Integrating Land Use Issues into Transportation Planning: Scenario Planning

Summary Report

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Abstract

Over the past 15 years, land use-transportation scenario planning has become an increasingly common technique in regional and sub-regional planning processes. This study investigates the breadth of the technique and some of the themes that are emerging by reviewing 80 scenario planning projects from more than 50 metropolitan areas in the U.S. The study identifies the antecedents to current land use-transportation scenario planning, observes trends emerging from the recent examples, and explores whether the technique has entered the state of the practice in land use-transportation planning. The study provides references to an annotated bibliography and a digital library containing information on source data.

Author's Note

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In recent years, numerous cities and towns across the United States have engaged in some form of visioning process to chart a future for their communities. These "vision quests" frequently use some form of scenario planning process that quantitatively evaluates impacts from several alternative development patterns, analyzing respective impacts on items ranging from the affordability of housing to water quality. Almost invariably, the analysis includes several measures of transportation efficiency.

This study was proposed to determine the degree to which planning processes in U.S. metropolitan areas use some form of scenario analysis to assess interactions and relative outcomes between land use and transportation policies and investments. Three groups of basic questions emerged:

1. What precisely do we mean when we refer to "scenario planning"? What is the history of the practice? How do we define it today?

2. What are the motivations of organizations that sponsor scenario planning projects? What methods do they employ? What outcomes do they achieve?

3. Do the frequent use of land use-transportation scenario planning in recent years and the methods employed in those processes suggest that the technique has moved from being "state of the art" to "state of the practice"?

The modern use of scenario planning in land use-transportation planning contexts arose from a combination of business and military strategic planning processes and a tradition of transportation alternatives analyses. The 80 projects analyzed in this study indicate that scenario planning processes tend to be sponsored by regional organizations, frequently metropolitan planning organizations (MPOs), and focused on regional level growth-related issues, such as spatial patterns and urban form. The scenarios used in these processes frequently focus on variations in development density and location of growth, employing some sort of "centers" or "cluster" archetype. They are most often analyzed for their impact on transportation related values, using traditional transportation forecasting models. The results of these analyses vary widely across projects; median values for measures such as vehicle mile traveled (VMT) and mobile emissions of oxides of nitrogen (NOx) in the minus 2-3% range compared to trend scenarios. The increasingly frequent use of scenario planning and the common methods and themes that emerge from the data suggest that scenario planning techniques may be considered part of the "state of the practice" in land use-transportation planning, though future development of those techniques will likely provide a more definitive answer.

A Definition of Scenario Planning

Humans have always pondered about the future, and wondered how they might be able to anticipate it. Concern about future circumstances and conditions is, seemingly, a part of the human condition. Although, periodically, there have been those who claim prophetic prescience, most humans are left unaided to wonder about the unforeseen. Of particular concern are those things over which one has no, or only partial, control. One method developed over time to reduce this degree of uncertainty is an approach now known as scenario planning.

A scenario is "an internally consistent view of what the future might turn out to be—not a forecast, but one possible future outcome" (Porter, 1985). Scenarios, fundamentally, are stories about the future. In fact, the use of *scenario* in the planning context is derived from the term's use in Hollywood screenwriting (Godet, 2001). Scenarios need not—and indeed, cannot—be unerringly predictive. Rather, their job is to present a vision of the future that is plausible in light of known information.

A process that uses scenarios to assess the future—a "scenario planning" process—utilizes a series of scenarios to gauge possible future conditions. The expectation is that through the process of conceiving, crafting, and evaluating a series of scenarios, an appropriate course, or series of courses, of action can be identified. Hence, through this process, the wide-open question of what the future might bring can be narrowed down to a more manageable set of possibilities.

Scenario planning can be used in a number of different fashions, as will be seen. While the technique is sometimes employed to identify future opportunities, it is frequently used to anticipate and, hence, avoid, future catastrophes. It is this emphasis on avoiding the negative that has led some to refer to scenario planning as "something like anticipatory disaster relief" (Ogilvy, 2002, p. 12).

Military & Business History

The current use of scenario planning techniques in land use-transportation planning is derived, in part, from the history of military and business strategic planning. Though humans have likely used some form of scenario planning-style decision making processes for millennia, the earliest traceable roots of the technique date from ancient Chinese and Roman cultures, and come from a military context. The military setting is, perhaps, one of the best exemplars of the need for, and the application of, a scenario planning approach. In the anticipation of battle, the commanding officers of each side cannot know how his/her opponent will pursue the conflict or how they might react to certain forays. Making a single prediction on these questions, and allocating resources based on that prediction, runs the risk of being caught in a vulnerable position should reality turn out differently. On the other hand, "maintaining a view of alternate possible forms of threat, and hence the ability to react" (Ringland, 1998, p. 12) provides the commander with a range of possible realities and thereby a range of possible actions and reactions, resulting in less uncertainty and a lower risk of being vulnerable.

In *The Art of War*, the sixth century BCE Qi general Sun Tzu articulates the need to contemplate alternative contingencies by analogizing to the flow of water:

> Water shapes its course according to the nature of the ground over which it flows; the soldier works out his victory in relation to the foe whom he is facing.

> Therefore, just as water retains no constant shape, so in warfare there are no constant conditions. He who can modify his tactics in relation to his opponent and thereby succeed in winning, may be called a heaven-born captain. (Giles, 1910, p. 46)

The armies of the Roman Empire appear to have operated, at least on some occasions, with a similar sense of adaptive responsiveness. The first century CE governor of Britain, Sextus Julius Frontinus, in his treatise (also titled *The Art of War*) stresses the need for adequate reserves that can be deployed depending "on the circumstances and above all on the enemy's formation" (Webster, 1969, p. 222). At the imperial level, Roman defensive strategy seems to have initially been based on fixed allocations of forces at the perimeter of the Empire. This proved to be inadequate for three primary reasons: the Empire's enemies could not be permanently eliminated, the occurrence of wars depended upon factors that could not be affected by the Roman defensive structure, and there were significant limitations on the amount of manpower and material available (Elton, 1996). Because of these factors, during the third century the defensive strategy was restructured, retaining some troops at posts along the border with the remainder dedicated to field armies operating with the Emperor that could be flexibly deployed in response to emergent circumstances.

The importance of flexible resource allocation continued in the Crusades of the early second millennium CE, as demonstrated by this description of how the European armies marched into battle:

> Two hundred knights went first as scouts. The main army followed, split up into nine divisions of knights which were equally divided into centre, advance and rear-guards. They were thus able to face the enemy on whichever side they might come. Three sections were always ready to meet them, an the three units of the centre were always ready to dash to the rescue. (Verbruggen, 1997, p. 208)

The modern military application of scenario planning was substantially refined by the RAND Corporation in the 1950s, especially with regard to nuclear threats. RAND capitalized on the substantial strategic planning resources developed during World War II to create a structured process of assessing potential nuclear conflict situations and constructing a series of possible actions and responses (Ringland, 1998).

Apart from the military, scenario planning's most extensive modern applications have been in business contexts. During the 1960s and 1970s, strategic planners at several of the world's largest business enterprises began using scenario planning to anticipate future market conditions and reduce business risk, particularly from external, environmental conditions. Perhaps the most famous business application from this period is the planning exercise mounted by Royal Dutch/Shell. Challenging the company's single forecast assumption that global political environments would remain stable, or would not affect the price of oil, planners created a set of scenarios that anticipated a range of political and market conditions. One of those scenarios essentially anticipated the conditions that occurred as a result of the Arab oil embargo of 1973-74. The planning exercise thus gave the company an ability to anticipate the embargo in a way that its competitors had not. It also substantially popularized scenario planning as a business planning technique (Ringland, 1998). Publications on the use of scenario-type business planning techniques are now common, including several that reach back to ancient sources, such as Sun Tzu (Michaelson, 1998). The approach is also being adapted to a variety of other contexts, including public health (Neiner, Howze, & Greaney, 2004), critical science (Chermack & Lynham, 2004), medical practice (Freeman, 2003), conservation biology (Peterson, Cumming, & Carpenter, 2003), nursing (Woude, Damgaard, Hegge, Soholt, & Bunkers, 2003), education (Wieringen, 1999), and library science (O'Connor & Blair, 1997).

Although the concepts of adaptive response that are inherent in scenario planning have existed for millennia, the history of modern business and military scenario planning technique is rather short, dating back to the RAND and Royal Dutch/Shell applications in the 1950s and ‘60s. During this period, a number of different processes have developed, with no clear determination of a single correct, or preferred method. Though much attention is paid to defining external “driving” forces that could affect the issue at hand, scenario planning can also include consideration of internal influences over which the actor has at least some control (Godet, 2001). Similarly, the practice is not limited only to the identification of a range of possible futures, but also incorporates consideration of normatively desirable outcomes (Chermack & Lynham, 2004). Regardless of the approach, the key appears to be that the process focuses on interactive causal relationships between various conditions, strategies, and results, and identifies important decision points (Georgantzas & Acar, 1995).

Alternatives Analysis in Federal Documents

Current land use-transportation scenario planning processes also have their roots in the tradition of alternatives analyses that arose with a variety of federal mandates in the second half of the twentieth century. Alternatives analysis became a common feature in federal planning activities beginning with the Federal-Aid Highway Act of 1962. Under the Act, metropolitan areas were required, as a condition for receiving federal funding, to adopt long-range transportation plans for entire urban areas and for multiple modes of transportation (Weiner, 1999). Rather than sporadic planning for a particular project (or even a specific system, like the interstate highways), the planning required under the Act was to be “continuing, comprehensive, and cooperative” (Federal-Aid Highway Act, 1962).

