Growth Visioning and Regional Planning

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Abstract

The visioning process, which is newly introduced in the regional planning process, has affected the existing growth planning process. It directly influenced the way of modeling the small area growth, while it has no or little effect on the way of forecasting the large area growth. The scenario approach was actively used as a significant way to identify alternative growth patterns. Four major findings of the growth planning process from the recent visioning approach in Southern California are as follows: First, growth planning is deemed as a participatory and interactive process in a collaborative framework. The active and meaningful public participation is warranted. Second, growth planning relies on a very small geographical scale for better interactive communication. Land use and transportation scenarios are developed at the grid cell level. Third, people-driven growth planning puts more emphasis on the qualitative and bottom-up approach than on the quantitative and top-down approach in allocating regional growth into a grid cell. Visioning principles and growth strategies play more important role in determining the future growth of communities than the mathematical allocation model. Fourth and last, the performance measures of transportation and environment are used to evaluate strengths and weaknesses of the growth planning scenarios. The interactive evaluation process of diverse scenarios results in selecting or searching the most desirable and realistic land use and transportation scenario.

Key Words: Visioning, Forecasting, Scenario Planning, Small Area Modeling, Land Use, Transportation

I. Introductions

Traditionally land use and transportation have been dealt with separately by different levels of governments. Land use is regulated by local jurisdictions and land use regulation is understood as the police power of the local jurisdiction to protect the public health, safety and welfare of its residents (Curtin, Jr., 1993, p1.). A local jurisdiction does not change its future land use due to transportation implications. However, transportation is a regional issue, where local boundaries have no meaning. Regional transportation usually assumes local land use as a given. Using future land use information (e.g., population and employment projection), long range transportation needs by area and by travel mode are identified. Travel modes include air, bicycle, bus, rail, roads, pedestrian, and water. The long-range plans provide transportation solutions that cover 20 or more years. The solutions can range from new traffic signal systems to pedestrian pathways or new bus lines to completely new road projects. Different transportation alternatives are reviewed and selected after serious evaluation of alternatives.

The major issues regarding one directional process are that effects of transportation on future land use are not properly considered. Recent transportation planning practice emphasizes two-directional interaction of land use and transportation to develop the most effective use of land use and transportation. Of course, the limited availability and efficient use of financial sources for transportation was a major motive for coordinating land use and transportation. In summary, future land use could be adapted to make effective use of the available transportation resources. Future growth could be redirected to areas where transportation infrastructure is available. These transportation solutions must be able to keep the air quality of a state or region safe for all people in the community. Air emissions should not exceed the maximum amount of pollution set by The Environmental Protection Agency (EPA). Land use and growth distribution is an important factor in determining the future air quality level. As a result of conformity analysis, the future land use may need to be adjusted.

The growing challenge of meeting future transportation needs, combined with limited new infrastructure resources, means that the metropolitan region must find more creative solutions to ensure mobility in the future. Southern California Association of Governments (SCAG), a Metropolitan Planning Organization (MPO), has learned through the completion of the 2001 Regional Transportation Plan (RTP)[i] that growth and development patterns have a dramatic effect on the performance of the transportation system. In particular, the distributions of people, housing units, and jobs have an effect on transportation in the following two ways: mode split and trip length. First, people living near the rail or the bus station tend to take transit. In addition, people living in the mixed-use development area tend to use bicycles and take a walk for commuting or personal trips. Second, people located near employment, amenities, or services tend to make shorter trips. The regional consensus was to take advantage of these potential benefits related to urban form and development patterns. The regional movement toward more coordination of urban use and transportation was due to two federal legislations: Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 and Clean Air Act Amendments (CAAA) of 1990. A key planning requirement is to integrate land use, transportation, and environment. ISTEA, among other things, requires that transportation plans include applicable land use strategies that assist in relieving congestion and reducing air pollution, and a discussion of the consistency of long-range transportation strategies and land use policies. An example of land use strategy is the planning of community and commercial design which encourages pedestrian, transit and bicycle uses. This can be accompanied through local zoning, which encourages mixed-use development, increased densities especially near transit stations, park-and-ride lots, and improved jobs-housing balance.

The main purpose of the paper is to identify the role of visioning in the regional planning process, and to assess its impact on the existing growth planning approaches. First, the paper overviews concepts, methods, and tools of visioning and other major growth planning modes (forecasting, scenario planning, and small area modeling) in the growth planning process. The paper also discusses the relationship among those growth planning modes. Second, the paper assesses the overall impacts of visioning on the existing growth planning practices during the development process of the 2004 RTP[ii] in Southern California. The impacts include the growth planning approach, growth allocation methods and models, scenario evaluations, and geographical unit of analysis.

