CHAPTER 4

TECHNICAL PLANNING PROCESS

In each of the metropolitan areas examined by the study, the rapid transit proposals put before the public rested upon a complex process of technical planning and design work. This 'technical planning process," performed by professionals, plays an important role in decisionmaking. It provides the information that the responsible public officials draw upon in making plans and decisions. There is a constant interplay between decision-makers and planning professionals during a planning study, so that the resulting plans and recommendations are the joint products of the two groups. For the purposes of this assessment, the distinction between them is drawn as clearly as possible. The influence that decisionmakers exert in shaping transit plans was discussed in the previous chapter; the effect of the adequacy of the technical planning work itself is discussed here.

The quality of the proposals presented to decisionmakers in the nine case cities was largely influenced by the comprehensiveness (or lack thereof) of the scope of the proposals. This comprehensiveness varies tremendously from city to city, reflecting a number of factors, including the state-of-the-art of the technical planning process at the time of the study; changing images of mass transit and its impact; changing Federal guidelines and requirements, coupled with the availability of technical study funds; and the amount of local pressure applied in support of a given transit alternative.

Many of the proposals for modern fixed-guideway transit systems originated in the early 1950s. At that time, heavy rail rapid transit of conventional technology (except for the use of advanced train control technology) was basically the only form of major transit system under consideration. This form of transit was aimed primarily at saving the ailing downtowns of major metropolitan areas and providing an alternative to major new radial freeway construction.

Increasingly the tendency has been to consider several alternative types of technology for mass transit systems including light rail, personal rapid transit (PRT) and group rapid transit (GRT), and several types of bus systems ranging from extensive networks of busways to low-capital improvements on existing street systems. The range of objectives and impacts of concern for transit system planners has also been increasing rapidly. Typical concerns now include not only the revitalization of downtown but also service to suburban centers and neighborhoods, mobility of

nondrivers, reduction of air pollution, and conservation of energy.

Technical aspects of the transit planning process have undergone corresponding similar increases in complexity over the last 25 years. Early transit studies usually relied upon data and techniques developed in connection with highway studies to justify the need and determine the corridors of a rail system. Recent studies have used data and techniques developed more specifically for the-evaluation of several alternative transit systems.

Federal guidelines and requirements have become more demanding over this period. They have begun to exert a profound effect on the conduct of the technical work, although to date they have been distinctly unsuccessful in implementing the long-held Federal policy of integrating transit, highway, and land-use planning in a single, interrelated process. Nevertheless, these requirements already have become too great a burden in the eyes of many metropolitan officials, and some metropolitan officials have expressed strong resistance to the recent efforts of UMTA to substantially increase the planning requirements.

Throughout the past 25 years the influence of the proponents of one transit system or another also has had a great effect on the technical work. Many studies, especially early ones, were designed to justify an already favored type of system and thus were biased in one manner or another. In some cities where no one transit system was the clear favorite, the technical process has produced much more impartial information concerning the merits of alternative transit proposals.

These themes highlight the lessons learned in the metropolitan cases, and this chapter will describe them more extensively. Following a general discussion of the basic elements of the technical planning process and the Federal policies and guidelines that have shaped it, the relevant experience in the nine metropolitan cases will be reported. The chapter ends with a concluding discussion of the significant findings and their implications for UMTA's recently proposed transit investment policy.

GENERAL GUIDELINES FOR METROPOLITAN ASSESSMENT

The technical transit planning work in the nine case study metropolitan areas was assessed according to a number of general guidelines. These guidelines were developed to conform to the state-of-the-art of technical planning and the requirements of Federal agencies. This section describes the general context of the technical planning process, as it is currently understood. Next, it outlines the Federal role in local planning efforts. Finally, the general guidelines derived from this information are set forth.

Basic Elements of the Technical Planning Process

Transportation planning generally is performed within the context of the comprehensive planning process. The comprehensive planning process strives to encompass the aggregate of urban area goals and plans involving all of the elements of the urban environment: land use, transportation, other major public works, the regional economy, conservation of open space and other aspects of the physical environment, housing and community facilities, and often is extended to encompass various elements of social welfare planning. Since none of these factors is static during the seven- to 20-year planning period for large-scale rapid transit systems, it is generally recognized that work programs for transportation systems planning and their urban context must be continuously integrated during all phases.

The process of planning a major new transit system is often termed "system planning" to distinguish the process which leads up to a formal commitment to a new system, or major component thereof, from the more detailed type of transit planning associated with implementation and operation of an existing transit system. System planning has several objectives:

- The determination of transit needs within the region of its communities;
- The selection of modes and routes;
- preliminary engineering and architectural design;
- Multiyear programming of construction; and
- Identification of related general corridor and station area development opportunities.

The implementation phase of the planning process follows after system selection and programming decisions have been made. It generally includes final design and construction and is not of primary concern in this assessment. However, certain elements of both implementation and transit operations decisionmaking need to become involved in the system planning process. For example, large system plans are almost certain to require significant changes during the process of making final system design and construction decisions. Likewise system planning must concern itself, at least at a general level, with intermodal coordination -- through transfer arrangements and levels of service and capacity -- as well as with the system's ability to meet the changing transit requirements of the region within the limits of a variety of practical operating considerations.

Within the system planning phase, there are six basic work steps. Although these steps imply discrete stages in the system planning process, they are in fact closely interconnected. Step 1 is determination of transit goals; Step 2, data collection, analysis, and model building; Step 3, development of alternative systems; and Step 4, evaluation of alternatives. The completion of these tasks leads to Step 5, the system selection decision. This decision is closely related to Step 6, which involves programming and initial design of the selected system.

Step 1: Determination of transit goals. The goals to be achieved by the proposed new transit system provide the basis for the evaluation of alternative transit systems and should strongly influence the entire transit planning process. Goals include not only transportation objectives, but also land use, social, and economic objectives. They should be developed through a participatory process and should provide for identification of groups most affected by options to be studied.

Step 2: Data collection, analysis, and model building. The availability of data for transportation planning purposes had increased dramatically by the mid-1960s as a result of the highway and comprehensive metropolitan planning processes that were established in most metropolitan areas during that period. Prior to that period early system planning studies, such as those for San Francisco's BART and the Chicago Area Transportation Study. (CATS) , both of which were initiated in 1955, had to assemble their own land use data, conduct traffic surveys and make forecasts of travel on the test networks, all within the framework of the system planning process.

Today much of the data base being used in comprehensive planning, particularly the origin-destination data, dates from that period. In contrast to the massive data collection programs of the major metropolitan highway programs, more recent transit and highway system planning has relied on data from published sources such as the census or on small sample surveys. In addition, local and regional planning agencies have provided data on existing and future land use and related subjects.

The availability of this comprehensive data base on urban travel during the 1960s made possible an enormously improve understanding of the complex relationships involved in trip generation, travel patterns, choice of modes, and their relation to such factors as land use, travel- time, and various aspects of travel costs. A host of forecasting models for every aspect of planning has been developed to a fairly high level of sophistication. The fact that these models are sophisticated does not necessarily imply that resulting forecasts are assured of accuracy, of course, since this depends on several, factors:

The validity of the assumptions made as inputs to the forecasts. These typically include forecasts of land use (the geographic distribution of population and employment) and measures of performance and cost of traveling on each link of the transit system and the competing highway system (such as fares, times for each portion of the trips, parking costs, fuel costs, and tolls) . If these input assumptions are in error, the forecasts of ridership can be expected to be in error as well.

