

TRANSPORTATION PLANNING IN THE 21ST CENTURY

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The world moves into the future as a result of decisions not as a result of plans.

Kenneth Boulding (1)

The substance and form of transportation planning during the past 40 years have reflected shifts in the issues and concerns of federal, state, and local officials. As these issues and concerns have changed, new factors have entered into the planning process. Part of this evolution has been a broadening perspective on what constitutes a transportation system (e.g., modal, multimodal, and intermodal definitions), the types of actions that should be taken to address transportation problems (e.g., capacity expansion, system management, demand management, and the application of advanced technologies), and an expanding definition of benefit measurement (e.g., quantitative system measures, societal costs, and sustainable development).

Today's transportation planning will likewise have to evolve to reflect tomorrow's expected demands and the changing demographic, technological, environmental, and economic factors that will greatly influence lifestyles and travel. In some cases, the issues of concern to future planners are suggested by historical trends that have consistently shown patterns of likely travel behavior. In other cases, the novelty and rapidity of change preclude any prediction based on observable fact, thus necessitating a best guess as to the likely changes and the associated consequences.

Evolution of Transportation Planning Issues

The transportation planning profession periodically holds national conferences on the status and future of transportation planning. Some of the more important conferences during the past several decades and the key issues discussed are shown in Table 1. This table suggests some interesting changes in focus during the past 40 years:

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| From: Methods and data in support of capital programming | To: Improved information on a wide-ranging set of impacts for a broad variety of capital, operational, pricing, lifestyle, and land use decisions |
| From: Efficiency of highway networks and corresponding levels of service (speed and travel time) | To: Multimodal systems operation and broad performance measurement (accessibility and mobility) |
| From: How to get from point A to point B | To: Broader context of transportation's role in a community and in the global, national, state, and local economic markets |
| From: Passenger movement | To: Commensurate importance of freight movement and productivity improvements |
| From: Vehicle and system technology viewed as a given | To: Innovative technologies used to influence system operation and travel behavior |
| From: Acceptance of land use patterns as a given and not part of the solution set | To: Use of growth-management tools in connection with corresponding transportation policies as a major strategy |
| From: Environmental impacts as a project-level mitigation issue | To: Linkage between transportation decisions and a broader systems and sustainability framework of ecological and community health |
| From: User benefits and costs | To: Equitable distribution of benefits and costs within the concept of a community |

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EDITOR'S NOTES:

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TABLE 1 Major Conferences on Transportation Planning, 1957 to Present

