techniques and the available computer programs in cases where the area is expected to experience exceptionally large population growth. However, the level of effort expended on the process should be a small fraction of that commonly employed. The analysis of a land-use-transportation scheme need not, and should not, exceed 3 to 4 person weeks of professional time plus a similar amount of technical and clerical support.

In most cases, such analysis should be limited to the preferred land-use-transportation alternative that is being considered for adoption. Therefore, the level of effort allocated to transportation planning procedures or techniques that are identified as long-range planning should be rather limited.

This does not mean that significant effort will not be needed for long-range planning. On the contrary, a city anticipating any amount of urban growth needs to carefully plan for its long-range development. The long-range planning effort associated with the 3C process should be redirected as by the following procedures:

1. Cooperation in maintenance of an updated and current comprehensive plan;
2. Assistance in preparing improved street-development standards in the subdivision ordinance and improved access-control practices and driveway design on arterial streets;
3. Assistance in preparing and developing zoning-administration practices that more adequately reflect the relationships between land use and the transportation system;
4. Development of guidelines, plans, and programs for upgrading existing arterial streets and the redevelopment of adjacent land; and
5. Coordination of the planning efforts and the various comprehensive plans when two or more municipalities are in close proximity and of the local comprehensive plan and the interregional transportation plans.

What, then, is the appropriate level of effort to be expended on an urban transportation study? How much effort should be devoted to long-run, as opposed to short-run, issues? on data collection? data analysis? formulation and evaluation of alternatives?

Where an up-to-date comprehensive plan does not exist, the level of effort necessary to develop and obtain adoption of a comprehensive plan might range from about 2 person years of professional effort in a small, slow-growing community to 10 or more person years in a medium-sized urban area experiencing rapid population increase.

The rate of growth will also have a significant effect on the level, as well as on the distribution, of the continuing planning effort. A desirable level for the continuing effort on the transportation-land-use elements is described below:

Criterion	Little or No Growth	Very Rapid Growth
Effort per year per 10 000 of population (person years)	0.2	0.5
Distribution of effort (percentage of total)		
Monitoring and projection updates	10	10
Long-range planning	10	30
Short-range planning and improvement programming	80	60

For a city of 100 000 population, this translates to the following:

Criterion	Little or No Growth	Very Rapid Growth
Total effort (person years)	2	5
Distribution of effort (person months)		
Monitoring and projection updates	3	6
Long-range planning	3	18
Short-range planning and programming	18	36

Additional effort will be necessary to carry on the work on the other community plan elements and for planning administration.

Achieving a Balance Between Long-Range and Short-Range Planning at an Appropriate Level of Effort

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Increasing concern is being focused on the need for an improved planning rationale for smaller (generally fewer than 200 000 population) urbanized areas. It is also necessary to provide officials at federal, state, and local levels with a clearer picture of the appropriate balance between short- and long-range planning for such areas. This paper presents a process for identifying and considering relevant factors that affect transportation planning and describes the planning activities that would result from these factors and the relationship between long- and short-range planning activities.

Urban transportation planning, as developed in the mid-1960s, requires a continuing, comprehensive, and cooperative (3C) transportation planning process as a basis for federal participation in programs of transportation projects in urbanized areas.

The urban transportation planning regulations, jointly issued by the Urban Mass Transportation Administration (UMTA) and the Federal Highway Administration (FHWA) on September 17, 1975, call for the preparation of a transportation system management (TSM) element as well as of a long-range element and the consideration of both in the transportation improvement program (TIP).

Transportation planning traditionally has been viewed as a long-range process culminating in a 20-year fixed and rigid statement of a transportation capital-improvements program for future target years and periodically requires major revisions because of unforeseen changes.

Currently, in addition to dealing with ever-changing public attitudes and policies, local and state officials must also cope with insufficient capital resources and, consequently, must deal more with the present than with the uncertain future and must look more closely at less costly transportation options. Many urban areas today are served by mature transportation systems, and the effective management of these systems, including adequate consideration of energy and air-quality concerns, is the most important transportation planning and programming function that can be performed. Most importantly, both long- and short-range planning, as identified in unified planning work (UPW) programs, must reflect the changes in the thrust of policy issues and local problems experienced in urban areas today.