The accuracy with which current behavioral relationships are measured and incorporated in the model. Predicting transit ridership involves several basic forecasting steps. Measurements of trip generation and trip distribution yield an estimated total number of future daily and peak hour trips. Using these numbers, modal split forecasts predict the proportion of future travelers who will use transit instead of auto.

Simply stated, the key statistical measurement in modal split looks at the average proportion of travelers between any two points who use transit instead of auto, assuming a given set of comparative travel time and cost conditions for a given purpose of travel (work versus other) or time of day (peak versus off-peak) . The models used for forecasting the modal split can take a variety of specific mathematical forms, but a common, simple form is a set of "diversion curves" that relate modal split (percent who go by transit) to. comparative times and costs, with different curves for different trip purposes or times of day, and perhaps for different income classes of the travelers.

Generally speaking, the ability to measure these relationships improved during the 1960s as experience was passed from one study to another. A degree of standardization of procedures occurred largely as a result of Federal Highway Administration efforts, thus providing comparability and improvement in the confidence with which these measurements were made. This is much less true, however, regarding transit and modal split relationships. Major transit planning studies generally came along later, were fewer in number, and tended to be more peculiar to the local, technological, institutional, and political circumstances than the major highway studies. They were often less oriented to objective technical assessment of market potential and were performed comparatively independently because, unlike FHWA, UMTA did not provide a strong technical coordinating role.

One of the remaining relationships that has not yet been assessed, but is of major importance in transit system planning, is the effect of various amenity aspects of new transit technologies on patronage -- i.e. how much additional transit travel can be expected (either in new trips or diversion from autos) due to such factors as air conditioning, smoother riding qualities, reduced noise, reduced crowding, and more pleasant design of the stations and vehicle interiors. The models that have been developed for transit forecasting provide a framework for incorporation of such factors once the necessary empirical investigations are done, but until recently there was little opportunity to carry out those investigations because of the lack of transit facilities and services that possessed these amenities. Research of this type will be performed under the BART Impact Study.

The stability of all of these relationships over time. There is relatively little evidence regarding the long term stability of these relationships because the comprehensive data bases required to measure these relationships have been assembled only once for major original system planning efforts in most metropolitan areas, and most of these data collection efforts occurred during a relatively short period in the late 1950s and early 1960s. There is a limited amount of evidence from the Washington, D. C., area, where repeat surveys were conducted, that some of these behavioral relationships are fairly stable over a medium-range time period even under rapidly changing conditions -- growth in population, affluence, auto use and suburbanization, decline in transit use, and other factors. However, no empirical knowledge exists as to how stable they will be under the different of changes that are taking place today.

Step 3: Development of alternative systems. The development of alternative systems to meet transit needs is the heart of the creative design process. It involves an effort to search for different strategies to combine existing transit and other elements of the transportation system with a wide range of potential improvements including elements of existing, evolutionary, and new technologies. These can be combined in a variety of geographic configurations and levels of service. The systems should be developed to provide transit services for all major functions and needs of the area and all segments of the transit market, including CBD- and non-CBD-oriented travel, peak and off-peak, regional line-haul and community level short-haul travel, commuters, nondriving groups, and others. The process of developing these alternatives should be guided by the transit goals, by interaction with interested participants, and by feedback from the evaluation process.

Step4: Evaluation of alternatives. The evaluation of alternative urban transportation systems is becoming much more complex in response to four trends or pressures. First, the surge of public concern for human equality and environmental enhancement during the 1960s led to the consideration of nontransportation goals addressing social, economic, environmental, and urban design considerations. Second, some of the same pressures, institutionalized in the National Environmental Policy Act, gave rise to a need to give serious consideration to several system alternatives rather than simply justifying one alternative. Third, the desirability for an interactive transportation planning process was recognized, as described. Fourth, UMTA's efforts to require cost effectiveness analyses also influenced the approach to alternatives evaluation.

The evaluation process previously had been seen as a one-time comprehensive assessment of all alternatives considered, leading directly to system selection. For several reasons, this approach is being replaced by a two- or three-phased evaluation process. For one thing, most project budgets cannot afford to fully develop and evaluate all feasible alternatives. An initial evaluation effort might be performed in very little depth to "screen out" options that are far too costly or disruptive, or fail to meet minimal standards of service, or other criteria. This effort might be simply designed to narrow down the large range of possible alternatives and to aid in packaging various components of the existing system with components of new systems or service improvements. Decisions to adopt and move forward with early implementation of a selected component might possibly be made at this early stage if it were found that a clear consensus was reached.

This might be followed by the major comprehensive round of system development and evaluation, wherein all evaluation criteria would be applied to the alternative systems in depth, followed by an effort to select a preferred system. However, this period will almost always fail to obtain consensus in any major system planning effort involving diverse interests and alternatives. Thus it is usually desirable to program a conflict resolution period that may involve development of compromise systems, packaging of components in different combinations, efforts to set priorities among competing components of a system, and the like. The evaluation work at this stage may concentrate on very Particular impacts (and their amelioration) that have given rise to greatest concern among participants.

A resolution of conflict process is a phase of planning that always occurs in any complex planning process involving diverse interests. However, it is unfortunately almost never anticipated in planning work programs. Because this is so the resolution of conflict almost always takes place under the worst type of conditions: deadlines are not met, staff resources are not available to assist in developing compromise plans or performing special analyses, and opportunities are missing to continue the interaction that is required in order to resolve the conflict. These activities should be recognized as essential parts of system planning work programs.

Step 5: Selection of the system. The technical transit planning process cannot be designed to present a definitive answer as to what transit system is best for an area. The technical process should provide information on the forecast success of transit alternatives in achieving goals. This estimated performance as well as other pertinent data should be used by the decisionmakers in their selection of alternatives. Therefore, the major responsibility of the technical planning process is to ensure that all those who should have an opportunity to participate in decisionmaking are adequately informed of such data.

Step 6: Programming and initial design. Most transit planning has a producing a single, regionwide, long-range plan. Little or no attention was paid to several important program planning questions. planners have done little analysis of how best to proceed in reaching the end stage of implementation, which components to build first, and how to coordinate early components with existing transit and other systems. Their plans have tended to be inflexible instead of preserving options both to deal with conceivable, if not predictable, future problems and for taking advantage of future technological developments. Neither have they considered how implementation might be staged over time.

Analysis of all of these program planning considerations should be an important and continuing part of system planning. Indeed there is growing recognition among leaders in the transit field for system planning to take on this type of emphasis. UMTA's new draft policy regulations require "incremental" planning with an emphasis on setting priorities, considering mixed-mode systems, and establishing multiyear improvement programs. Despite this recognition of the direction that system planning must move, however, actual accomplishments are few.