Conference	Key Issues
1957, Hartford, Connecticut <i>New Highways: Challenge to the Metropolitan Region</i>	◆ Design of urban Interstates to fit into an urban environment ◆ Importance of comprehensive land use plans and linkage to transportation plans
1958, Sagamore, New York <i>Highways and Urban Development</i>	◆ Extension of Interstates into urban areas ◆ Linkage between highway investment and economic development ◆ Highway design characteristics ◆ Need for comprehensive focus in planning ◆ Benefit/cost evaluation strategies
1962, Hershey, Pennsylvania <i>Freeways and the Urban Setting</i>	◆ Conflict among highway, housing, and land use goals ◆ Desire for broader perspective in transportation planning
1965, Williamsburg, Virginia <i>Highways and Urban Development</i>	◆ Cooperative planning among different groups ◆ Community values and goals ◆ Coordination of land use plans with transportation planning ◆ Desire for more formalized transportation planning process
1971, Mt. Pocono, Pennsylvania <i>Organization for Continuing Urban Transportation Planning</i>	◆ Linkage between transportation investment and environment ◆ Community values and their incorporation into transportation planning ◆ Multimodal perspectives ◆ Citizen participation
1982, Airlie House, Virginia <i>Urban Transportation Planning in the 1980's</i>	◆ Need for systematic urban transportation planning ◆ More flexibility in the planning process; streamlining of regulations ◆ Corridor perspectives ◆ More responsibility for state and local officials
1988, Washington, D.C. <i>A Look Ahead: Year 2020</i>	◆ Linkage between transportation investment and economic productivity ◆ Need to monitor demographic changes and impacts on travel ◆ Environmental impacts ◆ Institutional responsibilities ◆ Urban form and its relationship to transportation investment ◆ Role of technology
1989, Boston, Massachusetts <i>Statewide Transportation Planning</i>	◆ Relationship between planning and decision making ◆ Importance of vision ◆ System management ◆ Multimodal perspectives in evaluation ◆ Role of technology
1990, Irvine, California <i>Transportation, Urban Form and the Environment</i>	◆ Importance of good data ◆ Dynamics of demographic and social changes ◆ Transportation and air quality ◆ Accessibility and its measurement ◆ Means of judging the effectiveness of the planning process ◆ Institutional arrangements and financial innovation
1992, Charlotte, North Carolina <i>Moving Urban America</i>	◆ Importance of partnerships for getting things done ◆ Means of serving the needs of customers and system users ◆ Mobility as a goal ◆ Social costs of transportation provision and use ◆ Importance of public involvement ◆ Transportation-land use connection ◆ Transportation and air quality ◆ Management systems in the context of transportation planning ◆ Means of measuring quality-of-life indicators
1992, Irvine, California <i>ISTEA and Intermodal Planning^a</i>	◆ Focus on effectiveness of intermodal connections ◆ Partnerships ◆ Role of freight movement in transportation planning ◆ Stakeholder participation ◆ Performance orientation in planning ◆ Institutional barriers

TABLE 1 Major Conferences on Transportation Planning, 1957 to Present *continued*

Conference	Key Issues
1992, Seattle, Washington <i>Transportation Planning, Programming, and Finance</i>	◆ Multimodal planning and programming ◆ Transportation and land use ◆ Consideration of freight in the planning process ◆ Need for cooperation among many different groups ◆ Importance of demographics in identifying travel characteristics ◆ Performance-oriented planning and evaluation
1996, Coeur d'Alene, Idaho <i>Statewide Transportation Planning</i>	◆ Role of the private sector in transportation ◆ System preservation as a goal of planning ◆ Financial constraints ◆ Performance-based planning ◆ Incorporation of operations issues into planning ◆ Freight planning ◆ System monitoring ◆ Multistate planning efforts
1998, Irvine, California <i>Statewide Travel Forecasting</i>	◆ Investment methods to provide support for decisions among modes and between capacity and operational improvements ◆ Need to tie methods into asset management ◆ Performance measures ◆ Integration of economic activities into forecasting ◆ Need to test modes that do not exist today ◆ Transportation and land use connections

^aISTEA = Intermodal Surface Transportation Efficiency Act of 1991.

From: Use of data on today's system operation (e.g., traffic counts) to calibrate models for forecasting

To: Monitoring and measurement of today's system operation for real-time control and development of historical files

From: What the planning and/or transportation agency should do to solve transportation problems

To: What everyone should do to solve transportation problems (e.g., partnerships)

The continuation of these changes in the future means that transportation planning is likely to be affected by a wide range of concerns and constituent demands. As a result, the planning process will have to be more flexibly structured and more responsive to a variety of issues that will arise at many levels of decision making.

Transportation Planning and the Future

Ten key issues are likely to demand the attention of transportation decision makers during the next two decades. Because of their importance to the future transportation system and to the decisions that will be made, these issues should be incorporated into today's planning process.