In implementing the Act, the Bureau of Public Roads (the precursor to the Federal Highway Administration) published a series of reports, providing guidance to metropolitan regions on how to comply with the planning provisions of the Act. According to these reports, regions needed to create a process that, among other actions, developed and assessed a series of alternative transportation networks, and evaluated their relative effectiveness and impacts (U.S. Department of Commerce, 1963).

By the end of the 1960s, the methodical consideration of alternative courses of action was becoming more common in transportation and resources planning. That reality was no where better expressed—and enshrined—than in the National Environmental Policy Act of 1969. The central part of the Act, the now familiar threshold language mandating the creation of environmental impact statements, requires "all agencies of the Federal Government [to] ... include in ... major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on ... alternatives to the proposed action" (National Environmental Policy Act, 1970). As a result of this mandate, and similar ones in state legislation inspired by NEPA,[1] the process of creating a series of possible actions and measuring their likely consequences is now a familiar feature in public decision-making processes.

For much of the 35-year history of NEPA, this style of considering alternative courses of action has significantly differed from the business and military applications of scenario planning. In the latter contexts, the focus is on assessing the interactive causal relationships between external influences—such as environmental, political, or economic conditions—and one's range of possible action strategies (Avin & Dembner, 2000). Most NEPA-style alternatives analyses, on the other hand, focus on a range of internally specified alternative actions, gauging their relative impacts on external resources and conditions, with little attention paid to internal/external interactions.

No where is this difference more apparent than in the traditional style of planning and decision-making for transportation systems and projects. Largely as a result of the 1962 Highway Act, a style of transportation planning developed that is highly dependent on computerized modeling systems. These now familiar systems take current trends, which are identified by the collection of survey data, to project into the future the possible operation of a proposed new system or facility. Among the system inputs are a series of socio-economic data, including the location of future household and employment growth. In the traditional form of these planning processes, the allocation of those future land uses does not vary across alternatives. In other words, the future land use pattern is involved in the study process only as a single, specified *input* to the analysis, not as a variable or as a possible outcome. The possibility that differences in the land use pattern might affect the effectiveness and operation of the transportation system is not explored. The possibility that the nature of the transportation system might influence the land use pattern is also ignored. In short, the process largely overlooks the interactive nature of land use patterns and transportation systems.

The desire to overcome these limitations is largely at the root of many recent land use-transportation scenario planning processes (see, e.g., 1000 Friends of Oregon, 1997). By incorporating approaches and techniques that capture or reflect the interactive nature of important causal relationships, these recent projects have essentially grafted the military/business approach to scenario planning onto NEPA-type alternatives analysis, creating a new type of planning approach. This study was conceived to determine the degree to which that approach is in use in U.S. metropolitan areas, to assess some of the methods utilized, and to observe some of the outcomes.

Data Collection & Methodology

To address these issues, I conducted a survey in 2003-04 to gather information about past and current land use-transportation scenario planning practices. The survey was open-ended and designed to maximize the breadth of information about the respondents' knowledge of scenario planning projects in their regions or elsewhere. I sent the survey initially to the planning directors of the 658 member organizations in the National Association of Regional Councils (NARC). Additional surveys were sent to members of the Association of Metropolitan Planning Organizations that were not also members of NARC. One-hundred fifty-two recipients responded, 45% of which indicated that they had direct information on a scenario planning project, or knew of someone who might. A second, slightly different survey was sent to 69 persons or organizations that had been identified by respondents of the first survey. Responses from the two surveys were supplemented by hundreds of emails, telephone calls, and internet searches, resulting in an initial data pool of 153 projects.

This initial pool was subjected to a threshold analysis to determine whether the projects in fact utilized land use-transportation scenario planning techniques. The primary discriminating criterion was whether future land use assumptions in a project were held static or varied across scenarios. Whether the variations were in overall amounts of population and employment growth, in the spatial allocation, arrangement, or design of that growth, or a combination of these features, was of secondary importance. The fundamental concern was whether land use was used as a variable in defining future scenarios. A second, and rather obvious, criterion was whether the project included two or more alternatives or scenarios. Those having just one future outcome or forecast were clearly outside of any notion of scenario planning. The threshold analysis indicated a total of 80 projects that met the criteria, a result independently verified by another researcher. A list of the projects is provided in the appendix.[2]

The results from the threshold analysis provide the basis for addressing the three question groups outlined in the introduction. To connect the data to the question groups, a separate series of six topic areas, with their own related questions, were developed and applied to each of the projects in the data pool. In addition to creating a framework for addressing the question groups, the analysis provided the basis for an extended bibliography, which is another part of this study. The six topic areas are:

1. Impetus for the study: What issues motivated the project sponsor to engage in the study process?

2. The nature of the scenarios: What types of land use elements were varied between scenarios (e.g., the overall magnitude of growth; the mix between jobs and households; the location, density, heterogeneity, and/or design of the growth)?

3. The evaluation process: What indices were selected to evaluate/compare the scenarios and what technical tools were used to measure those indices?

4. Evaluation results: What were the outputs from the evaluation process?

5. Public involvement: At what points in the process and in what ways were members of the public involved?

6. Resulting actions: What follow-on actions or institutional changes were undertaken by the sponsor or other entities as a result of the study?

This data collection/analysis process is represented graphically in Figure 1.

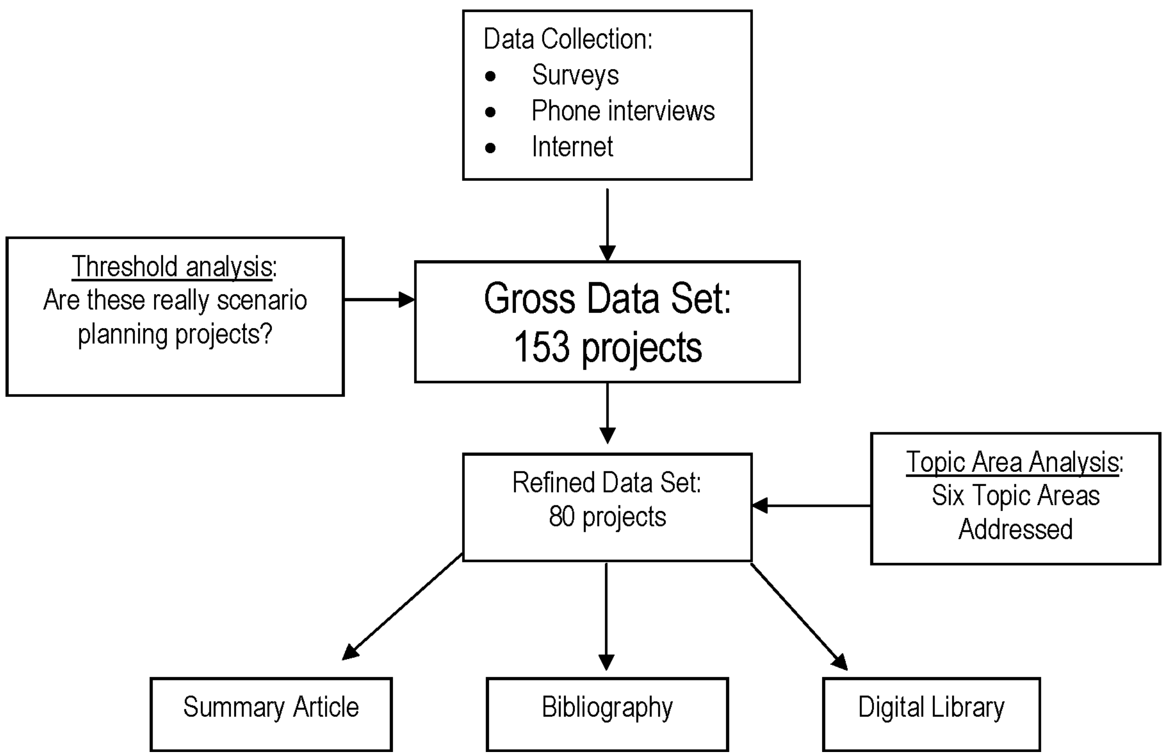

Figure 1. The study process.

Results: Land Use-Transportation Scenario Planning Practice

Frequency of Occurrence

The impact of land use patterns on human and natural resources was well-understood at the time NEPA became law. Proposed federal legislation and a series of state laws adopted in the early 1970s were significantly inspired by the realization that land use patterns were at the root of many environmental and resource issues (Bosselman & Callies, 1971). In academe, a series of ground-breaking research efforts were beginning to quantify the impacts that varying land use patterns had on natural resource demands, particularly on energy consumption (see Edwards & Schofer, 1976; Mazziotti, Hemphill, Churchill, Hamilton, & Gies, 1977; Peskin & Schofer, 1977). In 1977, Indiana University Press published *Public Transportation and Land Use Policy*, a seminal work that cemented the notion that the functioning of transportation systems was significantly dependent on the nature of surrounding land use patterns (Pushkarev & Zupan).