II. Visioning

In the early days of planning, 'grand' visions were created by a limited number of actors-usually urban planners or designers-, including Ebenezer Howard, Le Corbusier, Frederick Law Olmstead, etc. Their idealized futures and grand visions were guideposts for current actions, and the road map that planners used to navigate the present (Wachs, 2001). After the World War II, the planners, as ordinary bureaucrats (Krumholz, 1983), did not think about the future in visionary terms. Why? Wachs provides the following reasons. First, planning has evolved from concentrating on end states to focusing processes. Second, the modern planners focus more on analytical thinking by applied scientists and engineers. The future is no longer envisioned, but rather is forecast using elaborate databases, mathematical models, and algorithms. The visions are now back to the planning field to present the alternative futures (Grant, 2007; SCAG, 2001), and to reflect new urbanism smart growth principles and thinking (Myers, 2001). They are highly normative (Harvey and Deakin, 1993). Plans often include vision statements in text and some include graphic depictions of spatial patterns or three-dimensional forms as visions (Hopkins and Zapata, 2007). The newly revived visions are now re-defined as “an optimistic picture of what might be achieved within a municipality or region, given available capacities and resources” (Myers and Kituse, 2000), “what community participants see as most desirable in the future” (Grant, 2007), “particular goals usually generated through a participatory process with the public” (Neilson and Stouffer, 2005). The most well known visions are coming from the smart growth movement. They include restoring community and vitality to center cities and older suburbs, promoting more town-centered development, encouraging transit and pedestrian oriented development, supporting a greater mix of housing, commercial and retail uses, and preserving open space and many other environmental amenities.

As a process of developing the most desirable vision, visioning has now become a frequent, up-front, stand-alone exercise in planning efforts (Avin, 2007) and a popular planning element across North America and Europe since early 1990s (Hopkins and Zapata, 2007; Grant; 2007; Shipley, 2002; Helling, 1998; Shipley and Newkirk, 1998). Visioning gains widespread attention as a method of stimulating rethinking about how the future might be shaped in neighborhoods, communities and regions (SCAG, 2001). Visioning is closely related to goal setting (Berke et al, 200, 2006; Ames, 1998; Meck, 2002), is the most participatory (Grant, 2007), and provides a framework for identifying community concerns, developing and prioritizing actions, and measuring results (Myers and Kitsuse, 2000).

Visioning is eventually used with citizen participants to identify preferred types of development and patterns of growth (Berke et al, 2006). A visioning process involves gathering a broad range of participants and stakeholders to gradually form a consensus vision for the region (Barbour and Teitz, 2006). This includes administering a region-wide citizen survey, developing and refining a series of principles to guide the vision and the process. Although visioning is widely used in the recent planning practices, the comprehensive research on evaluating visioning is yet limited (Helling, 1998) and the assessment of the experiences is rather anecdotal (SCAG, 2001). Visioning has directly or indirectly influenced the traditional growth planning practice mainly comprised of forecasting, scenario planning, and small area modeling.

III. Forecasting, Scenario Planning, and Small Area Modeling

1. Forecasting

While visions tend to reflect the “most desirable” future state, forecasting predict the “most likely” future state. Sometimes a vision and a forecast can be a same future if the future is deemed as the most desirable, through collaborative visioning, and as the most likely, through expert analysis by forecasting (Harris, 1960; Isserman, 1984; Hopkins and Zapata, 2007). Forecasting relies on some analytical tools (models) to predict urban or regional future (population, economy). There are a few well-known forecasting models. These forecasting models focus on the size and composition of population or economy, usually covering a large area (metropolitan or county). They are briefly discussed below.

Forecasting models of local populations can be better understood by dividing into four categories: simple extrapolation, complex extrapolation, cohort-component, and structural models (Smith et al, 2001). Simple extrapolation methods have simple mathematic structures and require data from only two points in time. They are easy to apply and are useful for the small area projection, but they are not useful as analytical tool and hard to develop detailed demographic characteristics. Complex extrapolation methods have more complex mathematical structures and require data from a number of points in time. They also require an algorithm for estimating the model's parameters (e.g., intercept, slope). They are relatively more difficult to apply than simple extrapolation methods and are less useful for the small area projection than simple extrapolation methods. They are not useful as analytical tool and hard to develop detailed demographic characteristics. Cohort-component methods compute the projection of major components (birth, death, migration) of population change. One of major advantages of these methods is to develop population projections by the cohort and by detailed demographic characteristics (e.g., age, sex, and others). These methods are applied to the relatively large area, where the required demographic data are available. These methods are very useful for the analytical purpose. They are not easy to apply due to its large data requirements and its complex set of interrelationships.

The process-oriented collaborative approach toward developing the core demographic and socioeconomic assumptions naturally is important in developing the consensus assumptions of the future demographic rates and forecasts. Those involved in the demographic forecast process to build consensus include: a panel of forecasting experts, local workshops, stakeholders, data users and researchers, technical committees, policy committees, etc.