This paper begins by discussing a series of considerations or determinants that can provide a base for making key decisions regarding the nature and extent of the planning program and the procedures that might be used to execute it. Because local transportation issues, opportunities, and constraints vary from area to area, the paper does not propose a formula for identification of specific problem-solving techniques. Rather, a process for identifying and considering factors that affect transportation planning and problem solving is proposed.

The paper then describes the long- and short-range planning activities that would flow from these determinants and the necessary relations between long- and short-range planning.

Next, a level-of-effort scale is presented that provides an idea of what programs might result from different combinations of urbanized area issues, opportunities, and constraints, and an illustrative example of relative distribution of effort is given.

Finally, guidelines that will assist in minimizing the complexity of planning programs are presented.

This process can be used in any size urbanized area. However, because the planning process in larger areas is usually well staffed and because traditional, well-known systems planning techniques are more applicable to larger areas, this paper emphasizes the design of planning programs for smaller urbanized areas.

LEVEL OF PLANNING EFFORT

The appropriate scope and scale of planning activities necessary to best address the needs of a local urban area should be clearly thought out by the metropolitan planning organization (MPO) and identified in the UPW program. This is effective planning management and covers everything from the determination of planning needs through management of the various planning projects. Continual planning management and evaluation is not new, but its explicit use is something that may well be missing or deficient in many urban planning organizations. But as the need that the planning process be relevant and cost-effective increases, decisions about types of technical procedures to be used to analyze and evaluate long- and short-range strategies become extremely important. Factors such as anticipated population and economic growth rate, existing and anticipated transportation problems and system performance, consideration of environmental and energy concerns, available financial and technical resources, prevailing political and public attitudes, and the current status of planning and plans must be considered in establishing an appropriate technical level of effort. Failure to consider these factors may result in an expenditure of technical effort that is beyond that necessary to develop a sound TIP.

Given these continuing considerations, it is necessary to make decisions (or revise those made previously) regarding the range of potential solutions appropriate for the current and anticipated transportation problems and conditions. These may include isolated spot improvements through traffic-engineering projects, areawide traffic-engineering improvements, transit management strategies, or new major-facility construction. The point is that entirely appropriate and effective planning may vary from area to area in both methodology and time frame, depending on the nature of local problems, issues, and characteristics. For example, detailed long-range two-year travel-demand forecasts are not appropriate for a smaller urbanized area experiencing slow or no growth and having current local problems best solved through TSM actions. On the other hand, it would be inappropriate to ignore the importance of sound long-range planning in the same urbanized area if the transportation issues require the provision of new facilities.

The maintenance of an appropriate planning program by the MPO should be based primarily on the continual review of available information from both the transportation planning process and the various local governmental groups and on discussions with business and community leaders and public officials rather than on any substantial new data-collection and analysis process.

The following considerations should lead to the development or maintenance of an appropriate urban planning program.

1. Local goals and issues: This should include both existing and anticipated.
2. Area characteristics: This should include population, economic development, land use, and geographic constraints to land and transportation development.
3. Transportation system characteristics: This should include the physical and operating conditions of existing highway and transit facilities, connectivity and coverage, and user travel trends.
4. Range of realistic transportation solutions: The range of transportation and land-use alternatives for smaller urbanized areas will in most cases be a much narrower set than that in larger areas due to the less complex nature of the problems and issues and the size and density necessary to make many options feasible. There is no need to develop a complex systems planning process that has a detailed network-based multimodal forecasting capability if there are no areawide systems and impacts to be tested.
5. Constraints on planning: These fall in three categories—general, administrative and legal requirements, and external effects.

General includes personnel and staff (both state and local), computer facilities, available technical tools, and financial resources. In the presence of severe constraints, smaller urbanized areas should allocate a larger share of available resources to the solution of near-term problems rather than to the analysis of projected long-term problems and uncertain future conditions. This might require a shift in the skills mix of MPO staffs to enable short-range transit planning and traffic engineering studies to be performed.