This relationship between land use patterns and travel behavior was advanced during the 1980s by a pair of studies sponsored by nonprofit organizations. The Middlesex Somerset Mercer (MSM) Regional Council, in the Princeton, New Jersey area, undertook an analysis of how suburban development practices were leading to increased reliance on automotive transportation (MSM, 1988). In Portland, Oregon, 1000 Friends of Oregon first sued the regional transportation authority to stop a proposed suburban freeway, then posited its own integrated land use, transportation, demand management alternative, demonstrating that the freeway was not needed (1000 Friends of Oregon, 1997). In both circumstances, land use patterns were not held constant, as in the more traditional transportation planning processes, but were used as a variable to assess impacts on the transportation system, economic conditions, and the environment.

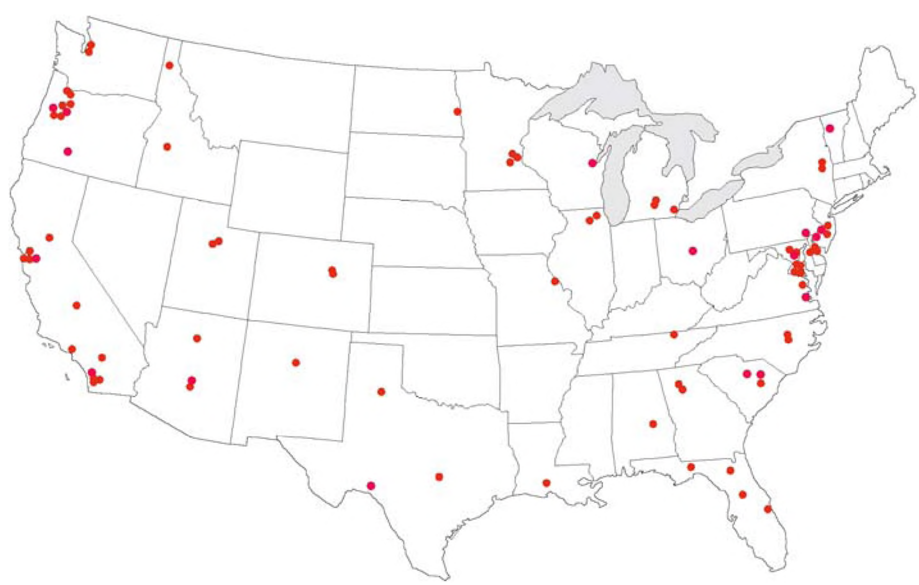

Figure 2. Land use-transportation scenario planning projects in the U.S.

When these and other studies (Replogle, 1993) were underway in the late 1980s/early 1990s, they were considered by many to be "cutting edge" and "state of the art." Since then, however, the practice of using land use as a variable in analyses of future alternatives has become much more wide-spread. In the late 1990s/early 2000s, numerous studies and projects were launched in metropolitan regions around the country to look at ways in which alternative land use futures might effect the quality of the human and natural environments. Under titles that use words like "vision," "blueprint," and "livable," these projects are becoming common enough to ponder whether using land use as a variable in alternatives analysis has become an accepted part of the practice.

In my analysis of more than 150 projects nationwide, I found 80 that met a threshold definition of land use-transportation scenario planning. The geographical distribution of these projects is depicted in Figure 2. The pattern indicates interesting clusters of projects along the west coast, and in the Chesapeake Bays area, suggesting a connection between land use-transportation scenario planning, and states that have some level of growth management legislation in place (see Johnson, Salkin, Jordan, & Finucan, 2002).

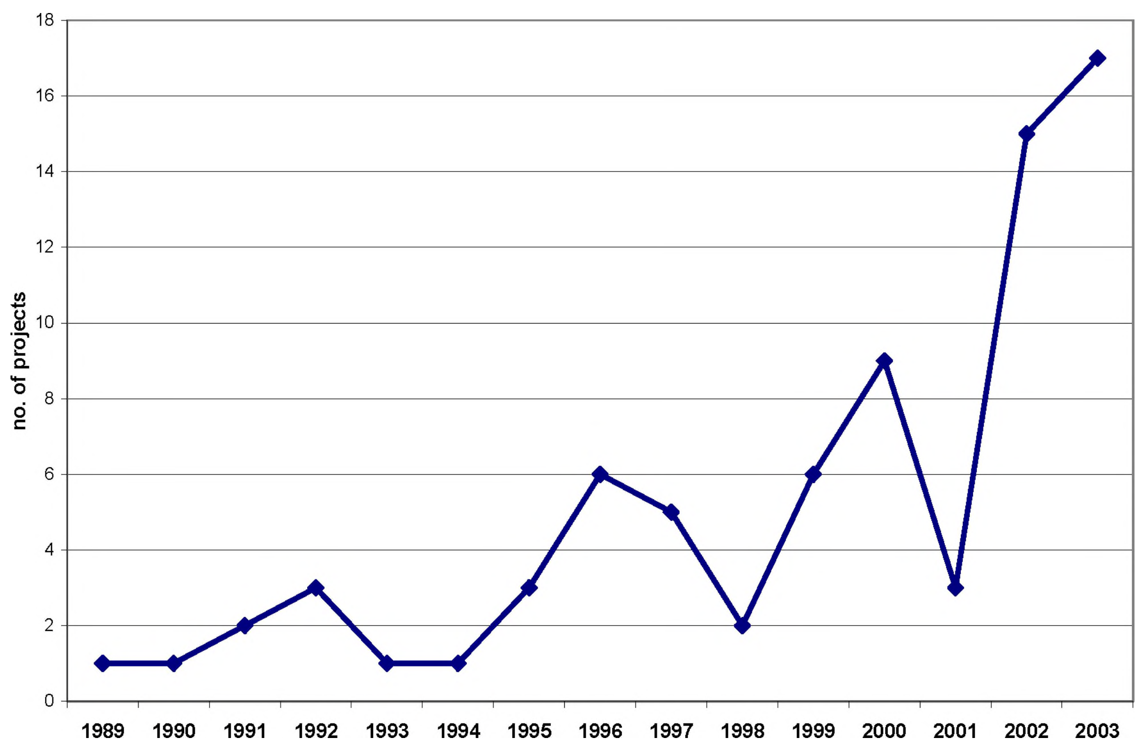

Figure 3. Land use-transportation scenario planning project completion dates.

Temporally, the rate that scenario planning projects have been undertaken has been increasing steadily since the late 1980s. See Figure 3. It should be noted, however, that this is most likely a conservative assessment for at least two reasons. First, as with any survey of this type, it was impossible for me to provide complete universal coverage of the occurrence of land use-transportation scenario planning in the U.S. Certainly, I failed to include an unknown number of projects because I was unaware of them or had insufficient information. Second, and more profoundly, the technology used to conduct scenario planning has changed radically within the last several years. Since 2000, a number of computer-based geographic information system (GIS) tools have entered the market that allow users, be they government agencies or nonprofit organizations, to undertake "real-time" scenario planning exercises within the space of a single evening. Examples of these tools include software packages distributed under names such as PLACE^{3}S, CommunityViz, INDEX®, EPA Smart Growth Index, GB-Quest, and Smart Places. These packages permit users to input scenarios, either graphically or numerically, and observe the projected impacts of their assumptions almost instantaneously. With the introduction of this "just in time" capacity, scenario planning projects have become virtually too numerous to count. Moreover, many of these "instant" scenario planning exercises are memorialized with little or no documentation, making the job of tracking projects almost impossible.

Impetus for the Study

Understanding why organizations undertake scenario planning projects can give an insight into how those organizations view system interactions and indicate the type and possible extent of policy changes the organization anticipates might result from the process. At a broad level, most scenario planning sponsors (61%) are concerned about some type of spatial pattern or urban form issue (see Table 1). Common concerns listed within this category include: ensuring sufficient amounts of land for future growth; promoting modally balanced transportation systems; and avoiding sprawl and the traffic congestion, loss of open space, and air and water pollution frequently associated with sprawl.

Table 1
Primary Project Purpose (N=80)

Project purpose	Number of projects
Spatial patterns/urban form	50
Transportation Capacity/Efficiency	24
General Infrastructure	5
Other	1

With respect to system interactions, concern about land capacity issues obviously connects to the simple equation between development density and land consumption: lower densities require greater amounts of land for the same population. It is clear that sponsors of projects with this concern are hoping the process will lead to policy changes that will result in higher land use intensities and lower consumption rates. The latter two concerns—promoting balanced transportation systems and avoiding sprawl—indicate an understanding about relationships between land use attributes, such as development density, diversity, and design (Cervero, 2002), and transportation system functions and associated environmental values (Downs, 2004). These project sponsors seem to be looking for policy changes that will result in less automobile use and, usually, greater reliance on transit.

Table 2
Scenario Planning Project Sponsors (N=80)

Organization type	Number of projects
Council of Government (COG)*	12
Intergovernmental Agreement	5
Regional Government	4
Metropolitan Planning Organization (MPO)	31
Local Government	15
State Government	7
Federal Government	3
University	1
Nonprofit Organization	16
Other	3

Note: Many projects had multiple sponsors. As a result, the sum of the right-hand column (99) exceeds the total number of projects in the study (80).

*Organizations that were both MPOs and COGs were classified as MPOs only. Hence, those organizations classified here as COGs are councils of government but not MPOs, while the MPO classification includes both COG and non-COG MPOs.