2. Scenario Planning

Myers and Kitsuse (2000) argue that the requirement for the effective visioning process is the availability of feasibility forecasts and grounding in action scenarios. Without strategies and action plans, the visions easily become wish lists for the future. Action scenarios tend to be more precise and analytical than visions (Berke et al, 2006). According to the Oxford English Dictionary, a scenario is a sketch, outline, or description of an imagined situation or sequence of events; esp. a) a synopsis of the development of a hypothetical future world war, and hence an outline of any possible sequence of future events; b) an outline of an intended course of action. A scenario is a set of reasonably plausible but structurally different futures (Avin and Dembner, 2001). Scenarios are not forecasts, and they are not predictions. They are possible futures that are based on what already exists, on trends that are evident, and on the values and preferences of a region and on decisions that might shape future outcomes (SCAG, 2004). The most popular scenario is focused on the spatial pattern or urban form (61% of total projects) (Bartholomew, 2005), which is related to ensuring sufficient amounts of land for future growth, promoting the balanced transportation systems, and avoiding sprawl, traffic congestion, air pollution, water pollution, and loss of open space. As part of the visioning approach, scenarios are mostly fed by input received from the combination of public workshops, surveys and stakeholder meetings. The essential requirement of any scenario is that it be plausible – within the realm of what exists and what is now known. Usually three or four scenarios are built as a way to compare outcomes and learn about the forces that are shaping the future.

Scenario planning is widely used in business and military settings and in the analyses of transportation alternatives (Bartholomew, 2005; Myers and Kitsuse, 2000). Scenario planning is a process in which professional planners and citizens work together to analyze and shape the long-term future of their communities (SCAG, 2004). Scenario planning is simply intended to generate different, plausible futures, not envisioning a desirable future or forecasting a likely future (Avin, 2007). Using a variety of tools and techniques, participants in scenario planning assess trends in key factors such as transportation, land use, demographics, health, economic development, environment, and more. Participants bring factors together in alternative future scenarios, each of these reflecting different trend assumptions and tradeoff preferences (Hopkins and Zapata, 2007). The preferred scenario eventually becomes the long-term policy framework for the community's growth and land use plan. Each of the scenarios represents a different snapshot of the future with its own attendant consequences. The scenarios will allow us to compare how different growth patterns are likely to shape or affect the future. Ultimately, a scenario can serve as a vision of the future, or elements of multiple scenarios can be combined to create a regional vision. In addition to selecting a vision, scenarios can be especially helpful in selecting the right strategies. For example, if a key investment performs well in multiple scenarios, it is said to be robust. If an investment works well in only one scenario, it is fragile. Clearly, where possible, strategies that are robust are more likely to succeed in an uncertain future (SCAG, 2004).

Scenario planning process objectively evaluates impacts from several alternative development patterns using quantifiable criteria. Scenario planning is more flexible and allows for more creativity than conventional planning, especially in creating solutions that are not initially obvious. For example, a trend growth scenario is compared with alternative growth scenarios, and a final growth plan is derived from the objective evaluation of each scenario. The popular alternative growth scenarios include Center, Cluster, or Satellite (25% of total scenarios) and Compact (19% of total scenarios) (Bartholomew, 2005). Scenario planning is so complex that geographic information system (GIS) based planning tools are required to undertake scenario planning exercises. GIS based planning support tools[iii] are a collection of technologies that enable planners and policy makers to visualize and evaluate alternative futures for their cities and regions, and to enhance the level of public participation in the planning process (Allen, 2001). These models provide various indicators of community impacts. These models generally require detailed parcel-level land use data. As a result, they are usually applied at a community level, e.g., for site or small-area planning. But increasingly, they are being applied to regional-level analysis. Since it can be difficult to develop detailed parcel-level land use projections at this level, the indicators are often based on the generic small-area "templates" used for developing forecasts (NTI, 2008). Typically these models need to be customized for a particular application/region – based on local data availability and the intended planning application(s) - rather than being usable directly off-the-shelf.

3. Small Area Modeling

A model is a representation of reality (Lee, 1973), and a schematic but precise description of the system, which appears to fit its past behavior and can be used to predict the future (Hall, 1992). The choice of a model depends on how to answer two questions that urban planner generally faces in the modeling process. The first question is what urban planner wants to model. Urban planner might select the cohort-component model to predict the size and composition of population of the region in the future. The model shows how demographic processes (births, deaths, and migration) of the region change over time. Urban planner also might select urban systems model to predict the spatial distribution of population of the region in the future. The model shows how population of the communities changes over time in relation to the location of employment activities. The second question is what kinds of model are available. The models could be descriptive or prescriptive or normative (Lee, 1973), simple or complex, deterministic or probabilistic, static or dynamic, spatially aggregated or spatially disaggregated, descriptive or predictive (Hall, 1992).