Administrative and legal requirements include both federal and state-local requirements. Federal regulations call for the following technical activities to be included in the transportation planning process in accordance with the size of the area and the complexity of its transportation problems—(a) analysis of existing conditions of travel, transportation facilities, and systems management; (b) evaluation of alternative TSM improvements (TSM element of plan); (c) projection of economic, demographic, and land-use activities and transportation demands based on these activities; (d) analysis of areawide new transportation-investment alternatives (long-range element of plan); (e) refinement of the transportation plan by corridor, transit technology, staging, subarea studies, and such; (f) monitoring of urban development and transportation indicators, and regularly reappraising the plan; and (g) development of the TIP. In developing potential transportation demands, several tools and methods are available, but the selection of the appropriate ones to use should be governed by the decisions about growth and the current transportation problems. The procedures used to determine the future travel demand may range from simply factoring current traffic counts to applying sophisticated travel demand models.

A local area should not feel bound to any preconceived ideas of federal requirements for a specific type of planning process. An area in which the growth is decreasing and the transportation facilities are adequate should not be required to dedicate large sums to sophisticated models that test large-scale capital-intensive transportation alternatives. There is no specific set of procedures, forecasts, or models that must be adhered to.

External effects include consistency with any action plans that are in existence for a given state. Also, the level of sophistication of projections of future air-quality impacts should be commensurate with the sophistication of the remaining parts of the planning process.

6. Existing planning process: Some small urban areas have never started a comprehensive 3C transportation planning process, although larger urbanized areas have already had major revisions of their long-range forecasts and plans.

The extent to which an area has established planning capabilities (both transportation and comprehensive urban) and the extent to which it has a good continuing long-range transportation planning process will greatly influence the allocation of planning resources among competing needs. However, the presence, locally or at the state central office, of a standard computerized modeling package should not be the sole determinant of the technical approach to be used.

Once the approximate bounds on the goals, issues, and solutions for the area have been determined (or re-assessed for continuing planning processes), the actual planning process identified by the planning work program can be used to analyze the transportation alternatives and their effects. An appropriate scale of planning can be identified by the professional planners studying a particular urban area. The best process is one that is cost-effective in terms of being responsive to decision makers and pragmatic in the sense that it is realistic, yet flexible, and produces plans that have a good chance of being implemented.

The design of the appropriately scaled planning process should be a continual consideration in the administration of the planning process by the MPO. The factors listed above should provide the framework for a cost-effective planning program that satisfies the unique situation of the area. Adequate involvement of key community leaders and citizens in the assessment of the required planning should enable it to more adequately address the specific goals and issues of an urbanized area.

LONG-RANGE PLANNING

The development and evaluation of alternative long-range strategies follows a different course today than the plan development process used by transportation studies in the mid-1960s. In the past, the planning process tended to focus on the development of detailed long-range plans. These plans reflected the best forecast of future conditions and policy direction at the time; however, an inherent difficulty of such plans is that they are not easily modified to reflect changing conditions, policies, local attitudes, or unforeseen circumstances. The traditional 5- and 10-year long-range plan reappraisal and revision cycle is no longer appropriate in most cases, given the local issues and problems most urbanized areas have to deal with today and the premium that must be placed on providing timely information for making sound transportation-improvement decisions. Instead, one of the most important activities of an MPO is an adequate and ongoing routine review process that identifies and tests the appropriateness of previously defined capital improvements. Many plans that were realistic 10 years ago are now too expensive, and segments may be financially unattainable or environmentally unsound. Analysis within the corridor of the facility in question should include a new appraisal of multimodal alternatives and TSM actions.

In addition, there may be areas of rapid growth or redistribution of land-use activities may have occurred since the long-range plan was developed. Broad development policies may have significantly changed growth objectives. In such cases, the evaluation of alternative strategies at the system level may be necessary, but the development and evaluation of alternatives should be in general terms. For example, sketch-planning techniques would be appropriate at the system level to test alternative growth policies or contingencies, identify deficient corridors or subareas that have potential problems, eliminate alternatives that are clearly not feasible, and indicate those alternatives that should be retained for additional detailed analysis.