The organization type of a project sponsor may also suggest something about the sponsor's motivations in undertaking a scenario planning project, as well as provide possible historic perspectives on the sponsor's role in policy development and insights on the organization's relative position in local power structures. With the history of alternative analysis in transportation planning practice, and the metropolitan focus of federal transportation policy, it is not surprising to find that the leading player in scenario planning processes are metropolitan planning organizations (MPOs). Their sponsorship rate (39% of projects) was twice that of the next leading types of organizations: local governments (see Table 2). With the other regional entities represented in the data (councils of government, intergovernmental agreements, and regional governments), one sees a clear dominance of regional interests in scenario planning. That dominance is also reflected in the geo-jurisdictional extant of the study areas used for scenario planning. More than 62% of the projects operated at a regional geographic level, while sub-regional projects accounted for 26% of the projects and corridor-level projects for only 9%.

Given the traditional local government monopoly of general land use authority, it is somewhat surprising to see the relatively low percentage of projects (20%) sponsored by local governments. This may indicate a conservative attitude regarding land use and a general lack of willingness to entertain the widespread land use policy changes that could result from a scenario planning process. Alternatively, it may reflect the nature of the transportation forecasting systems frequently used in scenario planning, which are regionally based and tend to contain large geographic areas within single analysis zones. If so, one would expect the increased use of GIS-based scenario software packages—which lend themselves to smaller geographic levels of analyses—to lead to increased local government sponsorship of scenario planning projects. While the data in this study do not support that assertion, it is important to note that projects using GIS systems are probably under-represented in the data and that the systems themselves have only recently entered the market. A further possible explanation for the low local government sponsorship rate is that many of the issues addressed by scenario planning are regional in scale. The socio-economic/environmental impacts of urban growth are most frequently observed and expressed in regional terms and most of the effective policy options to address those impacts are also regional (Downs, 2004).

Another trend worth noting is the sponsorship rate of nonprofit organizations. While their overall rate was the same as local governments (20%), 11 of the 16 nonprofit projects were completed in the last six years. A number of these projects—e.g., the Eureka (MN) Envisioning Task Force (1000 Friends of Minnesota, 2003)—made use of the new generation GIS software tools. With the increasing availability of these tools, and their relative low cost, one would expect increased nonprofit sponsorship of scenario planning projects in the future.

In addition to the recent increased rate of nonprofit project sponsorship, the data also suggest a sub-trend within the nonprofit category. Nonprofits, of course, come in many sub-types. While most of the earlier (i.e., 1989-1998) nonprofit sponsored projects could be classified as advocacy style organizations, such as 1000 Friends of Oregon, most of the later projects (1999-2004) were developed by civic groups, like Sacramento's Valley Vision, many working in conjunction with governmental organizations (usually MPOs). This trend—if indeed it is a trend—illustrates the "political icebreaker" function that nonprofit groups can sometimes play in land use policy debates. Being insulated from electoral politics, nonprofits can operate in politically riskier climates and therefore safely propose policies that if ultimately popular can later be incorporated by government institutions (Bartholomew, 1999).

The Nature of the Scenarios

Given that urban form concerns seem to dominate scenario planning processes, establishing just how many different forms to include in a project seems fundamental. Literature on the psychology of decision making tells us that the human brain has a fairly limited ability to hold multiple bits of information simultaneously (Georgantzas & Acar, 1995). We are particularly challenged in situations where we need to assess a series of alternative courses of action across a range of values (Hastie & Dawes, 2001). As a consequence, scenario planning processes usually attempt to limit the number of scenarios under consideration (Godet, 2001). Having too few scenarios, however, can also lead to problems. Having only two scenarios can suggest that one scenario is "good" and the other "bad" (Ringland, 1998). Having three might imply that one of the scenarios is the normative "forecast" (Ringland, 1998), or can lead participants to choose the middle scenario as the "Goldilocks" compromise between the other two more antipodal options. A consensus appears to emerge from the literature that four scenarios is about the right number: not too many to confuse participants, but enough to allow for divergent thinking and coherent story telling (Godet, 2001; Ringland, 1998, 2002).

The data confirm these observations, in part. One-quarter of the projects contained the recommended four scenarios (see Table 3). One-third of the projects, however, contained three scenarios, while another 17% contained only two. Although only 10 projects contained six or more final scenarios, several projects developed many more preliminary "sketch" scenarios in early stages of their processes. In the San Francisco Bay Area's Smart Growth Strategy/Regional Livability Footprint Project, participants developed more than 100 preliminary county-wide scenarios in a series of workshops held around the region (Bay Area Alliance for Sustainable Development, 2002). Project staff subsequently optimized and condensed these into four region-wide scenarios, which were later used for full-scale analysis.

Table 3
Number of Scenarios per Project (N=80)

Number of scenarios	Number of projects
2	14
3	27
4	20
5	9
6+	10

How project sponsors name and arrange the scenarios for presentation can effect public perceptions of the scenarios and can influence processes to select a preferred scenario. Value associated names such as *Urban Sprawl* (American Farmland Trust, 1995) and *Business as Usual* (Allen, McKeever, & Mitchum, 1995), on the negative side, or *Wise Growth* (Tri-County Regional Planning Commission, 2003) and *Quality of Life* (Allen, McKeever, & Mitchum, 1995), on the positive side, send clear signals on how the sponsors wish the public to perceive the scenarios. Scenarios titles that seem less value laden still are not without the potential for bias. Titles such as *Village/Town Centers* (Metropolitan Transportation Planning Organization, 2000) or *Development* (Pacific Northwest Ecosystem Research Consortium, 2002) still can have associated connotations that may artificially attract or repel participants in scenario planning processes. (see Wirthlin Worldwide, 1997).

While using letters or numbers would seem to avoid these pitfalls, that approach can have other potential problems. The order in which scenarios are presented can significantly influence the attitudes and perceptions planning process participants hold toward the scenarios, with people often using the first presented scenario as an "anchor" from which all subsequently presented scenarios are measured and evaluated (Hastie & Dawes, 2001). When lettered or numbered scenarios are arranged in increasing order of intensity or development density, as is frequently the case (see, e.g., Envision Central Texas, 2003; Metro, 1994; Quality Growth Efficiency Tools, 1998), participants tend to anchor off of the least dense scenario, which is frequently associated with the status quo-based trend. Because people tend to anchor off the status quo in most circumstantces, regardless of the order in which it is presented (Hastie & Dawes, 2001), presenting the trend as the first scenario could further amplify that effect.

The data in this study indicate that scenario planning project sponsors tend to use the more value-ladened and letter/number labels in roughly equal amounts (13 and 11 of 80, respectively). Another seven used transportation modes for scenario names (e.g., *Rail*, *Highway*) and 16 made use of miscellaneous systems. The clearly dominant method (37 of 80) was to use names associated with various land use types and forms, such as *Major Centers* (Puget Sound Council of Governments, 1990), *Residential Cluster* (1000 Friends of Minnesota, 2003), and *Corridor Development* (Denver Regional Council of Governments, 1995).

Judging by the textual descriptions provided in project documents, the scenarios analyzed in this study tended to fall into certain archetypes. Virtually all of the projects (79 of 80) used development types and densities of the recent past and existing local government land use plans to extrapolate some sort of future trend or baseline scenario. In most of these cases, the trend scenario was also the official land use forecast used by metropolitan and state transportation agencies for developing long-range transportation plans under the federal transportation statutes (Intermodal Surface Transportation Efficiency Act, 1991; Safe, Accountable, Flexible, Efficient Transportation Equity Act, 2005; Transportation Equity Act for the 21st Century, 1998). In several projects, however, sponsors created distinct scenarios, one for the official forecast and another based on market trends (e.g., Envision Utah, n.d.; Maricopa Association of Governments, 2003). In some of these cases, it appears the sponsor's intent was to illustrate the asserted benefits of the current policy regime upon which the official forecast was based. In other words, the message was: Look how bad things might have gotten if we hadn't adopted these nifty policies/plans (see Center for Urban Policy Research, 1992; Center for Urban Policy Research, 2000; City & County of Denver, 2002). In at least one case, the sponsors were concerned that current implementation practices might not be sufficient to actualize existing policy. The purpose here was to issue a warning: Unless implementation practices become more vigorous, the vision behind current policy and plans will not come to fruition (see Treasure Valley Futures Project, 2002).

Table 4
Archetypes of Scenarios Used (N=225)

Scenario types	Number of scenarios
Center, cluster, or satellite	58
Compact	43
Dispersed, fringe, or highway-oriented	39
Corridor	25
Infill or redevelopment	24
Other or undefined	36

Beyond trend or baseline scenarios, five primary archetypes are evident (see Table 4). The dominant type is Center, Cluster, or Satellite (58 of 225 scenarios). Scenarios under this type relied on a nodal, sub-center focused strategy to accommodate new growth, rather than the more uniform density increases contained in the scenarios in the Compact type (43). The Infill and Redevelopment type (24) contains scenarios that focused growth into a single central city, as opposed to the multi-nodal Center, Cluster or Satellite. Corridor scenarios (25) focused growth along a transportation corridor in a more or less uniform fashion, and Dispersed, Fringe, or Highway-oriented scenarios (39) are the "sprawl" scenarios.