Federal Planning Guidelines and Requirements.

Federal legal and administrative guidelines influence the content and practice of technical planning. Metropolitan areas seeking financial assistance from UMTA for both technical study grants, under Section 9, and capital development grants, under Section 3, must comply with a variety of administrative requirements and procedures. The bulk of these are prescribed

by administrative guidelines rather than by Federal legislation. However, Federal legislation has strongly influenced the planning process, and most administrative regulations have roots in legislative directives.

The UMTA administrative guidelines are derived from statutory provisions set forth in Section 4 of the Urban Mass Transportation Act. They are embodied largely in the agency's External Operating Manual. More specifically, the UMTA Planning Requirements Guide sets out an extensive listing of factors to be covered in both urban comprehensive planning and transportation planning. These requirements are primarily concerned with the scope of concerns to be dealt. with in the planning process and with the qualifications of the public agencies that sponsor the work. The Guide defines required elements for comprehensive planning and transportation planning, describes how the two processes must interrelate, and outlines the format and content of a transit development program. It explains requirements for preparing grant applications. The Guide does not describe or require technical procedures for accomplishing any of the planning elements.

Like the Guide and the External Operating Manual, the recently published joint UMTA-FHWA regulations for urban transportation planning are limited to descriptions of the required plans. [1]/ The new regulations require metropolitan planners to prepare (.1) a long-range general transportation plan, including a separate plan for improvements in management of the existing transportation system; (2) an annually updated list of specific projects, called the transportation improvement program (Tip), to implement portions of the long-range plan; and (3) a multiyear planning prospectus supplemented by annual unified planning work programs.

Federal environmental laws also have shaped the technical planning process. The most significant statutory requirement is contained in Section 14 of the Urban Mass Transportation Act. This section requires a detailed assessment of the significant social, physical, and economic effects of a proposed UMTA project that includes development of alternatives to the proposal. The assessment process must provide ample opportunity for public participation. Section 14 was added by the Urban Mass Transportation Assistance Act of 1970 apparently in response to the National Environmental Policy Act of 1969 (NEPA) and the Department of Transportation Act of 1966. It expands the legislative intent of Section 4(f) of the Department of Transportation Act. which was intended for the protection of significant publicly-owned land of a public park, recreational

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1/ UMTA-FHWA "Planning Assistance and Standards: Urban Transportation Planning," op. cit.

are a, wildlife and waterfowl refuge, or historical sites. Following the NEPA language, Section 14 requires the Secretary to find that "no feasible and prudent alternative" exists to a project where any adverse effect results.

The effect of the environmental requirements is to call for a transportation system planning approach that embodies thorough consideration of alternatives. These requirements are similar to the approach described in the earlier discussion of the elements of the technical planning process. However, when the new regulations were promulgated, they were applied to already selected systems. This resulted in delays probably well beyond the intent of the NEPA legislation.

UMTA recently took steps toward defining more clearly a general approach for developing and evaluating alternatives. The agency promulgated a draft policy statement that requires each community to determine which alternative transit improvement "best serves the area's needs, taking into account. the social, economic, environmental, and urban development goals."[1]/

UMTA's new policy calls for transit alternatives to be developed in packages of combinations of transit modes, each appropriate to the service requirements of a specific corridor. Improvements must be considered that employ effective management and operation of existing transportation systems as well . as construction of new facilities. The plan should be implemented in increments, based on analysis of projected 5- to 10-year transportation needs, with priority given to the area's more immediate needs. The evaluation of the alternatives must indicate which one is the most cost-effective plan for meeting the area's goals. It must provide full opportunity for public involvement from the early stages of the process.

UMTA proposes to base the extent of Federal commitment on "the cost of the initial increment of the plan which provides for the transportation needs of the community in a cost-effective manner." The locality could opt to apply the Federal grant toward a more costly alternative so long as the coverage of transportation service is essentially the same.

The approach UMTA adopts in administering the new guidelines is critically important to their ability to improve the quality of urban transportation planning -- and the quality of urban transportation as well.

Guidelines for Metropolitan Evaluation

The metropolitan cases were selected to represent diverse planning issues that arise in different types of situations.

1/ UMTA, "Proposed Policy for Major Urban Mass Transportation Investments," op. cit.

These situations ranged from decisions regarding reconstruction or extension of long-standing public rail transit operations; to decisions regarding the planning and evaluation of new rail or new technology systems or the rejection of such systems; and, finally, to decisions involving the implementation of entirely new rail systems.

, Although a variety of technical planning activities were underway in each case. four categories of crtically important planning activities were defined for purposes of the assessment. A set of guidelines was formulated for evaluating how these steps were carried out. The four categories are not all-inclusive and that they are meant only to provide a framework for focusing the assessment on key elements of the planning and decisionmaking process. The categories and their corresponding assessment guidelines are discussed below:

Broad, explicit goals and objectives should guide technical planning and decisionmaking. The technical process has been examined to determine the explicitness of the goals and objectives, the extent to which they were employed as criteria in-evaluating alternative systems, who participated in goal setting, and the relationship of goals to other regional objectives, insofar as these have been defined in the comprehensive metropolitan planning program. In addition, the goals and objectives should reflect the interests of all major constituencies and types of travel needs. They should also encourage a multimodal transportation strategy appropriate to the area and not be merely designed to lead the evaluation process toward a predetermined solution.

A range of realistic alternative solutions should be developed. The rationale for their development has been examined to evaluate their technical relationship to the projected transit market, the relationship to areawide goals, and the degree to which the alternatives were determined by narrowly defined political considerations, as distinct from political decisions based on solid technical evaluation of how the alternatives affect, or serve the objectives of, various constituencies . Assumptions that were made for each alternative have been examined to determine if they are unnecessarily restrictive or costly for the efficient functioning of the proposed system and thus if they had a significant negative influence on the results of the evaluation.

The evaluation of alternatives should be thorough and fair. The investigation considered both the effectiveness of evaluation techniques and the validity or reasonableness of the , data, particularly the forecasts, used for testing the alternatives. The range of factors used in the evaluation and the

weight attached to important considerations such as cost effectiveness and the achievement of defined goals and objectives also have been examined. A critical question was the extent to which balanced consideration was given to the full range of goals and objectives as opposed to excessive concern with a particular class of them, such as those that are quantifiable, those relating only to system users, or those relating only to particular land development interests. Similarly, the evaluation should consider the effects on all major interests. It should make technical information available to decisionmakers and the public and provide sufficient opportunities for the results of the evaluation to be reviewed by all interests. These comments should be given appropriate consideration in the course of planning.

A practical and flexible plan of implementation should be developed. The Implementation plans have been examined to determine the influence exerted by availability (or lack of availability) of Federal financing as well as the effect of local finance requirements on decisionmaking. The ability of the plan to respond to changing circumstances and permit staging of implementation also have been considered.

One factor that has been considered throughout is the participation of the public in each of these phases. Public participation is discussed in greater detail in the decisionmaking chapter and is only briefly mentioned here as it relates directly to the technical process.