The urban systems model usually is composed of several submodels: regional forecast model, small area (land use) model, and other submodels (e.g., transportation model, emission model, etc). First, the regional forecast model is a set of economic and demographic forecasts for the region. This model is used to develop the control totals. Second, the small area model is designed to allocate the regional control totals into small area zones (e.g., transportation analysis zones). Third, the transportation and emission models are used to estimate transportation and emission impacts of small area growth.

The major focus of small area modelers in urban planning field is small area modeling, which is designed to model the spatial distribution of population and employment. The future spatial distribution of population and employment plays a key role in understanding the future regional transportation needs and determining the transportation investments. In fact, the computer models linking residential and nonresidential activities and the transportation system emerged in 1950s and have developed as urban systems models (Harris, 1965; Lowry, 1964). Although there was a period of reduced expectation of performance of such urban system models after Lee's paper (1973), the model development continued and major theoretical and practical advances occurred in the world (Wegener, 1994). In the U.S., the interest in urban systems model resurged since the early 1990s for a couple of reasons. First, two pieces of federal legislation (ISTEA (1991) and CAAA (1990)) mandated the long term transportation plans and related air quality analysis consider the long-term effects of interactions among land use patterns, residential and nonresidential activities, and the transportation systems (Smith et al, 2001). Second, the computer capability has improved a lot enough to process tremendous amount of data in a short time period. Also there have been further theoretical and practical advances in understanding urban growth and development. (Smith et al, 2001).

The small area model is different from visioning in terms that it is based on historical trends or the estimated relationship among variables. They usually rely on data and model specification, rather than community opinion and aspirations (Lemp et al, 2008). The small area growth allocation span the full range from qualitative, expert panel/negotiation approaches to sophisticated, complex quantitative models (Harvey and Deakin, 1993; Parsons Brinckerhoff Quade and Douglas, 1999; Science Applications International Corporation, 2000; Johnston and McCoy, 2006; NTI, 2008). Qualitative methods rely on the input of experts through what is known as a "Delphi" or expert panel approach or negotiation between the regional agency and local jurisdictions. Simplified quantitative models are usually custom-developed sets of equations calibrated with whatever current and historical data can be obtained. Some allocate growth based on factors such as transportation accessibility or proximity (e.g., distance from highway interchange or roadway), available land, and other measures of development suitability and attractiveness (e.g., UPLAN (Walker et al, 2008) and WhatIF? (Klosterman, 2001)). Complex quantitative models are typically regional-scale models that interface with travel demand model input and output (or may be integrated with a built-in travel model). As with simplified methods, accessibility and/or proximity are usually the basis for relating transportation and land use in integrated models. However, these models contain a range of other variables and relationships as well. Models such as DRAM-EMPAL (Putman, 1983) (developed into METROPILUS (Putman, 2001)) have been used in many metropolitan areas to develop baseline population and employment forecasts. These models incorporate basic relationships between transportation accessibility and growth patterns. They are not very policy-sensitive, however, and are rarely used in land use scenario analysis or policy planning (NTI, 2008). More sophisticated models, such as MEPLAN (Echenique et al, 1990), UrbanSim (Waddell, 2001), and PECAS (Hunt, 2003) include additional land use policy and market variables (e.g., amount of zoned land by use and intensity, land prices, sewer and water availability) and often contain economic underpinnings as well (e.g., economic input-output tables) rather than simple gravity models[iv]. These models are deemed as most advanced models and are rapidly introduced into the planning practice in the U.S. But they are relatively difficult and expensive to develop and apply. The costs for developing this kind of advanced model for a large planning agency are estimated between 2.5-4.5 million dollars for five-year period (Fehr & Peers, 2007). They also show weakness in terms that they are still limited in their policy sensitivity, they are not such accurate (Rodier, 2005), and they need a tremendous amount of data, and the reliable results are driven by the reliable time series data, which are almost impossible to acquire. Third, a transportation model and an emission model produce a variety of transportation and air quality performance measures, which are used to evaluate alternative scenarios. A travel modeling process is usually called the four-step modeling process, since it is composed of four steps: trip generation, trip distribution, mode choice, and network assignment. As a result of the modeling process, a travel demand model produces travel performance measures such as mobility, accessibility, etc. After the four-step model, a standard emissions model estimates the vehicle emissions by considering the emission factors for vehicle type and age (Johnston, 2004).

In summary, forecasts contain judgments about the likelihood of their assumptions and thus the likelihood of outcomes. Forecasts are the “most likely” normative outcomes (Isserman, 1984). A vision would be the “most desirable” image of the future. A scenario is not a specific forecast of the future, but a plausible description of what might happen. A scenario is not the most likely future. Small area modeling refers to the analytical process of allocating the regional controls. Small area model results tend to be challenged by local jurisdictions for several reasons (Porter, 1991). First, local jurisdictions tend to decide their futures individually. They may use the regional demographic and economic forecasts prepared by regional agencies, and reflect regional transportation plans based on these forecasts in their own plans. They often want to modify regional forecasts and plans to suit their own needs, if the forecasts suggest the need for unwanted policy changes.