Rather than defining specific solutions at this level, attempts should be made to bound the problem and answer "what if" type questions. For example, the long-term impacts on a corridor highway facility of achieving a 5 or a 15 percent increase in peak-period transit patronage might be a policy decision to be assessed. A pivot-point approach in which alternative solutions pivot about either the existing conditions or a previously defined solution in terms of measures of transportation demand and system supply can help decision makers in making necessary trade-offs. In very few instances today should the traditional and detailed four-step sequential computerized modeling process (trip generation, trip distribution, modal choice, and trip assignment) be used at this level of detail.

In this context, long-range planning should provide an indication of future corridors of demand; the type, locations, and severity of possible deficiencies; and a reference against which more specific transportation solutions can be formulated from alternative courses of action. Long-range planning thus represents a statement of need and policy direction with corridors or subareas of deficiency identified. It is a framework that can be easily refined and redefined over time. Most importantly, it is not an end-state condition.

BALANCE BETWEEN LONG-RANGE AND SHORT-RANGE PLANNING

The refinement of the long-range element represents a translation of the framework into more-specific long-

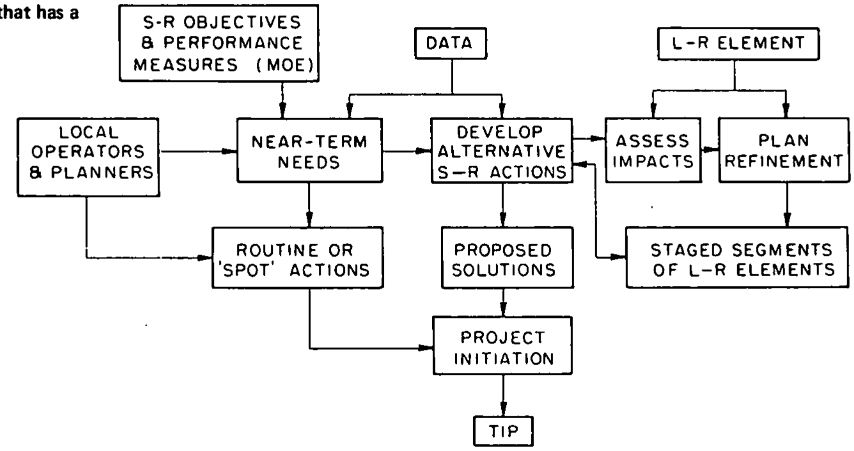

Figure 1. Urban transportation planning process that has a short-range emphasis.

range strategies, both capital-improvement and system-management actions, that reflect current policies, financial-resource estimates, and public attitudes in effect at the time. As major changes in these factors occur, the framework of the long-range planning effort should be reviewed. This can also result in the identification of different transportation solutions. Also, as transportation improvements are implemented and uncertainties are reduced, the generalized long-range framework may be refined.

The refinement of the long-range plan can be carried out through corridor or subarea, feasibility, fiscal, staging, location, and functional classification studies. Once the corridors are identified or the needs are reanalyzed, more detailed analytical procedures can be used to define and refine the alternatives within the corridor. Depending on the appropriate degree of analysis, the range of techniques that can be used vary widely (from factoring traffic counts on individual facilities to models that forecast trips, trip distribution, modal split, and traffic assignment). Finally, travel-demand estimates focusing or windowing in on specific corridors or subareas of concern can be used to analyze impacts and trade-offs among proposed solutions.

In addition, the impacts of proposed TSM actions, based on an analysis of near-term needs, must be defined and analyzed. A TSM strategy may make a more-capital-intensive solution unnecessary, postpone its implementation, or alter its design. Conversely, the early stages of a programmed long-range element can affect the type of TSM strategy proposed for use as an interim measure. For example, congestion on a major arterial can be relieved in several ways: adding lanes, channelizing intersections, eliminating parking, or improving signal systems. If the long-range analysis indicates that additional lanes are needed, channelized intersections may be the appropriate short-range solution, because this permits phasing in the street widening over a long time period. If a new facility is needed to relieve the traffic in the longer range, a new signal system may be appropriate. The flexibility of the near-term solution to uncertain long-term circumstances should weigh heavily in the decision. In addition, areawide actions such as parking and other terminal- and transfer-facility needs, carpooling programs, systemwide traffic-engineering and transit-technology studies, and paratransit projects should be analyzed, and their impacts measured on the long-range element.