METROPOLITAN EXPERIENCE

This section evaluates the technical procedures that planners in the nine case metropolitan areas followed in developing transit plans. The information is subdivided into categories corresponding to the guidelines used in assessing the metropolitan experience and described in the preceding section.

The assessment of technical planning processes looked at the following study activities in the nine metropolitan cases:

- The Boston assessment focused on the Boston Transportation Planning Review, carried out between 1971 and 1973. This study was established to reevaluate major highway proposals.

- Recent planning for Chicago transit improvements has called for extensions to existing commuter rail lines into suburban counties, expansion of regional bus service, and additions to the central city-focused rapid transit system, including proposals to depress the elevated loop and add new "distributor" links. The loop and distributor subway proposals have been evolving since 1965. The first plan was published in 1968. It was updated in 1971 and subsequently subjected to an environmental impact analysis, completed in 1973, that reaffirmed the same scheme. In June 1974 these proposals -- and other subway, commuter rail, and bus improvements -- were included in the 1995 Transportation System Plan.

- planning for San Francisco's rail system was grounded in a 1947 joint Army-Navy study of alternative bay crossings. In 1956 the Bay Area Rapid Transit Commission prepared a preliminary engineering study for a rapid rail transit system. In 1961 principal technical studies were completed that led to a plan for a five-county Bay Area Rapid Transit system. In 1962 the system was trimmed to three counties, and a bond issue to build it won approval in referendum. In recent years, technical studies have been undertaken to plan BART extensions.

- Seattle's major transit plans were proposed in 1967, 1970, and 1972. The 1967 plan, published by the Puget Sound Governmental Conference, called for a 47-mile, four-leg rapid rail system focused on the CBD. Voters rejected the proposal in 1968. Two years later the same plan, bolstered by evaluation and discard of several bus alternatives, was again presented to voters and defeated. In 1972 a new study produced a short-term bus improvement program that won approval in referendum that fall.

- Like Seattle, Los Angeles took rail transit proposals to the polls twice, in 1968 and 1974, and both times the proposals were turned down. Several plans were produced prior to 1968, but the system placed before voters was based most directly on an engineering study begun in 1967. Planning for the recently rejected system began in 1972. A plan for a 116-mile system was published in July 1973 and was followed by another round of alternatives analysis leading to a proposal for a 145-mile rapid rail system, published in March 1974. This plan was defeated in a referendum vote in November 1974, and subsequently a new system planning effort was begun.

- Washington, D.C. , initiated transit system planning with the 1959 Mass Transportation Survey, which made preliminary proposals for a 33-mile rail transit system and a network of new highways. Between 1960 and 1962 a new study team, using new data and incorporating preliminary engineering, produced a new plan that recommended an 83-mile rail transit system and reduced the highway mileage proposed earlier. Subsequently, transit planning and highway planning took separate courses. The 1962 transit plan was trimmed to a 25-mile "bobtail" system for the District of Columbia only and was approved for construction in 1965. A new technical study process began in 1967 to extend the system to the suburbs; it produced the 98-mile regional system that was approved for construction in 1968.

- Atlanta's early technical plans were developed in 1960-1962. In June 1961, the regional comprehensive planning body called for a 60-mile rapid rail system. Preliminary engineering studies resulted in a plan for a 66-mile rail system which was published in 1962. in 1967 an update of this plan recommended a 54-mile rail system, which was cut back to 40.3 miles and presented to voters in 1968. The plan was rejected. Earlier in 1968 an alternatives analysis was begun that led in 1969 to a draft recommendation for a busway system. By 1971 the busway system had been rejected, and a modification of the earlier rail plan -- coupled with a program for short-term bus improvements and a fare reduction -- was approved that year in referendum.

- Denver began transit system planning in 1971, and in 1972 a first phase plan was published that laid forth a concept for future land-use configuration and a complementary regional transportation concept. It was the goal-setting phase of a transit planning process that recommended in 1973 a 98-mile personal rapid transit system. Voters that year approved a sales tax measure to finance an early action bus improvement program, further study of the PRT proposal, and, ultimately, construction. At UMTA's request, Denver proceeded with an alternatives evaluation study and, in April 1975, recommended an 80--milc automated rapid transit system (a considerable modification of the earlier PRT concept) supplemented by express bus.

- The Twin Cities Metropolitan Planning Commission (the regional transit authority) began a series of long-range planning studies in 1968-1969. In 1970 conventional rail rapid transit was recommended to serve as the backbone of a regional system. A subsequent study evaluated alternatives and proposed a 37-mile rail system. Meanwhile, the Metropolitan Council (the regional comprehensive planning agency) produced a plan calling for exclusive busways; and private organizations were promoting study of advanced technology systems. The state legislature stepped in to arbitrate and requested both regional agencies to cooperate in planning an automated small-vehicle system. The resulting plan, published in January 1975, recommended a 16-passenger group rapid transit concept to replace conventional rapid transit as the region's backbone system. No system selection decision has been made as yet.

Goals and Objectives

Generally speaking, the technical approach to goal setting in the case metropolitan areas has corresponded to the historical period during which the planning was initiated. Thus, goals articulated during the 1950s and early 1960s were more narrowly focused than the goals developed since the late 1960s. Between that period and the present, two main factors have led to a broader range of goals for transit plans: growing popular concern for equal opportunity and environmental protection, and a more participatory approach to goal setting. Only in recently initiated studies have goals been translated into evaluation criteria for use during the course of the planning process. And although every case shared the goal of reducing forecasted automobile . traffic, none represented a truly multimodal planning approach.

These points are amplified in the discussions that follow. In each discussion, summary examples are cited from relevant metropolitan cases.

Early plans . During the 1950s and early 1960s transit was viewed as a means for dealing with several of the most serious urban problems perceived at the time. Transit promoters and others expected major new systems to (1) revitalize the ailing central cores of older metropolitan areas, (2) reduce auto congestion and the need for new highways serving commuters, and (3) help counter the trend toward suburban sprawl. The land use focus of these goals rightly indicates that in most cases early transit proposals were shaped by a close relationship between land use goals and transit goals (and their respective planners) .

At this time, although goals were often established as a first step in developing a comprehensive plan, a formal goal-setting procedure was not usually incorporated into the transit planning process. Thus, areas that initiated transit plans during this period usually did not solicit public input into goal setting.

With these factors at work, the goals for transit programs begun in the 1950s and early 1960s tended to imply a particular type of system. Indeed, two of the three plans started by the case cities during this period were undertaken with the clear assumption that their product would be a rapid rail transit system.

Atlanta. Atlanta initiated transit planning out of a desire to reduce highway congestion, channel regional growth, and enhance the center city, although these goals were not explicitly laid out as such, and were not employed directly in evaluating transit alternatives in the early plans. (The first early transit plan, Atlanta Region Comprehensive Plan: Rapid Atlanta, 1961, or Plan and Program for the Atlanta Metropolitan Region, 1962.) Both plans were expected to propose rapid rail systems at the outset, and both did.

San Francisco. As early as during the 1941-1947 Joint Army Navy Board Study, San Francisco planners viewed rail transit as a potential substitute for additional bridges across the bay and as a means for preserving San Francisco from the effects of additional automobile traffic. This work was followed by a series of studies specifically addressing the need for rail rapid transit.