Another method to assess the type of scenarios used is to look at the policy variables employed (see Table 5). With spatial patterns and urban form being the dominant concern motivating project sponsors, it is not surprising that *location of growth* and *density of growth* were the two leading variables used to distinguish scenarios (73 and 76 of 80 projects, respectively). Land use diversity (homo/heterogeneity) was also a popular variable (50). With the focus on density and diversity, one would expect there to

Table 5
Variables between Scenarios (N=80)

Variable	Number of Projects
Rate or amount of growth	20
Location of growth	73
Density of growth	76
Design of growth	25
Homo/heterogeneity of growth	50
Transportation system elements	40
Pricing/policy elements	12

Note: Many projects used multiple variables. As a result, the sum of the right-hand column exceeds the total number of projects in the study.

be greater interest in using land use design—the third "D" in the triumvirate of density, diversity, and design (Cervero & Kockelman, 1997)—than the 25 projects indicated in the data. The lower than expected number, however, may be more the result of limitations in the sensitivity of the transportation models used in many of these projects (see 1000 Friends of Oregon, 1991) than in a lack of interest on the part of project sponsors. Although the amount/rate of growth has historically been a leading concern among municipalities that adopt growth management policies (Kelly, 2004), only 20 out of 80 projects used the amount or rate of growth as a variable. Only 12 projects incorporated a pricing or similar policy element into their scenarios. This, despite research indicating that such policy interventions are frequently effective in influencing travel choices (Downs, 2004).

The widespread use of land use density as a variable raises obvious questions about the degree to which sponsors varied that attribute across scenarios within a given project. In other words, how dense, or dispersed, were sponsors willing to go in their planning processes. Although density was a variable in 76 of the 80 projects in the study,

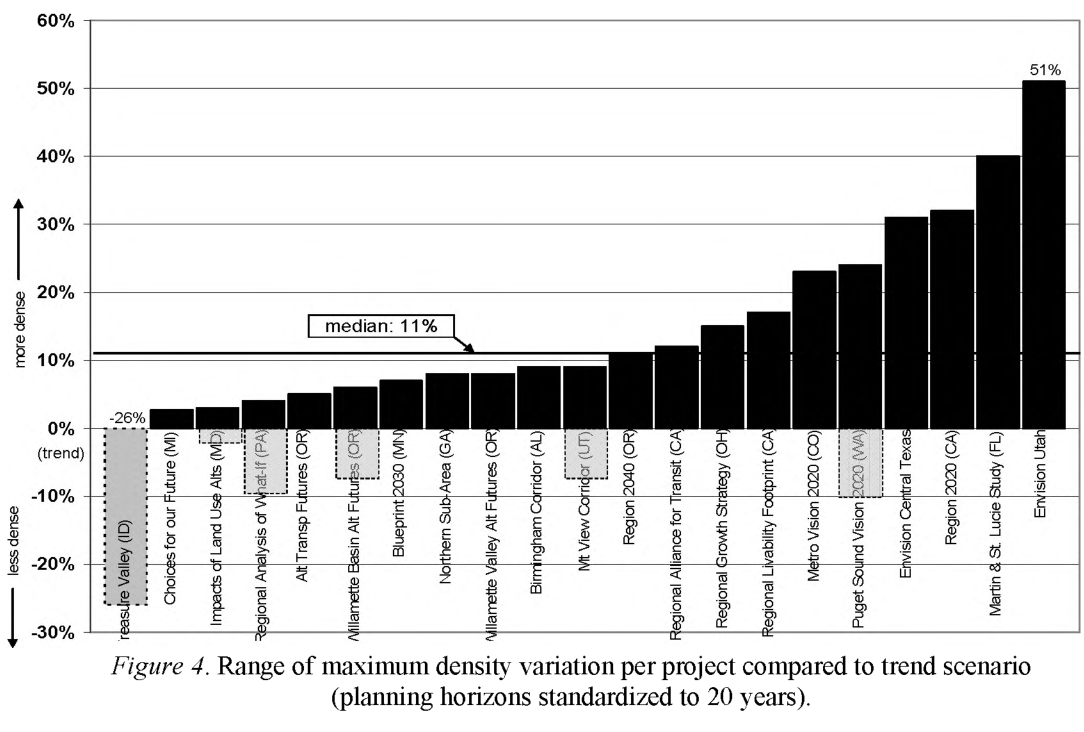

Figure 4. Range of maximum density variation per project compared to trend scenario (planning horizons standardized to 20 years).

the data were sufficient to make comparisons across only 22 projects. These projects presented data indicating the expected average development density for each scenario in the planning horizon year over the entire study area. Figure 4 shows the maximum range, both positive and negative, of scenario densities for each of these projects, compared to the identified trend or baseline scenario.

The first thing to note about the figure is how few projects include scenarios that are less dense than the trend. This is consistent with the widespread concern of possible future sprawl as a strong motivation to engage in scenario planning, as noted above. None of the projects indicated a concern about possible future trend development patterns being too dense; the one project that tested only less dense scenarios was the Treasure Valley Futures Project (2002) and its purpose was to illustrate the results of ineffective implementation of existing plans.

The second notable feature of Figure 4 is the narrowness of the density ranges. All but four of the projects have a range below 27%, and the median value of the group is 11%. Since the density ranges measured in Figure 4 are averages based on total development—both old development, as well as new—one would expect the degree of density change possible during the planning window to be somewhat limited. This is, indeed, consistent with observations of development patterns in the past (Downs, 2004), though future patterns may change more quickly (Nelson & Dawkins, 2004). It is important to note that the vertical bars in Figure 4 represent the scenario with the maximum density change for each of the represented projects. Most of those projects included other scenarios based on less dense development patterns. In those projects, it is possible that the most dense scenario is provided as a "straw man" to demonstrate the role of density in regional socio-environmental systems and to provide an anchor point to facilitate the selection of another, less dense alternative.

One final item to note about Figure 4 is that for most regions the trend line (0%) actually represents an over all decrease in density from current conditions. The fact is that more recent development has been, and continues to be, built at lower densities than older development. The Regional Growth Strategy project sponsored by the Mid-Ohio Regional Planning Commission in Columbus illustrates this point (2004). The project's Trend Scenario continues growth in a business as usual fashion, based on current land use plans and continued highway investment. Over a 30 planning horizon, this development pattern is expected to result in a 22% reduction in housing density compared to current conditions. The next dense scenario—the Shifting Inward Scenario—shifts some growth to inner parts of the region, with minor intensification and integration of land uses, but still is expected to result in a pattern 17% less dense. The Shifting Inward with Increased Transit Scenario shaves the decrease to -13%. Only the Aggressively Inward Scenario, the most extreme of the study's options, maintains current overall density levels.

The Evaluation Process

As noted previously, most of the scenario planning projects included in this study were sponsored, at least in part, by some regional entity, often by an MPO. Given the traditional MPO focus on transportation, it is not surprising to see that more than threequarters of the projects utilized some type of transportation measurement (see Table 6). Within the transportation category, the most often used measure was vehicle miles of travel (VMT). While the strong reliance on VMT may be a reflection of the measure's perceived usefulness in incorporating a number of values related to transportation (for example both numbers of trips and trip lengths are reflected in VMT), it is also true the VMT is a normal output for most of the U.S. travel forecasting models and an input for most air emissions models (Johnston, 2004). Hence, it is a readily available measurement. Approximately one-third of the projects included some form of congestion measurement, a rate that seems intuitively low given the degree of concern about congestion in the general population. Recent research, however, shows that public concern about congestion is not as compelling as once thought (Downs, 2004). More than half of the projects used some measurement of land use, most frequently in the form of total area developed or amount of agricultural land consumed.

Table 6
Indices Used to Evaluate Scenarios (N=80)

Measure	Number of projects
Transportation	63
Auto ownership	5
Vehicle miles of travel	50
Vehicle trips	20
Average trip length	16
Vehicle hours of travel	24
Vehicle hours of delay	15
Average peak hour speed	19
Other congestion	28
Mode shares	23
Transit ridership	27
Households served by transit	20
Other transportation measures	23
Land use	47
Amount of developed land	33
Amount of agricultural land converted	25
Other land use measures	32
Sewer capacity	6
Water consumption	12
Fiscal cost	30
Air quality	33
Energy consumption	18
Greenhouse gas emissions	10

The transportation focus of many scenario planning projects is also reflected in the types of assessment tools used. Over half of the projects (47 of 80) relied to some degree on the travel forecasting models used to develop federally required long-range transportation plans and to determine air quality conformity under the federal Clean Air Act (2005) (see Table 7).

Twelve percent of the projects relied exclusively, or primarily, on one of the GIS software packages cited earlier both to develop scenarios as well as test them for various transportation, land use, and environmental impacts. These projects tended to be small in geographic scale, at a level where GIS tends to function effectively and regional transportation models usually do not (see, e.g., 1000 Friends of Minnesota & Eureka Township Envisioning Task Force, 2003). About twice as many projects combined GIS and regional transportation modeling by using the GIS tool to assist with the development of scenarios, but then relying on standard travel/emissions forecasting models to assess transportation and air quality impacts. Sacramento Region Blueprint (Sacramento Area Council of Governments & Valley Vision, 2004) and the Bay Area's Smart Growth Strategy/Regional Livability Footprint Project (Bay Area Alliance for Sustainable Development, 2002) are both good examples of this technique.

