would be more free to select development activities to fit its particular circumstances and to implement them within an integrated program.

Problems Related to State Government

Washington has always been strongly oriented to automobile travel, and it was not until September 1977 that the State Highway Commission and Department were reorganized to provide for over-all transportation responsibilities. The institutional structure of the new Transportation Commission is very similar to that of the former Highway Commission; there are now 7 members, appointed by the Governor as before, and the Commission rather than the Governor continues to select the Department's Secretary. However, the Department now includes a Division of Planning and Public Transportation, as well as Marine and Aeronautics Divisions.

Under the provisions of the 18th Amendment of the State Constitution, revenues from state gasoline taxes are still designated exclusively for road purposes. No state funds have yet been allocated for transit development, but have recently been made available for transit feasibility studies and planning. In the past, however, \$1.8 million in gasoline tax revenues were given to Metro to assist in the construction of park-and-ride lots and express bus stops, while other amounts have been used to develop reserved freeway lanes for high-occupancy vehicles on the basis of benefits of these measures in improving driving conditions.

The first task of the Transportation Commission, to draw up a statewide transportation policy, has been carried out; when this policy has been approved by the State Legislature, work will begin on the development of a statewide transportation plan. This plan will cover all modes of transportation and incorporate the plans of local governments. To this end, state funds have been allocated to assist local governments in carrying out transit feasibility studies and subsequently plans for transit development.

The problem remains, however, that no state funds are available on a regular basis for subsidizing the operation or improvement of transit, and local governments must rely on alternatives, such as the special sales tax that supports Metro Transit. Within the Seattle area, cooperation between state highway representatives and local government has been good. On the Evergreen Point Bridge, tolls were reduced and a bypass on-ramp was provided for carpool vehicles. The state has provided 4 carpool parking lots, and freeway lanes are reserved for buses and carpool vehicles.

On the other hand, the need to coordinate ferry and bus schedules and promote bus-ferry in place of auto-ferry

commuting was first discussed over 5 years ago, but little progress has been made. New negotiations between Metro and the State Ferry System are now being initiated with the primary purpose of agreeing to revise schedules at the same intervals. The State Ferry System currently does this four times a year and Metro only three, and careful scheduling of buses to meet ferry arrivals and departures is destroyed by the uncoordinated timing of revisions. The State Ferry System is now planning to adopt a system of individual route cards in place of a complete schedule so that seasonal changes that are necessary on some routes can be made without involving routes that remain fairly constant throughout the year.

The State Ferry System is also considering the operation of its own buses to provide access at both ends of the boat trip, and looking into joint ticketing for bus-ferry commuters, initially with privately owned transit services and subsequently with public services, such as Metro.

Problems Related to the Regional Organization

In 1972, the field investigator visited Seattle in the course of a study of transit integration and interviewed several representatives of the regional, metropolitan, and city agencies at the time when the city-owned and privately operated transit systems in Seattle and King County were being merged and placed under the authority of Metro. At that time the regional planning body, Puget Sound Governmental Conference, was an important instrument in promoting this change, with its professional staff playing a very strong role. The transit group in Metro was politically skilled, imaginative, and eager to undertake new activities. An exceptionally competent and impressive citizens' advisory group made important contributions to the design of the proposed transit service and to the formation of long-range transportation goals. There was excellent rapport between PSGC, Metro, the citizens' group, and the consulting firm drawing up the detailed plans, as well as the City of Seattle and King County.

By 1977 this admirable cooperative atmosphere had seriously degenerated, and evidence of mutual ill-will became apparent with each successive interview.

At the regional level, the counties are generally aligned against the cities, but there are additional conflicts between individual counties or cities: King County considers itself progressive and values planning, while Pierce County is antiplanning; the cities of Seattle and Tacoma are traditional rivals; and smaller cities within King County itself often see a threat to their particular concerns in what they believe to be Seattle's greater influence over regional decisions.

The 1975 joint FHWA/UMTA planning regulations increased the role of the MPO (at this time PSGC) and reduced local independence in transportation action. The subregional form of the new PSCOG is a response to these attitudes.

The major problem associated with the decentralized regional organization is that it is much less efficient. Policy decisions, proposed action programs, and applications for federal assistance must work their way slowly through a series of subregional and regionwide approvals, which require so many meetings of so many bodies that

delay cannot be avoided because of scheduling problems. One person interviewed observed that he could hardly criticize federal expediting of grant approval when the approval process at the regional level takes an average of three months to complete.

Another problem is that the smaller subregions do not have the resources to carry out transportation planning and programming at the high professional level of the larger units of government or of the former regional organization. This situation may change, however, now the point of local independence has been won. The subregions may find it more effective and economical to reallocate certain research and planning responsibilities one-by-one, back to the centralized body. It would be interesting to follow the course of this institution to see if the decentralization process is maintained or if it slowly returns to a situation very similar to that which existed prior to 1975.

Problems Related to Countywide Authorities

The two countywide authorities involved in transportation are Metro and Commuter Pool, and they present radically different institutional postures at the present time.