Washington, D. C. In Washington, D. C., the earliest transit study pursued a more broadly framed goal than in the other two cases. This goal, nonetheless characteristic of the period, was to accommodate the future transportation needs of an expanding population. In the 1959 report of the Mass Transportation Survey, transit was not predetermined to be included in the plan. However, the 1959 survey was completed during a period of growing public concern about the unwanted effects of highways on neighborhoods and parks. Critics thought it called for too many highways and too little transit. That report, prepared by the National Capital Transportation Agency, spelled out the need for an improved transportation system to enhance the welfare of the District of Columbia, enable the orderly growth and development of the national capital region, and preserve the beauty and dignity of the nation's capital, although these goals were not employed in the planning process.

Recent plans. During the 1960s and 1970s, the scope of national concerns expanded to include a range of new issues that made their way into statements of goals for transit systems. One of the issues was reflected in campaigns for providing equal opportu- . nity -- to ethnic minorities, the poor, the elderly, and the handicapped. Another issue, spawned by urban growth and particularly the increased use of the automobile, was created by the threat of environmental degradation as measured principally by air pollution, energy consumption, and suburban sprawl. In devising ways to deal with suburban development and the paralleling increase in suburban-oriented work trips, public attention began to focus on the desirability of encouraging nodal growth with clustered land uses.

New transit goals responding to these issues called for maximum mobility for transit dependents; reduction in auto use to improve air quality, conserve energy, and control growth; and new attention to suburban-oriented transit service. Land-use-oriented goals usually were borrowed from regional land-use plans, a step that reflected a high degree of apparent coordination during this period -- as earlier -- between transportation and regional planners.

Until about 1970, most of the goals were developed by planners with the aid of public officials. Since then, citizens have played an increasingly direct role in the development of goals. This formal establishment of a gOal-Setting process was accompanied by the development of evaluation criteria, based on the goals, to assist in the planning process.

Examples from the case metropolitan areas that illustrate most or all of these changes are:

Seattle. Seattle's 1967 transit plan adopted the goals of the regional land use plan without structuring a participatory goal-setting process. After rail plans were defeated twice at the polls, Seattle planners modified their approach. The bus transit plan subsequently developed (and approved) encouraged public participation in formulating goals through a series of public meetings. A wide-ranging set of four goals was listed: (1) improved mobility for the general population and especially for the transit dependent; (2) furthering the region's environmental and development policies; (3) a flexible transit system in which routes could be added and changed with ease to meet changing demand; (4) providing channels for citizen participation during both planning and operations phases. These goals reflect the trend toward placing priority on serving suburban locations, and they were used to select a system that provided express bus service to four "high volume service areas" (including three non-CBD areas) . (The rejected alternative concentrated service to the CBD.)

Denver. Denver's goal-setting procedures embodied all the characteristics of recent planning efforts. General transit goals were developed in parallel with land use goals in the first phase of the transit planning process, which was completed in 1972. These goals included: (1) directing growth into designated areas; (2) providing access to employment and activity centers; and (3) supporting national energy programs. The regional land use plan, which grew out of the same goal-setting process as Denver's transit 'plan, called for encouraging growth in 12 suburban nodes in addition to the CBD.

These goals were expanded during Denver's recent (1975) analysis of alternatives to the PRT-type system proposed in 1973. Community values expressed during public meetings and incorporated as goals included mobility issues, minimization of disruption, environmental enhancement, esthetic concerns, and cost minimization. Many of these goals were later used in evaluating alternatives, although the one most important goal -- shaping growth to conform to the land-use plan -- was not effectively applied.

Minneapolis - St. Paul. The Twin Cities 1968-1969 long-range transit study established a comprehensive set of goals using inputs from major local agencies and citizens. The goals included: (1) ease of movement throughout the area; (2) provision of a variety of transit modes to meet needs of different people; and (3) achievement of "a higher quality of life." Evaluation criteria were derived from these goals for application to each study alternative.

Boston, The 1971-1973 Boston Transportation Planning Review incorporated a broadly participatory goal-setting process that led to a comprehensive set of formal objectives intended to guide the refinement of proposals for transit improvements. Although the citizen participation procedures in Boston are typical of recent trends, Boston is atypical in its CBD orientation. One of MBTA's current principal goals calls for emphasizing improved access to existing areas of dense development, particularly the downtown.

Discussion. Due to the interest in limiting suburban sprawl and channeling growth into activity centers, one might have-expected a greater degree of focus on neighborhood-level service. However, all of the transit studies examined gave priority to regional needs, and most did not attempt to consider intra-neighborhood types of service.

Each of the nine cases has held the goal of reducing automobile use as an important purpose for developing a transit system. One might expect this goal to have led to multimodal planning -- simultaneous study of transit and highway alternatives to serve a single set of travel demand projections. However, none of the cities pursued multimodal planning in the strictest sense.

- Highway-oriented transportation plans in Atlanta and Seattle included transit proposals, but these were rejected in favor of the recommendations of transit-oriented studies.

- Washington, D.C., began transit planning with a study -- the 1959 Mass Transportation Survey -- that was multimodal in concept. However, highway planning responsibilities were eventually claimed by the region's highway agencies. "

- A number of cases, including Washington, Atlanta, San Francisco, and Seattle, proposed joint use of planned highway facilities for transit and automobiles.

- Boston offers the best example of metropolitan wide coordination of transit and highway planning. The BTPR's sketch-planning process evaluated both highway and transit alternatives. However, the transit options were not studied to the same level of detail as the highway options.

In summary, the use of goals as an evaluation tool is a recent development and has occurred only when active citizen participation has been a part of the planning process. In spite of goals for coordinated transportation systems, transit plans are usually developed independent of highway planning.

Development of Alternatives

Like goals, the concept of alternatives has evolved over the decades of transit planning in the nine cases. Planning begun prior to the late 1960s typically did not develop as broad an array of alternatives as occurred in more recently initiated plans.

Early studies. The early transit studies in San Francisco and Atlanta and the 1962 study in Washington, D.C., viewed transit fundamentally as an alternative to the automobile. At the time, rapid rail transit was popularly considered the only transit option. Typically, a rail system was compared to an all-highway system; in a few studies comparisons were made also to an all-bus system.

A major impetus behind the early tendency to polarize the transportation options into expressway versus extensive rapid rail was provided by the highway-oriented transportation studies conducted in most large urban areas during the 1950s and the 1960s. These studies included CATS [1]/, BATS [2]/, AATS [3]/, PSRTS [4]/, and DMATS [5]/. They usually constituted their region's first effort at areawide urban transportation planning. These studies typically forecast rapid urban growth and called for an expanded highway construction program to cope with the increased travel demand. In this way they alerted regional planners and the public to the growing urgency of the need to provide an alternative to the automobile.