Demographic Change

In the Distinguished Lecture at the 1999 Annual Meeting of the Transportation Research Board (published in *Transportation Research Record* 1660), Alan Pisarski argued that transportation professionals in the 1980s missed several key trends that had a profound impact on travel. These trends included substantial growth in jobs, increases in truck travel, significant growth in vehicle-miles traveled, and changes in economic production processes. Pisarski also suggested that the trends to watch during the next decade were increasing immigration, higher household incomes (which will lead to increased vehicle ownership), and the aging of the population. These trends are indeed likely to have profound impacts on transportation planning. Mobility for the elderly, who will more than ever be driving during their later years, creates a special challenge for transportation planners. This challenge could have important implications for the way travel information is disseminated and the importance of nonwork trips as they relate to daily travel, as well as the provision of transportation services to the elderly.

Immigration also presents special challenges to transportation planners. Immigrants tend to locate in metropolitan areas (90 percent do so), and within those areas, in central cities more than suburbs (55 versus 45 percent). In the short term, transportation options that provide access to jobs will become a major issue. For example, the cities with



Demographic trends likely to affect travel in the next decade are growing immigration; higher household incomes, which translate to increased vehicle ownership; and the aging population.

the largest increases in zero-vehicle households between 1980 and 1990 were Miami, San Diego, and Phoenix, cities experiencing large influxes of Spanish-speaking immigrants (2). However, as immigrants become assimilated into society, it is likely that they will represent a new wave of automobile users.

Economic Production and Market Forces

The fundamental relationship between economic activity and transportation demand has been the cornerstone of transportation demand analysis for decades. And yet my perception is that transportation planners are often caught unaware of the profound changes in the technology of production and in the movement of resources and products that have such significant impacts on the transportation system. Free-trade agreements, globalization of the production process, diversification of employment sites, innovations in the movement of goods that increase productivity but shift flows (e.g., containerization), and demand for larger capacity and faster movement of goods all have important effects on metropolitan transportation systems. It is clearly necessary to do a better job of incorporating freight movement into the transportation planning process. Many planners see this simply as a matter of better understanding truck flows on a region's highway network; the scale of analysis, however, needs to extend far beyond such a simple view.

Multimodal Perspective

Multimodal transportation planning has been discussed and pursued for many years, but only recently have examples of such planning begun to emerge. Public officials and transportation experts are increasingly calling for a more balanced transportation policy and planning process, one that recognizes the inherent subsidies prevalent in automobile use and considers the full societal cost of all transportation options.

A possible prototype for the corridor planning study of the future is Maryland's U.S. 301 corridor study, in which the following elements were considered: transportation management associations in major employment centers, employee vanpool programs, home-based ridesharing programs, local paratransit programs with community centers, improved park-and-ride amenities, new park-and-ride lots, additional area telework centers, additional bicycle and pedestrian facilities, transit-oriented development amenities, travel demand management in the development approval process, congestion pricing, reduced transit fares, pricing of parking for public facilities, and parking cash-out programs. The implication for transportation planning of adopting such a multimodal perspective is the need to have in place the data collection systems, analysis tools, evaluation methods, prioritization schemes, and funding mechanisms required to answer the basic questions of how much each action will cost and what its impacts will be.

Operations Perspective

Beginning with the transportation system management (TSM) initiative in the mid-1970s, the planning process within the U.S. transportation community has increasingly emphasized more efficient operation of the existing transportation system.¹ Incorporating such concerns into the planning process reflects the convergence of several policy thrusts that originated in differing policy environments. Among these are increasing traffic efficiency and capacity; providing alternatives for large-scale infrastructure investment; reducing the consumption of fuel in the face of serious disruptions in fuel supplies; improving air quality through more effective use of road space; and, more recently, a resurgent emphasis on land policy and urban densification. Given that the focus of traffic operations managers tends to be short term, hardware oriented, and

¹ In 1975 the U.S. Department of Transportation issued joint planning regulations that included an appendix outlining different types of operational improvements to be considered in solving transportation problems. This policy initiative also required that a TSM element be part of the transportation plan.

technically grounded in engineering, operations strategies have not often found a place in the planning process. However, with the addition of intelligent transportation system technologies to the array of transportation options, operations personnel become a critical component of successful implementation efforts. We need to do a better job of providing a place for an operations perspective in the planning process.