Second, the regional allocations of demographic and employment forecasts to individual jurisdictions are based on the adopted plans of local jurisdictions. Third, the local officials undoubtedly peg their visions of land use futures on their sense of likely transportation improvements, thus creating a chicken-and-egg situation. Local plans seldom evolve from a zero base on a clean playing field. In summary, these problems are caught in a policy loop that protects the status quo.

IV. Visioning and Growth Planning in Southern California

The Southern California region in this study represents six counties (Imperial, Los Angeles, Orange, Riverside, San Bernardino and Ventura), 189 cities, 38,000 square miles, and nearly 19 million residents. Southern California is not only the nation's largest metropolitan region in terms of land area, it is also the most socially, culturally and economically diverse region in the world. Southern California's population is larger than many states, and if our region were its own country, it would have the world's 16th largest economy. Southern California's trade infrastructure is a global gateway that serves the rest of the nation. By the year 2030, the region will add another six million residents to total population in 2000. Southern California's size and diversity bring challenges that cross city and county borders. The transportation network does not easily keep up with ever-growing demand. Air pollution generated in one community can impact residents living in other community cross county borders. Land use decisions made in one city can also have traffic, environmental and economic impacts on other communities and the region as a whole. There is an increasing need for reinvestment and increased development near public transit, along corridors and in-town, mixed-use urban centers (SCAG, 2008). The visioning approach is one of regional planning efforts to make the Southern California region more mobile, livable, sustainable, and prosperous.

1. Traditional Approach

What would be a typical growth planning process without a visioning approach? A traditional approach would start with developing a baseline forecast, the most likely future in the absence of major regional policies, and ends with developing a preferred plan forecast, the most likely future in the presence of major regional policies (scenarios). The combined use of three major growth planning tools, such as forecasts, scenarios, and small area modeling, results in a preferred regional growth forecast. There is no officially adopted "most desirable" formula of allocating regional population and employment forecasts. The mathematical small area allocation process is combined with local input process to produce a preferred growth forecast.

The traditional regional growth plan would be developed using the following five steps (See table 1). The first step is to analyze recent regional growth trends and collect significant local plan updates. A variety of large area estimates and forecasts are collected from diverse sources including federal and state governments, and private vendors. Small area estimates are also available from census data, aerial land use data, general plan, property data from tax assessor's office, and building permit and demolition data. The second step is to develop or update the regional growth forecasts by using updated regional growth forecast methodology and key assumptions. The currently used forecasting methodologies include complex cohort-component methods, shift-share models, or structural models (Smith, 2001). The key technical assumptions to be updated include fertility rate, mortality rate, net immigration, domestic in-migration, domestic out-migration, labor force participation rates, double jobbing rates, and unemployment rates, etc. The major concern is the reasonableness of core assumptions underlying the regional growth forecasts. Although core assumptions are more important than forecast methods in developing accurate forecasts (Ascher, 1978), developing reasonable core assumptions is very difficult because of their uncertainty. For example, internal migration pattern of the past has been unstable over time due to business cycles. Trend extrapolation is oftentimes used to develop migration assumptions, but it might not be the best method. Migration assumptions might end up with the average of alternative assumptions derived by different methods or the most likely assumptions supported by a variety of reviews by a panel of experts, subregional/local jurisdictions, stakeholders/data users, technical committee, policy committee, and the regional council. The third step is to disaggregate regional economic and demographic forecasts to approximately 200 local jurisdictions using stochastic trend extrapolation model and accessibility-based model (SCAG, 2004). The local demographic and economic forecasts are further disaggregated to nearly 3,200 TAZs using small area allocation model (SCAG, 2003). These preliminary "baseline growth allocation" is finalized or adjusted through local input process. If there are newly proposed regional growth policies and strategies, which include economic growth initiative, goods movement strategy, smart growth strategies, etc., they might lead to development of "alternative growth scenarios", which reflect the different size or the spatial distribution of the regional population and employment. The fourth step is to assess the impacts of the baseline and alternative growth forecasts on transportation and environmental measures using transportation and emission models. The fifth and last step is to select and adopt a preferred regional growth forecast.