Seattle, Denver. The 1967 Seattle study and the 1973 Denver study presented transit-oriented alternatives to the PSRTS and DMATS studies, respectively. The transit studies developed land-use as well as transportation alternatives to the earlier plans. The highway studies assumed trend growth patterns -- sprawl -- while the transit plans called for containment of growth in designated nodes. It 'is interesting that the population and economic growth predicted in the transit studies reflects the same optimistic growth forecasts as the highway-oriented plans. These forecasts, especially the predictions for the CBD, tended to build a case for large-capacity transit systems.

Later studies. Later studies looked at alternatives to heavy rail systems. The growth in low-density suburban areas, which could not easily be served by conventional rail modes, was a major factor influencing the-examination of such alternatives as-bus, PRT, and light rail. The range varied greatly among the case metropolitan areas, from two to over one hundred. Most of the studies compared two fixed guideway alternatives with a low-capital alternative and an improved version of the existing bus system. Examples of the quality and breadth of alternatives are listed here. The Twin Cities boasts the most complete range; several cases display unrealistically expensive or otherwise inadequate choices of alternatives; while most of the cases fall somewhere in between.

1/ Chicago Area Transportation Study.

2/ Bay Area Transportation Study.

3/ Atlanta Area Transportation Study.

4/ Puget Sound Regional Transportation Study.

5/ Denver Metropolitan Area Transportation Study.

Seattle. In the 1970 Seattle plan four alternatives were tested, including (1) buses in mixed traffic, (2) buses with metered freeways, (3) busways, and (4) rail and bus. The plan assumed growth forecasts that were optimistic, especially in light of the recession that Seattle was experiencing at the time. (More recent studies have projected greatly reduced growth.) The first two alternatives were eliminated because they could not carry the traffic that would be generated by the forecasted growth. The busway alternative required a double-deck tunnel in the downtown to handle the load. The tunnel cost helped raise the total cost for the busway system to $350 million more than the cost of the rail-bus alternative. Therefore, the bus-rail alternative was selected, but it met defeat in referendum later that year.

Denver. The 1973 Denver study evaluated four alternatives: (1) all bus (2) all fixed guideway, (3) PRT with bus, and (4) rail with bus. The PRT alternative used advanced technology that had not been demonstrated in operation at the time (and that still has not been tested)- It was demand-responsive, with 7.5-second headways, and made few intermediate stops. The system easily outperformed the conventional alternatives.

Twin Cities. The 1969 Twin Cities study developed a range of alternatives that represent both hiqh- and low-capital systems. From a field of over 100 alternatives, the selection was narrowed to include (1) intermediate capacity rapid rail transit, (2) rapid rail with extended station spacing, (3) buses in mixed traffic, (4) commuter railroads, (5) busways without downtown subways, (6) busways with downtown subways, and (7) buses with metered freeways. Although this array is relatively comprehensive, it omits any automated system. A later study examined automated systems and compared their performances against the 1969 results.

Los Angeles. The Southern California Rapid Transit District in Los Angeles was mandated by the state legislature to develop a regional “mass rapid transit system." SCRTD interpreted the phrase narrowly to imply a rapid rail system. In its 1972-1973 study, SCRTD did not consider a full range of bus alternatives until pressured to do so by UMTA

Discussion. In summary, most examples of impartial and comprehensive selection of alternatives have occurred in cases where no one transit system is the local favorite. Cases in which rapid rail transit was assumed to be the solution predominate among system planning efforts that began during the 1950s and 1960s.

A major reason for much of the narrowness of early transit planning was the mere lack of knowledge among U.S. professionals of what options were available and what their capabilities were. The contrast between the record in this country and European accomplishments during the 1950s and 1960s is notable in this regard. We grew unsophisticated as a result of long public neglect.

Evaluation of Alternatives

Alternatives evaluation is designed to produce sufficient technical information for decisionmakers to be able to understand the advantages and disadvantages of alternative transit systems. The product is used to guide decisionmaking but not to determine the decision; other factors, such as political considerations, come into play in selecting a system from among alternatives. However, it is important that these external factors not bias the technical evaluation. This discussion focuses on the content of the technical procedures in each case.

The conduct of alternatives evaluation has changed over time, responding to advances in the state of the art and to new Federal requirements. Thus, cases that began system planning 10 years or more ago built fewer factors into the process than occurred in more recent studies. The current UMTA emphasis on determining relative cost-effectiveness of alternative systems has already influenced the evaluation process in one case (Denver) .

Although the type and range of factors used in evaluation has changed over time, the quality of the process has not necessarily improved. Studies initiated recently as well as earlier ones illustrate both poor and commendable approaches to alternatives analysis.

The discussion that follows examines first the changing character of the technical procedures for alternatives evaluation. The quality of the process in the case cities is described next.

Importance of economic factors. The relative importance of economic factors in the comparison of alternatives has varied greatly over the approximately two decades of transit planning in the case metropolitan areas. Early studies for the San Francisco, Atlanta, and Washington, D.C. systems relied chiefly on benefit-cost analysis to justify the selected rail systems. Following this period and up to a year ago, most systems were evaluated on the basis of a wide range of environmental and social factors as well as economic considerations, which were no longer of primary importance. However, since UMTA began requesting a determination of cost-effectiveness , economic factors are once again assuming greater importance in alternatives analysis.

The following examples describe the changing approaches within the metropolitan cases to alternatives analysis.

Chicago. The Chicago CATS (1958) , like most other studies of its type, used only a limited n-umber of factors to evaluate the transit proposals. Most of them were expressed in monetary terms. They included costs of capital, interest, and annual operations; benefits of time savings to existing transit riders; and accident reduction.

Washington, D.C. The 1968 study that led to selection of the Washington, D.C., adopted rail system justified the recommended system with a benefit-cost analysis that quantified benefits due to time savings by transit and auto users, auto insurance and operating cost reduction, conservation of land for better use, reduction in job tardiness and early departure, reduction in dismissal for inclement weather, elimination of second and third cars, and reduction in employer-provided parking facilities.

Boston. The Boston Transportation Planning Review (1971-1973) provides a good example of an alternatives evaluation using a variety of factors that reemphasize economic considerations. Each alternative was evaluated by factors grouped in 10 categories: (1) capital costs; (2) transportation service; (3) housing relocation needs; (4) effect on regional economic patterns, (5) community economic impact; (6) impacts on landscape, open space, and historic resources; (7) impact on air quality; (8) noise levels created; (9) effect on community quality; (10) impacts on natural ecosystems.

Denver. The 1975 Denver plan represents the first attempt to build community goals into the process of identifying a cost-effective transit alternative. The evaluation used a wide range of considerations, many reflecting community goals, to evaluate alternatives. A low-capital alternative was rejected because it could not achieve community goals, and the most cost-effective of the remaining high-capital alternatives was selected.

Quality of the analysis. The quality of the alternatives analysis varied greatly from study to study, and not necessarily with respect to time. Even if the changes in the state-of-the-art over time are considered, examples of inadequate procedures can be found among recently initiated studies as well as those begun early, and vice versa. A good technical evaluation should measure the comparative capacities Of the alternatives to meet goals established by the community in question. If the evaluation process is biased, decisionmakers are given incomplete information and they may not be able to identify all of the potential problems inherent in the various alternatives or to identify the steps necessary to overcome these problems. In many cases, the technical work was used

to justify an already selected (or strongly favored) alternative.