Table 7
Analysis Tools Used in Scenario Planning Projects (N=80)

Type of tool	Number of projects
Travel forecasting model	47
with transit/pedestrian-oriented development submodel	9
with a GIS scenario building tool	20
with a land use allocation model	7
Sketch travel model	3
Sketch land use/travel model	3
Land use model only	4
GIS scenario building tool only	10
Economic model/analysis	6
Other/no data	13

Nine projects highlighted in their respective project reports a particular analysis component intended to improve the model's ability to evaluate the features frequently emphasized in pedestrian- or transit-oriented development patterns (e.g., use mixing and pedestrian-oriented design). One project of particular interest in this category is Shaping Our Future, sponsored by Contra Costa County, California (2003). The study team for that project supplemented the MPO's standard travel demand model with a spreadsheet-based "3D" (density, diversity, design) sketch model to adjust the trip tables in between the mode split and the route assignment steps in the modeling process. The adjustments were based on elasticities derived from Bay Area household surveys, census data, and neighborhood paired-comparison studies. For each sub-area zone in the study area, the study team established an index measuring population and employment density per acre, the mix of population, retail and non-retail employment, and a pedestrian-friendliness measure of street connectivity, sidewalk coverage, and street density (block size). After 3D indices were established by sub-zone for each scenario, the percentage differences between the scenarios were calculated, and the corresponding elasticity applied. The results were then summed for each sub-zone and then applied to the trip tables.

As innovative as projects such as Shaping Our Future are, however, it appears that many of the other projects reviewed in this study may have used transportation models that lack the necessary components to assess adequately important land use variations. Traditional four-step travel demand models are relatively incapable of reflecting differences in travel patterns associated with variations in land use patterns, especially those more fine-grained design features intended to facilitate non-automotive travel (1000 Friends of Oregon, 1991; Beimborn & Kennedy, n.d.). Only 11% of the projects assessed in this study reported using some method or sub-model to compensate for this lack of sensitivity. It seems likely that the data pool contains additional projects that used similar modeling features, but did not mention that fact in the project documentation. Nevertheless, the low reported number highlights a potential disconnect between a common motivation behind land use-transportation scenario planning—reducing sprawl and the auto reliance associated with it—and the tools used in scenario planning processes.

Evaluation Results

As outlined in Table 6, data on the relative impacts of scenarios was available for a wide range of indices. Because of challenges in standardizing the data, just three indices are presented here: vehicle miles traveled (VMT), emissions of oxides of nitrogen (NOx), and land consumption. Figure 5 shows the maximum range of variation in vehicle miles traveled (VMT), compared to the trend scenario, for 31 projects. An obvious feature of the figure is that not all scenarios resulted in VMT reductions. This is due to several causes. First, some projects intentionally analyzed scenarios that were more auto-oriented; in at least one project, these were the only type of scenarios considered (see

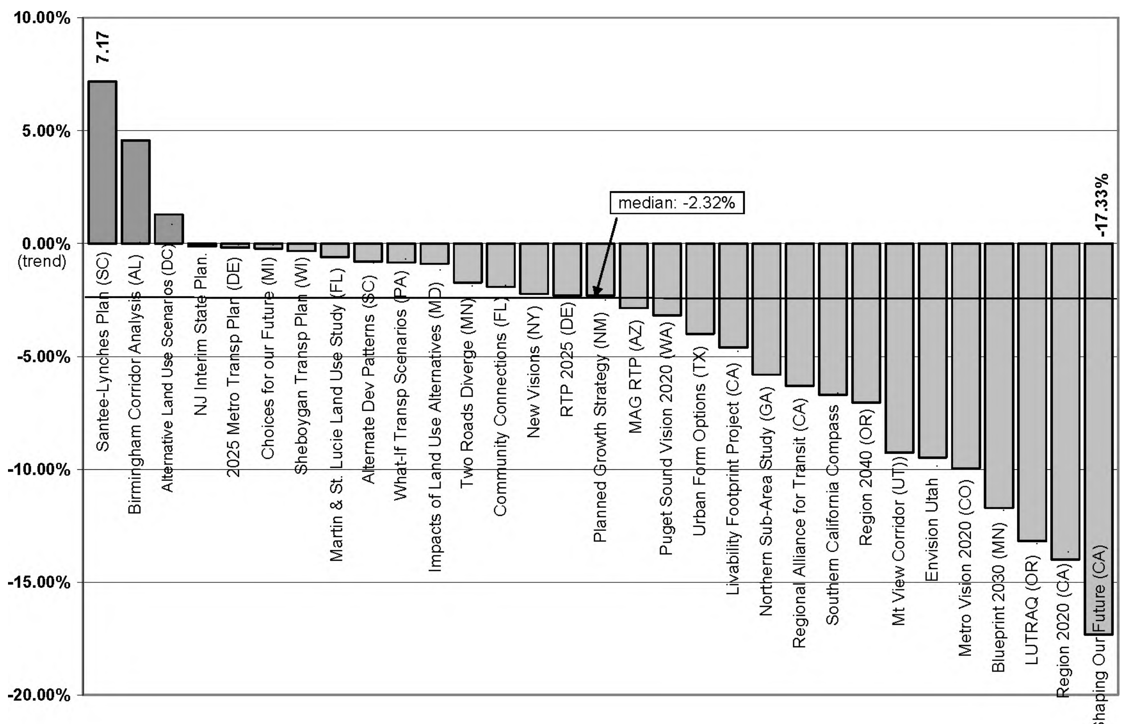

Figure 5. Range of maximum variation in vehicle miles traveled compared to trend scenario (planning horizons standardized to 20 years).

Santee–Lynches Regional Council of Governments, 2003). Second, in at least two of the other projects, the non-trend scenarios had larger population and employment totals, which would tend to increase overall VMT compared to the trend (Regional Planning Commission of Greater Birmingham, 2002; Wickstrom & Malone, 1993). These instances aside, however, the predominant direction in VMT is downward, with a median reduction of 2.32%. Due to the possible limitations in modeling land use variations, discussed previously, this figure is likely to be a conservative figure that underreports the VMT variations.

Five projects included scenarios that demonstrated a 10% or greater reduction. One of these scenarios—from the LUTRAQ project—included significant pricing components, as well as land use and transportation elements (1000 Friends of Oregon, 1997). The other four projects, however, appear to have relied only on land use and transportation features. Significantly, the three scenarios with the greatest variation in VMT come from projects that reported using some method to increase modeling sensitivity to land use variations, including the Shaping Our Future project highlighted above.

The data on emissions of NOx show a similar direction of change, and a comparable median (-2.07%), but a much wider range than the VMT data (see Figure 6). Whereas the VMT results range from 7.17% to -17.33%, the NOx data start at the same figure, but range down to more than -50%. As with VMT, the NOx data show three projects with scenarios that increase emissions versus the trend. Two of these projects, one of which was noted above, included scenarios that were less dense and more auto-oriented than the trend (Pee Dee Regional Council of Governments, 2003; Santee–Lynches Regional Council of Governments, 2003). The third explained the seemingly counter-intuitive results by pointing out that the state department of transportation modeling software (which was also used in the other two projects) "does not properly factor in alternative modes of transportation and does not consider denser, walkable developments" (Catawba Regional Council of Governments, 2003, p. 41).

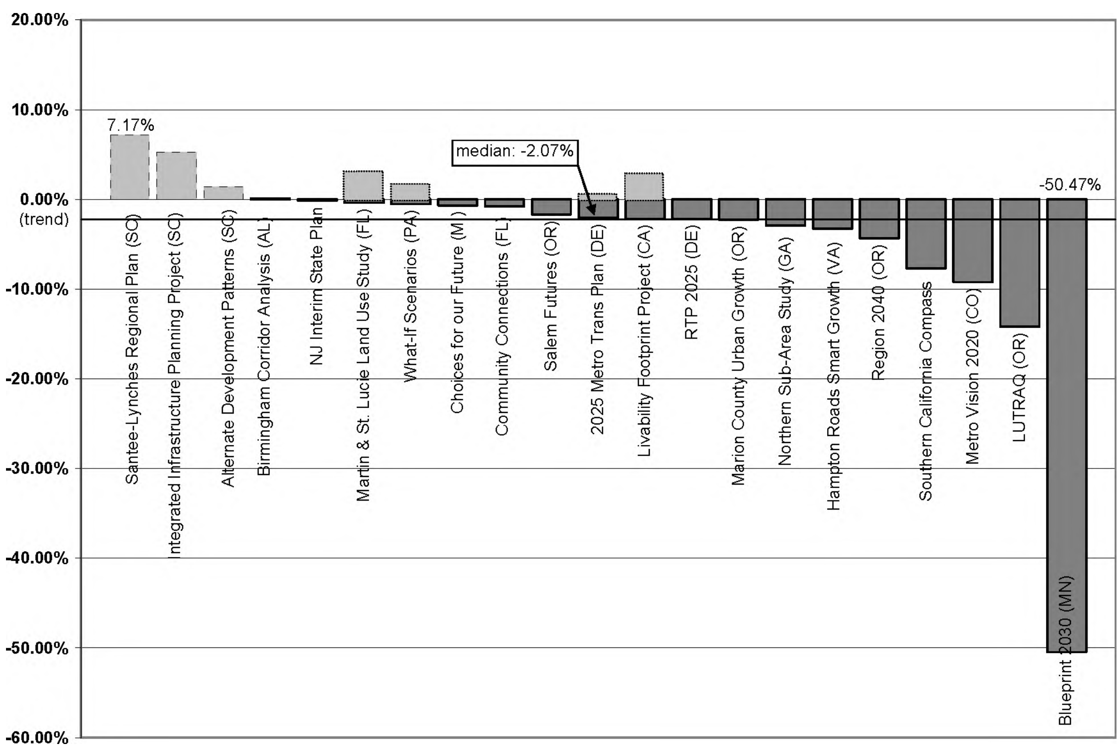

Figure 6. Range of maximum variation in NOx emissions compared to trend scenario (planning horizons standardized to 20 years).