Table 1. Two Approaches toward Growth Planning: Traditional vs. Visioning

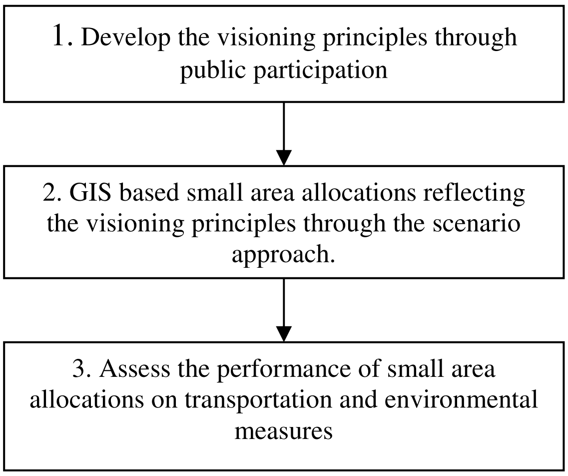
Step	Traditional Approach	Visioning Approach
Step 1	Analyze recent regional growth trends and collect significant local plan updates	Same as the traditional approach
Step 2	Develop or update regional baseline growth forecasts with updated methodology, assumptions, and policy scenarios	Same as the traditional approach
Step 3	Develop small area (TAZ) allocations using quantitative/top-down modeling approach and local input with growth scenarios.	Develop GIS based small area (5.5 acre Grid Cell) allocations using qualitative/bottom-up modeling approach and local input with growth scenarios.
Step 4	Assess the impacts of the small area allocations on transportation and environmental measures	Same as the traditional approach
Step 5	Select and adopt a preferred growth forecast	Same as the traditional approach

2. Visioning Approach

Beginning in 2000, SCAG initiated one of the first large-scale regional growth visioning efforts in the nation. Through its Compass Blueprint Growth Vision, SCAG sought to integrate land use and transportation through a consensus based regional plan (see Choi and Choi (2007), and Sohn (2007) for more detailed description of the visioning process in Southern California). Since the visioning approach is directly related with the third step of the traditional regional forecast development process described above, it has directly affected how the regional growth be disaggregated into small areas (See table 1).

Figure 1 presents three major elements of the visioning approach. The first element of the visioning approach is to develop the visioning principles though public participation. Widespread public participation is the cornerstone of the visioning process, with many stakeholders taking part in dozens of workshops, focus groups and polls region-wide. Using the extensive input from these efforts, in conjunction with capacity, economic and redevelopment analyses, technical modeling analysis and expert and peer review, SCAG established regional consensus toward the growth vision. The visioning principles are used as a guide to allocate the regional growth during the planning horizon. Four major visioning principles are identified through public participation. They include improving mobility for all residents, fostering livability in all communities, enabling prosperity for all people, and promoting sustainability for future generations. Decisions regarding residential and employment growth, transportation, and land use should support and be guided by these principles. Specific policy and planning strategies are also identified to achieve each of the principles. The visioning principles are developed and adopted by SCAG reflecting the perspectives of residents. The growth vision provides a policy-based growth alternative, encouraging future population and economic growth in strategic opportunity areas throughout the region. Specifically, the plan calls for mixed use and transit-oriented development, a range of housing and transportation options, jobs-housing balance and more walkable communities in existing and planned centers and along transportation corridors. Using these growth strategies, anticipated growth is expected to be accommodated through modest changes to just 2% of the region. The policies at the foundation of the policy-based alternative encourage changes to the urban form that improve accessibility to transit, and create more compact development, thereby yielding a number of transportation benefits to the region. These included reductions in travel time, vehicle miles traveled, vehicle hours traveled, and vehicle hours of delay. Concurrently, the policy-based alternative yielded increased transit use and mode share. All of these effects lead to tangible air quality improvements.