Metro Transit is currently very much occupied in the day-to-day chores of running a bus service. It is a model transit system by many counts: reliable, frequent, and well-dispersed services; clean, comfortable buses; courteous, friendly drivers; a wide range of incentive programs from park-and-ride lots to reduced fares; a first-rate public information system; and highly sophisticated management techniques. However, the agency has not evidenced any interest in expanding its role in urban transportation beyond the operation of a fixed-route service. It has not experimented with demand-responsive feeder systems or other forms of paratransit, nor has it actively pursued the integration of cross-Sound commuter transit.

The creation of Commuter Pool and that agency's subsequent involvement not only with carpooling but also with vanpooling, subscription bus services, parking, and use of taxis for public transit is evidence of community interest in a broader spectrum of urban transportation options. It also suggests that the several local governments are not opposed in principle to the consolidation of areawide responsibility for these diverse transportation functions within a single public authority.

Metro already existed as an areawide public body with an important urban transportation function. If it had looked beyond its present task of operating the bus service and assumed responsibility for developing the area's over-all transportation system, the further dispersion of transportation authority to a new public body, Commuter Pool, might have been avoided.

Metro currently perceives its role in urban transportation as restricted to operation of the countywide fixed-route bus services by the concept under which Metro Transit was originally created and funded by the special sales tax. Institutional barriers to assuming broader transportation responsibilities may not be as fixed as Metro believes. The agency is apparently not absolutely prohibited from such activities, inasmuch as it functions in an advisory capacity to Commuter Pool and is designated as one of that body's

four sponsors. Also, the Commuter Pool program is funded through federal assistance sought out by the City Traffic Engineer, as Metro might have done.

Metro's reluctance to take a more active role in finding solutions to the over-all transportation problems of the Seattle commuting area may be one of the reasons that Washington State Ferries is currently thinking in terms of integrated ferry-bus services that would not involve Metro. These thoughts include "getting into the bus business" to make more efficient use of vehicle accommodations on their ferries, and joint-fare arrangements with privately owned bus companies, none of which are large enough to have the impact on travel patterns that could be realized under Metro cooperation.

Certainly, Metro's stance has resulted in the creation of another joint Seattle/King County institution, the Commuter Pool, which is moving rapidly from its initial objective of promoting carpools into other modes of paratransit incentives for group riding, such as reduced tolls (a form of road pricing), preferential access to freeways, use of exclusive lanes, and free and reduced-fee parking, and even into the area of changing traditional work hours through staggered- and flexible-hour days and shortened (4/40) weeks. It can be argued that these activities and bus operations could be coordinated most effectively by a single metropolitan transportation agency.

Problems at City and County Levels

The institutional problems brought up by respondents almost exclusively concerned working relationships between local governments, which have been previously described. A benefit of strong intergovernmental rivalry, apparently, is to reduce the potential for serious conflicts of interest between divisions of the same government. People generally described their coagencies as cooperative and supportive.

Only two minor intragovernment problems were mentioned, and these are probably common within any organization—public or private. The first involved budget negotiations with the executive body and its failure to appreciate fully the difficulties of achieving immediate, demonstrable results within complex, long-term programs. The second was the existence of some conflict on policy matters between individuals of different professional backgrounds.

It is also interesting to the study of institutional cooperation that it is the policy-making level that is strongly involved in interagency conflicts. Personnel in other technical and professional roles apparently do not adopt the policy-makers attitudes and continue to maintain easy working relations with their counterparts in rival agencies. This can also be observed in other communities, but is particularly apparent in Seattle in the aftermath of the reorganization of the regional planning authority where many of that agency's former staff have been absorbed in city and county transportation agencies, and in the not uncommon shifts of individuals between city and county.

Problems with Nongovernment Institutions

Four particular institutional barriers to implementing

congestion-reduction packages in Seattle are also common to many urban areas: negotiations with transportation unions, insurance rates for vanpool operations; private ownership of downtown parking facilities; and maintaining genuine citizen input to the transportation planning process.

The major barrier to the integration of ferry and bus transit services is the necessity to negotiate with the labor unions involved in these operations. The State Ferry System alone employs members of 14 unions and a special assistant for labor relations. Any changes in routes and schedules must meet the approval of these labor organizations.

Insurance is still the major barrier to the implementation of "public" or third-party vanpool programs. Commuter Pool, which provides vans for multiemployer services found insurance companies unwilling to issue vanpool insurance, particularly because the liability of a public agency was involved. The reason given was that the loss rate on this innovative mode of transportation was not yet known. Commuter Pool is currently investigating a self-insurance concept.

In downtown Seattle a large portion of off-street parking is under private ownership and nearly all of these facilities are owned by one entrepreneur. Any attempt to manipulate parking costs through taxes penalizing long-term parkers could be expected to be resisted by this entrepreneur, according to local observers.

It has always been difficult to maintain representative and effective citizen advisory groups for urban programs, although it is essential that such input be available to assist in shaping a program acceptable to the public. Since there are no established methods of creating citizen advisory groups, individuals with strong personal interests, often with above-average means and education, usually make up the majority of members. Metro Transit's advisory group, for example, is appointed by the elected officials of Seattle and King County. They are appointed as individuals rather than as representatives of organized special-interest groups, and some are politically powerful people who have a strong influence over the community's development. Agencies being advised by such a group will tend to treat their participation as a formality. When citizen groups are not truly representative, plans unacceptable to large portions of the public may be implemented only to be met with strong public protest.

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