The data on land consumed by new development show a similar downward direction (see Figure 7). Here too, however, several projects incorporated scenarios that were projected to be more land consumptive than the trend. The obvious difference in this figure is that the degree of change is substantially larger. Where the VMT and NOx data varied by single whole digits between projects, the differences in land consumption are measured in 5 and 10 percent increments, and the range extends from 18% to -100%.

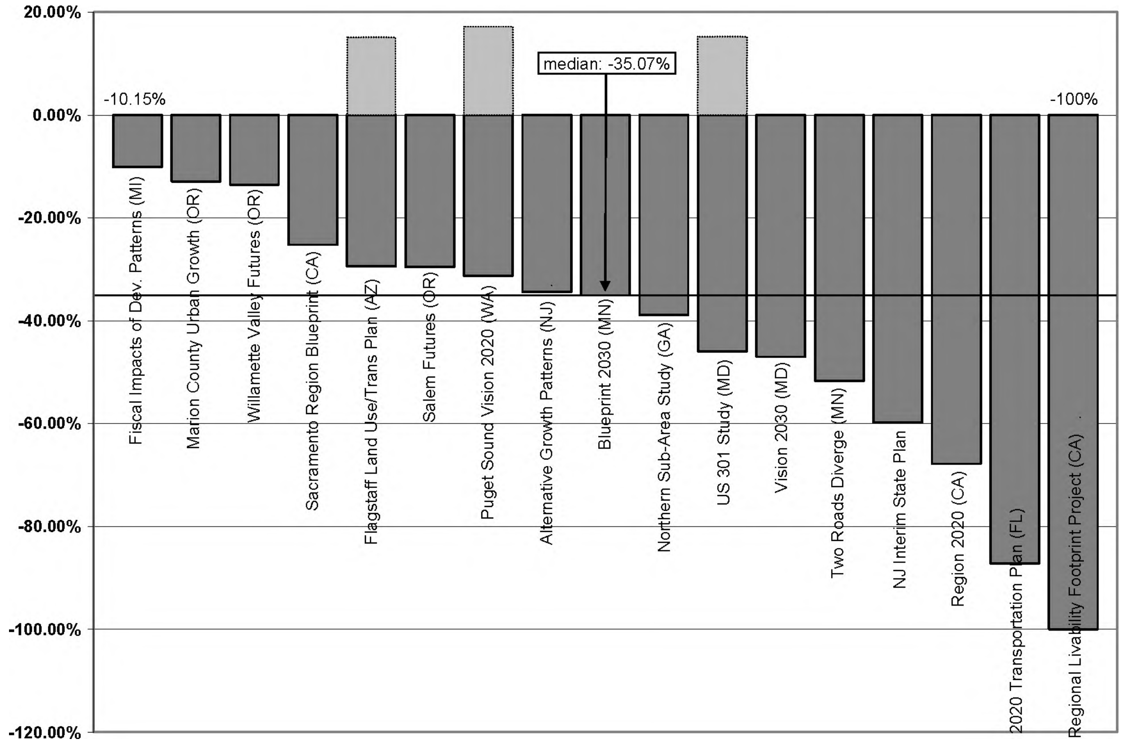

Figure 7. Range of maximum variation in land consumed for new development compared to trend scenario (planning horizons standardized to 20 years).

Public Participation

It would seem that one of the reasons for undertaking a scenario planning project would be to engage the public in some meaningful interaction on growth and development issues (Burbank & Ways, 2005). While most of the projects analyzed as part of this study had some public hearings or presentations on the scenario planning process, only a minority involved citizens or stakeholders in some interactive process. Only 22 projects (28%) significantly involved citizens in the development of scenarios, compared to 70 projects that involved sponsor staff and 26 that involved consultants (see Table 8). Of the 49 projects that concluded with the selection of a preferred scenario, only 19 (39%) significantly involved citizens in that selection process.

At first blush, it would appear, overall, that scenario planning is a field dominated by experts, with only nominal citizen involvement. Recent practice, however, suggests that a significant shift toward citizen involvement may be underway. Sixteen of the 22 projects involving citizens in the development of scenarios were completed since 2000. Virtually all of the projects involving citizens in the selection process also date from 2000 onward. Several well-known projects used modified charrette-type planning processes to engage citizens in crafting possible scenarios (see, e.g., Contra Cost County, California, 2003; Envision Central Texas, 2003; Envision Utah, n.d.). Other projects used GIS software packages to facilitate neighborhood and county level workshops where citizens worked interactively with project staff to craft scenarios that could then be tested at the meeting (see, e.g., 1000 Friends of Minnesota & Eureka Township Envisioning Task Force, 2003; Bay Area Alliance for Sustainable Development, 2002; Sacramento Area Council of Governments & Valley Vision, 2004). With the increased use of these software packages, one would anticipate additional citizen involvement with scenario planning in the future.

Table 8
Citizen Participation in Scenario Planning (N=80)

Who was involved in the scenario development process?	Number of projects
Citizens	22
Focus groups	5
Elected officials	25
Other stakeholders	37
Sponsor staff	70
Consultants	26
Who was involved in selecting a preferred scenario?	
Citizens	19
Focus groups	2
Elected officials	20
Other stakeholders	21
Sponsor staff	23
Consultants	7

Resulting Actions

Given the level of effort required by most of these scenario planning projects, one would anticipate that some concrete result would be forthcoming at the end of each process. To a large extent, this is indeed what the data show. The leading result from this group of projects was the adoption of some type of transportation plan (27 projects). With the high degree of MPO involvement, already noted, this is not a surprise. Twenty projects resulted in the adoption of a general or comprehensive plan, and another 14 ended with some other type of policy plan. Twenty other projects, however, ended with no action being reported, and in 14 of those cases project documentation indicated that no future action was anticipated.

Among the projects resulting in concrete action, the type of action pursued varied substantially. The Shaping Our Future project in Contra Costa County, California resulted in a significant inter-jurisdictional agreement about a number of important growth issues, including the need to have a single, consistent urban limit line and where that should be, the location and nature of transportation investments, and the coordination of open space protection (Contra Cost County, California, 2003). Also in the San Francisco Bay area, the Association of Bay Area Governments chose to use the Smart Growth Strategy resulting from the Regional Livability Footprint Project as the basis for the 2003 Projection, the official economic-land use forecast for the Bay Area. This is the projection that the MPO for the region will use in the next update to its long-range transportation plan. It will also provide the basis for corridor and project level transportation decisions (Bay Area Alliance for Sustainable Development, 2002). In the Denver area, the Metro Vision process led to the development of a regional open spaces plan and the creation of the Mile High Compact, through which a majority of the region's local governments have committed to adopt policies and amendments to planning and zoning documents consistent with a Metro Vision Framework (Denver Regional Council of Governments, 1995). In Gainesville's Livable Community Reinvestment Plan, the project sponsor acknowledged that it has direct authority only over transportation decisions, not land use policy. However, it also noted that as the MPO, the agency has institutional and persuasive roles to play in how land use policy for the region is set: "[B]ecause the MTPO consists of all members of the City of Gainesville Commission and the Alachua County Board of County Commissioners and is the only routine occasion for those two boards to sit together as a single body, the MTPO is arguably in the best position to discuss and promote policies relating to the integration of land use and transportation on a broad, regional scale" (Metropolitan Transportation Planning Organization for the Gainesville Urbanized Area, 2000, p. 8).

Conclusion

History and the projects assessed in this study indicate that the modern practice of land use-transportation scenario planning is the culmination of two formerly distinct practices: scenario-based military and business strategic planning, and the alternatives analysis techniques developed in response to NEPA and federal transportation legislation. While the projects analyzed here show a broad range of practice in certain areas—for example, in how to translate the outcome of scenario planning into decision-making processes—they also show a substantial degree of similarity. Scenario planning projects tend to be sponsored by regional bodies, as opposed to state or local entities. Motivations for undertaking scenario planning cluster around issues relating to growth and its impacts on various measures of quality of life. Scenario planning projects tend to utilize three to four scenarios that use centers or clustering as a common archetype and density and the location of growth as primary variables. They focus mainly on transportation and land use indices and they utilize traditional transportation forecasting models, though a notable shift has occurred in recent years toward GIS-based assessment tools. While interactive citizen participation in scenario planning was uncommon 15 years ago, it is increasingly becoming a common feature.

Many questions remain unanswered, of course. For example, what are the various theoretical constructs that underlie land use-transportation scenario planning? Can these constructs provide a helpful framework for researchers and practitioners? What implications does the recent increase in scenario planning raise for compliance with federal statutes requiring alternatives analyses, in particular the National Environmental Policy Act (2005), section 404 of the Clean Water Act (2005), and section 4(f) of the Department of Transportation Act (2005)? How can the tools for measuring the relative impacts of scenarios be made more appropriate for the types of values contained in the scenarios? How does the output from scenario planning feed into long-range transportation planning processes under the new federal transportation statute, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (2005)? Additional explorations could occur in areas touched on, only briefly, by this study. For example, more in-depth analysis of project sponsor motivations, expectations, and outcomes could bring additional light to planning and decision-making processes.