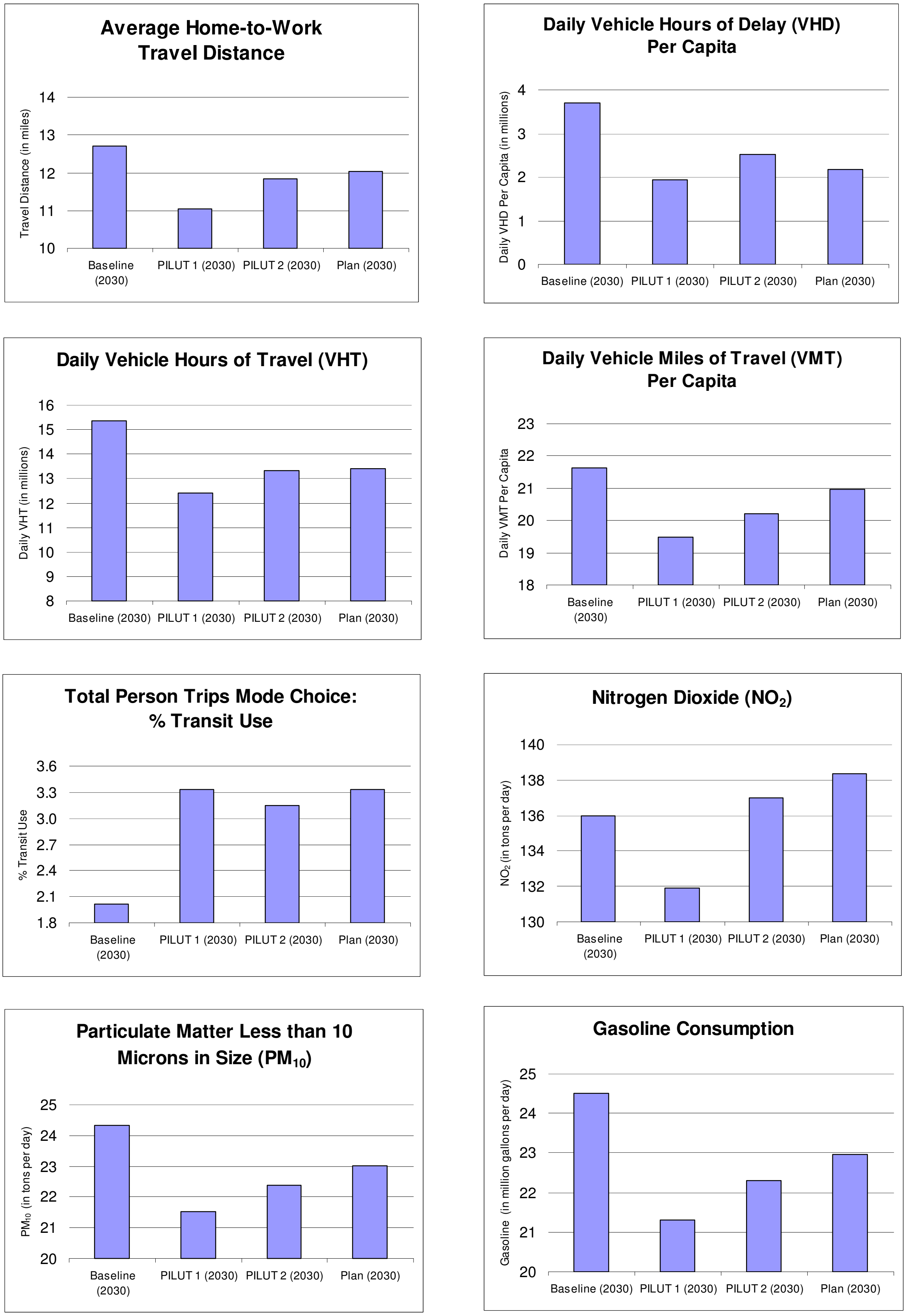
Figure 1. Three Major Elements of the Visioning Approach



The second element of the visioning approach is to implement GIS based small area allocations reflecting visioning principles through the scenario approach. First, the scenario approach is used to develop the most desirable growth pattern at a large scale. The plan growth scenario is evolved from evaluation of two book-end scenarios. Plan for Integrated Land Use and Transportation (PILUT) 1 is often referred to as the 'Infill' scenario. It is based on an intense growth of the existing urban area in the coastal counties (e.g., Los Angeles and Orange). PILUT 2 is often referred to as the 'Fifth Ring' scenario. It is based on an extensive sprawl of future growth in the region. Redevelopment and infill will continue to play an important role in the development of new housing, likely continuing at roughly the same pace as it is today. Plan Scenario is referred to as a hybrid of PILUT1 and PILUT2, employing integrated land use-transportation perspective, results in significantly better performances than the conventionally created scenarios. Both scenarios are plausible in the long term, but not in the short term. To be a realistic scenario, both PILUT 1 and PILUT 2 required significant revisions. The Plan Scenario is based on a combination of what was learned from the model runs, and is a realistic scenario in both the short and long-term. Second, small area allocations are implemented, with four visioning principles in mind, using the GIS based scenario development tool, PLACE^{3}S (later upgraded to EnvisionTomorrow). PLACE^{3}S is a GIS ArcView3.2 extension that allows users to create and analyze growth scenarios. PLACE^{3}S locates different development types on vacant and developed land while limiting development in environmentally constrained areas. The geographic representation of development types for each scenario is the foundation for calculating benchmarks. The benchmarks are then used to evaluate the viability of each growth scenario. The series of development types for PLACE^{3}S are created from a set of building types that represent residential, employment and mixed-use alternatives. Each building type has an associated household and job density. The households and jobs per acre for each building type is multiplied by the percentage each building type represents within the development type to determine the households and jobs per acre for each development type. PLACE^{3}S seamlessly integrates with Excel to provide near-instant analysis of scenario decisions. The process and software are scalable, so scenarios can be created for large regions to downtowns. PLACE^{3}S is used to allocate the regional growth to a grid cell (5.5 acre) under different scenarios, based on input from workshops with the communities and stakeholders. The size of the grid cell is generally much smaller than that of TAZ. The small size of the grid cell allows local planners and the general public to easily participate in the scenario development process. PLACE^{3}S provides immediate feedback on their choices in public workshops. In summary, visioning principles and growth strategies are somewhat subjective and hard to quantify, but the expected household and employment growth for each 5.5 acre grid cell is identified by applying a development types-building types-household/job density conversion table through iterative communication between regional planners and local planners.