Role of Technology

Each of the great leaps in transportation progress occurred because of technological innovation. In transportation, this innovation was driven by demands for faster travel, improved safety, and increased capacity for both passengers and cargo. One of the unmistakable trends in urban transportation today is the increasing application of advanced technologies to vehicle and system operation. ITS technologies are the most visible of these trends. In addition, low-emission vehicles are being designed that could greatly reduce pollutant emissions. Telecommunications technologies are evolving so rapidly that technological obsolescence is now measured in months instead of decades. In the broad perspective of transportation history, telecommunications technologies represent the first opportunity to render physical presence (and thus transportation) immaterial (telegraphs and telephones do not provide the range of functionality necessary to

substitute fully for physical presence). Over a long planning horizon, therefore, the consequences of such travel substitution become a critical factor in assessing future demand, although admittedly one that is difficult to gauge.

In the shorter term, transportation planning needs to anticipate the application of increasingly advanced technologies in system operation. Infrastructure and systems design will have to be compatible with the ITS national architecture, and operational improvements that include ITS strategies will need to be identified. For the longer term, the use of information systems in all aspects of society will continue to shape dramatically both personal and business decisions that relate directly to transportation.

Sense of Community

A recent study conducted by The Drucker Foundation examined the future of society, and led to the conclusion that one of the guiding concepts will be the search for a "sense of community" (3). A remarkable feature of this study is that, although the major contributors are best known for their treatises on effective management techniques and corporate strategy, they all agreed on the key role of this search for community. As Peter Drucker puts it, "the task today, therefore, is to create urban communities—something that never existed before. Instead of the traditional communities of history, urban communi-

Innovations in movement of goods, such as containerization, that increase productivity but shift flows have a significant impact on the transportation system. Transportation planners need to do a better job incorporating freight movement into the planning process.





Transportation innovations result from demands for faster travel, improved safety, and increased capacity for both passengers and cargo.

ties need to be free and voluntary. But they also need to offer the individual in the city an opportunity to achieve, to contribute, to matter" (4,p. 5).

The transportation community has heard a great deal about quality of life and environmental justice, but I do not believe we have placed these concerns in a larger context of community responsibility and values. As the disparity between central-city and metropolitan median incomes continues to widen, decision makers will face increasing pressures to provide economic opportunities for all of society. Transportation will have an important role in providing access to such opportunities.

Laying the Groundwork for Pricing

Economists have argued for years that road use is underpriced (especially when externalities are considered),² and that the solution is to implement road or congestion pricing (see article by Berg et al. in this issue). There is little doubt that pricing offers the best potential means of reducing congestion. Yet a threshold level of congestion "cost" that would cause automobile users in U.S. urban areas to make significant changes in their travel mode or times of travel has not yet been reached to any great extent. There have been several policy initiatives aimed at clearly defined groups, but the costs of compliance

were considered too intrusive. Examples include mandatory employer trip reduction programs in the 1990 Clean Air Act Amendments, Regulation XV in Southern California, congestion pricing demonstrations, and an extensive congestion pricing study conducted in Minneapolis-St. Paul. These examples suggest that the public, and thus political decision makers, are not yet ready for the large-scale application of road pricing.

The transportation planning process can, however, serve as an important catalyst in the collective learning curve that will lead to implementation of road pricing schemes. By being selective in the targeting of potential markets for demonstrations or experiments, transportation agencies can lay the groundwork for a changing public perception. Note that this suggestion implies a role for transportation planning that goes beyond the development of a plan or program, to the heart of the pressures likely to be faced by decision makers. Without supportive constituencies, it is unlikely that any dramatic changes in road pricing will be adopted by elected officials.