URBAN TRANSPORTATION PLANNING THAT HAS A SHORT-RANGE EMPHASIS

Alternative short-range actions leading to a transportation improvement program are developed from near-term needs and the early stages of the refined long-range plan element. This idea is illustrated in Figure 1. The balance between TSM and more-capital-intensive solutions should reflect such things as city size, problem complexity, and growth potential as discussed above. It is vital to the effectiveness of planning that most of the emphasis be placed on short-range planning stages and that it be made clear that the remaining stages are subject to further study. To this end, it is necessary to make a comprehensive study of short-range needs to develop an implementable short-range program for highway and transit. This most likely will be based on an analysis of current conditions and a comprehensive regional analysis of short-range TSM alternatives. In other cases, the short-range program could be composed of TSM strategies developed by the local implementors or operators. Depending on local programming policies, this short-range period may cover from three to eight years.

Other important aspects of the concept include the following:

1. Impacts of short-range actions on the mid-range and long-range plan must be assessed.
2. Short-range objectives and performance measures must be compatible with long-range goals and objectives.
3. Performance measures must be chosen to determine whether objectives are being achieved.
4. Some of the locally developed short-range actions are routine or spot solutions to problems and therefore have known consequences and do not require a comprehensive analysis.
5. Although not shown explicitly in Figure 1, the long-range planning process is important and should include the identification of future travel demand and the location and severity of deficiencies. This is the framework for developing solutions to long-range problems and corridor or subarea identification for further plan refinement.

Given the short-range estimates and a long-range plan element, it is necessary to develop a short-range improvement program of facilities and strategies that is financially feasible and operationally workable.

LEVEL-OF-EFFORT SCALE

Based on different combinations of urbanized area issues, problems, opportunities, and constraints, an appropriate level of planning effort must be established and maintained for a cost-effective ongoing transportation planning program. The relative distribution of planning resources can be based on key determinants (see below) to the level of effort (as characterized very generally in Figure 2).

Determinant	Range
Size	Small to large
Complexity	Low to high
Growth rate	Low to high
Feasible solutions	Traffic engineering to major facility

More specifically, situations in many urbanized areas can be identified within the bounds of the criteria shown in Table 1. The criteria within the major categories are not necessarily mutually exclusive and other measures might be identifiable, but the ranges shown provide an idea of the scale of operations and are indicative of the conditions often found in smaller urbanized areas. Without placing too much objective reliance on Figure 2 for the identification of a specific level of effort, situations nearing the conditions in the high side of the range generally require a higher level of effort and sophistication of planning, a longer forecast horizon, more long-range planning and alternatives, and relatively less attention to short-range programs. Under these hypothetical conditions, the allocation of resources among the major elements of a planning work program might be as follows:

Element	Allocation (%)
Long-range planning	35
Short-range planning	35
Short-range programming	15
Monitoring	15

Conditions tending toward the low side of the range might

Figure 2. Relationship between distribution of planning resources and determinants of level of effort.

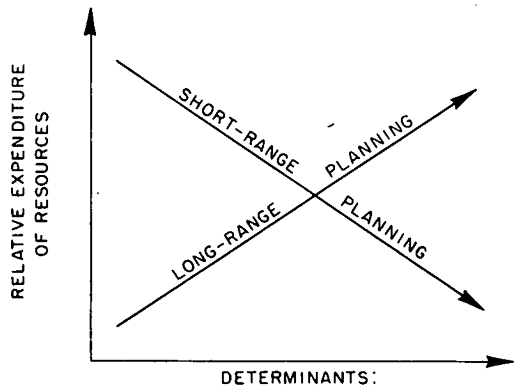

Table 1. Level-of-effort scale.