The third element of the visioning approach is to measure the performance of the different small area allocations in terms of transportation efficiency and air quality improvement. The performance measures are actively used to analyze and assess a range of land use/transportation scenarios, including growth strategies that will help shape the future urban form of Southern California. For Los Angeles, the only metropolitan area in the extreme non-attainment class for ozone, evaluation and selection of cost-effective strategies for reaching attainment should dominate the planning process. The selected performance measures include mobility (VMT, Speed, Delay), accessibility, air quality (CO, ROG, NO_X), and gasoline consumption. The scenarios developed by SCAG encouraged decision makers to focus on what results will be required from specific strategies, including significant growth in transit, reduced trips through telecommuting, and an improved jobs-housing balance to meet extremely demanding air quality and other objectives. Figure 2 shows selected major performance measures (e.g., average home-to-work travel distance, vehicle hours of delay, vehicle hours of travel, vehicle miles of travel, percentage of transit use, NO_X, PM_{10}, and gasoline consumption) for four land use/transportation scenarios for year 2030. PILUT1, which emphasizes the infill process of the existing urban areas and promoting more housing and employment growth in the current activity centers and corridors, shows a better performance than PILUT2. Although PILUT2 shows a worse performance than PILUT1, it can not be ignored because it well reflects the ongoing sprawl pattern influenced by the regional demographic, economic and housing dynamics. The Plan Scenario is derived by combining what was learned from the diverse performance results of those growth scenarios and incorporate smaller, pragmatic changes in building the plan growth scenario. Then tailored transportation projects are selected for the plan scenario for the plan. The feedback from transportation to land use can be repeated to find the most acceptable relationship between transportation and growth. It is not known how much iteration would be ideal. It is usually subject to the time lines of the plan process. It becomes very important to create a “realistic” scenario as a plan forecast.

Figure 2. Performance Measures



Source: Authors' preparation using travel demand model summaries by the modeling division staff of SCAG.

V. Conclusions

The American planning system has evolved within a decentralized and fragmented political framework. The Federal government has played a decisive role in developing a metropolitan plan in the nation through federal regulation and finance. The Federal government has made a continuous effort to guide the growth of the metropolitan areas by providing more detailed planning guidelines. Since ISTEA (1991) and CAAA (1990), land use and transportation policies and plans, which were dealt with separately by different levels of governments, are suggested to be integrated during the planning process. Local land uses are not assumed as a given during the regional transportation planning process. The limited availability and efficient use of financial sources for transportation investment was a major motive for coordinating land use and transportation.

The visioning process, which is newly introduced in the regional planning process, has affected the existing growth planning process. It directly influenced the way of modeling the small area growth, while it has no or little effect on the way of forecasting the large area growth. The scenario approach was actively used as a significant way to identify alternative growth patterns. Four major findings of the growth planning process from the recent visioning approach in Southern California are as follows: First, growth planning is deemed as a participatory and interactive process in a collaborative framework. The active and meaningful public participation is warranted. Second, growth planning relies on a very small geographical scale for better interactive communication. Land use and transportation scenarios are developed at the grid cell level. Third, people-driven growth planning puts more emphasis on the qualitative and bottom-up approach than on the quantitative and top-down approach in allocating regional growth into a grid cell. Visioning principles and growth strategies play more important role in determining the future growth of communities than the mathematical allocation model. Fourth and last, the performance measures of transportation and environment are used to evaluate strengths and weaknesses of the growth planning scenarios. The interactive evaluation process of diverse scenarios results in selecting or searching the most desirable and realistic land use and transportation scenario.

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[i] The regional Transportation Plan (RTP), prepared by the designated Metropolitan Planning Organization (MPO), comprises policies, programs, and specific projects to meet long-range transportation needs. The RTP is

updated every three or four years and must reflect funding constraints and air quality regulations (DKS Associates et al, 2007). The 2001 RTP for the SCAG region was adopted by the Regional Council on April 2001.

[ii] The 2004 RTP for the SCAG region was adopted by the Regional Council on April 2004.

[iii] GIS based decision support tools include PLACE^{3}S (http://www.energy.ca.gov/places/), CommunityViz (http://www.placeways.com/), INDEX (Allen, 2001. http://www.crit.com/), EPA Smart Growth Index (http://www.epa.gov/smartgrowth/topics/sg_index.htm), GB-Quest (Carmichael, 2004), Smart Places (Croteau et al, 1997), • CorPlan (http://www.citiesthatwork.com/), MetroQuest (http://www.envisiontools.com/), What-If?(Klosterman, 2001).

[iv] Other selected complex land use models include POLIS (Prastacos, 1986a, b), TOPAZ (Brotchie et al, 1980), CUF (Landis, 2001), CUFII (Landis, 2001), DELTA (Simmonds, 2001), TRANUS (de la Barra et al, 2001), METROSIM (Anas, 1994).