Putting Teeth into Growth Management

Efforts to reduce congestion and develop mobility strategies must encompass land use actions, especially at the regional level. In some parts of the country, such regional or growth management strategies have forged better links between investment decisions on infrastructure and desired development patterns. A recent and highly visible example is Maryland's Smart Growth Initiative. Incorporating different land use patterns into transportation analysis has been fairly common for more than a decade (see, e.g., 5-8). However, many of these efforts were simply scenarios for determining "what if..." contexts for transportation demand. The primary role for transportation plans in actually achieving these futures was to encourage new patterns of development through the provision of transportation infrastructure. Although policy statements often included encouragement to local governments to make land use decisions within such a regional context, there were seldom any incentives or sanctions involved.

Today there are signs of a movement toward incentives and sanctions that reflect several characteristics related to the integration of land use and transportation planning. It appears likely that decision makers who are adopting more stringent criteria for development decisions will want transportation policies conducive to their overall goal. Transportation agencies will have to be part of the team; the role of transportation planning may differ significantly from what it has been in the past.

² Externalities are defined as benefits or costs that are external to the operation of the transportation market. An example in this case might be the health costs of pollution-related illness caused by automobile exhaust.

Transportation Planning Within a Sustainability Framework

Public concern for a safe and healthy environment will grow in the 21st century and will be addressed under the general rubric of "sustainable development" or "sustainable transportation." To some, sustainability pertains to the compatibility between a specific action and natural ecological principles (9). To others, and especially in the context of community development, physical, biological, and social "connectedness" requires a broader perspective on how communities should be designed. This broader perspective encompasses certain principles (10):

- ◆ Coordinating decisions related to land use, transportation, environment, and social services.
- ◆ Reducing the exposure of people and property to natural hazards.
- ◆ Limiting exposure to air and water pollution and the consumption of nonrenewable resources.
- ◆ Developing land efficiently with higher densities and contiguous to existing development.
- ◆ Promoting a sense of place by protecting views and encouraging compatible urban designs.
- ◆ Providing a cultural milieu and public spaces that encourage the interaction of people from different social and economic groups.
- ◆ Providing access and mobility for all socioeconomic groups.

Others have focused on the characteristics of a sustainable transportation system and the implications for the transportation planning process (11). Perhaps the most forceful perspective on what sustainable transportation means to transportation planning is represented by the argument that planning for accessibility in all forms should be the ultimate goal, rather than planning for the automobile (12).

It is likely that the concept of sustainability, especially the focus on the interaction between humans and natural ecosystems, will receive increasing emphasis in the future. From a decision-making perspective (and thus with implications for planning), this greater emphasis is likely to mean new demands on the planning process to place proposed actions in a broader context of environmental evaluation. For example, the future transportation planning process might begin with an environmental scan of a region, aimed at identifying sensitive environmental (broadly defined) areas and likely consequences of further infrastructure development in those areas. Secondary and cumulative impacts would be key issues under such an approach.

Accountability for Decision Making and Planning

An important recent trend in almost every government program is growing public interest in account-

ability, that is, what has actually happened or changed as a result of public investment. In transportation, this trend has taken many forms, including audits, program assessments, and performance-based planning. As congestion becomes worse, the collective frustration of the public and the political system can lead to some dramatic finger pointing.

In Atlanta, for example, the business community led a regional examination of what to do about transportation problems in light of the perceived inability of public agencies to deal with the often opposing political forces for real change. This group recommended that the Atlanta region and a new governor:

- ◆ Set and communicate short- and long-term performance objectives for Atlanta's regional transportation system.
- ◆ Adopt aspiration-based strategic planning and land use compliance incentives.
- ◆ Create a regional transit authority to plan and coordinate all transit services in the region.
- ◆ Secure adequate and flexible funding for transportation needs.
- ◆ Build public awareness about transportation issues and alternatives to single-occupancy vehicle travel.
- ◆ Mobilize the business community to support recommendations and change commuter behavior.
- ◆ Give one regionally focused agency integrated responsibility for planning, resource allocation, and monitoring of implementation for all forms of transportation in the Atlanta region.