	Range	
Criterion	Low	High
Local issues and policies		
Growth policies	No growth	Growth
Air quality	No problem	Requires transportation control plan
Land-use development patterns	Limited (filling in)	New concentrations (redistribution)
Central business district	Declining	Revitalized and promoting growth
Attitude of state and local officials	Good and open to new approaches	Closed
Area characteristics		
Growth potential and past trends	Low (negative to +1%)	High (+5%)
Physical constraints	Limited growth potential	Growth allowed
Population	About 75 000	About 300 000
Type of area	Self-contained and limited attractor of new industry	Bedroom community to rapidly growing metropolitan area
Employment location and distribution	Low density and scattered	Significant major generators
Land-use development patterns	Limited (filling in)	New concentrations (redistribution)
Central business district	Declining	Growing and dynamic
System characteristics		
Complexity and nature of problems		
Extent and limits of congestion	Limited and localized	Severe and areawide
Traffic flow and capacity	Level of service B-C, few links having high volume:capacity ratios	Level of service E extensive, many links having high volume:capacity ratios
Status of existing system	Mature	Developing and expanding
Extent of public transportation	Good regional service	None or limited service
Source of traffic problems	External (predominantly through travel on existing Interstate highway bypass)	External (no existing bypass) or internal (area is attractor)
Parking supply	Adequate	Limited
Effect of other services	Transportation facilities developed as part of orderly comprehensive development	Transportation service plays catch up only
Range of feasible solutions		
Amount of capital resources available	Limited	Not as limited
Possible transportation solutions	Traffic engineering, transit operation	New highway systems, major facilities
Constraints on planning		
Local regulations	Supportive of planned development and effective	Hinderance to effective TSM actions
Staff capability	Little or no staff	Full skills mix
Amount of planning resources available	Limited	Not as limited
Attitude of local and state officials	Good and open to new approaches	Closed
Program level support by planning	Supportive	Significant justification required
Existing planning process		
Status of existing plans and planning	Established process	None or long-range-plan evaluation needed
Existing data base	Adequate data base	None

call for the following distribution of resources:

Element	Allocation (%)
Long-range planning	15
Short-range planning	50
Short-range programming	25
Monitoring	10

SUMMARY COMMENTS AND GENERAL SIMPLIFICATION GUIDELINES

1. The trend should be toward the elimination of unwarranted complexity, excessive data collection, and oversophisticated computer processes.
2. Some areas have developed very systematic, efficient analysis methods based on computer models; however, the mere availability of a standardized computer modeling package should not be the sole determinant of the approach to be used.
3. For many areas, an incremental planning process may be the best approach; i.e., the area should develop a responsible, ongoing capability through a traffic-engineering and transit-development program. If situations warrant, the techniques can be expanded to be more responsive to other issues.
4. The long-range time frame is not fixed. Every area is not constrained by 20 years as the appropriate planning horizon.
5. Travel-demand modeling should be reserved for major system testing; the use of land-use and road-spacing techniques and functional classification are more appropriate for lower facility types.
6. Greater use should be made of sketch planning and growth-level analysis for testing alternative systems and rejecting noncompetitive options.
7. Procedures should be kept operational, and excessive startup times should be avoided. This is especially important in small urban areas where limited staff and funding can make a sophisticated modeling approach stretch out for years before any useful results are available.
8. Transit planning should consist of studies leading to TSM actions, demonstration projects, and service improvements.
9. Greater use should be made of traffic-engineering studies. In many areas, the best approach may be the combination of several traffic-engineering studies.
10. Large-scale origin-destination surveys should be eliminated for small urbanized areas; if surveys are needed at all, well-designed stratified sampling techniques should be used for obtaining trip-rate checks, trip lengths, and such.
11. The surveillance of existing conditions should be made by a comprehensive traffic-counting program. This is important for evaluating the effectiveness of improvement programs and verifying synthetic traffic-estimating techniques.
12. The use of secondary sources of socioeconomic data, previously developed travel relationships, and generalized system supply data should be maximized.
13. There are certain problems in which well-documented, easy-to-use computer software is the most efficient approach. Usually, these problems involve large amounts of data or numerous calculations (e.g., processing and tabulating the results of the simple transit onboard survey).
14. Short-range plans should be emphasized, particularly for transit where easily changed bus and paratransit options are the norm.
15. For many small areas, informed judgment and common sense may contribute as much as detailed technical analysis.
16. The long-term consequences of all near-term alternatives should be evaluated, and future options should be examined and varied in light of changing community attitudes.
17. Procedures for quickly assessing alternative programs and their cost-effectiveness should be emphasized.