Washington, D.C. The first transit plan in Washington, D.C., grew out of a regional transportation study that addressed both highway and transit needs. This study, the Mass Transportation Survey of 1959, laid the groundwork for future transit planning although its transit proposals were not directly represented in the system that was eventually adopted. The study began with no preconceived solution and conducted a thorough and fair evaluation of alternatives.

Boston. The BTPR process, initiated in 1971, is an example of a comprehensive analysis, as has been explained. However, as the study began, there was strong political support for the decision that was ultimately made not to build the highways under study, and the prevalence of this antihighway attitude tended to distort the otherwise well-structured evaluation process. If the BTPR process had placed more emphasis on the development of transit alternatives, rather than concentrating on the elimination of highways, some of the subsequent delays in selecting particular transit alternatives within each corridor tight have been lessened.

San Francisco. BART planners assumed from the beginning that their plan would be a "heavy rail" system. If their evaluation of the proposed BART system had been more careful, it should have identified the proposed automatic train control system as a potential source of problems because it was a technology still under development.

Atlanta. Atlanta's early plans in 1961 and 1962 did not formally test alternative transit systems. The Metropolitan Atlanta Transit Study Commission briefly investigated improved bus service concepts and the use of commuter rail but discarded these without rigorous analysis. The first serious look at alternative concepts occurred with the Voorhees study that began shortly before the defeat of Atlanta's first transit proposal at the polls in 1968.

Denver. The analysis of alternatives published by Denver's Regional Transit District in 1975 demonstrates a recent case in which questions have been raised about the validity and reliability of the assumptions and procedures used. To the extent that the process did not provide complete, accurate information about a full range of feasible alternatives, it illustrates the difficulty in accomplishing this ideal in a metropolitan area where, with few exceptions, there was solid support from public officials and private citizens for a specific transit system. Few forces were pushing for a thorough analysis of alternative transit improvements in Denver when, to meet a requirement imposed by UMTA, the ART study was begun. In the view of most Denver residents, the time for alternatives analysis had passed.

Discussion. One of the limitations on the range of alternatives developed in a number of cases was exerted by the engineering consultants hired to do the planning work. Engineering consultants were selected for their previous experience in transit rather than for their ability to conceive or evaluate alternative technologies. Their mission and their approach was more "design" than development and evaluation of alternatives.

Engineering consultants who were hired to do transit system planning could look forward to being hired for larger, more lucrative engineering design contracts, particularly if the system selected was one in which they had extensive previous experience. Engineering design contracts were generally written so that there was no incentive to develop a lower cost transit system. Many contracts were written so that the fee increased as the system cost increased, thus tending to create an incentive to design conventional heavy rail of highest performance standards and complete grade separation.

One of the most important lessons learned from the metropolitan experience concerns the ability of a predetermined solution to distort the technical planning work. Throughout the past 25 years the influence of the proponents of one transit system or another has had a great effect on the degree of objectivity of the technical work. Many studies, especially early ones, were designed to justify an already favored type of system and thus were biased in one manner or another. This bias can also be seen in some of the system evaluations that were performed at UMTA's insistence after a basic system planning effort had been completed. In some cities where no one transit system was the clear favorite, the technical process has produced much more impartial information concerning the merits of alternative transit proposals.

In addition, the level of public involvement has been shown to have an important effect on the technical work. The inclusion of a formal, participatory goal-setting process as a step in technical process is likely to lead to the use of the goals in the evaluation of alternatives. The findings show that

evaluating options for entire transit-only systems in many situations may be less effective than conducting a large portion of the work program on a subregional basis. The Boston Transportation Planning Review (BTPR) provides an example of this approach.

For the BTPR, the area under study was broken down into several sectors or corridors that were relatively independent of each other but that each contained highly interrelated transportation elements (existing facilities and services, controversial expressways, and proposed transit facilities and services). Within each subregional area various options were conceived, refined, and evaluated. Typically, these options included a diverse array of public transportation improvement possibilities, such as rejuvenation of commuter rail service, extension or relocation of rail rapid transit, conventional local surface transit service improvements, establishment of new cross-town routes and special services for the transit dependent. Considerable emphasis was placed on short-term improvements as well as long-range capital improvements, the timing of implementation, funding sources, associated changes required in operating policies in legislation or in institutional arrangements in order to carry out each promising element of the options.

The process allowed early decisions to eliminate from further consideration or to approve for implementation certain elements for which a clear consensus was formed. This weeding-out step resulted in a narrowing of the number of options, plus a redefinition of some of them, that would be subjected to further study. The BTPR also merits attention for having set aside periods of time for the critical work that was expected to be needed to help resolve the conflicts that inevitably develop in the course of planning.

Implementation Plan

In addition to generating information to help the system selection decision, planners must create a detailed plan to guide implementation. The success of an implementation plan depends largely on three factors. First, a secure source of construction funds must be obtained. Second, a flexible implementation schedule must be drawn up that can respond to changing regional and local circumstances. Third, means must be developed for directing and controlling transit-related effects, particularly development impacts.

Financing. The metropolitan experience in creating the financing portions of implementation plans shows a clear pattern of historical development. Other aspects of the experience in planning for implementation have been more anomalous.

Financing plans have been an integral part of new system proposals in every city studied. Since UMTA began funding capital programs in 1966, planners in all of the case cities assumed they could tap UMTA for its share and concentrated instead on generating the local share. Five of the cases had to win voter approval for their financing plans. [1]/ Transit plans in three Of the cases (Atlanta, Los Angeles, and Seattle) were defeated at least once; and only three cases have approved fixed guideway transit systems (Atlanta, Denver, San Francisco) . The experience of these five cities in attempts to gain public support show an evolution in both the financing measures used and the nature of the transit plan they are intended to support.

One of the more obvious changes in financial planning has been the nature of the local taxing mechanism proposed. Bond issues supported by property or sales taxes have been the principal methods suggested for financing new systems. Property taxes were recommended by early studies. However, after initial success in San Francisco, property taxes were defeated in Seattle and Atlanta. Sales taxes were substituted and led to voter approval in Atlanta and Denver -- but to defeat twice in Los Angeles.

Changes also have occurred in the nature of the transit plan itself. One of the factors common to the most recent successful fixed guideway transit financing referendums -- in Atlanta (1971) and Denver (1973) -- was the inclusion of short-term bus transit improvements to accompany the long-term transit plan. Immediate transit improvements were not associated with most of the previous financing referend

Another recent trend is incorporating a provision for operating assistance to support existing service as part of the financing plan for a new system. Early proposals had assumed new transit systems would be able to offset at least part of the construction costs with operating surpluses.

Case examples representing a range of approaches to and successes with different financing proposals are summarized below:

1/ These five cases are Atlanta, Denver, Los Angeles, San Francisco, and Seattle. Only a few participating jurisdictions in the Washington region had to vote approval of the financing plan; Boston and Chicago can plan on existing authority; and the Twin Cities has not yet selected a system or financing plan.