The last recommendation was in response to the widely held belief that the current institutional structure was unable to advance a transportation plan that would result in significant congestion reduction and air quality improvement. The new governor has created such an agency.

In a planning context, increased emphasis on the accountability of government programs results in the need to demonstrate accomplishments—planners must identify ways of linking system performance outcomes to targeted investments. As was the case in Atlanta, institutional change designed to overcome perceived barriers to program implementation may also be involved.

Conclusion

Figure 1 is a simple illustration of the evolution of transportation planning during the past 40 years. As shown, each period saw the addition of new perspectives and decision-making requirements to the core planning process. To a large extent, the basic mission of transportation planning has remained the same—providing mobility in as safe and cost-

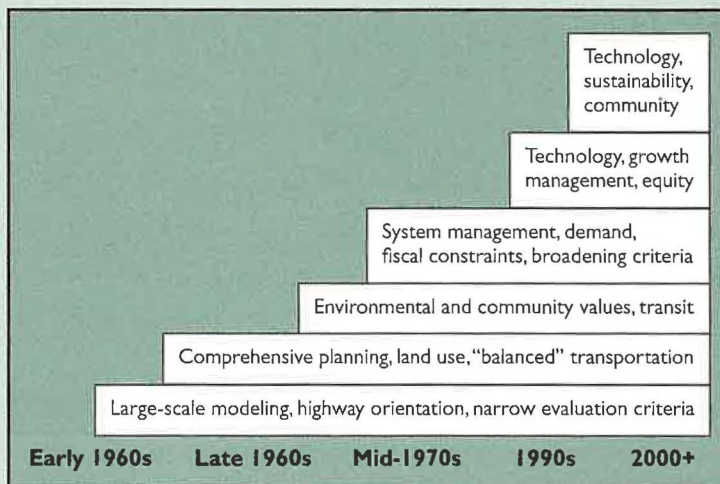


FIGURE 1
Key issues in
the evolution of
transportation
planning.

effective a manner as possible. This basic mission, however, has been augmented to reflect changing issues of concern to policy makers and to respond to the larger context within which success is now measured. Given the role of planning as support for decision making, this is exactly as it should be.

Although the discussion here has focused on the types of issues likely to be faced by decision makers in the 21st century, any examination of transportation planning should include some attention to process. The transportation planning process has evolved, guided by regulations and law, to encompass many tasks and activities that purport to meet decision-making needs. In general, the process has been opened to new participants with new perspectives. However, the analytical framework that has evolved to support state and regional planning has tended to fall short in answering the types of questions asked by these new groups. A responsive 21st-century transportation planning process will have to be much more attuned to the customers for the information, ranging from the individual traveler to elected decision makers. Achieving this responsiveness to customer needs may necessitate increased use of market research techniques, and most certainly will require innovative opportunities for participation in the process.

The period of transportation planning that approaches with the 21st century will likely be influenced by many different societal concerns and desires. However, the next era of planning may well be viewed by future historians as being defined by the convergence of two dominant trends—the ever-increasing technological sophistication of society and the growing societal concern for sustainable community development. If approached carefully and planned for, these two trends can be mutually

reinforcing. If not, we face the prospect of technological advances fostering lifestyle patterns that are not in keeping with the broader values of a healthy society and ecosystem. Indeed, many of the issues discussed earlier can be included within these categories; for example, an operations focus in systems planning necessarily leads to a discussion of technology. The success of the next period of transportation planning may well be measured by the effectiveness with which these two trends are addressed. Will technology (defined in its broadest sense to include fuels, materials, telecommunications, and system/vehicle control) be able to reinforce the desire for a level of community development that is more livable and sustainable? Or will technology be applied so as to encourage travel behavior and development patterns that are incompatible with sustainability principles? The answers to these questions may represent the next great challenge for transportation planners.

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