Fifteen years ago, land use-transportation scenario planning projects such as the Puget Sound 2020 project in Washington and the LUTRAQ study in Oregon were considered ground breaking efforts (Delaware Valley Regional Planning Commission, 2003, pp. 1-2). Given the rapid rise in the use of similar techniques in recent years, can we say that scenario planning is now within the state of the practice in land use-transportation planning? Perhaps. The repeated themes and techniques exhibited in the 80 projects surveyed here suggests that scenario planning techniques have become widespread enough to include them in the group of common tools used by planners grappling with growth issues. The recent development in the use of GIS assessment tools indicates that scenario planning will become even more wide spread in coming years. At the very least, the projects assessed in this study can provide a baseline from which a more definitive answer may be possible in the future.

Footnotes

[1] State-level "NEPAs" exist in California, Connecticut, District of Columbia, Georgia, Hawaii, Indiana, Massachusetts, Minnesota, Montana, North Carolina, South Dakota, Virginia, Washington, and Wisconsin (NEPA Law & Litigation, 2003).

[2] Many of the reports documenting these projects are now in a digital library maintained at the University of Utah J. Willard Marriott Library. The library can be accessed at: http://content.lib.utah.edu/cgi-bin/browseresults.exe?CISOROOT=%2FFHWA.

[3] The bibliography is available at www.arch.utah.edu/bartholomew.

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Appendix

Project List

City	State	Sponsoring Organization	Project Name
Birmingham	AL	Regional Planning Commission of Greater Birmingham	Birmingham Regional Transportation Corridor Alternative Analysis
Flagstaff	AZ	City of Flagstaff & Coconino County	Flagstaff Area Regional Land Use & Transp. Plan
Phoenix	AZ	City of Phoenix	North Land Use Plan
Phoenix	AZ	Maricopa Association of Governments	MAG Regional Transportation Plan
Fresno	CA	American Farmland Trust	Alts. for Future Growth in CA's Central Valley
Contra Costa County	CA	Shaping Our Future	Contra Costa Shaping Our Future
San Diego	CA	San Diego Ass'n of Governments & California Energy Commission	San Diego Growth Alternatives Study
San Diego	CA	San Diego Ass'n of Governments & California Energy Commission	Vista Transit Focus Area Study
San Diego	CA	California Energy Commission	Euclid Trolley Station Project
Livermore	CA	Alameda County Planning Department	North Livermore: Last Chance for Smart Growth
Sacramento	CA	Sacramento Area Council of Governments & Valley Vision	Sacramento Region Blueprint

San Diego	CA	San Diego Association of Governments	Region 2020
SF Bay Area	CA	Regional Alliance for Transit	Regional Alliance for Transit
SF Bay Area	CA	Bay Area Alliance for Sustainable Communities	Regional Livability Footprint Project
Los Angeles	CA	Southern California Association of Governments	Southern California Compass
Denver	CO	City & County of Denver	Blueprint Denver
Denver	CO	Denver Regional Council of Governments	Metro Vision 2020
Washington	DC	Metropolitan Washington Council of Governments	Regional Mobility & Accessibility Study
Washington	DC	Metropolitan Washington Council of Governments	Transportation Demand Impacts of Alternative Land Use Scenarios
Washington	DC	Chesapeake Bay Foundation & Environmental Defense Fund	A Network of Livable Communities
Wilmington	DE	Fox Point Association	Edgemoor Transit Oriented Development
Wilmington	DE	Wilmington Area Planning Council	2025 Metropolitan Transportation Plan
Wilmington	DE	Wilmington Area Planning Council	Regional Transportation Plan 2025
Gainesville	FL	Metropolitan Transportation Planning Organization	2020 Transportation Plan
West Palm Beach	FL	Treasure Coast Regional Planning Council	Martin & St. Lucie Counties Reg. Land Use Study
Orlando	FL	Metroplan Orlando	Community Connections: A Transportation Vision for the Next 25 Years
Atlanta	GA	U.S. Environmental Protection Agency	17th Street Extension
Atlanta	GA	Georgia Regional Transportation Authority	Northern Sub-Area Study
Post Falls	ID	City of Post Falls	Highway 41 Corridor Master Plan
Boise	ID	Treasure Valley Futures Project	Treasure Valley Growth Scenario Analysis
Chicago	IL	Environmental Law & Policy Center of the Midwest	CROSSROADS
Elgin	IL	Conservation Research Institute	Route 47/Kishwaukee River Corridor Project
Baltimore	MD	Baltimore Metropolitan Council	Baltimore Region 2020 Long-Range Trans. Plan
Montgomery County	MD	Montgomery County Planning Board	Transportation Policy Task Force Report
Baltimore	MD	Baltimore Regional Council of Governments	Impacts of Land Use Alts. on Transportation Demand
Chesapeake Bay Area	MD	The Chesapeake Bay Program	Chesapeake Futures
Baltimore	MD	Baltimore Regional Transportation Board	Vision 2030: Shaping the Region's Future Together
DC area	MD	Maryland Department of Transportation	US 301 Transportation Study
Montgomery County	MD	Maryland-National Capital Park & Planning Commission	Comprehensive Growth Policy Study

Detroit	MI	Southeast Michigan Council of Governments	Fiscal Impacts of Alt. Land Dev. Patterns in MI
Lansing	MI	Tri-County Regional Planning Commission	Regional Growth: Choices for our Future/Regional 2025 Transportation Plan
Minneapolis/St. Paul	MN	Metropolitan Council	Blueprint 2030
Eureka	MN	Eureka Envisioning Task Force	Eureka Township Envisioning Project
Minneapolis/St. Paul	MN	Center for Energy and Environment	Two Roads Diverge: Analyzing Growth Scenarios / Twin Cities
Kansas City	MO	Mid-American Regional Council	Smart Choices: Understanding the Cost of Development
Raleigh	NC	Greater Triangle Regional Council	Regional Development Choices Project
Fargo	ND	Fargo-Moorhead Metropolitan Council of Gov.	Short and Long Range Metropolitan Transportation Plan
---	NJ	New Jersey Office of State Planning	Impact Assessment of the NJ Interim State Development & Redevelopment Plan
---	NJ	New Jersey Office of State Planning	The Costs and Benefits of Alternative Growth Patterns
Princeton	NJ	Middlesex Somerset Mercer Regional Council	Impact of Various Land Use Strategies on Suburban Mobility
Princeton	NJ	Delaware Valley Regional Planning Commission	Central Jersey Transportation Forum
Albuquerque	NM	City of Albuquerque	Planned Growth Strategy
Albany	NY	Capital District Transportation Committee	NY5 Corridor Land Use & Transportation Study
Albany	NY	Capital District Transportation Committee	Evaluation of the Transp. Impacts of Land Use and Development Scenarios (New Visions)
Columbus	OH	Mid-Ohio Regional Planning Commission	Regional Growth Strategy -- Regional Connections
Albany	OR	City of Albany	Balanced Development Patterns Project
Willamette Valley	OR	Pacific Northwest Ecosystem Research Consortium	Willamette Basin Alternative Futures Analysis
Willamette Valley	OR	1000 Friends of Oregon	Willamette Valley Alternative Futures Project
Willamette Valley	OR	Willamette Valley Liveability Forum	Alternative Transportation Futures Project
Salem	OR	City of Salem, Oregon	Salem Futures
Salem	OR	Marion County Planning Department	Marion County Urban Growth Management Project
Portland	OR	1000 Friends of Oregon	Making the Land Use, Transportation, Air Quality Connection (LUTRAQ)
Portland	OR	Metro	Region 2040
Portland	OR	City of Portland; Oregon Dept. of Energy	River District Alternative Futures (PLACES)
Medford	OR	Rogue Valley Council of Governments	Transit Oriented Design and Transit Corridor Development Strategies Project
Philadelphia	PA	Delaware Valley Regional Planning Commission	Regional Analysis of What-If Transportation Scenarios
Catawba County	SC	Catawba Regional Council of Governments	Integrated Infrastructure Planning Project
Pee Dee region	SC	Pee Dee Regional Council of Governments	Planning Implications of Alternate Development Patterns on Infrastructure and Existing Planning

			Policies
Santee-Lynches	SC	Santee-Lynches Regional Council of Governments	Santee-Lynches Regional Infrastructure Plan
Oak Ridge National Laboratory	TN	Oak Ridge National Laboratory	Oak Ridge Reservation Land Use Planning Process
Austin	TX	Envision Central Texas	Envision Central Texas
Dallas	TX	North Central Texas Council of Governments	Urban Form/Transportation System Options for the Future
San Antonio	TX	VIA Metropolitan Transit	Broadway Corridor Smart Growth Analysis
Salt Lake City	UT	Coalition for Utah's Future	Envision Utah
Salt Lake City	UT	Coalition for Utah's Future	Mountain View Corridor Growth Choices Study
Burlington	VT	Chittenden County Metropolitan Planning Organization	2025 Chittenden County Metropolitan Transportation Plan
Charlottesville	VA	Thomas Jefferson Planning District Commission	Jefferson Area Eastern Planning Initiative
Hampton Roads	VA	Hampton Roads Planning District Commission	Hampton Roads Smart Growth Analysis
Seattle-Tacoma	WA	Puget Sound Council of Governments	Vision 2020
Green Bay	WI	Bay-Lake Regional Planning Commission	Year 2020 Sheboygan Area Transportation Plan