Seattle. In 1968 and 1970 Seattle voters rejected bond issues backed by property taxes to finance construction of a new rail system. In 1972, however, voters approved the use of auto excise tax money to support a short-range bus transit plan.

Atlanta. In 1968, Atlanta voters rejected a rail transit system to be financed by property taxes. However in 1971 Fulton and DeKalb county residents approved a sales tax increase to finance a similar rail system and cover bus operating deficits. Part of the financing plan assumed a reduction to 15 cents in the transit fare and increased bus service. An unexpected drain was placed on the new tax fund due to high operating deficits. Even though the state legislature acted to restrict the portion that can be spent on operating deficits, paying for the remainder of the short-term bus improvements and the first segment of the rail system will require careful budgetary management.

Denver. In 1973 Denver area voters approved a sales tax for the operation and construction of a regional transit system. The financing plan was closely associated with an extensive short-range bus improvement plan and implied the construction of a PRT system.

Los Angeles. In 1968 Los Angeles area voters rejected a sales tax-based financing plan for an extensive rail system. Again in 1974 Los Angeles voters rejected a sales tax plan that would have financed an extensive (although ill-defined) new system and the operation of a large short-term bus improvement program.

Washington, D. C. In 1968 WMATA approved a rapid rail system for Washington, D. C., to be financed by local government contributions, revenue bonds guaranteed by the Federal and local governments, and a Federal contribution to pay two-thirds of the total cost. The financing plan was approved by local jurisdictions, which legally committed themselves to contributing a share of the initial estimated costs of the system. Cost escalation has plagued WMATA since then. The source of funds to cover increased construction costs has not been determined at this time.

Staging of construction. The second element of an implementation plan concerns the staging of construction. All of the major transit programs proposed to schedule implementation over time, and to this end staging plans were designed. However, the new UMTA guideline for building in increments casts the concept in a different light. 1/ Traditional construction stages directly follow one after another. According to UMTA, the incremental approach means placing fixed-guideway systems initially only in high density transit corridors, and waiting to build in other corridors until demand develops. Thus existing or near-term needs would be served, while additional service would be held back until future growth had generated enough demand to justify a transit system. Meanwhile, other transit modes could serve the corridor. Inherent in this kind of implementation plan is the flexibility to respond to future growth.

Examples of proposed staged implementation of new systems along these lines are limited, and all are UMTA inspired.

Denver. RTD has prepared an 80-mile Automated Rapid Transit Plan for the Denver area. The initial segment is to be only 28 miles long with additional segments to be constructed as transit demand warrants and as local citizens and governments take actions favoring their construction. RTD's position reflects UMTA's implementation guideline. It also responds to the existence of neighborhood opposition to several potential future segments, although not to the initial segment.

Los Angeles. A March 1974 report in Los Angeles proposed several options for building the initial segment of the proposed system. These options ranged from an initial 33-mile segment to be constructed in six years to an initial 124-mile segment that would require eight years. The proposal, called the "building block" approach, responded to UMTA suggestions. However, all of the building blocks were rejected in favor of building the entire 145-mile system (which met defeat in public referendum later that year).

Atlanta. UMTA has pledged funding for only a segment of the proposed Atlanta system and has made no commitment to support the entire system. By controlling the amount and timing of Federal money committed to the Atlanta system, UMTA will be able to initiate a policy of staged implementation.

1/ UMTA, "Proposed Policy for Major Urban Mass Transportation Investments," op. cit.

Shaping urban growth. The final concern of an implementation plan involves procedures for controlling and shaping development impacts. None of the cases has faced this matter squarely. Transit is typically expected, in effect, to influence future land use in a beneficial manner on its own power through the market place.

Transit's role in shaping development in the pre-automobile age is undisputed. However, at this time the effect of transit on shaping future development patterns has not been proven to be significant. None of the cases has demonstrated convincingly that its proposed transit system could have sufficient influence on land use development to achieve land use benefits. In the case of BART, there is widespread belief, backed by little evidence to date, that the intensification of growth in San Francisco's CBD is due in part to BART. However, there is growing disenchantment over this trend even though it was widely viewed as an objective in the 1945-to-1962 planning period.

In order to achieve potential land use benefits, other governmental actions (such as zoning restrictions and incentives, sewer service -limitation, and auto restraints) must be combined with the provision of transit service. Some localities in the Atlanta, Washington, and San Francisco metropolitan areas have taken steps to encourage high density development around rapid transit stations. But to date none of the cases has adopted or proposed to adopt a package of effective governmental actions to assist a new transit system in creating preferred land use patterns for the entire region.

The following examples cover a representative set of experiences:

Atlanta. In Atlanta the rail system conceived by the '1 planning organization during the 1960s was part of an overall metropolitan growth plan, but no practical means of shaping the land uses accompanied it. In March 1968, before the first referendum, a study entitled Impacts of Rapid Transit on Metropolitan Atlanta was done for the Atlanta Region Metropolitan Planning Commission (MPC's successor). It covered land use impacts, effect on community facilities, social impacts and relocation. It also laid out methods for coordinating urban renewal and transit station development. The report was not carried out to the letter, but the Metropolitan Atlanta Regional Transit Authority (MARTA), the Atlanta Regional Commission, and the City of Atlanta are doing station area impact studies which are designed to plan and control the development around the station areas.

Los Angeles. In Los Angeles, the Southern California Rapid Transit District's plans paid little attention to the Southern California Association of Government's regional land use concept during most of the planning period. Recently SCRTD has shown some recognition of the relationship, but there has been no evidence of any mechanisms to implement SCAG's plans as part of the transit implementation program. CACORT (a blue-ribbon community involvement process) raised the issue of joint development at transit station areas because it had not been built into SCRTD's Phase 111 plan.

Boston. In Boston, the Massachusetts Bay Transportation Authority (MBTA) and the Metropolitan Area planning council (MAPC) have produced generally compatible plans and proposals over the years, reflecting the traditional interlocking relationship between these two agencies. At the project scale, the experience in the Boston area has been mixed. Quincy Center is a good example of joint development that has been implemented pursuant to state legislation with the aid and encouragement of local officials. Developers have responded and a major public parking facility at the station is well utilized. At Wellington Station, by contrast, the MBTA designed a railyard/maintenance facility in the heart of an otherwise excellent, publicly owned development site.

San Francisco. In the San Francisco Bay Area, despite the excellent work in developing a regional land use concept plan as part of the original BART system planning, the implementation of the plan has been characterized by a number of missed opportunities for joint development, one major clash (with Berkeley), and several lesser ones. Significant instances of coordinated development ultimately have been achieved (e.g. at Embarcadero Station, along Market Street, and in downtown Oakland) and subsequent corridor extension studies have been well coordinated with local planning.

Discussion. In summary, successful implementation plans depend on workable financing plans, construction schedules, and development controls. Most recent successful financing referendums have been closely tied to short-term transit improvements. The necessity of achieving areawide support at the polls has encouraged the development of large systems that are to be implemented in one long-term construction effort. Staging of system implementation has been largely in response to UMTA policy. Although all of the new transit systems claim significant land use benefits, none of the systems has been presented as part of a package of governmental actions that would assure achievement of these land use goals.